P R O T E C T I O N  O F  A U T H O R ’ S  C O P Y R I G H T

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Pastoralism and the Transformation of the Rangelands of the
South Island of New Zealand, 1841 to 1912.

Mt Peel Station, a case study

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ABSTRACT

The transformation of the rangelands of the South Island of New Zealand during the pastoral era fits into the wider international context of European expansion into the 'new' world. European settlers displaced native peoples, introduced 'old' world animals and plants, and imposed a capitalist system that converted local resources into international commodities. In New Zealand the orthodox explanation of the pastoral impact on the rangelands claims that pastoralists introduced an unsustainable system of land use to the region. The pastoralists' indiscriminate burning practices and overstocking with sheep opened up the country to invasion by rabbits. Burning and overgrazing by sheep and rabbits stripped the natural fertility of the soils and left the country depleted, eroded, and overwhelmed by pests and weeds.

This thesis sets out to test those claims. It explores burning, the stocking of the rangelands with sheep and the impact of rabbits in detail. It also examines other land management practices, as well as sheep breeding, to see what impact they had on the landscape. The timeframe is set between 1841, when formal British settlement was established in the South Island, and 1912, by which time most of the great estates and stations had been broken up into smaller runs and farms.

The thesis uses station diaries, memoirs, contemporary newspapers and farming journals to assess what happened on the ground during the pastoral era. In particular, the thesis uses Mt Peel Station as a case study to examine the intensification in land use that took place between 1841 and 1912, in order to explain the transformation of the landscape and to answer the questions: what happened, how did it happen and why did it happen as it did?

These sources illustrate that the pastoral era was characterised by innovation. Pastoralists had access to technical and scientific information from around the world. Some conducted their own experiments to improve the productivity of the land and their stock. There was also a learning process
involved in adapting their methods to fit the local rangeland environments. They were not simply rapacious capitalists out to strip the wealth from the land for their own personal gain; indeed, many pastoralists set out to establish viable and sustainable enterprises.

The thesis argues that the rangelands consisted of a variety of landscapes and climates. Differences in resource endowments had a considerable influence in shaping the environmental outcomes on different stations. Aridity and rabbits were two key factors in the depletion of the vegetation and the degradation of the landscape in the rangelands. Runs in semi-arid districts that were overwhelmed by rabbits suffered long-term damage. In districts where rainfall was more reliable stations that had been overrun by rabbits recovered remarkably quickly. Stations like Mt Peel, that were largely unaffected by the first rabbit plague, were able to maintain and even increase their productivity up to the time they were subdivided. The orthodox analysis of the transformation of the rangelands in the pastoral era does not account for these differences in outcomes.
I owe many people an enormous debt of gratitude for the help and support they have given me while I have been working on this thesis. I have been extremely fortunate to have had two enthusiastic and supportive supervisors for this project. Professor Tom Brooking's wealth of knowledge of New Zealand's agricultural past and his thorough understanding of the international literature on environmental history have been invaluable in guiding me along the way. Graeme Dunstall of the History Department, University of Canterbury, co-supervised this thesis. Graeme has an uncanny ability to get to the nub of problems and to ask questions that I had never thought of. Thank you both.

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CHAPTER ONE
INTRODUCTION

The spread of pastoralism onto the rangelands of the South Island of New Zealand after 1841 led to profound changes in the landscape of the region. The introduction of sheep from the Australian colonies and sheep farming practices from Britain resulted in the reduction of the biomass, the reduction in diversity of plant species, and the replacement of native plants by introduced species. It has also been claimed that the introduction of pastoralism resulted in soil erosion and mass movement on a large scale. Three key agents have been identified as the causal factors responsible for these changes in the rangeland environment: indiscriminate burning, overstocking with sheep, and the rabbit plague that began in the mid-1870s. This thesis sets out to examine the impact of each of these factors as well as considering that of other sheep farming practices in the context of the transformation of the open country of the South Island.

There was nothing exceptional about the spread of pastoralism in New Zealand in the second half of the nineteenth century. Similar processes were happening concurrently in Canada, USA, South America, and Australia. If anything made the process in New Zealand distinctive it was the country’s geological and biological history. Isolated from any major landmass for eighty-five million years the vegetation developed without the impact of grazing by mammals. Grasses, forbs and shrubs had been subject to browsing by ground dwelling birds, but were not adapted to the seasonal grazing pressure to which grasslands were subjected elsewhere in the world. It was inevitable that the introduction of millions of sheep into what has been called this ‘naïve’ land would have dramatic consequences for the suite of plants that made up the rangelands at the time of European settlement.¹

The orthodox story of this process is largely negative: the pastoralists misread their environment and tried to subjugate nature until nature could take no more. The reality of course was much more subtle: the pastoralists did try to impose a system of land use that reshaped the environment of the tussock grasslands, but that environment also shaped the pastoralists’ outlook, their methods and their livestock. In a process of trial and error the pastoralists had to learn to read the climatic and biological cues of their natural surroundings and to respond to them. Of course, some learned quickly, and some not at all, and it is a process that continues today.

Changing land use during the pastoral era, 1841 to 1912

Pastoralism was not a static, monolithic system; on the contrary, it went through a series of distinct but overlapping phases and each one helped to change and shape the rangeland environment. The first stage saw the rapid spatial expansion of sheep ranching until 1865 when all the country suited to running sheep, as well as some entirely unsuitable country, had been taken up. L.G.D. Acland called this process ‘a great scramble for runs’.2 During this time conditions and methods were simple; the objective was to find country, claim it, burn it and stock it, and to keep a close watch on those precious assets, the sheep. A common myth in New Zealand’s history is that pastoralism in the early years required little capital. Sheep prices stayed high throughout this initial phase, ranging to thirty shillings a head and more in the early 1860s, so it took money to stock a run, even if the annual rental cost for the grazing country was low.3

The second phase involved the consolidation of the holding. Initially, the runholder and his men lived in tents or rough whares, and handled the sheep only at shearing time, and that was done outside on tarpaulins.4 Once money was available permanent housing was built, a shearing shed erected,

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3 Lyttelton Times, 25 March 1863, p.4.
4 Whare is the Maori word for house or building and was adopted by early settlers to describe the rough huts that they initially erected for their accommodation.
yards put up for handling the sheep, and often a dip was put in. These improvements helped to enhance the sorting of the wool, the sorting of sheep, and assisted in the control of scab, but otherwise the daily and seasonal management of the flock remained dependant on boundary keepers to hold the sheep onto their allocated blocks.

As their wealth increased many pastoralists embarked on large scale development programmes. In some cases the development improved the management and feeding of their sheep - and thereby increased their productivity - through fencing, drainage and broadcast sowing of ‘English’ grasses; in other cases, particularly on the plains and easy downlands, it involved large scale cultivation to produce grain for export to Britain. Some of the improvements must have taken prodigious effort considering the contemporary technology: Duncan Cameron had put in forty miles of water races on his Springfield run by 1880; John Grigg began draining 30,000 acres at Longbeach in 1867, and later built his own factory to supply tiles for the job; Charles Tripp had thirty miles of wire fencing erected on his hill country at Orari Gorge before 1871 and in the next three years erected another thirty miles.5

Twenty-five years of declining wool prices, the disappearance of any market for surplus stock, and the rabbit plague ushered in a phase of depression and stagnation on many pastoral properties from the mid-1870s. Wool prices began their long decline at the end of the American Civil War, picked up briefly during the Franco Prussian War, before continuing to fall until reaching a historic low around 1900. By the late 1860s the runs were stocked up and sheep prices fell so dramatically that through the 1870s the only outlet for surplus sheep was to render them into tallow. Since Merinos

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off run country were rarely fat enough to make this profitable many were kept until they died, although it has been reported that at The Levels the old sheep were killed and their carcases thrown into the sea simply to lighten the stocking load. At the very time that the returns from pastoralism went into decline the rabbit plague began in Marlborough and Southland and spread through most of the tussock grasslands by the end of the century, with only central Canterbury remaining relatively free of the pest.

The introduction of refrigerated shipping in 1882 promised to be the saviour for runholders and farmers alike; however, it was not until the mid to late-1890s that the benefits really started to be seen in consistent sheep prices and sheep farming started to become profitable again. By this stage the pastoral era had entered its final phase. Extensive pastoralism, with large areas of land concentrated in the hands of a few hundred runholders had been an anathema for many since the beginning of organised settlement in New Zealand. The policy of the Liberal Government, elected in 1890, was to ‘burst up’ the large holdings to settle the ‘small man’. This began under the Minister of Lands, John McKenzie, with the purchase of the Cheviot Hills estate in 1893 and continued until 1916 when the last great run, Benmore Station, was subdivided. Many estate owners also realised that a considerable profit could be made in subdividing and selling off land, and undertook the process on their own account, so that the break up of the great runs was driven by a profit motive as well as being a social crusade.

These phases were integral in a process of on-going intensification in land use in the pastoral era, 1841 to 1912. However, it must be emphasised that not all stations went through these phases. Some never progressed beyond the stage of stocking the run and made do with limited investment in fencing and cultivation. These differences can be accounted for, in general,
by differences in the natural resources of the runs. The harsher environment of the mountain stations and those in the semi-arid zones made any investment more risky than for stations on easier country.

Geographer Garth Cant has neatly classified the timeframe of the pastoral era into the wool boom, the wheat boom and the land boom, emphasising the sequence of the main sources of income for large landowners on the plains and downlands through the period.9 Kevin O’Connor, an agricultural scientist and specialist on New Zealand’s high country environment, developed a schema that divided the pastoral era into two: an initial period of what he called ‘exploitative pastoralism’, followed by the development of pastoral farming. He argued that exploitative pastoralism, which ‘makes use of existing plant resources with virtually no application of energy to augment, maintain or replace those plant resources’, lasted until about 1880 in lowland areas, and earlier on lighter country, but persisted long after in the high country.10 According to O’Connor, pastoral farming, which ‘involved farming the land, management of the soil and deliberate enhancement of the food supply of livestock, … and control over animal utilisation of pasturage’, developed out of necessity as exploitative pastoralism ‘ecologically failed very widely on the lowlands’.11 Essentially O’Connor’s thesis posited that pastoralists exploited the existing resources of the rangelands and this exploitation soon became unsustainable. Within twenty years the grassland became depleted and, he argued, it was this depletion and ‘not just lagging wool prices or the pull of wheat markets and refrigerated trade’ that forced the hand of estate owners into reconstructing their grassland environment.12

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9 Garth Cant, personal comment, Christchurch, April 2001.
12 O’Connor, “Changing Diversity,” 76.
Historical geographers Holland's and Hargreaves' study of The Point Station described a management system that provided a marked contrast to O'Connor's analysis. They found that from the time the Phillips family took up the station they began a programme of progressive improvement that involved careful tussock burning, cultivation to sow pastures and crops to provide superior feed for stock, fencing to manage feed and stock better, and shelter to protect the land and stock from the prevailing winds. The Phillips family did not develop in response to the ecological deterioration of their run, but followed the ideal of improvement that permeated contemporary Victorian society and underpinned colonisation in New Zealand. O'Connor and Holland and Hargreaves propose contrasting models of land use that will be explored through this thesis.

The timeframe and parameters of the thesis

The timeframe 1841 to 1912 was, in essence, the great pastoral era in the rangelands of the South Island. In 1841 organised British settlement began in the South Island with the establishment of the New Zealand Company's colony at Nelson and soon after sheep were imported from New South Wales. Further south, in 1843, the Deans brothers introduced sheep onto the Canterbury Plains, while in the Otago region entrepreneurs, whose capital had been derived initially from whaling, built up sheep flocks in several places. From these beginnings pastoralism soon expanded to become the dominant industry in New Zealand, except for a decade beginning in the early 1860s when gold earned more revenue for the country than wool.

The years 1841 to 1912 cover the period of the first generation of pastoralists; by the end of that time most of the men who had taken up the original runs had died. It was during their time of occupation that pastoralism in New Zealand took shape, and it was in their time that the processes that reshaped that open country east of the main divide began. Critics of

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exploitative pastoralism blame this first generation of pastoralists for setting in motion the forces that have led to the depletion of the tussock grasslands and the desertification of the semi arid parts of Central Otago, the Upper Waitaki, and the Mackenzie Country. This thesis proposes to test those claims.

The thesis finishes in the year 1912 because that was when the case study station, Mt Peel, was subdivided by the Crown. Extensive pastoralism continued after the subdivision of the great runs of the nineteenth century, but their partitioning into smaller blocks led to changes in land management. For example, in 1912 the Land Board split Mt Peel into seven separate properties. Inevitably, the different backgrounds, financial strength, experience and expectations of the different owners led to the land being run in a different way than it had under a single management structure. It has already been noted that the subdivision of the runs took place over twenty-six years and Mt Peel was far from the last run to be broken up. However, the process of ‘bursting up’ the runs was well through its course by 1912, so it is an appropriate endpoint for an analysis of the pastoral era.

The use of a case study as a tool to explore sheep ranching and the transformation of the rangelands has been adopted in an attempt to overcome a fundamental weakness in the way histories of pastoralism in New Zealand have been written. Critics of the role of the pastoralists have tended to argue by example: they have generalised the behaviour and practices of runholders from fragmentary evidence picked up from various runs, or even a single run, where it suited their thesis. An example of this sort of analysis has been the misuse of Lady Barker’s writing on burning. In her book *Station Life in New Zealand* she described in detail the ‘exceeding joy’ that she derived from going out to burn tussock country. A host of writers have subsequently drawn on this account to suggest that her behaviour typified the use of fire as a land management tool on pastoral properties. In fact, it did not. But from this thin evidence such eminent historians as Pyne and Belich

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concluded that burning by runholders 'went beyond necessity', and that some became 'addicted to arson'. Using a case study allows us to examine the use of tussock burning on a single property over an extended time, thereby illuminating the way fire was used in practice.

A case study can provide a detailed understanding of a run and the way it was managed. It can present a snapshot in time to illustrate what was happening on a run at a particular stage in the process of intensification of land management. It can also demonstrate what changes took place over time and, in the context of this thesis, it can illustrate how those changes effected vegetation and landscape change. A case study is a tool that can help to overcome a problem found in many explanations of pastoralism: too many generalisations have been drawn from random examples of behaviour or practice and, therefore, have been based on limited evidence or conclusions drawn out of context.

The limitation of a case study is the problem of typicality; what happened on one property may not be typical of what happened on other runs. There were, of course, elements that were typical of all the pastoral properties that concern this thesis: they were all in the South Island; they all ran sheep as their major enterprise; they were all subject to capricious climatic cycles and to erratic wool prices; and they were owned and run by people whose origin was overwhelmingly British. Despite considerable diversity in the landscapes and climatic zones that made up the rangelands, pastoralism, it has been argued, was a 'single, relatively uniform way of land occupation and settlement [that] became the dominant force for changing open country'. Thus pastoral properties, especially in the early phases, differed by degree rather than kind.

Some attempts have been made to group pastoral properties into categories that can explain production patterns. J.G. Hughes, who wrote on high country issues, grouped 300 high country runs into seven categories based on land district and rainfall. Bussières, a student of O'Connor's, proposed a much more rigorous classification schema for high country runs in 1984. She divided the high country into three geographical zones, within which she grouped runs into categories according to their landforms and soils. Bussières acknowledged that 'real world' pastoral runs are extremely variable in nature because of differences in management and what she called 'micro environment'. Both Hughes and Bussières were dealing with modern high country properties; this thesis is concerned with much larger pastoral properties that took in all the open country of the South Island and thereby making the problem of classification and generalisation even more problematic.

In many ways every run had its own distinctive characteristics and not only for its physical qualities of altitude, aspect, climate, soil type, vegetation cover, and ease of access or isolation, but also for the qualities of the runholder: their experience, financial resources, farming knowledge, motivation, timing and luck. Not only were there 'good' runs and 'bad' runs, but a good operator could do well on a 'bad' run, while a poor operator could fail on a 'good' run. Consequently, the use of the example of Mt Peel in this thesis is not to represent a typical pastoral run, but to explore the development of sheep farming practice over time on a single property and to assess how those practices and changes affected the vegetation of that run. In this way the broad generalisations that have been made by numerous writers about the impact of pastoralism in the nineteenth century can be tested against a known case.

Mt Peel has been chosen as the case study property because it is one of the few stations that can provide a reasonably full record from the time it was

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taken up to the time of subdivision. It also has the advantage for this study in that once it reached its full extent in 1861 the station retained the same land area, whereas it was not uncommon for other stations to sell off run blocks or to add them. The continuity of ownership of the station was also an advantage. During fifty-six years between 1856 and 1912 Mt Peel had three owners: John Barton Acland in partnership with Charles George Tripp from 1856 to 1861; Acland from that time until he died in 1904; and the family trust. In that time the station had just five managers. There are other stations that can claim such a record of continuity, but not many.

‘Rangelands’ and ‘Ranching’

An explanation relating to the use of the term ‘rangelands’ in the thesis is necessary as it is not normally used in New Zealand to describe the open country, that is, the country not covered in bush. For a time commentators debated whether the grasslands should be called a steppe because contemporary botanists thought they were the climax vegetation of the region. However, as early as 1868 Dr Munro observed that the grasslands and shrub lands had occurred as a secondary growth after ‘the destruction of the primitive forest’ by fire.

Biologist Leonard Cockayne used the term ‘tussock grassland’ as an alternative to ‘tussock steppe’ in 1919, and although it took some time for it to become established, it has gradually become the customary expression for the open country of the South Island. However, in the context of this thesis, this description is too limited. The open lands of the South Island at the time of the first phase of pastoral expansion were not simply tussock grassland. In

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20 See MAP: 2.2. Chapter Two, Map of Mt Peel 1861 to 1912, p. 81.
21 Bush is an Australian and New Zealand expression for the natural forest cover. The word ‘forest’ is often used in New Zealand for large scale plantings of exotic pines, for example the Kaingaroa Forest; but the indigenous forest is colloquially known as ‘the bush’.
fact, in many places, as Munro has stated, it was a shrub-land where woody species were in the process of recolonising the country. Pastoralists created the tussock grasslands when they set out to turn the mosaic of shrubs, tussocks, herbs and forbs into pasturage for their sheep. The term rangelands, defined as ‘a type of land on which the natural vegetation is dominated by grasses, forbs and shrubs’, is a better fit for the country that became the domain of the great sheep runs and so it has been adopted as a generic term for this thesis.

Another term used frequently through this thesis, but one that is rarely used in the context of extensive sheep farming in New Zealand, is ‘sheep ranching’. Like the term ‘rangeland’, which is used to avoid confusion with the term tussock grasslands, ranching is used here to avoid confusion with the term pastoral farming. O’Connor, as already noted, argued that pastoralism and pastoral farming are distinctly different approaches to running sheep on open country, the former using no inputs. Ranching is commonly recognised as a system of running livestock on rangelands, so I have adopted it as a general term. The thesis will refer to pastoral ‘farming’ or extensive sheep ‘farming’ only when it refers to systems where inputs were used.

The thesis and its place

The transformation of the rangelands of the South Island by pastoralists and their sheep draws upon several different historical approaches. The exploration of sheep farming practice places the thesis firmly in the realm of agricultural history. The examination of the interaction between sheep farming practice and the landscape of the rangelands shifts the study to the field of environmental history/historical geography. These two approaches are clearly central to understanding the processes of change that took place in the pastoral era and provide insights as to how the rangelands were changed. However, it is impossible to appreciate the actions

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of the pastoralists outside of the economic, social and cultural milieu in which they operated. These approaches help to explain why the pastoralists managed their runs as they did. Consequently, these themes are also explored through the thesis.

**Pastoralism in the old and new worlds**

It has already been noted that the pastoral expansion in New Zealand was part of a world-wide phenomenon where people of European origin, with livestock of European origin, and backed by capital from Europe, spread across the ‘empty’ lands of the ‘new world’. Moreover, the methods that they used to run their stock were those that had been developed in their ‘old world’ environments. Distinctly different systems for running sheep had developed in different regions of Europe and these also changed over time. Environmental differences account for some of these variations. Carla and William Phillips, in their comprehensive book on Spain’s wool industry and the Mesta, argue that the ecology of the country provided the context for the most striking feature of the system, transhumance, and that historical developments determined how it was shaped and regulated.26 A modified version of Spanish methods was transferred to the Mexico and the regions that became California and the South Western states of the USA.

The Spanish sheep industry went into decline after the Peninsular campaign of 1806-09, and Spanish Merinos were dispersed throughout Europe, the USA, and the Australian colonies of Van Diemen’s Land and New South Wales. Saxony became the most important fine-wool growing centre in the world in the first half of the nineteenth century. However much more intensive management methods were adopted as Merino sheep, which had been bred for the semi-arid regions of Spain, were not suited to the cooler wetter climate of central Europe and, in order to keep them protected

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and healthy, the Saxony Merinos were housed for much of the time and hand fed.\textsuperscript{27}

Merinos were fashionable briefly in Britain, but they did not thrive in the damp climate and were not popular with British flockmasters who were used to farming bigger, more robust sheep. Britain had a long history of sheep farming and a remarkable variety of sheep-farming systems and different types of sheep had been developed in different regions. In lighter soils where agriculture was the primary land use, particularly in southern and eastern England, sheep were valued for their role in fertilising ground before crops were sown and after harvest. Burke, who wrote a treatise on agriculture in the nineteenth century, described how sheep were held on folds by hurdles, and Moore-Colyer, an agricultural historian, has written that farmers even paid flock masters for this service.\textsuperscript{28}

This intensive system of management represented the antithesis of the open range methods that were developed in the Border Hill districts of northern England and Southern Scotland. This was the hearth area for the methods that were later used for running sheep in the South Island rangelands. Robson’s doctoral thesis, which described in detail the sheep-farming practices found in the Scottish Border Hills before 1900, and a book of essays, \textit{Herding a Hirsel. How to do it and how not to do it}, by shepherds and farmers from the Border districts, both illustrate striking similarities with sheep ranching methods found in colonial New Zealand.\textsuperscript{29} The system that


developed in the Borders involved leaving the sheep on the hills year round. Farmers divided the flock into classes - ewes, wethers, and hogs - each of which was run on its own country and looked after by a boundary keeper (in New Zealand) or a herd (in the Borders). The sheep were summered in the higher country and brought down to the valleys and sunny slopes for winter. Since the sheep were handled infrequently they remained semi-wild so dogs became essential for gathering the stock on the open country.

Richards, Turnock, and others, have demonstrated that the expansion of sheep ranching into the Highlands of Scotland in the second half of the eighteenth century began with Border sheep and Border shepherds. In New Zealand, Border Scots, such as John Scot Caverhill and George Rutherford, were influential in the early years of pastoralism, while the Highland influence became more marked particularly from the 1860s and particularly in the high country. Historian W.J. Gardner has emphasised the importance of the Scottish influence in the Amuri district, and both Burdon and Crawford stressed the popularity of Scottish shepherds and the role that they played in improving the management of sheep runs.

The Australian influence in the spread of pastoralism in New Zealand was important, but has been over played by many historians. Reminiscences from the 1840s, such as those of Edward Curr and Alfred Joyce, the early histories of squatting by Collier (1911) and Roberts (1935), and the more recent study by Massy (1990) all illustrate that the early management of sheep in Australia followed the intensive English system of close shepherding and folding the sheep at night, which were quite different methods from those practiced in the New Zealand rangelands.

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been a great deal written about the Australian Merino and its breeding. John Ryrie Graham published a treatise on the breeding and management of the Australian Merino in 1870 and Cox, Austin, and Garran and White have developed the theme since. Perhaps the most thorough analysis has been by Massy, who concluded that Spanish and Saxon Merinos have been bred with English long-wooled sheep to develop different strains of Merinos to suit different environments within Australia.

A similar process has taken place in New Zealand. Pastoralism began with sheep imported from Australia, although pastoralists realised from the outset that while the local pasturage could not grow wool as fine as that grown in the Australian colonies, they could grow longer stapled and heavier fleeces. Accordingly, in the South Island rangelands sheep breeders selected for different traits to those looked for by sheep breeders in Australia. Moreover, as pastures began to be improved pastoralists looked to increase the productivity of their sheep and there was a marked shift to cross breeding. This led to the development of the halfbred and the in-bred halfbred, the Corriedale. This process was concurrent with the development of the Australian Merino and took place because both Australian and New Zealand breeders saw the need to adapt their sheep to suit their local environments as well as meeting the demand in the marketplace for stronger combing wool in preference to fine Merino wools.

The literature on the pastoral history of the South Island of New Zealand is mixed. Historian Tom Brooking has observed that the various


34 Frederick Weld, Hints To Intending Sheep farmers in New Zealand (London: Trelawny Saunders, 1851), 2.

ways in which runholders have been portrayed is ‘close to caricature’: chroniclers, family and district centennial histories depicted them as ‘heroes taming a fierce and capricious wilderness’; alternatively, post-Marxist historians presented them as ‘greedy, grasping and all-powerful exploiters of Maori, land and labour’; whereas, in environmental histories the pastoralists are seen as ‘destructive pyromaniacs hell-bent on destroying indigenous flora and fauna’. Despite this lack of balance in the literature, there are some works that stand out as gems amongst the dross. L.G.D. Acland managed to tease out most of the knots in the complex story of the ownership of the early Canterbury runs and his book has become the reference work for scholars in the subject. Herries Beattie, one of the chroniclers, has written and compiled a collection of books on pioneering pastoralism in Otago and Southland that describe the pastoral expansion in its social and ecological context. Beattie usually managed to find a balance between the heroic and the environmental spoilers models.

The environmental history theme

The expansion of pastoralism and the changes that it wrought on grassland environments has been a rich field of study for historical geographers and more recently environmental historians. However, as Simon Schama, in his work on landscape, has observed, the stories portrayed in these studies are almost uniformly depressing: ‘environmental history tells the same dismal tale: of land taken, exploited, exhausted; of traditional cultures said to have lived in a relationship of sacred reverence with the soil displaced by the reckless individualist, the capitalist oppressor’. William Cronon made a similar observation when he described the ‘declensionist’

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narrative found in environmental history, where ‘the plot line ... falls toward an ending that is more negative – sadder, poorer, less free, worse – than the place where the story began.’

Historical geographers, botanists, and other writers have painted a gloomy picture of the interaction between humans (especially pakeha) and the New Zealand landscape. Wearing (1998) has argued that both Maori and Europeans misread the semi-arid environments of the South Island with ‘detrimental and cumulative consequences for native plants and animals, soils, and the well-being of people’. A.H. Clark in his book tellingly called The Invasion of New Zealand by People, Plants and Animals (1949) bemoaned the lack of ‘any strongly established love of the land’ by those involved in farming in the South Island of New Zealand, writing: ‘People who look upon land as a commodity ... seem not to develop a strong resistance to practices leading to the mutilation of the area within which they live’.

Schama’s remarks on environmental history could well have been written expressly for Kenneth B. Cumberland’s description of the European impact on New Zealand’s environment. Cumberland, a geographer, wrote that the ‘decimation of the natural vegetation has been the most obvious manifestation of this “victory over environment”’ and that ‘the damage done to the ... soils is in parts beyond repair and elsewhere is rapidly approaching the critical stage. The reckless mining of resources for quick monetary returns and the destruction of capital wealth are no permanent substitute for the “primitive” Maori economy, which lived well within the means of its area and used only its surplus’. Forty years later Cumberland published a popular book about the New Zealand landscape and, apart from his

41 Andrew Hill Clark, The Invasion of New Zealand by People, Plants and Animals (New Brunswick: Rutgers University Press, 1949), 158.
observation of the impact of Polynesians, who he now called ‘fire-raising hunters who wiped out vast forests along with unique wildlife’, his views remained unchanged, with one chapter called ‘The looting of nature’s treasures’, and another ‘Nature exacts its revenge ... Abused and exhausted, the land rebels’.43

Cumberland was a man of his times and clearly influenced by the American ‘dustbowl’ calamity, the US Department of Agriculture’s soil conservation policies, and Jacks and Whyte’s book The Rape of the Earth. The thrust of their argument was that nature ‘preserved a perfect equilibrium between denudation and soil formation’, that ‘climate is never (or only very seldom) the cause of erosion’ and that ‘[w]idespread floods are unusual in regions and disturbed by man’.44 They argued that the spread of Europeans to ‘new’ lands where their land management practices were driven by external economic circumstances rather than by natural environmental factors resulted in the ‘world-wide despoliation of the earth and irreparable soil erosion’.45 In the 1940s these ideas led to a widespread panic about soil erosion that was apparent in South Africa, Australia and New Zealand.

Jacks and Whyte’s linkage between the demands of a commercial (or capitalist) system of production and the exploitation of the land was not new and has since been followed by some of the most eminent environmental historians. Cronon used this explanation to describe the actions of European colonisers in New England. He argued that ‘the colonists’ economic relations of production were ‘ecologically self-destructive’ as land became a form of capital, ‘a thing consumed for the express purpose of creating augmented wealth’.46 In his book on the ‘dustbowl’ Worster explicitly blamed the ‘capitalist ethos’ for the disaster as ‘it replaced man’s attachments to the

43 Kenneth B. Cumberland, Landmarks (Surry Hills, NSW: Reader’s Digest, 1981), 40, 4, 5.
45 Jacks and Whyte, 27.
earth ... with an all out dedication to cash, it replaced a rural economy aimed at sufficiency with one driving toward unlimited wealth.47

American agricultural historian Geoff Cunfer countered Worster’s thesis in his study of the Great Plains. Cunfer gathered agricultural census data from 450 counties across the Great Plains and concluded that ‘dust storms, rather than being evidence of human ecological failure, are instead normal forms of ecological disturbance on the southern plains that happen whenever the region experiences extended periods of low rainfall and high temperatures’.48 Cunfer argued that progressive and declensionist narratives oversimplify and misrepresent history.49

The linkage between capitalism and the over exploitation of resources is too simplistic an explanation to account for the complex relationship between humans and environmental change. Cumberland has illustrated that Maori society that lived far removed from a capitalist setting exploited and depleted the resources of New Zealand. Flannery has proposed a similar thesis for the impact of native peoples on the ecology of Australia, New Guinea, New Caledonia, and New Zealand.50 This approach can be broadly interpreted as a biological account of human behaviour and ecological change. Melville has argued that the biological expansion of Europe into the New World brought about an ecological revolution in those regions. Her study explored ‘the idea that the expansion of pastoralism enabled the conquest of the indigenous populations and the domination of vast areas of rural space’.51 Melville’s analysis used a model of ungulate irruptions that will be critically assessed in this thesis.

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49 Cunfer, 234-5.
Her work was based on the insights of Alfred Crosby who proposed a biological explanation of environmental change. His analysis looked not only at the ‘catastrophic takeover’ of ‘new’ lands that he called Neo-Europes, but also at the ‘general invasion of these lands by a portmanteau biota’ that European explorers and colonisers took with them.\(^5\) Crosby has used New Zealand as a case study to demonstrate why the ‘portmanteau biota’ were so triumphant and has argued that they were successful because they were mostly weed species that had been forged in the highly competitive large ecosystem of the Old World; many small and invasive organisms were part of the package; and many mutually supportive organisms made up the ‘portmanteau biota’.\(^5\) Crosby’s idea that Old World organisms were stronger than those of the New World is remarkably similar to the views held in settler society, that New Zealand’s plant and animal life could not compete against introduced species. This culminated in the idea that Maori were a dying race that would soon disappear. Environmental historians Griffiths and Robin have pointed out that in Crosby’s thesis humans lack agency, whereas the introduction of Old World species to the New World, Crosby’s ‘ecological imperialism’, was both conscious and unconscious.\(^5\) An example of this was the deliberate introduction of gorse by settlers to provide live fencing; unfortunately, they did not foresee the potential of gorse to become a vigorous invasive weed.

New Zealand has been blessed with two great observers of the New Zealand environment and the early impact of introduced plants and animals: Herbert Guthrie-Smith and T.H. Potts. Potts, who arrived in New Zealand in 1854, described in great detail the flora and fauna of New Zealand in a time of rapid ecological change. His book Out in the Open, published in 1882, has left us with invaluable descriptions of New Zealand’s wildlife that was in the process of being relegated to regions that were economically marginal for

\(^5\) Crosby 180-181.
farming or 'improvement'. Potts, who was the absentee owner of Hakatere Station, was a naturalist with a deep appreciation and knowledge of New Zealand’s environment; Guthrie-Smith was a pastoralist with a naturalist’s eye for detail. His book, *Tutira*, is a masterful environmental history of his sheep station for the period between 1880 and 1921. His fine grained description of the pastoral impact on the landscape and the spread of alien species (Crosby’s portmanteau biota) was a first hand account of events specific to the Hawke’s Bay region. Similar processes occurred elsewhere in New Zealand, with differences accounted for by local environments. One of the great strengths of Guthrie-Smith is that his work did not fall into Schama’s model of environmental history being a ‘dismal tale’; rather he told a vibrant story of human endeavour, mistakes and unforeseen consequences in a setting that the author came to know over a period of over sixty years: it is a classic story of learning to read the environment.

However, near the end of his life even Guthrie-Smith questioned the results of his lifetime’s work at *Tutira*, asking in the preface to the third edition of his book, ‘Have I then for sixty years desecrated God’s earth and dubbed it improvement?’ Guthrie-Smith’s doubts illustrate that our stories of the past can change according to the timeframe in which they begin and end. In 1940, when the third edition of *Tutira* was published, Guthrie-Smith was nearly eighty years old, the country was at war, and farming was in decline with shortages of labour and capital; it was a grim time. Would his view have been different had Guthrie-Smith lived until say 1960, when ten years of good product prices and the results of recent scientific research, as well as increased investment, made farming, and the country, more prosperous than it had ever been?

A good deal of the writing on the history of the South Island rangelands has fitted Cronon’s declensionist narrative and there is no

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57 Guthrie-Smith, xv.
question that in many places, especially in the semi-arid parts, the depletion of the vegetation in the pastoral era has, indeed, been a dismal tale. The causes of this have invariably been cited as indiscriminate burning, overgrazing with sheep, and rabbits; Clark called it a ‘triple attack’ on the grasslands.\(^5^8\) Petrie (1912), Cockayne (1919), McGillivray (1929), Hilgendorf (1935), Zotov (1938), Gibbs and Raeside (1945), Kerr (1992), Wearing (1998), and Mark (2004) have all postulated that these three agents, to different degrees, were responsible for a massive and disastrous transformation of the rangelands.\(^5^9\)

More recently Holland, O’Connor and Wearing provided a more balanced account of how the grasslands of the open country were remade in the pastoral era. They described the management of the runs, tussock burning and rabbits within the environmental context of the rangelands and the economic, social and cultural context of the pastoralists. The authors concluded that the transformation of the rangelands constituted a managed activity that had unforeseen consequences resulting in serious damage to the ecosystem. Although their chapter was less pejorative than some other accounts it retained a declensionist perspective, describing the open country

\(^5^8\) A.H. Clark, “The impact of exotic invasions on the remaining New World mid-latitude grasslands,” in Man’s Role in Changing the Face of the Earth, ed. W.L. Thomas et al. (Chicago: University of Chicago Press, 1956), 756.

under pastoralism as being ‘quarried and exploited’. It also inferred that the impact of pastoralism on the open country was uniform across the region. This thesis will demonstrate that this was not the case.

**Economics as a shaping agent for pastoral development**

This is not an economic history of pastoralism, but inevitably there is a strong thread of economic history in the thesis because economic forces influenced the way pastoralists ran their stations and that helped shape the transformation of the rangelands. The three main sites of organised settlement in the South Island were established according to Wakefield’s theory of colonisation and, initially and very briefly, were firmly agrarian and hostile to extensive pastoralism. Yet the economic reality, that wool provided the key to economic survival, forced their acceptance of pastoralism as the main method of land use. The colonial economy was, from the outset, firmly tied to the world economy through the export of commodities, principally wool, and the importation of manufactured goods. The early pastoralists were entrepreneurs who migrated to New Zealand because they saw it as an opportunity to ‘get on’, that is, to make money. Moreover, the pastoral era was a ‘big man’s’ frontier, a realm for men with capital. Having said that, even the small farmer soon became part of the wider commercial world; the American model of the self-sufficient homesteader was never part of mainstream New Zealand agriculture. The capitalist drive for profit shaped the way pastoralists managed their business and, therefore, their land, and the consequences of the capitalist ethos on the environment have already been noted in Cronon’s and Worster’s histories.

A neo-Marxist history of pastoralism has been presented by Eldred-Grigg. It represented the pastoralists as a rich landed class that made up a social, economic and political elite. Eldred-Grigg’s portrayal of the

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pastoralists as petty aristocrats from Britain who became great sheep lords in New Zealand has found little support. Economic historian Jim McAloon concluded that the pastoralists were middle class entrepreneurs who ‘were forward-looking rural capitalists, not backward-looking feudal lords’. In his doctoral thesis Fergus Sinclair demonstrated that run holding was no easy path to wealth and that, in fact, it was a very precarious business. Ian Horsfield’s doctoral thesis also found pastoralism to be an economically marginal enterprise. He argued that, after stock prices fell in 1866 and when wool prices followed, flock owners found themselves in a bind; they needed to develop their holdings to improve productivity, but had limited capital to do so. Those who borrowed heavily to develop their runs over burdened themselves with liabilities and so that they received little economic benefit from the improved output.

Davidson, an economic historian, argued that, in Australia, high profits could only be made in the fine wool industry where the industry was expanding, that is, when sheep could be sold at high prices to newcomers entering the business. This was obvious to sheep owners at the time; in 1841 Neil Black, a pioneering squatter in the Western District inland from Port Phillip, wondered ‘What shall become of us unless a new Port Phillip is found to carry our surplus stock?’ Similarly, in New Zealand pastoralism was only really profitable when the industry was expanding. According to Gardner there were four requirements for success in run holding: capital, initiative, experience, and luck. A fifth advantage was early arrival and McAloon claimed that most of those who made rural fortunes had arrived by

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‘Getting in’ early gave a prospective runholder the opportunity to select better country and, once he had bred up his flock, there was a ready market for his surplus sheep. Samuel Butler’s success in doubling his capital in a little over four years, from 1860 to 1864, has often been used to illustrate the easy profits that accrued from pastoralism, but even Butler admitted he had been lucky. Reminiscing in 1897 he wrote, ‘[m]y sheep had bred; wool had kept high and so had sheep; runs which were pretty cheap when I reached New Zealand had gone up greatly in value’. In fact, Scotter has suggested that the period May 1860 to May 1864 was a time of good prices, so one cannot but admire Butler’s timing.

Others were not so lucky. In the 1850s scab ruined some runholders. George Mason had farming experience in England, came out with some high quality Merino sheep that he had personally selected in Saxony, and in 1854 set himself up on a run immediately south of the Hurunui. Unfortunately for Mason this was the main route for sheep coming from Nelson to Canterbury and with the Nelson sheep came scab. Fines for possessing scabby sheep, the cost of treating his flock and the problem of regular re-infection of his stock resulted in Mason going into receivership in 1860. Mason had ‘got in’ much earlier than Butler and was able to select a run that took in much easier sheep country, but he had the bad luck to be ruined by scab. Rabbits also took their toll, particularly in Otago and Southland, with seventy-five runs abandoned in Otago between 1877 and 1884 due to their impact. Severe snowstorms were another problem for pastoralists, with the worst disasters coming in 1862, 1867, 1878 and 1895. The snow of 1862 put the Kennaway brothers and their partner F.W. Delamain out of Clayton, and G.A.E. Ross and

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68 McAloon, 33.
69 Peter Bromley Maling, Samuel Butler at Mesopotamia together with Butler’s “Forest Creek” manuscript and his letters to Tripp and Acland (1960; reprinted Wellington: Historic Places trust, 1984), 28.
72 Appendix to the Journal of the House of Representatives of New Zealand, 1885, C-9, 1-3.
Charles Harper were forced off the same run by the 1867 snow. It is not surprising that Acland wrote: ‘On the whole, runholding has not been much of a business in Canterbury. Some runholders have done well, but I think more have lost money’.

The social dimension of pastoralism

A social history interpretation of the pastoral era has several dimensions. One of those is class. As already noted, Eldred-Grigg has argued that the pastoralists constituted a ‘gentry’ class that made up an economic, social and political elite in colonial society, while McAloon has countered that, in the main, the pastoralists were not petty aristocrats, but rather part of the colonial capitalist class. Cottle has analysed social mobility in colonial society by studying the careers of a group of farm workers from Mt Peel Station, and labour historian John Martin has explored the lives of rural workers. However, the social aspect that has most interest for this thesis is the attitude of colonial society to land monopoly and land tenure.

Historian John Weaver has placed the New Zealand experience of land tenure in the pastoral era in an international context. He proposed that the rush for land in South Africa, Australia, America, Canada and New Zealand was a foundation event in the making of the modern world. His analysis of the introduction of property rights among British settlement colonies and the USA set out the pattern for the processes that occurred in the South Island in the pastoral era. He detailed a progression of increasingly ordered rights to grazing that developed over time on British colonial frontiers: beginning with squatting without authority, to squatting with licences, then licences that

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74 L.G.D. Acland, 21.
75 MeAloon, 23.
acknowledged definite boundaries, to grazing on land leased from the
Crown. In the South Island rangelands squatting was short-lived and
localised. McIntosh described squatting in the Wairau Valley in the late
1840s, until the first licences were issued, which ran from January 1849 for a
period of eighteen months. Thereafter, a system of licences, which varied
according to political manoeuvrings within the provincial governments,
accompanied the expansion of pastoralism. The term squatting is incorrectly
applied when used to describe runholding in New Zealand since the
pastoralists did not simply squat on vacant land. The term squatter was used
in the pastoral era, but more often as a term of opprobrium, as in the epithet
‘bloated squatters’.

An undercurrent of antipathy towards pastoralism existed from the
outset of organised settlement in New Zealand. The Nelson, Canterbury and
Otago settlements had been established according to Wakefield’s theories of
colonisation. Wakefield had formulated his ideas to address the breakdown
in social order that he believed had occurred in New South Wales because of
the squatting system. Pastoralism turned out to be the economic saviour of
the eastern regions of the South Island, but the view that extensive areas of
land should be concentrated in the hands of relatively few pastoralists
remained an anathema in the wider society.

During the pastoral era provincial and central governments passed
numerous laws and amendments in an attempt to balance the ideal of yeoman
farmers living and working on freehold land and the realities of pastoralists
with grazing licences running sheep on waste land. In the era of provincial
government, 1852 to 1876, each provincial authority established its own
pastoral licensing provisions for waste land and adjustments were made to

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78 Weaver, 301-310.
79 A.D. McIntosh, ed., Marlborough. A Provincial History (1940; reprinted Christchurch:
80 Tom Brooking, Lands for the People?, 81.
81 W.R. Jourdain, Land Legislation and Settlement in New Zealand (Wellington:
Department of Lands and Survey, 1925).
those provisions throughout the period.\textsuperscript{82} These complex regulations had a considerable influence on the security of pastoral runs and the economics of the business, thereby having a considerable influence of the way pastoralists managed their land. In Otago, although provincial authorities let grazing licences for a period of fourteen years, central government, on the advice of the provincial government, could set aside land, known as Hundreds, for closer settlement. In the years after gold began to run out, miners agitated for access to land and stations in the proximity of the goldfield had land taken out of their area to provide for this. These issues created some uncertainty for runholders. In Canterbury, in the 1870s, pressure for closer settlement and land speculation drove what Wynn and Cant have called a frantic ‘land grab’, whereby the better land on the Canterbury Plains and easy downlands was changed from leasehold to freehold title.\textsuperscript{83}

By the judicious purchase of freehold sections a runholder or an ambitious interloper could control the use of large areas of cheaper leasehold country. Through the seventies runholders and speculators fought tactical battles for control of stations. Charles Percy Cox bought the lease to Mt Somers Station in 1862, but did not have the capital to compete with speculators purchasing freehold blocks. In 1887 he ‘had to bow to the inevitable, and give up trying “to do the impossible”’.\textsuperscript{84} He sold out and moved to Christchurch. At Elephant Hill Station John McGregor bought large blocks of freehold out of the Parker brothers’ run, which left them with a marginal property and in financial difficulties.\textsuperscript{85} At Blue Cliffs, Charles Meyer borrowed heavily to purchase 8,400 acres of freehold to protect his 30,000 acres of leasehold country. When he died in 1878 he had a £10,000


mortgage and an £11,227 overdraft. As in Meyer’s case, the high cost of freeholding left many runholders heavily indebted and when depression came in the 1880s their financial situations became even more marginal.

When grazing licences came to the end of their term there was no automatic right of renewal, so that runholders had to bid at open auction to retain them. Competition for some runs was stiff with bidders prepared to pay high rents. At the auction of runs in South Canterbury in 1890 two runholders lost their stations, while others had to pay high rentals to keep theirs. The result was that they had to borrow at high rates of interest and so increased their indebtedness.

The election of the Liberal Party to government in 1891 resulted in a profound shift in land policy. Through the eighties circumstances had changed in the economics of farming. Wool prices had continued to decline and indebtedness increase for runholders, partly as a result of the what Belich has called the ‘frenzy’ of freeholding, while the success of refrigeration after 1882 meant that small farming producing sheep meat or dairy products for export was now viable. The pressure for closer settlement that had been building since the 1870s was released with the 1892 Liberal’s ‘Land for Settlement’ Act and the 1894 compulsory acquisition clause, which set in motion the breaking up of the great estates and stations that had been built up over the preceding forty years. However, it must be acknowledged that the reallocation of leasehold and freehold land under the Liberals was largely voluntary. Brooking stated that the Liberals ‘did not so much as “burst open” estates as provide estate owners with the keys to unlock excess acres’, while McAloon has argued that many large landowners made substantial profits from land subdivision, and that the subdivision coincided with the retirement

88 The Liberals were elected in 1890 and became the Government in 1891.
of the first generation of wealthy settlers. Thus the land policy of the Liberals helped to bring to an end the great pastoral era in New Zealand.

The cultural foundation of pastoralism

A cultural explanation of history is problematic. One of the problems is that the sources used are subjective and therefore difficult to tie down. F.M.L. Thompson, in a book methodically dissecting the contention that England’s industrial decline has occurred because ‘gentlemanly values have emasculated the industrial spirit’, wrote: ‘culture is a fickle guide, so flexible, anxious to please, and so easily moulded to suit any one of a range of preconceptions, that it is unwise for historians to trust it beyond the limits of independent corroboration from other types of more objective witnesses.’

The concept of Victorian values has received a good deal of interest from historians and there are divergent opinions about its use as an explanatory tool. Delahaye has suggested that it is ‘impossible to abstract a single set of moral notions from a period that spanned sixty-three years’. Harris agreed, writing: ‘Victorian Britain was a large, ramshackle, complex, diverse society which lasted a very long time and embraced a multiplicity of cultural traditions – and is therefore open to a wide variety of often mutually-conflicting stereotyped interpretations’.

In the face of these problems it could well be foolhardy to undertake an exploration of the cultural foundations of pastoralism. However, this thesis is an attempt to understand not only how the pastoralists transformed the rangeland environment that they encountered, but also to understand why

90 Brooking, *Lands for the People?*, 260; McAloon, 141.
they behaved as they did. The first generation of pastoralists, save for only a few exceptions, were British; they were overwhelmingly middle and upper-middle class; many had been educated at public schools and many had been through the university system. As a small group with a similar background it is highly probable that the pastoralists shared a common world view and held a common value system. Thus there is a cultural thread which is fundamental to understanding the pastoralists and the way they interacted with the rangelands of the South Island.

Those who have written on the Victorians have identified that one of their core values was the belief in progress and 'improvement', although there has been a good deal of debate about the timing of this improvement ideology. Asa Briggs identified an age of improvement as being between 1783 and 1867.94 Richard B Sher saw an era of 'improvement' permeating Scotland in the second half of the eighteenth century.95 Turner, Beckett and Afton have argued that 'improvement' in agriculture, the agricultural revolution, took place in England in the years between 1800 and 1850.96 Weaver has identified the ideology of improvement as fundamental to the colonisation process. He linked it to the Lockean notion that the application of labour and capital to waste land led to the belief that it was 'human kind's duty to tame the wilderness' and suggested that the diffusion of the doctrine of improvement occurred from the late eighteenth century and lasted to at least the mid-nineteenth century.97

The ideology of progress is closely intertwined with the notion of improvement, and Peter Bowler placed it firmly in the Victorian era. He argued that the Victorians believed that in a changing world change must be moving in a purposeful direction.98 Nations, like people were either

97 Weaver, 81-84.
progressing or stagnating, and Victorians had an underlying fear that if they did not progress their society could decline into barbarism.\textsuperscript{99} Biological and social evolution were linked so that improvement of the environment through the application of labour, capital and technology was a driving force behind social change.\textsuperscript{100} Both Lockhead and Bowler have argued that individual effort and initiative were the keys to progress; in the words of Carlyle ‘work is worship’.\textsuperscript{101} The industrial power of the Victorians gave them the ability to dominate the world, while their values and beliefs gave them the moral and religious sanction to do so. After all, \textit{The Bible} told them: ‘Be fruitful, and multiply and replenish the earth, and subdue it: and have dominion ... over every living thing that moveth upon the earth.’\textsuperscript{102} This was the \textit{mentalit\'e} of the Victorian age and so, according to Worster, the Victorians ‘set out to conquer nature and the savage world’.\textsuperscript{103} It is, therefore, not surprising that British entrepreneurs arrived in New Zealand with the belief that with capital and hard work they could reshape the landscape and profit from doing so.

\textbf{The thesis proposition and structure}

There is a long lineage of papers, reports and theses that have described the transformation of the rangelands of the South Island in the nineteenth and early twentieth century as an ecological disaster. Moreover, it has not been uncommon for writers to describe the worst outcome of the impact of pastoralism, which occurred in the semi-arid districts of Central Otago, and generalise that outcome across all the tussock grasslands. This thesis sets out to test that line of argument. The thesis proposes that there were variety of landscapes and climate zones across the rangelands and that the impact of pastoralism varied markedly from region to region.

\textsuperscript{100} Bowler, 193.
\textsuperscript{101} Lockhead, 28; Bowler, 38.
\textsuperscript{102} \textit{The Bible}, Genesis 1:27-28.
\textsuperscript{103} Lockhead, 36.
Three causal factors, in particular, have been proposed for the transformation: indiscriminate burning, overstocking with sheep, and rabbits. Clark acknowledged that it was uncertain which of these was the most important agent in the process of vegetation depletion, but then proceeded to identify burning and overstocking as the likely culprits. O'Connor has suggested that unravelling the respective roles of rabbits and stock in this 'ecological debacle' is impossible. Mather acknowledged this statement by O'Connor, but then went on to say that 'land degradation in the interior of South Island was facilitated by the prevailing system of land tenure and by indiscriminate use of fire'. Zotov also blamed the use of fire as 'the primary cause of depletion', aided by heavy grazing. The invasion of rabbits, he claimed, 'was possible largely through the depletion already in progress'. This thesis will examine each of these issues, tussock burning, overstocking, and rabbits, and try to unravel the role that each played in the vegetation change that occurred in the period up to 1912.

Another question that has arisen from the pastoral era concerning vegetation change is how quickly the pastoralists began to become pastoral farmers. O'Connor has claimed that exploitative methods were the rule until vegetation depletion and declining profitability forced pastoralists to begin to apply inputs in the 1880s, and before this on lighter lands. Holland and Hargreaves demonstrated that, on one property at least, this was not the case and that the Philips family were pastoral farmers from the outset. I have found many examples of pastoralists who set out to apply inputs and to manage their properties from the time they took them up. After all, the pastoralists came with an improvement mentalité. They brought techniques from home, some of them learned Australian methods along the way, and they were alert to new developments from around the world: new fencing

104 A.H. Clark, *The Invasion of New Zealand*, 210-211
107 Zotov, 212A.
108 Zotov, 212A.
technology, new agricultural implements and machinery, new pasture species, new shelter species and improved animal breeds.

Moreover, there is evidence to suggest that the pastoralists did not simply impose their methods upon the landscape. They had to learn what worked and what did not work in their new environment. This involved experimentation in animal breeding and in plant trials; they had to learn how and where to erect fences on hills and mountains; they developed implements and machinery that better suited local conditions. Of course, as with any group there were leaders and followers and not all were progressive farmers, but there was a strong core of entrepreneurs who undertook remarkable programmes of development and many of these began well before the 1880s. This issue will be assessed in chapters on animal breeding and land development.

A singular feature of the early pastoral era was the almost palpable enthusiasm of the runholders for their business. It has been argued that many came simply to make money so that they could return to home to live in style, and some, such as Duppa and Butler, achieved that goal. Others, like John Hall and John Barton Acland came with a vision not only to make money, but also to be part of a society less constricted by established conventions. Diaries and letters from the early years impart a sense of adventure and excitement about the business of runholding.

However, it did not last and by the mid-1890s these dreams, for many, had proved elusive: the decline in wool prices and sheep prices, the rabbit plague, and increasing costs led to heavy indebtedness. From that time increasing returns from the frozen meat trade and the ‘bursting up’ of the estates led to changes in land use and changes in land tenure in the rangelands. Extensive pastoralism was pushed back to the hardest mountain regions and the semi-arid country while mixed farming and pastoral farming became established in the easier country of the plains, downlands and foothills.
The thesis is structured into nine chapters, including the introduction and conclusion. The second chapter, after the introduction, is contextual. It explores the way the early pastoralists and surveyors assessed the environment of the rangelands. It also examines the occupation of the land, the process of learning to read the environmental cues of the ‘new’ landscape, the process of learning the business of pastoralism and the establishment of Mt Peel Station. The chapter also addresses the issue of typicality in terms of the resource endowments of different runs and the danger of extrapolating from a run in a particular ecological area to runs in different ecological areas.

The third chapter is concerned with the question of tussock burning. It looks at how the literature has portrayed burning as indiscriminate and reckless. This proposition is tested by looking at diaries and memoirs from various stations including Mt Peel. It demonstrates that on those properties, burning was a management tool used for specific purposes and carried out at particular times of the year, at particular times of the day and in particular conditions that were favourable for a successful outcome.

The fourth chapter is a history of the rabbit plague and explores the geography and ecology of the rabbit explosion and attempts at controlling their spread. The following chapter examines the impact of rabbits with particular emphasis on four runs, including Mt Peel, in different environments and with different outcomes. It also looks at the arguments that suggest the rabbit plague was the result of the burning and overgrazing. By comparing the ecology of rabbits in their natural habitat and the environment of the South Island rangelands I conclude that, once rabbits became established, pastoralists had little influence in creating the first rabbit irruption or in controlling it.

The question of overstocking is assessed in the sixth chapter. It looks at the model of ungulate irruptions and ‘overshoot’ used by Melville and O’Connor. Stock numbers and changes in liveweights of sheep on Mt Peel over the period 1856 to 1912 do not conform to the model. The thesis
questions whether this model has the explanatory power to account for changes in the stock loading on stations in the pastoral era. The chapter then goes on to explore differences in the stock loading across a range of counties and pastoral properties.

Chapter seven is concerned with the land management practices of the pastoralists, apart from burning: fencing, cultivation, oversowing and drainage. It uses diaries, journals, newspapers and developments on Mt Peel to demonstrate that an 'improvement' ethic was part of the world view of the pastoralists. The thesis argues that there were different outcomes in different regions and that these were largely a result of differences in the resource endowments of the stations.

The eighth and penultimate chapter explores sheep breeding over the period of the pastoral era. It analyses breed improvement and breed changes. It also explores how sheep breeders had to adapt the sheep types that they had imported to suit local environments. Animal health issues as well as changing demand in the marketplace forced sheep breeders to experiment with breeding programmes that resulted in more productive animals that were better suited to local conditions. Moreover, when the technology of refrigeration opened markets for frozen sheep meat, South Island farmers had sheep that were already adapted for meat production. This gave New Zealand an export advantage that it has continued to maintain. These assertions are tested by looking at diaries and memoirs of those involved in breeding, as well as articles in farming journals, and newspapers that reported the developments as they came to notice.

This thesis is a documentary study of the pastoral era and uses contemporary sources to explore pastoralism and the transformation of the rangelands of the South Island in the years 1841 to 1912. The most important primary sources for this thesis are listed here. Information on Mt Peel comes from the Acland Family Papers, held at the Macmillan Brown Library, University of Canterbury. The diaries from Waitangi Station are held on the property by the Sutton family. A number of memoirs, reminiscences and
station diaries have been used from the Documentary Research Centre of the Canterbury Museum. Other sources include newspapers covering the years 1851 to 1912: the Lyttelton Times, 1851 to 1864; the Timaru Herald, 1864 to 1874, and 1909-1912; the Otago Witness, 1874-1908. Agricultural journals have been valuable: the New Zealand Country Journal, 1877-1899, and the Journal of the Department of Agriculture, 1910, 1911, 1912. A major source of information, particularly on the rabbit plague, was The Appendices to the Journals of the New Zealand House of Representatives.

Researchers from other disciplines have used other methods to evaluate vegetation and landscape change in the region's past. Techniques such as carbon dating, comparative photographic studies and pollen studies have all been applied to the study of the changing environment of the rangelands. It is hoped that this thesis will add insights to the understandings that we have gained from this earlier research.
MAP: 1.1 The Rangelands of the South Island c.1840

The period of provincial government ended in 1876, but provincial differences continue 130 years later.
CHAPTER TWO
THE PASTORAL FRONTIER:
ASSESSING AND OCCUPYING THE RANGELANDS

At four o'clock in the afternoon on 4 January 1855 the Royal Stuart dropped anchor at Lyttelton after eighty-six days at sea. Among the passengers was John Barton Arundel Acland, the youngest son of Sir Thomas Dyke Acland, 10th Baronet, who held the estates of Killerton in Devon and Holnicote in Somerset. Acland, who was thirty years old at the time of his arrival in New Zealand, had been educated at Harrow and taken a degree at Christ Church, Oxford. He had practiced law in London, but had become bored with both the law and the city. With his eldest bother, Thomas Dyke Acland, taking a keen interest in the management of the family estates as well as making a name for himself as an agricultural improver, John Barton had to look elsewhere for an opportunity. Encouraged by his friend Charles George Tripp, who was disillusioned by the lack of prospects in England, the two decided to take up the challenge of sheep farming in the colony of New Zealand.

Within hours of arriving the two men walked to the top of the Bridle Path, a steep walking track between the port of Lyttelton and the settlement of Christchurch, to view their new country. Surprisingly, Acland did not record in his diary the scene or his response to it. However, his diary tended to be a record of events and he rarely comment on the landscape unless it had an immediate bearing on proceedings.

Henry Sewell, an official of the Canterbury Association and the parliamentary representative for Christchurch, noted the arrival of the two men with some scepticism, writing:

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1 MB 44. Acland Family Papers, Box 7, 4 January 1855, Macmillan Brown Library, University of Canterbury, Christchurch, New Zealand.
Acland is a queer addition to the Colony. Will he stay? I do not know. Whether men like the Colony and stay, depends on their success – and whether men succeed or not depends on individual character. Tripp and Acland talk bravely of going up to Sheep Stations to serve apprenticeships. Whether the reality will be as tolerable as they fancy, I doubt. Nous Verrons [we shall see].

By the time of Acland and Tripp’s arrival in January 1855 the expansion of pastoralism through the eastern region of the South Island was well under way as would-be pastoralists moved out from the sites of settlement to look for unclaimed land. This chapter examines the nature of the landscape, vegetation and climate of the rangelands and the assessment of the country for its agricultural and pastoral potential by early pastoralists and surveyors. The chapter also explores the occupation of the land and the process of learning the business of sheep ranching.

Pastoralism precedes organised settlement

Historian John Weaver has argued that exploration by ‘resource hunters’ extended the frontiers in British and American settlement colonies and that formal authority was reactive to those initiatives. That was undoubtedly the situation in the expansion of pastoralism in New Zealand, where people looking for land for sheep ranching preceded settlement or soon moved beyond the boundaries of the settlement lands. Formal surveys and the establishment of grazing licences followed the advance of these pastoral entrepreneurs. In New Zealand the contrast between actions of the land hunters and the attitudes of the formal authorities was exacerbated initially by the underlying ideology of colonisation.

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The settlements of Wellington, Nelson, Canterbury and Otago were based on Edward Gibbon Wakefield’s theory of colonisation that arose from his belief that the squatting system in New South Wales, where easy access to land and an industry based on large scale wool growing, led to the breakdown of the social order. He decided that colonial settlements should be established where companies would buy land cheaply off native peoples and then sell it at a high price to settlers with capital. The high price of land would force workers to work hard and save before they could afford to buy land and set themselves up as farmers. The profit from land sales would fund further immigration and so the colonies would grow. This system, based on agricultural production, would create an ordered system of colonisation where everybody would have their place and know their place. Essentially it would transpose a slice of rural agrarian England, with its landlords, tenant farmers and rural workers, to ‘new’ lands on the other side of the world.

Wakefield’s theory was flawed. Its significant weakness was related to the idea that the economic base of the colonies was to be the production of grain and foodstuffs; but where were the markets for this produce? For all its apparent problems the pastoral system in Australia that Wakefield so despised had proven to be highly successful. Wool had proved to be a commodity that could be stored and shipped without spoiling. It found a ready market in English and European mills, although wool prices were subject to considerable fluctuations. Early settlers soon realised the economic advantage of pastoralism over agriculture. Dr David Munro, who accompanied Frederick Tuckett on a journey in 1844 to determine a site for a new New Zealand Company settlement in the south, wrote that ‘[p]asture is the natural and great resource of the east coast of this island. Agriculture will be subordinate to it for a long time’. He went on to suggest that the Port Cooper area, that later became the central core of the Canterbury Block, was unsuited for a Wakefield type settlement because it lacked trees for fuel and timber. He felt that large-scale farming by settlers ‘with considerable capital’ with ‘each having a range of a good many thousand acres, and thus being

4 Nelson Examiner, 5 October 1844, p.124.
enabled to combine the rearing of stock and tillage' would better suit the country.\(^5\)

The New Zealand Company founded the Wellington colony in 1840 and a settlement in Nelson the following year. Both colonies provided the take off points for pastoral expansion in New Zealand. In 1843 a group of young entrepreneurs, Charles Bidwell, Charles Clifford, William Vavasour, Henry Petre, and Frederick Weld, embarked on a venture to establish sheep runs in the Wairarapa on land leased from Maori. In 1844 they landed sheep from Sydney in Wellington and drove them around the coast to stock their new stations.\(^6\) Two years later Clifford and Weld leased a huge block of land on the north east coast of the South Island from Te Puaha of Kapiti. The run, that they called Flaxbourne, stretched from north of the Awatere River to Kekerenga, and in 1847 they stocked it with 3,000 sheep.\(^7\)

The exploration of the land outside the Nelson settlement block began only a year after its foundation. In 1846 Nathaniel George Morse squatted at Tophouse before Sir George Grey purchased the area from Maori the following year. Although none of the land had yet been surveyed, Grey's purchase opened the way for pastoralism, so that by 1849 thirty squatters had set themselves up in the Wairau valley and a year later both the Wairau and Awatere valleys had been almost completely taken up for sheep ranching.\(^8\) Soon after, the acting Agent for Nelson issued the first licences to pastoralists, which gave them the right to depasture stock for an eighteen month period from January 1849 to July 1850. This was an example of formal authority reacting to the reality of the situation. Thereafter, pastoralists were not squatters at all, but graziers who held pasturage rights issued by either the New Zealand Government or local provincial authorities.

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\(^5\) *Nelson Examiner*, 27 July 1844, p.84.
\(^8\) McIntosh, 91, 105.
Men looking for sheep country preceded organised settlement in Canterbury. The Deans brothers introduced the first sheep onto the Canterbury plains at their Riccarton farm in 1843. In 1847 the Greenwood brothers formed the first sheep station in Canterbury at Motunau, on the easy hills north of the plains and Captain Mitchell established a cattle station called Mt Grey on the north bank of the Ashley River in August 1850. Several other runs were formed in 1850 before the arrival of the first Canterbury settlers in December. The Deans stocked Dalethorpe and Robert Wait established Teviotdale, while outside the Canterbury block itself Clifford and Weld set up Stonyhurst in addition to their Nelson (later Marlborough) station Flaxbourne and the Rhodes brothers formed a huge holding, called The Levels, in the region that later became South Canterbury.

Historians have given considerable credit to a group of Australian squatters who arrived in Canterbury in 1851 for establishing pastoralism in the region. One of them, John Christie Aitkin, is supposed to have persuaded the Canterbury Association’s Resident Agent, John Robert Godley, to free up the regulations on the lease of ‘waste’ (unsold) land to enable pastoralists to set up in the Canterbury Block. Godley was no fool. He was well aware how precarious the economic base of the settlement was, and in a letter to his father in 1850 he wrote: ‘I wish most heartily that instead of two or three, we had twenty or thirty unlicensed squatters with 10,000 sheep or cattle each; if it were so, I should have tenfold more confidence than I have now in the rapid success of the settlement’. However, his hands were tied, as he had no authority to change the regulations established by the Association in London.

To get around the problem, in May 1851 Godley issued a temporary ‘form letter’ that enabled people to take up pastoral land without having to pay the high price of twenty shillings per hundred acres that was set down in

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the Association’s rules. Godley intended this as a temporary measure to encourage those with capital to invest in Canterbury while he waited for official approval to come from the Association headquarters in London. In February 1852, after gaining permission, Godley instituted a system that divided runs into three classes: Class I runs were leased with a pre-emptive right of purchase at twenty shillings per 100 acres; Class II runs took in blocks over 250 acres with the same rental as Class I, but with no pre-emptive right; Class III runs carried no pre-emptive right and had leases that ran for seven years at cheap annual rentals. These new regulations initiated a scramble for runs so that by the time Acland and Tripp landed most of the plains and easy hill country had been taken up.

In Otago too the ‘resource hunters’ preceded organised settlement. Whalers began bringing livestock from Australia in the early 1840s and, according to Munro, by 1844 Johnny Jones had 2,000 sheep on 40,000 hectares that he had purchased from Ngai Tahu leader Tuhawaiki. The Otago Block was purchased that year and the Scottish Free Church Society founded the colony in 1848. Pastoralism did not proceed as quickly in Otago as it did in Nelson and Canterbury. Berries Beattie records only three runs within the Otago Block, all applied for in 1853; but runs had been established in East and North Otago, outside the settlement block, by that time. The interest in Crown lands outside the Otago Block slowly increased and pioneers in search of run country explored much of Otago ahead of official surveyors.

Resource hunters assess the Canterbury Plains

Surveyors and exploring pastoralists, who were assessing the country for its value for farming or running livestock, made the earliest descriptions of the landscape and vegetation of the rangelands of the South Island.

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Consequently, its economic potential shaped their appreciation of the landscape. Samuel Butler, an acute observer and thoughtful writer, after admiring the beauty of Mount Cook pulled himself up as it clearly had no use as sheep country. He wrote ‘[a] mountain here is only beautiful if it has good grass on it. Scenery is not scenery – it is “country”’.\(^{14}\) This pragmatic view of land begs the question of what made good sheep country? After all, the assessment of what constituted good country could have considerable influence on the outcome of the venture.

John Macfarlane, who had shepherding experience both in the Scottish Border country and New Zealand, arrived in Canterbury in November 1850 and the following year occupied the Loburn Run, listed as Run 1A.\(^{15}\) It was a poor property with a good deal of scrub which made mustering difficult. It was not until Macfarlane bought and drained the smaller Coldstream property in the 1860s that he really prospered.\(^{16}\) One wonders why an experienced hand like Macfarlane chose such a difficult block as Loburn when so much unselected land was available.

Another who misread the landscape was Fredrick Tuckett who had been appointed by the New Zealand Company to select a site for the projected New Edinburgh settlement. His employers supposed that Tuckett would confirm Port Cooper (later Lyttelton), later the site of the Canterbury settlement, as the location. However, Tuckett judged the land unsuitable for agriculture and chose Otago as the site for the new settlement.\(^{17}\) It turned out that, despite being established before the Canterbury settlement, the Otago settlement languished while the former flourished as both farming and pastoralism expanded.

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\(^{16}\) Macfarlane, 126-127.

Dr David Munro accompanied Tuckett on his journey south from Nelson in 1844. He landed at Port Cooper and walked to the Deans’ farm located near the site of modern Christchurch. He described the country that they passed through:

The part of the plain we crossed … is uniformly covered with grass of various sorts, mixed with toi-toi and flax in the moister parts, and, in some places, thickly dotted over with the ti-ti. The grass, generally speaking, is a tufty wire grass of a very dry nature, and not relished by stock, but there are finer grasses between these tufts, though sparingly diffused, as well as an abundance of a tufty grass of a larger more succulent species, which I know from experience in this settlement is greedily eaten both by cattle and horses. I should not suppose the pasture to be capable at present of supporting a large amount of stock per acre; but I am satisfied that, by being fed down, its value would greatly improve, and a turf of a much better character rapidly be produced.¹⁸

This piece of writing contains some interesting insights: firstly, in regards of the vegetation of the plains and the way early writers saw it; and secondly, concerning the concept of what constituted good pasturage for livestock. As we will read in other accounts, the larger species of the suite of plants of the rangelands dominated the early perceptions. Here Munro named toi-toi (toetoe or Cortaderia toetoe), flax (Phormium tenax) and ti-ti (cabbage tree or Cordyline australis); in other environments exploring pastoralists, surveyors and settlers would add other species to this list. Munro had no names for the grasses that made up the rest of the plants in his description. The unpalatable ‘tufty wire grass’ may have been fescue tussock (Festuca novae zelandiae), while the more succulent grass was possibly blue tussock (Poa colensoi) as it was highly palatable to stock. It is interesting to note that the finer grasses that grew between the tussocks were not abundant

¹⁸ Nelson Examiner, 27 July 1844, p.84.
even at this time when the country had not been recently burnt or grazed by stock. Perhaps the most interesting point that Munro raised was his view that the rangeland in its unmodified condition would prove largely unproductive for stock raising. In order to make it productive the mass of the plants needed to be reduced. This is the first instance we have of the overarching aim of land management in the pastoral era, which was to transform the vegetation of the rangeland from a tall-tussock grassland to a short-tussock grassland.

Munro was a perceptive observer. Later in the journey he came across an area of burned forest with ‘numerous roots and stumps still remaining in the ground, blackened by fire, and holes where others have decayed out’ and he concluded ‘it is thus we find nothing but stunted fern or grass upon many hills and plains, which, I feel convinced, ‘were at one time covered with primeval forest’. John Deans came to the same conclusion, writing to his father in 1845 that ‘the plain ... is pretty much of one character, being all grass land, and I think at one time must have been nearly all covered with wood as we see in many places the roots and other remains of very heavy timber.’

Charles Obins Torlesse has left us with his assessment of the landscape of Canterbury before the period of organised settlement. He went to Nelson in 1841 and arrived in Canterbury in December 1848 as member of the party of surveyors sent out to prepare the way for the Canterbury settlement. At the time of his arrival the plains were only sparsely inhabited. There were several Maori settlements, chiefly at Tuahiwi and Kaiapoi, the Deans were well established at Riccarton, the Greenwoods were fifty miles to the north at Motunau, and fifty miles to the west John Hay had a whare at Kowai Bush.

Within six weeks of landing at Lyttelton Torlesse had explored from the Ashley River in the north, to the Rakaia in the south, and to the foothills in the west, assessing the country for its suitability as site for the new

19 Nelson Examiner, 27 July 1844, p. 84.
settlement. In a letter to E.W. Stafford in February 1849, his description of the country divided the plains into three strips. The coastal strip, he thought, reached about ten miles inland, and he saw it as ‘first-rate quality’, having a great deal of flax, toi-toi and grass growth, but also some sandy areas.\(^{21}\) The middle strip, running north/south, he estimated as fifteen to twenty miles in width and characterised it as ‘unvarying grass’ and having a ‘tolerable soil’. The western side of the plain running along the ‘snowy mountains’ he thought had good soil, though some parts were stony and others sandy, and had a ‘strong growth generally’. Torlesse then went on to describe the region scenically, writing that the peninsula was ‘wild and beautiful’, and the western side of the plains ‘very pretty’ with views from the ‘snowy mountains’ being ‘most romantic’. The middle plain, however, he judged ‘monotonous in the extreme’.\(^{22}\)

Torlesse saw no immediate future in agriculture for the prospective Canterbury settlement. In a letter to his mother in May 1850, well before any Australian squatter appeared on the scene, he wrote: ‘This is a pastoral country more than agricultural, and we must look forward to New Zealand wool maintaining its superiority over other Australian samples in the English wool market’.\(^{23}\)

Colonel Alexander Lean, like Torlesse, thought that the Canterbury Plains were varied in their quality as pastoral country. On a trip south from Christchurch in April 1854 to look for sheep country he described travelling over the area that is now Rolleston and Burnham, saying ‘for some miles we went over a sterile stony region, apparently ancient river bed’ and that further on ‘grass began to appear but the country generally dry and certainly poor’.\(^{24}\) Lean travelled on and crossed the Rakaia where he camped for the night on Edward Chapman’s Acton Station. The country above Acton was

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\(^{22}\) Maling, 54-55.

\(^{23}\) Maling, 143-4.

unoccupied, so the next day Lean walked up the south side of the Rakaia assessing the land. He described walking along the high terrace above the river where there was ‘a belt of rich soil thickly set with cabbage trees, from whence towards the interior [away from the river] the soil gradually shallowed’. About 120 feet below the high bank lay a flat river bottom half a mile to three-quarters of a mile wide ‘pretily diversified with clumps and single trees of manuka, goi [toi-toi], and koromeka [koromiko], amid which paraquets [sic], tuis and bellbirds were frequent’. He noted that the feed along the river was very good because ‘tussocks [are] not dominant and fern rare’.26

Lean took up a 20,000 acre station that he called Lendon (later it was known as Corwar), but he found the landscape unappealing. In 1885, on a trip to the Rakaia Gorge, Lean recalled:

My attention was attracted by the successive terraces on the opposite side evidently richly grassed ... What a contrast the romantic beauty of this neighbourhood to the dull monotony of the plains, to the bare shingle cliff and dusky river bed of my own run. Here was a place where to live, even to breathe the delicious mountain air was a delight.27

Beauty, as the cliché goes, is in the eye of the beholder and not everyone found the plains such unappealing country. Though John Barton Acland’s diary is largely bare of descriptive passages, after riding into Christchurch from the Malvern Hills in December 1855 he wrote: ‘The plains are now quite beautiful – parts being quite white with a mass of manuka blossom and other parts yellow from a flower sometimes called wild onion and sometimes wild hyacinth.’28

25 Colonel Lean’s Reminiscences 1889. Canterbury Museum Documentary research Centre, 11-12
26 Lean, Diary, 7 April 1854.
27 Lean, Reminiscences, 42.
28 Acland Papers, Box 7, 4 December 1855.
On parts of the plains and foothills, clearly on heavier country, there was a considerable build up of decayed tussock growth, in places two feet deep. Mark Pringle Stoddart described this after an exploring trip to Lake Coleridge. He came across a broken ridge of hills ‘bristling with wild Spaniard ... [and] dead vegetation [which] formed a deep rotten mat in which the horses’ feet sank at each step and conjoined with the torture from the prickly plants drove them nearly frantic’. Alexander Hewson commented on this build up of decayed vegetation and observed a feature that Samuel Butler had noted also: the tangled and decaying vegetation blocked water courses and creeks and created many swamps, but after a few burnings they ran more freely and the swampy areas dried out.

Other plants featured prominently in early reports and diaries. Matagouri (*Discaria toumatou*) or wild Irishman grew freely, often with Spaniard or speargrass (*Aciphylla* sp.), and the two plants formed a formidable barrier to stock. Torlesse found the plants a hindrance when exploring the downlands in South Canterbury in March 1849. He managed to force his way six miles inland from the Pareora Lagoon ‘by dint of great perseverance in picking our way through thorns’. Edward Jollie and his party found the shrubby plant a problem when driving the first flock of sheep from Nelson to Canterbury in 1852. In the Acheron River north of Hanmer they had to detour, ‘on account of the thick Wild Irishman scrub’.

A plant common throughout the South Island that was also a problem for people driving stock was tutu (*Coriaria arborea*). Stoddart described his sheep being ‘tuted’ (poisoned) after eating the plant. ‘The cure is instantaneous’ he wrote, ‘if applied in time and consists simply in bleeding by cutting boldly across the bars of the palate – the swallowing of the blood

32 Maling, 66.
brings immediate relief.\textsuperscript{34} In this case they did not lose a sheep, but many others were not so fortunate. Hewson described tutu as the greatest curse for travelling stock and claimed that Butler lost 260 of his sheep to the plant in one night in the Selwyn River bed when they were being driven to Mesopotamia. He also recounted an even more costly event when three bullockies lost nine bullocks out of twenty-four after grazing on tutu while they camped for the night when carting wool from Mesopotamia to Rakaia.\textsuperscript{35}

While matagouri, speargrass and tutu created problems for pastoralists, a more valuable plant, commonly mentioned in reminiscences, was anise. Edgar Jones claimed that sheep fattened well on the early runs because there was ‘a lot of anise and many annual grasses and herbs which have died out now’.\textsuperscript{36} L.G.D. Acland agreed that there were some very valuable fodder plants and listed aniseed (anise), wild parsnip, wild carrot, and bluegrass, and commented that ‘before the country was eaten out they grew all over the plains’.\textsuperscript{37} According to Acland, all these plants were so palatable that stock would not eat anything else, with the result that they were eaten right out.

**Resource hunters assess Otago and Southland**

Exploring pastoralists and surveyors found the same suite of plants - fern, manuka, toi-toi, flax, cabbage trees, spaniard, matagouri, tutu and tussocks - that dominated the descriptions of the vegetation in the Canterbury region also grew throughout Otago and Southland. As in Canterbury, there was considerable variation in the biomass and the group of plants, depending on rainfall and soil type, although in the wetter Southland valleys the country appeared to be always more overgrown.

One of the earliest land hunters to explore Southland was F.L. Mieville who had already taken up a run in North Otago. He left an account of his trip

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\textsuperscript{34} Stoddart, 5.  
\textsuperscript{35} Hewson, 21  
\textsuperscript{37} L.G.D. Acland, 17.
into the Mataura Valley in October 1853. He soon found that he could not make any headway because of ‘an amazing accumulation of flax, fern and debris that had been collecting for years, grown up and decayed again and again, while the growth of everything living was rank and high. The grass, flax and fern were as high as our heads’.38 The solution to the problem, as always, was to burn it and Mieville set the ‘whole “muss” alight’, estimating that it burned a tract ‘twenty miles in length and nearly the same in width’.39

The previous year C.J. Nairn and W. Stephen explored up the Waiau River in Western Southland as far as Lake Te Anau looking for suitable sheep country. In the Eastern Bush area they travelled over ‘high undulating land with flax, tutu and high grass’, but further north they found country ‘well grassed and well adapted for sheep’ because the ground was ‘gravelly’.40 Presumably the hard ground was considered suitable for sheep as it would prevent them from suffering from footrot, and the soils that they had travelled over to this point had been too wet and soft for sheep. Where today’s Grassy Creek joins the Wairaki River, just before it enters the Waiau, the explorers could not push their way through the thick growth of matagouri and fern and were forced to continue up the creek until it opened out into ‘well grassed’ undulating hills.41 They found the eastern shore of Lake Te Anau to be ‘undulating with manuka scrub and high fern, flax, etc.’ and noted that ‘the soil is very stony but well adapted for sheep grazing’.42 Nairn and Stephen, like so many other explorers, fired the country as they went and when camped at Te Anau a strong southerly wind carried the smoke to the lake ‘so as to obscure everything’.43

Resource hunters looking for pastoral land in the semi-arid inland region of Central Otago did not have to face the same overgrown and tangled

39 Beattie, Pioneer Recollections, 34.
41 Beattie, Pioneers Explore Otago, 28.
42 Beattie, Pioneers Explore Otago, 28.
43 Beattie, Pioneers Explore Otago, 29.
growth that Mieville, and Nairn and Stephen had to deal with in the wetter country, but their travel was also made difficult by the vegetation. In December 1857 the Shennan brothers explored up the Molyneux (Clutha River) assessing the land. For most of the way inland they found the country along side the river to be ‘very scrubby’, without elaborating or describing the type of scrub.\footnote{Beattie, \textit{Pioneers Explore Otago}, 59.} But then they did not elaborate about any of the vegetation, even the grazing, which was the sole purpose of their trip. The country was either ‘well grassed’ or the ‘cover of grass not so good’. The Manuherikia country, in particular, caught their eye, having ‘plenty of green grass … scrub for fuel, and a river of the purest water’ and the two brothers later applied for 100,000 acres in two blocks, Galloway and Moutere, one on each side of the river.\footnote{Beattie, \textit{Pioneers Explore Otago}, 60, 61.}

Alexander Garvie, Assistant Surveyor for the Otago Provincial Council, who traversed some of the same country as the Sheenans, left some of the best descriptions of the landscape and vegetation of early Otago. He found the pasture near the mouth of the Manuherikia to be ‘very fine’ but the ground ‘much encumbered by rocks and stones’.\footnote{Alex. Garvie, “Report on the Reconnaissance Survey of the South-Eastern Districts of the Province of Otago, executed during the months of October and November, also February, March and part of April, 1857-8,” \textit{Otago Provincial Government Gazette}, Vol.3 (January 1856-December 1859), 280.} He observed that east of the Manuherikia the grass became ‘rather thin’ and consisted ‘almost entirely of one species – a kind of oat grass, with a black seed’. The scrub that prevented the Shennans getting near the Clutha was, according to Garvie, ‘\textit{matakuru}’ (matagouri), but he thought that it was always a sign of good land and that it could be ‘completely destroyed by fire in two or three years’. Garvie noted other beneficial effects from burning. In the Tapanui district he saw that on one side of a creek that had not been burned the vegetation was ‘course [sic] snow grass’, whereas on the side that had been burned ‘superior pasture, consisting of brood-grass, anise, &c.’ could be found.\footnote{Garvie, 280.}
Garvie noticed the change in vegetation as he travelled inland. Fern, flax, tutu and ‘scrub’ dominated the pasturage within five or six miles of the coast. The fern began to disappear as he travelled away from the coast and often he found it only in gullies in association with tutu. He thought the pasture in the coastal zone inferior compared with inland regions, although at elevations above 2,000 feet the pasturage again became coarse and dominated by ‘snow grass, spear grass, and shrubs’.

Garvie’s superior, John Turnbull Thomson, the Chief Surveyor for Otago, was also a good observer of the landscape and vegetation. However, it must also be born in mind that both Garvie and Thomson often followed in the wake of earlier explorers and so they observed country that had already been subject to modification, in particular, by fire. In his report on a journey through southern districts of Otago early in 1857 Thomson noted:

The natural grasses are always found to grow in bunches known by the name of tussocks, and these tussocks vary in colour and dimensions with the qualities of the soil and the nature of the climate. In the lower and moister districts near the sea, the tussocks are sombre coloured, varying from red to brown, and attain considerable dimensions, rising above the ground at times to the height of four and even five feet. In the higher and drier districts the tussocks are light coloured and small, affording fine and soft pasture.

In late 1857 and early January 1858 Thomson travelled through North Otago, the Upper Waitaki, the Upper Clutha and parts of Central Otago assessing the pasturage. He observed a significant range of quality within relatively short distances. In the Kakanui Mountains and Horse Range the southern quarter possessed inferior pasturage overrun with fern, and the

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48 Garvie, 279.
eastern side, he noted, contained poor pasturage dominated by coarse tussock and snow grass, whereas the northern section had the finest pasture in the Otago province. Immediately north lie the Waitaki Downs, on the south bank of the Waitaki River, between Kurow and the sea, which Thomson thought was ‘the largest and generally finest pastoral country in the province’. Inland, on the Upper Waitaki Plains, which lie at a higher altitude than other Otago districts, Thomson thought the grasses were ‘generally scanty’. His assessment of the Manuherikia that Watson Shennan called ‘a very land of promise’ was more mixed. He acknowledged that the lower end of the valley had ‘much fine pasturage’, but thought it deteriorated at the head of the valley towards the Dunstan Mountains.

Flax, tutu, fern, matagouri, speargrass, tussock, snowgrass (Chionochloa sp.), and manuka (Leptospermum scoparium) dominated descriptions of plant communities in the accounts of exploring pastoralists and surveyors. However, Garvie did make an attempt to describe some of the smaller plants in the rangeland mix, referring to anise, oat grass, and broodgrass. By the mid-1860s a more formal approach was being made to describe and categorise the plants of New Zealand. John Buchanan wrote a Sketch of the Botany of Otago for the 1865 New Zealand Exhibition in which he noted that in the relatively recent past most of Otago had been covered with forest and that at the time of European settlement ‘large tracts of the province were being re-clothed with bush’ and that when this was burned off by explorers and pastoralists a ‘luxuriant growth of native grasses appeared without a seed being sown’. Buchanan’s conclusion was consistent with that drawn by David Munro twenty years earlier, except that Buchanan made the explicit connection of the transition from grasses to woody species to forest species.

51 Thomson, 1857-8, 272.
52 Beattie, Pioneers Explore Otago, 60.
53 Thomson, 1857-8, 272.
In more recent years this conclusion has been supported by scientific enquiry using tools such as carbon dating and pollen studies.\(^{55}\)

Several points arise from the contemporary accounts of early exploration and settlement. The descriptions of the vegetation of the rangelands were broad and general and by the time that scientific enquiry began most of the rangelands had already been heavily modified by burning and grazing. Significant differences in vegetation occurred within relatively small areas. On one side of a range of hills explorers assessed the pasturage as the best in the Otago, while on the other side they considered it some of the worst. Even on the plains soils and vegetation changed within the matter of a few miles.

Finally, the early assessors of country knew that what they wanted for their sheep was short pasturage. They understood that the overgrown tall tussocks and shrubs would provide little value as stock food. Moreover, sheep could not push through the dense growth of prickly plants such as matagouri and spaniard. Burning, then, soon proved to be an essential management tool for pastoralism to be viable in the rangelands of the South Island. This issue will be addressed in the following chapter.

**Learning to read the weather – another theme of environmental assessment**

The early boosters disseminated a good deal of misleading information about New Zealand’s natural abundance and its climate. The Reverend Robert Bateman Paul described Canterbury’s climate as being so equitable that the growth of grass was never sufficiently checked as to affect the condition of the stock.\(^{56}\) Hodgkinson, who had a brief experience as a sheep farmer in the region, conceded that Canterbury was a windy place and, being

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bare of trees, settlers would need to plant shelter for gardens and orchards. Settlers soon discovered that the climate was not always as benign as the boosters had led them to believe. The early accounts not only noted the marked variation in both the landscape and the vegetation over the rangelands but also commented on the variability of the climate, both across different areas within the region and from season to season.

The Deans brothers noticed the variations in the seasons in the first two years after settling at their Riccarton farm. The summer of 1844 was dry, whereas the following summer, according to John Deans, ‘was very different’ as they had an ‘abundance of rain’ and that resulted in a good season for their crops. They found the winter of 1846 to be particularly severe with more wind, rain and snow than they had experienced in New Zealand up to that time. In fact it was so wet that they were unable to prepare the land to sow winter wheat. The Kennaway brothers experienced a similar contrast in weather. They arrived in September 1851 and described the weather as perfect, being ‘bright clear and exhilarating for months’; however, the winter of 1853 proved to be one of weeks of incessant ‘sou’west’ storms and almost continuous floods of rain. Laurence Kennaway later recalled the ‘storms of winter, which swept over the unsheltered plains behind us, the roar of the wind around the thin walls at night was wild and deafening’.

These early descriptions of the weather allude to several features that characterise the climate of the rangelands of the South Island. Cycles of drought could often be followed by cycles of storms and floods; and then there was the wind. Alexander Lean observed the pattern of wind and weather as being a ‘norwester’ followed by a ‘southerly buster’ then perhaps

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57 S. Hodgkinson, Emigration to New Zealand. A description of the province of Canterbury, New Zealand founded on experience obtained during a residence of three years as a sheep-farmer in the colony (London: W. and F. Cash, 1856), 7.
59 Deans, 111.
60 Laurence J. Kennaway, Crusts. A Settler’s Fare Due South (1874; reprinted Christchurch: Capper Press, 190), 21, 34.
61 Kennaway, 19.
a few settled days before the cycle was repeated. Samuel Butler described the norwester as a ‘remarkable feature in the climate of the settlement’, being hot, dry and ‘excessively violent’ and could blow for days at a time. Like Lean, Butler noted that a period of norwesters would often be followed by a sudden change to the sou’west, ‘the cold, rainy, or snowy wind’. John Barton Acland wrote to his son Henry in 1886 about this weather pattern saying, ‘I remarked to Moffat [the gardener] this morning that this was an awful country. His reply was it was “a terror”’. This discussion had been instigated by the weekend’s weather: on Friday there had been a ‘howling’ norwester, with a shift to the sou’west and rain on Saturday, while on Sunday it had been fine in the morning before it came on to rain and hail and leave snow on the hills. In summer this weather pattern became less pronounced and settlers noted the north-easterly as the prevalent wind. Butler described it as blowing with ‘delightful freshness during the greater part of the day’.

For pastoralists and settlers living in open country without the shelter of trees the wind could be overwhelming. Lady Barker found it ‘hardly possible’ to describe the ‘force and fury’ of a norwest gale rampaging across the exposed plains. Mark Pringle Stoddart was another who commented on the ferocity of the norwester. He took up The Terrace Station just below the Rakaia Gorge, and found it such a windy place that he sold the run within two years. He described his experience of the winds there in a poem:

I’ve witnessed all the winds that blow from, from Land’s End to Barbadoes, Typhoons, pamperos, hurricanes, eke terrible tornadoes.
All these but gentle zephyrs are, which pleasantly go by ye,
To the howling, bellowing, horrid gusts which sweep down the Rakaia.

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62 Lean, Reminiscences, 30.
63 Butler, 108.
64 Acland Papers, Box 11, Letter to Henry, 13 December 1886.
65 Butler, 110.
66 Lady Barker, Station Life In New Zealand (1870; reprinted Christchurch: Vintage, 2000), 130.
Early settlers took some time to come to terms with the variation in rainfall across the region. The western ranges are subject to heavy rain from the westerly winds crossing the Southern Alps. Glenthorpe Station, twenty kilometres from the main divide, has an annual rainfall of 1,546 mm (60 inches), while in the foothills along the western edge of the plains the rainfall is around 1,000 mm (39.37 inches) and generally comes from the south, whereas the plains are drier with Christchurch averaging about 640 mm (25.6 inches) a year. The inland regions of Central Otago and the Mackenzie Country lie in the rainshadow of the Alps and are sheltered from the southerly and so are very dry; Alexandra averages 340 mm (13.4 inches) a year. Southland and west Otago are exposed to weather from the west and south and are much wetter; Invercargill’s annual rainfall is 1040 mm (40.9 inches).

The variation in rainfall over relatively short distances is the result of a combination of local factors, including the way that mountains and hills deflect or channel rain-bearing winds. The table below shows the average rainfall for Christchurch, Oamaru and Dunedin. Oamaru is approximately 240 kilometres south of Christchurch and about 110 north of Dunedin, yet despite the three towns being on the same coast and relatively close to each other the rainfall differences are marked. In 1878 Christchurch experienced one of its driest years, yet Oamaru’s rainfall was only slightly below average. In 1881 Oamaru had one its worst droughts and Christchurch’s rainfall was above average, while in both of those years Dunedin had sixty-five per cent of its normal rainfall.

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TABLE: 2.1. Average rainfall for Christchurch, Oamaru and Dunedin, 1864 to 1910, and the years 1878 and 1881

<table>
<thead>
<tr>
<th></th>
<th>Ave. rainfall</th>
<th>1878 rainfall</th>
<th>1881 rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inches</td>
<td>1878 rainfall</td>
<td>1878 rainfall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(343.9 mm)</td>
<td>(343.9 mm)</td>
</tr>
<tr>
<td>Christchurch</td>
<td>25.26 (641.6 mm)</td>
<td>25.26 (641.6 mm)</td>
<td>25.26 (641.6 mm)</td>
</tr>
<tr>
<td>Oamaru</td>
<td>21.88 (536.6 mm)</td>
<td>20.26 (514.6 mm)</td>
<td>13.47 (342.1 mm)</td>
</tr>
<tr>
<td>Dunedin</td>
<td>38.6 (980.4 mm)</td>
<td>25.26 (641.6 mm)</td>
<td>25.26 (641.6 mm)</td>
</tr>
</tbody>
</table>

Altitude was another factor contributing to the variation in rainfall. This can be seen in the following table where the rainfall nearly doubles as the altitude increases from 240 metres above sea level to 900 metres. This conferred considerable advantages to sheep farmers as it meant that higher altitude country on the same run could provide good summering feed when the lower altitude pastures dried out in the summer months. Conversely, the higher country was also subject to heavier snowfall so that stock needed to be brought down off the high country before the winter set in.

TABLE: 2.2. Altitude effect on rainfall at Blue Cliffs Station August 1947 to July 1949

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Rain 31/07/1947</th>
<th>Rain 1/08/1947</th>
<th>Rain 1/08/1948 - 31/07/1949</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 ft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>240 metres</td>
<td>23.9 inches</td>
<td>607 mm</td>
<td>23.7 inches 602 mm</td>
</tr>
<tr>
<td>1,500 ft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450 metres</td>
<td>32 inches</td>
<td>813 mm</td>
<td>32.4 inches 823 mm</td>
</tr>
<tr>
<td>3,000 ft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900 metres</td>
<td>45.6 inches</td>
<td>1158 mm</td>
<td>43.6 inches 1107 mm</td>
</tr>
</tbody>
</table>

The effect of altitude was more significant than just the change it brought to rainfall; it also modified the temperature and consequently the seasonal pattern of grass growth. The Kennaways found this when they explored the upper Canterbury plains to the foothills in 1854. After a freezing night in the open, they realised how ‘the climate, from elevation,'
was much more severe than that which we had hitherto experienced. Christchurch Airport, at thirty metres above sea level, experiences about 83 ground frosts a year, whereas Molesworth Station at 893 metres suffers 217 ground frosts a year. Thus the rise in altitude clearly limits the length of the growing season, which in the high country can be very short. For example at Tara Hills Station, near Omarama, high evaporation/transpiration rates in summer can stop pasture growth throughout January and February, while frosts can limit growth from mid-May to mid-August depending on the season. This results in grass growth being shut down for six months of the year. On a run with a good balance of sunny and shady country this pattern of pasture production can be extended, as the sunny slopes will have an earlier growth period in the spring and will grow later in the autumn, while shady country will continue to grow pasture through the high summer period.

In addition to having a shorter growing season higher altitude country has historically suffered more from extreme snow events. L.G.D. Acland listed the years 1862, 1867, 1878, 1887, 1888, 1895 (the worst of all), 1903, and 1908 as being years of severe snow in Canterbury. Laurence Kennaway wrote a poignant description of the 1862 snow at Clayton, when he and his partners lost most of their sheep. They sold the run the following summer. Lady Barker described her experience in the 1867 snow when her husband, Frederick Broome, and his partner lost 4,000 sheep out of their flock of 7,000. The loss broke Broome financially and he sold out to his partner the following year. The snow of 1867 lay for six months and when it thawed in February the following year it caused devastating floods. The

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73 Kennaway, 38.
74 Summaries of Climatological Observations to 1970, New Zealand Meteorological Service Miscellaneous Publication 143.
76 L.G.D. Acland, 21.
77 Kennaway, 220-223.
78 L.G.D. Acland, 228.
snow and the floods killed 60,000 sheep on Moa Flat Station, reducing the flock by half.79

The climate of the South Island rangelands, while erratic, was seen by the early pastoralists as superior to that of Australia, as they did not suffer the prolonged droughts that made farming so difficult across the Tasman. Yet cycles of drought and flood, storms and snow did create challenges. The settlers had to learn to read weather patterns in order to survive economically, and when they got it wrong the costs proved high. The other feature of the climate that settlers had to learn was its variability across the South Island; while one area suffered from drought, the people in the next valley might be enjoying a good season. Oliver Scott Thomson, manager at Mt Peel, made that very point in a letter to his stock firm in April 1898, saying that at Mt Peel feed was ‘plentiful’ and the sheep were looking ‘wonderfully well’, whereas the plains were in the grip of a bad drought.80

Clearly, in the early years of the pastoral expansion, for pastoralists to be successful an accelerated process of land assessment and environmental learning needed to occur. This raises the question of how an individual learned the business of sheep ranching in the new environment. The next section examines Acland’s initiation into the industry.

**John Barton Acland – learning the business**

In spite of Sewell’s doubts about Acland’s prospects as a pastoralist, within three weeks of landing in the colony he left Christchurch to take a closer look at the practicalities of the business. Acland joined Belfield Woolcombe, who was taking a load of wool packs to his station Hawkeswood which lay between the Waiau and Conway Rivers.81 Woolcombe, J. Stuart Wortley and Thomas Hanmer had established the


80 Acland Papers, Box 57, 14 April 1898.

81 MAP: 2.4, Some Marlborough and Amuri Stations, p.83.
station in partnership in the spring of 1852, but recently Hanmer had withdrawn to manage a new run being set up by George Duppa. After a trip of four days they crossed the Waiau to find that Wortley and his men were camping out at the site where they washed their sheep before they were shorn. Here Acland got his first taste of colonial sheep farming. The men took it in turn to stand in the water, which was four to five feet deep, and wash the sheep as they were thrown in. In this way they were able to handle about 600 sheep a day and as each mob was washed it was taken to a quarantine yard to be held there until it was shorn.82

Unlike the Australian system where the sheep were close shepherded through the day and yarded at night, the Hawkeswood flock, which numbered about 2,800 sheep, ran free in separate mobs on different parts of the run. This system of management had the advantage of requiring little labour for day to day shepherding, but it had the disadvantage that on the unfenced hills the sheep did not necessarily stay where they were put. One of Acland’s jobs while he was at Hawkeswood was a day spent with one of the men looking for a mob of lost sheep on steep hills that he estimated to be 3,000 to 4,000 feet high.

At Hawkeswood Acland noted the rough and ready ways of colonial sheep ranching. He wrote that bed sheets were seldom used on sheep stations ‘on account of the trouble of washing’ and the custom was to sleep between blankets.83 He also came across his first ‘parlour shepherd’ or cadet. Acland described the position as being someone who ‘lives in the house as a gentleman but works as a shepherd’ adding, ‘[it] is what I shall be when I settle down on a station’.84 For the privilege of working unpaid, save for his keep and learning the business, the cadet paid the station owner a fee. Although the system was widely practiced throughout the early pastoral era, it did have its critics. Butler had two cadets at different times, but concluded

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82 Acland Papers, Box 7, 24 January -5 February 1855.
83 Acland Papers, Box 7, 29 January 1855.
84 Acland Papers, Box 7, 29 January 1855.
that ‘the system is a bad one for all the parties concerned in it’. He thought that cadets soon got sick of working for no wage, and since they paid for the privilege they could choose to be idle if they wished.

Acland spent ten days helping out with washing, shearing, mustering and stacking oats at Hawkeswood. He then joined Tripp and Thomas Hanmer who had arrived at Hawkeswood to take charge of 2,000 sheep and drive them to George Duppa’s new run, St Leonards. The party was made up of Hanmer, Acland, Tripp, Darell Duppa (a nephew of George Duppa and his cadet), a shepherd named Bob, three saddle horses, three pack horses, two colts, a mule, three dogs and 2,000 sheep. They camped the first night in a dry river bed, but because of a full moon the sheep would not settle. Acland watched over them until about ten and then called on Bob to stand watch for the rest of the night. After three more day’s travel they arrived at the new station which consisted of a couple of tents. There were no buildings or yards, and the drinking water came from a hole dug in a nearby swamp. Acland commented that Hanmer hoped to have a house up before winter.

The hardships that Acland and Tripp experienced on the journey to the Amuri district did nothing to dampen their enthusiasm for sheep farming and soon after returning to Christchurch they became cadets: Acland at Malvern Hills with Henry Tancred and Tripp at Halswell Station with Michael John Burke. In early 1855 Burke was in the process of establishing a new station, Raincliff, in fork of the Opihi and Ophua Rivers in South Canterbury and towards the end of March Tripp and Acland joined him on an expedition to take supplies to the run. The convoy consisted of three drays, one pulled by six bullocks, one by four bullocks, and a lighter dray pulled by six horses. In addition to the drays there were four saddle horses. As well as Burke, Tripp and Acland the party included Mr Minchin, who wanted to go south to look for land, Mr Thompson, who was going down to the Otaio run that he held with his two brothers, and the bullock driver with his wife.

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86 Acland Papers, Box 7, 5 February 1855.
87 Acland Papers, Box 7, 8 February 1855.
Burke had a reputation for being a slow traveller as he tended to start late and usually did not get under way until mid-morning. Acland described their routine: upon rising they built a fire and boiled a billy to make tea; breakfast consisted of bread, butter and cold meat; the bullocks were caught and yoked up, and the horses caught and harnessed; then they packed up the camp and the convoy got on its way. In the evening they repeated same process in reverse, except that they enhanced the evening meal with potatoes boiled in the camp oven.\textsuperscript{88} They lost one day of travel because the bullocks wandered off overnight and the men spent most of the day searching for them. At the Rakaia all hands spent the morning cutting a track up the steep face of the terrace to get the drays up onto the plain.\textsuperscript{89} These occurrences constituted a normal part of travelling and the fourteen day journey gave Acland and Tripp the chance to gain experience and the opportunity to assess new country.

After his trip to Raincliff, Acland returned to Malvern Hills which remained his base for most of the following year. Through this time Acland worked closely with Tancred's shepherd, Laing. This experience gave him some practical insights into the day to day running of a sheep run. Laing taught him how to mark out and build a ditch and bank fence and how to shear. Acland learned how to bleed sheep after the wethers got 'tutted'.\textsuperscript{90} He helped sort out sheep to be sold and helped to lamb down the ewes. They tailed lambs in late November and in the middle of December they washed the sheep in preparation for shearing. At shearing time Acland's participation was erratic: shearing went for twenty days and Acland was around for ten of those. His best day's output was thirteen sheep shorn, but he was also busy with rolling and pressing the fleeces.\textsuperscript{91}

Despite Butler's misgivings about the benefits of the cadet system, both Acland and Tripp wrote positively about their experiences. In 1858 Acland returned to England for a brief visit. In an address to the Bath and

\textsuperscript{88} Acland Papers, Box 7, 30 March 1855.
\textsuperscript{89} Acland Papers, Box 7, 28 March 1855.
\textsuperscript{90} Acland Papers, Box 7, 21 April 1855.
\textsuperscript{91} Acland Papers, Box 7, 31 December 1855.
West of England Society he suggested any prospective sheep farmer should first spend six to twelve months on a sheep station 'where he will learn his business, and probably gain some experience without paying too dearly for it'. Tripp returned to England in 1862 and at a lecture at his home town of Silverton he too suggested that it was unwise to invest in sheep farming within twelve months after arriving in New Zealand without gaining practical experience first.

L.G.D. Acland reported that Tancred gave Acland two pieces of advice. When choosing a site for his homestead it should be handy to water, handy to firewood, and to make the garden where there were plenty of cabbage trees because that was a sure sign of good land. The other advice was never to work along side one of his men, because either the man slowed so as not to embarrass his employer or 'the employer knocked himself up trying to get full work out of the man'. Later experience suggests that Acland heeded both of Tancred's recommendations.

Exploring Mt Peel and setting up the station

By the beginning of 1855 over 100 runs had been taken up in the Canterbury region between the Hurunui River in the north and the Waitaki River in the south and from the sea to the foothills. MAP: 2.1 with its accompanying tables, shows the years in which the runs between the Hurunui and Waitaki Rivers were selected. The timing of the occupation of these runs suggests that, although there was some assessment being made about the merits of the country, many runs must have been applied for simply because the country was available. The map shows that the pastoral expansion spread from the settlement of Christchurch, generally with the handiest country being the earliest selected, although there were some

93 C.G. Tripp, Lecture given by the late C.G. Tripp of Orari Gorge, Canterbury at Silverton, Devon 1862 (Wellington: Ferguson and Osborn, 1926), 8-9.
94 L.G.D. Acland, 79.
95 See MAP: 2.1. The establishment of runs in Canterbury - showing years when they were first taken up, p. 78, with Key, pp. 79-80, L.G.D. Acland, map inside back cover.
exceptions. All the flat land and easy hills between the Waimakairi and Selwyn Rivers was taken up in 1851 and 1852, apart from Field’s and Guinness’. The following year all the country between the Ashley and Rakaia was occupied, as was all of the easier country between the Orari and Opihi Rivers in South Canterbury, a block that included Burke’s Raincliff Station. It is interesting that the resource hunters traversed the light stony plains between the Ashburton and Orari Rivers to take up this better country. However, in 1854 all the plains between the Ashburton and Orari back to the foothills were applied for, regardless of the quality of the land. What is clear is that the pattern of the occupation of the plains bore little relationship with Torlesse’s assessment that the better country lay along the coastal strip and the western plains.96

By mid-1855 no resource hunters had ventured in to the higher mountain country on the western side of the plains. Acland and Tripp had seen the Mt Peel country on their trip to Raincliff with Burke and decided that it was worth exploring as the possible site for their run. It is unclear whether they decided to take up Mt Peel on the basis of their assessment of the quality of the country or because it was simply unclaimed.

The two men left Christchurch on 5 September 1855, having already applied for 57,500 acres each in the Mt Peel area, although they had only ever seen the country from a distance.97 Others did not share the pair’s enthusiasm for their prospects. Laurence Kennaway later commented that Acland was looked upon as a ‘harmless maniac’ for taking up a run in the ranges.98 On their expedition south Acland and Tripp spent a night at Ashburton Station when a ‘souwester’ went through and in the morning Mrs Hayhurst, the manager’s wife, called them out to show them that the country they were going to explore ‘was perfectly white’ with snow, although the lower hills thawed during the day.99 Two days later Acland and Tripp

96 See pp.48-9 for Torlesse’s description of the plains.
97 G.W. Harte, Mount Peel is a Hundred. The story of the first high-country sheep station in Canterbury (Timaru: Timaru Herald, 1956), 13.
98 Kennaway, 60.
99 Acland Papers, Box 7, 15 September 1855.
stopped at Russell’s station, Gawler Downs. Russell laughed at their plans saying that the banks of the Rangitata were perpendicular, and that he would not take a horse down there for fifty pounds; moreover, the country opposite was impassable. The explorers’ response was ‘that it was very likely, but we had a fancy to look at it.’\(^{100}\)

The next day they arrived at the Rangitata and found the banks to be as bad as Russell had described; however, they eventually found a stony gully that gave them access to the river bed. After finding a ‘pretty fair crossing’ they set up camp about 3.30 and ‘set fire to the country as [they] found it would be impossible almost to go far without burning’.\(^{101}\) By 7.00 the fire had extended for miles and was seen sixty miles away. Acland was able to write his diary by the glare of the fire alone and stated that it ‘certainly beat any illumination I ever saw’.\(^{102}\) After spending the following three days exploring and burning the pair headed back to Christchurch where they made new land applications as a consequence of their discoveries.

On 5 October Acland and Tripp returned to Mt Peel and spent a fortnight exploring. The country below the Rangitata gorge was rough with thick manuka scrub, wild Irishman, and speargrass, and approaches up the steep banks were difficult. This time they gained access to the country above the gorge and found it altogether easier. Acland noted that there was not so much matagouri and ‘hardly a blade of snowgrass’.\(^{103}\) Clearly he viewed snowgrass as one of the undesirable plants as it left little room for anything else to grow. In his diary Acland described it as a tussock grass and ‘so near together are the tussocks that a man could jump from one to another for half a mile’ and that ‘after burning the mass that remains is ... one foot in height and two in diameter’.\(^{104}\)

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\(^{100}\) Acland Papers, Box 7, 17 September 1855.
\(^{101}\) Acland Papers, Box 7, 18 September 1855.
\(^{102}\) Acland Papers, Box 7, 18 September 1855.
\(^{103}\) Acland Papers, Box 7, 10 October 1855.
\(^{104}\) Acland Papers, Box 7, 10 October 1855.
The two explorers continued up the Rangitata valley and found the
spaniard to be ‘terribly bad’ for much of the way, so they continued to burn
as they went. Acland had brought along clover seed and on the way back
down the valley he sowed it over the burned ground as he rode along. Below
the gorge he continued to sow clover seed. They also saw wild pigs for the
first time, although they had seen signs of them before.  

On their third trip in February and March 1856 Acland and Tripp
explored more of the Mt Peel country and then took an extended trip into the
upper Ashburton River. It was on this expedition that they gained first hand
experience in the difficulties of crossing sheep over the rivers that cut across
the plains. At the Rakaia River Acland and Tripp came across ‘Nabob’
Wilson’s son, who was driving 5,000 sheep to their new run, Cracroft. By
that stage Wilson and his men had already been at the river for four days and
had managed to get only 300 sheep across. With Acland and Tripp helping
they got another 400 over, but the next day all they managed were 200 to
300. In the end it took nine days to get all the sheep over with the main mob
of 4,000 eventually crossing in about two hours. There were many similar
tales about the frustration of crossing large mobs of sheep over these rivers,
although Alexander Hewson reckoned that good drovers seldom lost a sheep
in the process. He also recalled when a mob travelling from Glenmark to
Lake Wenaka had to camp at the Waitaki for three months as the river was in
flood.

In late April Acland, Tripp and their party left Christchurch to establish
their run at Mt Peel. They had taken on Robert Smith as a farm worker and
he was accompanied by his wife and three children; W. Sharp, a friend of
Tripp’s, had been engaged as a cadet; there was William Wyatt who had
been employed as a carpenter; and at Ashburton Station they hired Ned
Samson, who was described as an ‘old hand’, which was the term for
someone who had been in the region before organised settlement. All the

105 Acland Papers, Box 7, 17-20 October 1855.
106 Acland Papers, Box 7, 22-27 February 1856.
107 Hewson, 20.
stores were on a dray pulled by eight bullocks, while Acland, Tripp and Sharp were mounted, and there was a spare horse.\textsuperscript{108}

The party reached the bank of the Rangitata on 1 May, and began to make a cutting to get the dray down the steep bank and onto the bed of the river. At this stage Acland and Tripp engaged Abner and Robinson Clough for six months and one year respectively as station workers.\textsuperscript{109} The Clough brothers, who were the sons of a whaler and a high-born Maori woman, had been working at Peel Forest Station and were experienced and knowledgeable hands. After six days of hard work they completed the cutting down the terrace and the following day cuttings were made across the river bed to make access easier for the dray. On 8 May 1856 they crossed the dray with half the stores onto the site of the new station and two days later they brought over Mrs Smith, the children and the rest of the supplies. Immediately they set about building accommodation, made from cabbage trees, for the Smiths.\textsuperscript{110} The house also had a dining room for the men and a loft for the stores. The rest of the party spent the winter sleeping in tents. In 1862 Tripp recalled the experience cheerfully enough, writing:

> The first six months Mr Acland and myself were on the run we slept on the bare ground, with a sheet of mackintosh under us, with our clothes for a pillow, and only a horse rug and a blanket apiece. I did not want for any more, and was as happy and jolly as if I had been lying in the best house in England.\textsuperscript{111}

\textbf{Mt Peel Station}

The site chosen for the station buildings was at the eastern end of the run. Acland described the area, saying:

\textsuperscript{108} Acland Papers, Box 7, 29 April 1855.
\textsuperscript{109} Acland Papers, Box 7, 3 May 1856.
\textsuperscript{110} Acland Papers, Box 7, 12 May 1856.
\textsuperscript{111} Tripp, 7.
The hills are very steep - they may be said to commence about one or two miles from the river but their base averages about 400 feet above the river – in this intervening open of one or two miles are regular sets of terraces one above the other perfectly flat – then a sudden rise of from fifty to one hundred feet ... so that it is often difficult to take a horse up.112

These terraces were cut by four deep gullies running from the hills to the river and these were difficult to cross, with easiest access being from the river bed. Acland described the gullies as being ‘more or less wooded and very pretty’.

While still in the process of establishing their station Acland and Tripp continued to explore surrounding country and adding to their run. The whole of Mt Peel was, in fact, taken up in seven different runs over a period of five years, with the final block being applied for in May 1861. In all the pair at one time held nearly 300,000 acres (121,400 hectares) including Mt Peel, Mt Somers, Mt Possession, Orari Gorge and parts of Mesopotamia and Hakatere.113 Mt Possession was sold in June 1861, and in June 1862, with both men now married, they dissolved their partnership. They settled the division of their holdings with Acland choosing Mt Peel, leaving Tripp with the Orari Gorge and Mt Somers runs.

At the time John Barton Acland took over Mt Peel the seven runs that made up the property took in about 105,000 acres (42,500 hectares).114 It was a particularly well balanced station and it is no surprise that Peter Newton, a former musterer, station manager and author thought it ‘one of the best stations in Canterbury’.115 The outstanding feature of the property was nearly thirty miles of sunny country between the Rangitata River and the Mt Peel Range. Compared with most high country properties this is low altitude country, with the homestead lying at just on 1,000 feet (300 metres) above

112 Acland Papers, Box 7, November 1855.
113 L.G.D. Acland, 143.
114 MAP: 2.2. Mt Peel Station 1861 to 1912, p. 81, Acland Papers, Box 89, 1889 map.
sea level, and the western boundary at Forest Creek under 1,500 feet (450 metres). The lower country along this valley is made up of good river flats, fertile terraces and easy hills, with the higher country being steep hills rising to 5,700 feet at Mount Peel. The highest parts of the station were the Ben McLeod Range at 6,500 feet and the high ridge between Butler’s Creek and Forest Creek at 7,000 feet.

The back side of the Mt Peel and Ben McLeod ranges took in the Orari country consisting of about 40,000 acres of steep tussock hills. Most of this is cold country, but because it lies away from the sun it does not dry up in summer and so provides ample feed for sheep in that season and in the autumn. There are some areas of sunny faces above the Phantom River; however, it is higher than the Rangitata valley and, consequently, in bad snow years Mt Peel lost thousands of sheep on this side of the range. The problem of snow on this dark country was exacerbated by the fact that the only access between the Orari side and the safe front country along the Rangitata was over Stew Point Saddle, which lies at 4,000 feet. Consequently, in a bad winter stock on the Orari side were trapped there.

As well as having a good balance of sunny and dark country Mt Peel lies in a high rainfall zone, although rainfall varied considerably over the station with the homestead area receiving, on average, 1140 mm (45 inches) annually whereas at the western boundary at Forest Creek the annual average is 756 mm (30 inches). The high rainfall in conjunction with the extensive area of sunny country along the Rangitata ensured that the station grew feed from early spring through to late autumn and drought was a rare occurrence. In fact a dry season was preferable to a wet one at Mt Peel, when footrot became a major animal health problem. Despite the widespread drought during the summer and autumn of 1898, the manager, Oliver Scott Thomson, made the observation that Mt Peel’s sheep do ‘very much better’ in a dry year and ‘they have been in splendid condition all through this season and also cut a lot of wool’. 116

116 Acland Papers, Box 57, Station Letterbook, 23 May 1898.
However, as Mt Peel is a mountain run it is subject to occasional extreme weather events and over the station’s history wind, rain, flood and snow have all taken a heavy toll. The station is situated in a gorge which channels the prevailing norwest wind between ranges of hills and increases its intensity. Acland often referred to the norwesters in his diary, describing them as ‘furious’, ‘frightful’, ‘violent’ and ‘extreme’.\textsuperscript{117} Episodes of intense rainfall are often associated with extreme norwest storms and Mt Peel suffered considerable damage from floods that arose from those storms. E.R. Chudleigh has left us with this wonderful description of a flood at Mt Peel in December 1865 that resulted from a norwest storm. He noted that the river ‘had risen to the greatest height ever known’:

It rolled over all the river flats covering fences and quite threatening the woolshed, the water rising into the yards. Trees and boulders kept sweeping by. The trees past [sic] by like racing monsters and the boulders with a grinding roar that spoke of an irresistible force, the banks falling in up and down, the river with an unpleasant encroaching sound.\textsuperscript{118}

**TABLE: 2.3. Floods noted in Mt Peel diaries, with diary comments\textsuperscript{119}**

<table>
<thead>
<tr>
<th>Year, Month</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1865 December</td>
<td>Highest fresh on record</td>
</tr>
<tr>
<td>1868 February</td>
<td>8 inches of rain in 40 hours. Scene of desolation</td>
</tr>
<tr>
<td>1870 April</td>
<td>High fresh. 3.42 inches of rain over night</td>
</tr>
<tr>
<td>1876 May</td>
<td>Heavy norwest flood</td>
</tr>
<tr>
<td>1877 December</td>
<td>Heaviest flood for years</td>
</tr>
<tr>
<td>1883 November</td>
<td>Heavy storm. Floods. Incalculable damage to garden.</td>
</tr>
<tr>
<td>December</td>
<td>Another heavy flood</td>
</tr>
<tr>
<td>1884 April</td>
<td>Heavy rain and heavy floods</td>
</tr>
<tr>
<td>September</td>
<td>Heavy norwest rain.</td>
</tr>
<tr>
<td>1888 August</td>
<td>3½ inches rain in 12 hours. 6¼ inches in 72 hours. Floods. Garden covered in shingle</td>
</tr>
</tbody>
</table>

\textsuperscript{117} Acland Papers, Box 4, J.B.A. Acland Diary, 3 February, 19 March, 28 October 4 November 1864; 31 July 1867.
\textsuperscript{118} Acland Papers, E.R. Chudleigh Diary, Box 90, 24 December 1865.
\textsuperscript{119} Acland Papers, Boxes 4, 7, J.B.A. Acland Diaries.
Winds and floods caused damage to the land and improvements such as fences, tracks, bridges and their approaches, station buildings, paddocks, hay stacks, shelter trees and gardens at Mt Peel; but snow killed sheep in their thousands. Snow is a normal part of the winter in the high country, however, over the seventy years that concern this thesis there were seven winters where snow caused high stock losses in Canterbury and on Mt Peel: 1862, 1867, 1887, 1888, 1895, 1903 and 1908. The snow of 1862 was the heaviest experienced on the plains but, although it was a hard winter on the station, Mt Peel did not suffer too badly as it was understocked and all the sheep were wintered on the safe Rangitata country. The station did not get off so lightly in 1867 when it lost one third of the flock: 10,000 out of 31,000 sheep. It was this snow that put Frederick Broome out of Steventon and killed 60,000 sheep at Moa Flat. The worst snow in Canterbury’s recorded history was in 1895. At Mt Peel Oliver Scott Thomson claimed to have put out 51,000 sheep for the winter, but only 32,769 were shorn the following year; this meant the loss of 18,200 sheep, or thirty-five per cent of the flock.

Despite suffering from these extreme events Mt Peel was a special property. Few other stations possessed such extensive areas of relatively low altitude sunny country with fertile terraces, river flats, and easy hills in such a reliable rainfall zone. Moreover, the station also included large areas of steeper tussock hill country that were ideal for summering sheep in order to spell the better front country. No other high country run in Canterbury consistently ran more sheep than Mt Peel and the station was able to maintain its stock loading up until the time it was subdivided in 1912. In Otago there were larger runs that carried more stock in the early years, but few of those were able to maintain their stock loading after the rabbit invasion.

120 L.D.G. Acland, 21.
121 Harte, 68.
122 Acland Papers, Box 52, 2 January 1896; 22 February 1896.
Conclusion

This chapter has examined the rangeland environment of the South Island as it was seen and understood by the early surveyors and pastoralists. It has also recounted the early pastoral expansion on to those rangelands. Pastoralists and surveyors found the landforms, climate and vegetation highly variable over the region with the result that there were considerable differences in the natural resources on the runs that were established in the pastoral era. This was accentuated in the hills and mountains where altitude and aspect are so important, but even on the plains there were significant differences between runs, with some having better and deeper soils while others possessed shallow and stony soils and so were less fertile and more prone to drought.

The evidence from the pattern of the selection of runs suggests that in many cases little regard was given to the quality of the country in the period of the pastoral expansion. It appears that luck might have had as much a part to play in the selection of Mt Peel as an eye for good country. Tripp recalled their first visit to the place saying ‘we thought, if it could produce such coarse herbage, with that burnt off regularly, and well stocked, it must produce fine grass in time’. Their supposition proved correct but it was supposition nonetheless. Others who made similar assumptions about the potential of run blocks did not necessarily meet with the same success.

Tripp’s observation about the need to turn the coarse pasturage into fine grass was found in many of the assessments of the pasturage made by the resource hunters during the exploration phase. It appears that the early surveyors and pastoralists were mindful that the shrubby tall-tussock country was not suitable for sheep grazing and in order to make it into sheep pasture the country needed to be burned. In time this became one of the most controversial practices of land management in the pastoral era. The next chapter deals with this issue in depth.

\[^{123}\text{Tripp, 7.}\]
MAP: 2.1. The Establishment of Stations in Canterbury to 1865
Key to map showing the years in which the Canterbury Runs were established\textsuperscript{124}

<table>
<thead>
<tr>
<th>1850 and earlier</th>
<th>1851</th>
<th>1852</th>
<th>1853</th>
<th>1854</th>
</tr>
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<tbody>
<tr>
<td>Dalethorpe</td>
<td>Ahuriri</td>
<td>Ashley Gorge</td>
<td>Acheron Bank</td>
<td>Alford</td>
</tr>
<tr>
<td>Gebbie’s</td>
<td>Ashfield</td>
<td>Broomfield</td>
<td>Acton</td>
<td>Anama</td>
</tr>
<tr>
<td>Kinloch</td>
<td>Birch Hollow</td>
<td>Camla</td>
<td>Arowhenua</td>
<td>Coldstream</td>
</tr>
<tr>
<td>Motunau</td>
<td>Broadlands</td>
<td>Carleton</td>
<td>Ashburton</td>
<td>Cracroft</td>
</tr>
<tr>
<td>Mt Grey</td>
<td>Burnt Hill</td>
<td>Coringa</td>
<td>Birch Hill</td>
<td>Day’s Run</td>
</tr>
<tr>
<td>Purau</td>
<td>Double Corner</td>
<td>Corwar</td>
<td>Birdling’s Brook</td>
<td>Elephant Hill</td>
</tr>
<tr>
<td>Stonyhurst</td>
<td>Easedale Nook</td>
<td>Haldon</td>
<td>Dunsandal</td>
<td>Glenmark</td>
</tr>
<tr>
<td>The Levels</td>
<td>Fernside</td>
<td>Harman and Davie’s</td>
<td>Eyrewell</td>
<td>Glentui</td>
</tr>
<tr>
<td>Teviotdale</td>
<td>Fooks</td>
<td>Highbank</td>
<td>Field’s</td>
<td>Guinness’s</td>
</tr>
<tr>
<td>Halswell</td>
<td>Malvern Hills</td>
<td>Milton</td>
<td>High Peak</td>
<td>Horsley Down</td>
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<tr>
<td>Heathstock</td>
<td>Ptebbles Run</td>
<td>Prebble’s Run</td>
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<td>Racecourse Hill</td>
<td>Homebrook</td>
<td>Maronon</td>
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<tr>
<td>Lansdown</td>
<td>Rockwood</td>
<td>Hororata</td>
<td>Orari</td>
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</tr>
<tr>
<td>Mt Grey</td>
<td>Spaxton</td>
<td>Kakahu</td>
<td>Shepherd’s Bush</td>
<td></td>
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<td>Mt Pleasant</td>
<td>Springfield</td>
<td>Lavington</td>
<td>Te Waimate</td>
<td></td>
</tr>
<tr>
<td>Mt Thomas</td>
<td>Steventon</td>
<td>Oakleigh</td>
<td>Valetta</td>
<td></td>
</tr>
<tr>
<td>Murphy’s Run</td>
<td>The Point</td>
<td>Opua Gorge</td>
<td>Wakanui</td>
<td></td>
</tr>
<tr>
<td>Pawsey’s Run</td>
<td>The Springs</td>
<td>Pareora</td>
<td>Waterford</td>
<td></td>
</tr>
<tr>
<td>Smart and Turner’s</td>
<td>The Sand Hills</td>
<td>Peel Forest</td>
<td>Westerfield</td>
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<td>Springbank</td>
<td>The Terrace</td>
<td>Price’s Stn</td>
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<td>Sandy Knobs</td>
<td>The Warren</td>
<td>Raincliff</td>
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<tr>
<td>The Desert</td>
<td>Tresillian</td>
<td>Raukapuka</td>
<td></td>
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<td>View Hill</td>
<td>Ringwood</td>
<td></td>
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<td>Rokeby</td>
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<td>Waireka</td>
<td>Waikakahi</td>
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<td>Washbourne’s</td>
<td>Winchmore</td>
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<td>Worthingham</td>
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<td></td>
<td>Snowdon</td>
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\textsuperscript{124} L.G.D. Acland, \textit{The Early Canterbury Runs} (Christchurch: Whitcombe and Tombs, 1951), map inside rear cover.
The establishment of the Canterbury Runs continued

<table>
<thead>
<tr>
<th>Date</th>
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<th>Place 3</th>
<th>Place 4</th>
<th>Place 5</th>
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<tbody>
<tr>
<td>1855</td>
<td>Albury</td>
<td>Bluecliffs</td>
<td>Avoca</td>
<td>Ashwick</td>
<td>Braemar</td>
</tr>
<tr>
<td>1855</td>
<td>Buccleugh</td>
<td>Cannington</td>
<td>Ben Ohau</td>
<td>Balmoral</td>
<td>Esk Head</td>
</tr>
<tr>
<td>1855</td>
<td>Grassdale</td>
<td>Four Peaks</td>
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MAP: 2.2. MT Peel Station, 1861-1912

Acland Papers, Box 89, 1889 Map
MAP: 2.3. The subdivision of Mt Peel Station, 1912.
MAP: 2.4. Some Marlborough and Amuri Stations.
MAP: 2.5. Some Otago and Southland Stations.
CHAPTER THREE
INDISCRIMINATE BURNING? FIRE AS A MANAGEMENT TOOL
IN THE RANGELANDS OF THE SOUTH ISLAND OF NEW
ZEALAND IN THE PASTORAL ERA, 1841 TO 1912

In her book *Station Life In New Zealand*, first published in 1870, Lady Barker wrote a chapter entitled ‘The exceeding joy of burning’ in which she described the delight that she got from setting fire to the tussock hills on Steventon, the run leased by her husband Frederick Broome and his partner Henry Hill. ‘In the height of the burning season last month I had Alice S--- to stay with me,’ she wrote, ‘and to my great delight I found our taste about fires agreed exactly.’ On finding they shared this pleasure the ladies decided to go out and do some burning. ‘After … we determined on our line of fire, we set to work vigorously, and the great thing was to see who could make the finest blaze. I used to feel very envious if my fire got into a bare patch … and languished, whilst Alice’s was roaring and rushing up a hill’.

This passage has been widely accepted as a template for the use of fire on pastoral runs. Stephen J. Pyne, in *Vestal Fire*, his authoritative account of anthropogenic fire and the environment, concluded from Lady Barker’s writing that burning by pastoralists ‘went beyond necessity’. James Belich also saw Lady Barker’s ‘joy of burning’ as a model for the actions of other pastoralists, claiming that some runholders ‘became addicted to arson’. Like others who have seized on to this excerpt from Lady Barker both Pyne and Belich have conflated two separate ideas. The ‘exceeding joy of burning’ described Lady Barker’s feeling of elation upon setting fire to tracts of

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1 Material from this chapter was published as an article: “‘The Exceeding Joy of Burning’ Pastoralists and the Lucifer Match. Burning the Rangelands of the South Island of New Zealand in the Nineteenth Century, 1850 to 1890,” *Agricultural History* 80, No. 1 (Winter 2006), 17-34.
tussock grassland; it is not a statement about the use of fire as a tool in the management of a pastoral property. Moreover, both of these writers have drawn sweeping conclusions on the burning practices of the early pastoralists from this meagre evidence.

Pyne and Belich have not been alone in making judgemental assumptions on tussock burning from limited sources. There is, in fact, a widely held view that pastoralists in the rangelands of the South Island were indiscriminate in their use of fire as a management tool and this view has been accepted with little critical appraisal. There have been too many untested, untenable and emotive statements made about tussock burning and, to date, there has been precious little sustained historical research on the issue. A more measured assessment of the past management of the rangelands in New Zealand is overdue. This chapter sets out to answer the questions of why the pastoralists burned, how often they burned and when they burned. It uses evidence from diaries and memoirs of people involved in the pastoral industry in its formative phase, when the settlers were coming to terms with the climate, soils and vegetation of their ‘new’ land. The evidence from these sources shows that burning was a crucially important tool and proved critical to the successful management of pastoral properties. Without burning sheep farming in the South Island would have been impossible on most of the rangelands. Furthermore, the data from station diaries used for this study illustrates that burning practices of these runholders were characterised by discrimination: burning took place in particular years, in particular seasons, on particular sites and for particular reasons.

**The critique of burning**

The schism between the pastoralists and their critics over the impact of tussock burning began almost at the outset of the pastoral expansion, although criticism of the practice became more strident in the twentieth century. A study of this criticism shows that much of it is merely the repetition of adages that have become accepted as ‘truths’ simply because they have been repeated often enough.
Alex Garvie and John Buchanan were two early observers of tussock burning in Otago; the latter much quoted by later critics of the practice in support of their argument. Yet neither was opposed to burning per se. Garvie saw instances of burning that he thought improved the quality of the pasturage, but elsewhere observed that ‘reckless and unseasonable burnings’ had caused widespread deterioration. Buchanan expressed concern at a similar outcome in arid districts, which he thought was the result of repeated burning of the rangeland. O’Connor has argued that what Garvie saw was the beginning of the transformation of the grasslands from tall-tussock to short-tussock due to the impact of burning and grazing. What Buchanan referred to as the effect of burning was the effect of grazing vegetation that was recovering after burning, and this was more likely to be destructive in arid districts. It was not the wholesale destruction of the pasturage that has been implied by subsequent writers.

Biologist A. H. Cockayne, writing in 1910, acknowledged that burning had a useful role in the management of the rangelands, but condemned what he described as ‘ruthless burning’, which he claimed would lead to the depletion of the natural grazing in the drier parts of the South Island. According to Cockayne, ‘as much country as possible was burnt over in spring’ and ‘large portions of this country may again be burnt later in the year’. He also claimed that much firing was done in midsummer and autumn. Cockayne provided no evidence for these claims. Nor do they stack up: country that had been burned in spring would simply not have enough vegetation to carry a fire again within the same season. Cockayne’s article drew an immediate response in the form of a letter to the Timaru Herald by a

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5 Alex Garvie, “Report on the Reconnaissance Survey of the South-Eastern Districts of the Province of Otago, executed during the months of October and November, also February, March, and part of April, 1857-8”, The Otago Provincial Government Gazette, Vol.3 (January 1856-December 1859), 280.


writer who commented, ‘Whoever heard of a practical high country man burning in either the summer or the autumn?’ Indeed.

At some stage the term ‘indiscriminate burning’ entered the language of the debate. The first use of the term that I have found was in a letter to the editor of the *Otago Witness* in August 1895. The author, who signed himself ‘Kea’, suggested that hundreds of thousands of acres in Central Otago and the Waitakai had been turned into a barren waste ‘from the ravages of rabbits, indiscriminate burning and the dryness of the climate’. Since then the triumvirate of indiscriminate burning, rabbits and overgrazing by sheep has been seen as the cause of vegetation depletion throughout the rangelands. In an article on the montane tussock-grasslands of New Zealand published in 1919 Leonard Cockayne, father of A.H. Cockayne, referred to ‘indiscriminate burning’ three times in two pages. The 1920 parliamentary commission of inquiry into the condition of the southern pastoral lands (of which Leonard Cockayne was a member) also condemned ‘indiscriminate burning’. Many writers, among them McGillivary, Hilgendorf, Cumberland, Relph, and Mather, have since applied the epithet arbitrarily.

V.D. Zotov published the findings of his survey of the tussock grasslands of the South Island in 1938 and concluded that ‘fire is the primary

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9 *Timaru Herald*, 14 July 1910, p.3.
10 *Otago Witness*, 8 August 1895, p.16.
cause of depletion’ of the vegetation. This supported earlier critics’ concerns that the firing of the rangelands led to the depletion of the vegetation, but Zotov went on to resurrect an argument that had been put forward by Leonard Cockayne in 1900, that burning could lead to mass erosion. In his presidential address to the Philosophical Institute in Christchurch Cockayne had made the claim that ‘above a certain altitude burning ... could result only in turning well grassed areas into shingle-slops’. Zotov agreed and claimed that the decline in the vegetation cover exposed the soil to the forces of erosion, which ultimately resulted in whole hillsides being covered in ‘stony debris’. Zotov’s condemnation of the ‘annual’ burning by early runholders relied on sketchy sources: he quoted Buchanan’s criticism of repeated burning in arid regions but applied it to all the grasslands, including those outside the arid zones; and he ‘conversed’ with ‘old settlers’, but they remained unnamed. Zotov also used a model of the grasslands at the time of colonization (one that he had developed) to assess the deterioration that had taken place. Although he admitted that this reconstruction had ‘many difficulties’.

Geographer Kenneth Cumberland was a vehement critic of the runholders’ burning practices. Following Zotov, he claimed that ‘annual haphazard’ burning in association with the rabbit infestation and the spread of tussock insects destroyed tussock species which, in the hills and mountains, resulted in the increased downhill creep of ‘shingle slips’ and mantles of wasting talus. In 1945 he published a survey of burning on sixty runs that took in nearly one million acres. Cumberland found that runholders burned in certain seasons, at certain times of the day, on selected sites, and for particular reasons. Moreover he noted that the intervals between burns depended on environmental factors and wrote: ‘In the drier

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15 Otago Witness, 12 April 1900, p.6.
16 Zotov, 228A.
17 Zotov, 224A.
18 Zotov, 212A, 222A.
areas burning is very limited; it is more frequently and widely resorted to in
damper situations." According to Cumberland the results ‘demonstrated
clearly that burning ... is very rarely indiscriminate’. Yet in his discussion he
fell back on the claims of Buchanan, A.H. Cockayne, L. Cockayne and
Zotov to criticise tussock burning and concluded that ‘in the latter part of the
last century annual [his emphasis] burning was often the rule’.

Geographer R.H. Relph studied early photographs of the landscape of
the upper Waimakariri valley, which had been burned by exploring
pastoralists in 1857. While providing no evidence to support this claim, he
wrote ‘severe and frequent burning continued to be normal management
practice for several decades [after 1857]’ and fires were ‘widespread, and
often indiscriminately-lit’. Relph found that the comparison of photographs
from 1882 with the contemporary vegetation ‘show[ed] but a slight evidence
of decreases in cover’. Relph had a real dilemma here: the evidence of his
own research did not conform to the literature, which had told him that the
practices of the pastoralists had set in motion a process of depletion of the
vegetation that led to accelerated erosion. In the end he had to conclude that
‘much of this accelerated erosion was initiated in the early years of
settlement [that is, after 1857], and since 1882 at least, it has been active but
unspectacular.’

Despite the timidity of Relph’s conclusion his research was a
worthwhile and novel approach in the attempt to understand the impact of
European settlement on the rangelands of New Zealand’s South Island. Other
writers preferred the established method of relying on the accepted wisdom
of earlier commentators. Without providing a source R.P. Hargeaves wrote
that ‘the tussock was burnt off every year, usually in summer’, and from a
single instance claimed that the tussock was fired on many occasions for no

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21 Cumberland (1945), 160.
22 Relph, 33.
23 Relph, 39.
24 Relph, 40.
apparent reason. Referring only to Cumberland’s writing from 1944 and 1945, Alan H. Grey, in *Aotearoa and New Zealand, A historical geography*, claimed that burning and overgrazing exposed the soil to weathering ‘which underwent greatly increased mass movement that left scars plainly visible today ... in Marlborough, the Canterbury foothills of the Southern Alps and the basin and range country of Otago’. A.D. McIntosh needed only anecdotal supporting evidence to justify this statement in his provincial history of Marlborough:

The prodigality of the early pastoral methods soon set in motion the inexorable law of diminishing returns and the magnificent natural pastures ... of the 1850s are today characterised by patches of indifferent tussock and scabweed with masses of rock and shingle where once there were feet of soil.

Clearly, the view that early pastoralists burned the grasslands of the South Island indiscriminately has become a powerful dogma in New Zealand’s environmental history. The story has become self-perpetuating with later writers, while adopting the voice of authority, simply repeating the earlier literature. Where the evidence has not fitted the accepted orthodoxy, as with the research of Cumberland and Relph, it has had to be explained away or watered down. Cumberland found that runholders in the 1940s did not burn indiscriminately, but assumed, using only the evidence of earlier writers, that the pioneer pastoralists of the nineteenth century must have done so. Relph found that there was little difference between the contemporary vegetation cover and that seen in photographs from 1882, so assumed that all the erosion he saw must have taken place between 1857 and 1882. The doctrine of reckless annual burning has become so entrenched that writers


such as Hargreaves, Belich, McIntosh, and Grey, working outside their areas of expertise, have felt little need to provide evidence to support their sweeping statements on burning and its consequences.

**Beyond the rhetoric of indiscriminate burning**

Scientists have led the reappraisal of the history of the rangelands and have provided a different perspective on the impact of tussock burning to that found in the rhetoric of earlier critics. The implications from these studies are that this burning did not result in the wholesale destruction of the native vegetation, nor did it precipitate the processes of erosion that resulted in the scree-covered mountains of the South Island.

From the results of a burning and top-dressing experiment in snow tussock O’Connor observed that neither tall-tussock nor inter-tussock plants were killed or unduly affected by burning and concluded that the damage to plants came from grazing immediately after burning. He has since concluded, from this and other experiments involving repeated defoliation of tall-tussocks, that it was this combination of burning and grazing that reduced the dominant grass on the rangelands from tall to short tussock. Moreover, this was a deliberate practice by the pastoralists who found that the unmodified tall-tussock grassland could not support productive sheep and the shift to a vegetation regime dominated by short-tussock was seen by them as improving the pasturage. O’Connor has also made the point that the transformation of the grasslands that had been noted by Garvie, Buchanan and others was this very process of transition taking place.

The claims of Zotov, Cumberland and others that burning and overgrazing ultimately led to extensive soil loss and widespread mass

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movement which created the shingle slopes so typical of the hills and mountains of the South Island are now disputed. In a study comparing landscape photographs from the past with present day sites Ian Whitehouse, a geomorphologist, reached a similar conclusion to Relph: there has been little change in the distribution of bare eroding areas in the last 100 years. However, where Relph decided that the erosion must have occurred in the preceding thirty years of pastoral occupation, McSaveney and Whitehouse concluded that the erosion scars found in the early photographs were much older than thirty years, so they could not have been caused by burning by the pastoralists. In fact Whitehouse and A.J. Pearce found that many scree slopes were very old and wrote in 1992: ‘Erosion has always been rapid in the high country and more related to high rainfall and steep slopes than the activities of pastoral farmers. Scree originally thought to be a result of overgrazing and burning in the nineteenth century are now seen as older natural features’.

Scientific methods - carbon dating, pollen analysis, the dating of scree, vegetation transects, repeat photography - have given us a new understanding of the processes that formed the rangelands of the South Island and have cast doubt on some of the claims made by critics of the burning practices of the early runholders. Until relatively recently, a glaring absence in the research has been the lack of systematic analysis of archival material. However, geographers Holland and Hargreaves did assess tussock burning as part of their analysis of the diaries from The Point Station for the 1860s and 1870s. They noted that burning took place between the end of August and early October in order ‘to promote fresh, palatable growth and to control the spread of native shrubby plants as well as gorse’. They found

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that burning normally involved one man and, on average, took place on six
days each year. American agricultural historians Hoy and Isern researched
the diaries of three runs, Benmore, Clayton, and Rakaia Terrace, looking for
dates when burning took place. They found that burning was seasonal
(mid-August to mid-October) and in some years burning was not recorded at
all. In terms of its analysis of burning practice the research was simple in its
scope, looking only at when and if, burning took place. However, it did show
that burning did not take place annually and therefore was undertaken with
some discrimination.

The rangeland vegetation

The early surveyors and explorers of the South Island’s rangelands
found a vegetation cover that appeared to be in transition. In the previous
chapter it was shown that Dr Munro and John Buchanan were just two who
concluded that the grasslands had once been forest and that the forest had
been destroyed by fire. Buchanan, in South Otago, noted areas ‘covered by
an impenetrable growth of shrubs and young trees’ and believed that at the
time of settlement large tracts of the region were being ‘relothed in bush’.

These observations have been confirmed in recent years by scientific
analysis of the ecology of the region. On the strength of carbon dating of
charcoal and pollen analysis botanist B.J. Molloy has argued that before that
arrival of Polynesian hunters and gatherers between 800 and 1,000 years ago
lowland and montane areas were clothed in forest. Massive fires, whether
accidental or deliberately lit, destroyed much of the forest on the plains and
mountains east of the Southern Alps, and because the forest trees ‘were
weakly resistant to disturbance with restricted powers of regeneration ... 
were easily destroyed and difficult to re-establish’.

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35 James F. Hoy and Thomas D. Isern, “Bluestem and Tussock. Fire and pastoralism in the
Flint Hills of Kansas and the tussock grasslands of New Zealand,” Great Plains Quarterly
(Summer 1995), 173-174.
36 Dr D. Munro, The Nelson Examiner, Saturday, July 27, 1844, p. 84.
37 Buchanan, 181.
38 B.P.J. Molloy, “Recent History of the Vegetation,” The Natural History of Canterbury,
The removal of the forest cover allowed the spread of grasses into zones that they had not previously occupied. McGlone, a palynologist, supported Molloy’s view that the fires that destroyed the forests occurred in the early period of settlement of the region by Polynesian hunters and that subsequent periodic fires prevented regeneration.39 His research, and that of botanist H.E. Connor, suggested that short-tussock species, which had occupied islands in braided riverbeds and drier areas with poor and shallow soils, were the first to benefit from the extensive fires and quickly extended their range.40 Burrows, a botanist, has concluded from his long-term study of the Cass district that snow-tussock (tall-tussock) species, which had been restricted to the zone above the tree line, migrated downwards after the fires.41 Tall-tussock species advanced slowly, but came to dominate the open country, while short-tussocks were increasingly confined to unstable sites.42 Later, burning and grazing with sheep reversed this process and encouraged the spread of short-tussock species.

Thus the rangelands that attracted the pastoralists to the South Island were anything but a simple environment of waving grasses. Along with tall-tussock, which could grow to a height of six feet, grew a wide variety of woody plants, herbs, and other grasses.43 Buchanan had called it ‘an impenetrable growth’ and three species in particular made access difficult even for people on horseback. These were: Discaria toumatou, a large thorny shrub called tūmatakurū by Maori and matagouri or ‘Wild Irishman’ by English and Scottish settlers; the sharply pointed Aciphylla, known as ‘Fierce Spaniard’ or speargrass; and the tangled, thorny vine, Rubus schmideliioides, which was given the name ‘Bush Lawyer’. Consequently, people exploring new run country burned to make travel easier and to open up the country for

43 H.E. Connor and A.H. MacRae, 168,177-187.
stock. An example of this practice occurred when John Barton Acland and Charles George Tripp explored the Mt Peel country in 1855: they set fires that burned for days and spread across an area estimated at 50,000 acres.44

The tangle of tussock and scrub made it particularly difficult for drovers taking sheep to newly opened regions. In March 1852 Edward James Lee and Edward Jollie drove the first mob of sheep overland from Nelson to Canterbury. On reaching the area now known as Jollie’s Pass they were unable to push through the tangle of matagouri, speargrass and tussock. They held their sheep on the opposite side of the Clarence River and set the country alight. The fire burned for several days, forcing the party to sit tight, until it burned itself out.45

Laurence Kennaway related a similar situation that confronted his brother and their partner F.W. Delamain when they drove sheep to their new run at Burke’s Pass. They reached an area so overgrown that they could not push their horses through let alone the sheep. They held the mob in a riverbed and set a fire that burned through the night. The next day the party passed through the charred and smoking country while the fire burned on ahead of them.46

Even on the drier plains the mass of decayed vegetation made travel difficult and grazing for sheep impossible until it was burned. Alexander Hewson recalled that on the Canterbury Plains there was a foot or two of decayed tussocks in places and that mass of material blocked up water courses and created swamps.47 W.H.S. Roberts noted the same feature in Southland where the matted roots of plants and the long ‘grass’ meant that

44 G.W. Harte, Mount Peel is a Hundred. The story of the first high country sheep station in Canterbury (Timaru: Timaru Herald, 1958), 15.
46 Laurence J. Kennaway, Crusts. A settler's Fare Due South (London: Sampson, Low, Marston, Searle, 1874), 130-132.
47 A. Hewson, Early Days in the Ashburton County, Documentary Research Centre Canterbury Museum, 12, 25.
the soil remained damp. Without burning this country would have been unsuited for sheep grazing.

**Burning as a management tool; more of an art than a science**

Burning by exploring pastoralists opened up the country to provide access and grazing for sheep. Subsequent burning was evidently used as a management tool as it had been in the uplands of the British Isles for generations. The early pastoralists came from Britain and brought farming techniques used in the pastoral hill districts of Scotland, Wales and parts of England. One of the practices they used was burning. In the upland areas of Exmoor, Dartmoor, the high Pennines, the Lake District, and the Scottish Highlands large areas of moor and heath land were grazed extensively by sheep. Since sheep are such selective grazers these areas were burned regularly to prevent the invasion of woody plants and other species that sheep did not require. Moreover, burning promoted the growth of palatable and nutritious young shoots. In his discussion of the relationship between sheep farming and the use of fire in upland Britain, Pyne commented that ‘the torch was as much a complement of the flock as was the shepherd’s staff’. Typically, shepherds burned a tenth of the moorland each year in spring and the practice continued into the twentieth century. In 1912 Frank Elgee wrote that ‘in spring, small fires could be observed sending their columns of smoke high above the moorland of north-east Yorkshire’.

The use of fire as a management tool was transposed from Britain to New Zealand. In 1858 pastoralist John Barton Acland, on a trip back to England, gave an address to the Bath and West Agricultural Society on sheep farming in New Zealand. He described burning as ‘the only way in which a sheep-walk ... is cultivated’. He noted that after a fire ‘the grass comes up young and tender, and the sheep delight to feed on it; but after some months

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50 Pyne, 352.
it comes up rank, and the sheep will almost starve than feed on it'. Acland claimed that in the year following a burn there were some young and tender grasses between tufts of tussock for the sheep and in the third year it would all burn again.

Acland’s ideal that a run could be burned on a three-year rotation has been picked up as a given fact. Lady Barker likewise indicated that her husband hoped to get round the run in a burning cycle in three years. In his doctoral thesis ‘Speed The Plough’, R.P. Hargreaves wrote that it was common for a run to be burned every three years. This is unlikely. For country to have enough material to carry a fire stock need to be removed from grazing for at least a growing season and often longer. Furthermore, taking a third of the run out of production each year for burning would have been physically impossible before fencing was erected and would have been economically unsustainable for most runholders unless they were still understocked in the establishment phase. Station diaries used here illustrate that burning was carried out in a much less regimented fashion than this and that particular areas were burned as the need arose and not just as a matter of course.

Samuel Butler, who held Mesopotamia Station between 1860 and 1864, observed that burning made for contented and well-conditioned sheep. He also commented that on a well-burned run a neighbour’s fire could not spread easily onto your property and burn your stock. Butler prescribed how to burn so as to avoid the problem of fire running out of control:

Burn ... in early spring, on a day when rain appears to be at hand. It is dangerous to burn too much at once: a large fire may run further than you wish, and, being no respecter of imaginary boundaries, will cross on to your neighbour’s run without compunction and without regard for his sheep, ... Burn,
however, you must; so do it carefully. Light one strip first, and keep putting it out by beating it with leafy branches. This will form a fireproof boundary between you and your neighbour.\textsuperscript{54}

Butler's sentence, '[b]urn you must, so do it carefully', provides us with a sense of the ambivalence with which the pastoralists viewed fire. It was seen not only as an essential practice, but also a dangerous one. In fact, burning inspired a sense of awe and fear, as there was a real personal risk for people involved in lighting and fighting fires, as well as the risk to livestock. E.C. Studholme of Te Waimate Station echoed this in his history of the run, writing that 'It was probably the spice of danger attached to burning that made it such a fascinating job'.\textsuperscript{55}

In spite of the care that Butler advised, it was not uncommon for tussock fires to get out of control and the consequences were serious. Henry Sewell noted in 1854 that firing the tussock was a dangerous practice and thought that it should be regulated so that it was 'not allowed to approach too near inhabited places'.\textsuperscript{56} Hewson recalled a fire in 1863 that started by accident and burned a huge spread of countryside on the northern side of the Rangitata River. The fire started above Cracroft Station and spread eastwards to the coast and westwards into the Rangitata Gorge where it burned for six weeks.\textsuperscript{57} According to Hewson one of the reasons for the size of this fire was that in 1863 thousands of acres on the plains had not yet been burned, so that there was a large source of fuel. A compelling example of the danger presented by uncontrolled fire occurred during a severe drought in the summer of 1885-6 when a fire that started accidentally on Glenmark Station got away and killed 4,000 sheep. A week later another accidental fire on the

\textsuperscript{54} Samuel Butler, \textit{A First year in the Canterbury Settlement} (London: A.C. Field, 1914), 133.

\textsuperscript{55} E. C. Studholme, \textit{Te Waimate. Early Station Life In New Zealand} (Wellington: Reed, 1954), 98.


\textsuperscript{57} Hewson, 12.
same run burned 50,000 acres of tussock and killed a further 10,000 sheep on the property.\textsuperscript{58}

L.R.C. Macfarlane of Kaiwara Station in the Amuri agreed that a tussock fire could travel for long distances and be very dangerous; however, in places where tussock was ‘big and thick and lusty’ without burning nothing else could grow as the giant tussocks smothered everything else.\textsuperscript{59} Burning was necessary, but it had to be done carefully and Macfarlane described the art of burning in this way:

The secret in burning is to select a time when the spring of the year is just appearing, and sap is rising; then make sure, very sure, that the base, the heart of the tussock, is moist enough not to burn. Then if possible burn in the afternoon, when there is every chance of a heavy dew that night. Avoid nor’west weather, but seek a breeze as fire will then run across the land and do less intensive burning. The real art is to just scorch the tops and open out the land between the individual tussocks so that the other plants can see the sun and receive the life it gives.\textsuperscript{60}

Macfarlane also warned against ‘under-burning’ where only small patches of a block were burned. In this situation sheep camped on the small burned patches as the feed was sweeter there and did not allow these areas to recover. This point also came up in a debate over the subdivision of the Mackenzie Country runs in 1910. ‘Observer’ wrote to the newspaper about the bad effects of burning and overgrazing, and reported an instance where about 200 acres had been burned by accident in a block of many thousands of acres. He claimed that the sheep grazed this bare and continued to return

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\textsuperscript{60} Macfarlane, 39.
to feed on this area every time a shoot appeared until it nothing grew.\textsuperscript{61} Bryant and May retorted that it was obvious that the problem was under-burning and not overgrazing and the rest of the block needed burning as the sheep ‘have crowded off rank and sour feed to eat out the sweeter burnt country’.\textsuperscript{62} Macfarlane would have agreed, as he thought it preferable to over-burn a block than under-burn it.\textsuperscript{63} Bryant and May, and Macfarlane were making the point that burning was an important tool for manipulating where sheep grazed. Judicious burning attracted sheep into parts of a run where they would otherwise not graze and so prevented the overgrazing of parts that the sheep normally found preferable. The practice allowed for the grazing of a larger area of a station.

**Station Diaries**

The diaries and memoirs from the early years of pastoralism provide a counterpoint to Lady Barker’s ‘exceeding joy of burning’. They show that the pastoralists were much more circumspect in their use of fire than has been allowed by the writers who have accused them of arson. The diaries, which were selected at random, provide accounts from ten different stations and cover the years from 1853 to 1912.

John Hall, with his brothers George and Thomas, bought the Rakaia Terrace run in May 1853.\textsuperscript{64} They kept a very detailed diary for their first year and burning was not mentioned. Similarly, on nearby Rockwood Station the only burning described in the diaries, which covered the period from July 1855 to November 1857, was of a fire lit on the neighbouring Snowden Station. The fire got out of control and threatened the Rockwood outstation. All the hands were called out to fight the fire and protect the buildings on the property.\textsuperscript{65}

\textsuperscript{61} *Timaru Herald*, 27 July 1910, p.3.
\textsuperscript{62} *Timaru Herald*, 1 August 1910, p.5.
\textsuperscript{63} Macfarlane, 39.
\textsuperscript{64} *Rakaia Terrace Station Journal*, 30 June 1853 – 14 June 1854, Canterbury Museum Documentary Research Centre.
\textsuperscript{65} *Rockwood Station Diary 1855-1857*, Transcript, Canterbury Museum Documentary Research Centre, 2 September 1856.
Harry Ford managed the Grampian Hills in the Mackenzie Country from October 1862 to March 1866 and then took up the manager’s position at Holme Station. He kept a detailed diary of the daily farming activities on the two runs from October 1862 until December 1873, yet there is very little said about burning. The Grampian Hills Station had been taken up in 1859 and, following common practice, it is likely to have been burned at this time. However, there is no record of burning in Ford’s diary for the three and a half years he managed the run. At Holme Station Ford did burn, but only on a few occasions. In the spring of 1866 he burned the downs at the head of the property and some of the hill country was fired. Unfortunately, the fire got away and burned an area of bush and eighty-five cords of wood that had been cut and stacked to dry. The following spring he had a man burning on a part of the station called ‘the wether run’ and Ford burned the ram paddock. He gave no other account of burning in the remainder of his diary. This suggests that Ford fired specific parts of the run only when he felt the country needed it.

Seventeen-year-old Frank Mathias went to work as a stockman at Lake Coleridge Station in October 1859. After a year he moved to Glenthorne for six months and then he shifted to the Rakaia Forks run, which he helped establish. There are several references to burning in his diary; however, none of them amount to the ‘ruthless’ burning for which the early pastoralists have been criticised. He described only one fire on Lake Coleridge and that spread from a neighbour’s burn. Station staff and neighbours fought the blaze and rescued about 1400 sheep. His diary makes no reference to any burning on Glenthorne, but there are several for the Rakaia Forks. The latter was a new run being established by William Rolleston. In line with what we have already seen, it was burned as it was opened up for stock. In May 1860 Mathias noted ‘a great smoke from Rolleston country’. The following September he saw ‘large columns of smoke rising from Rolleston’s’ and

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66 Henry Ford Diary. Typescript of Grampian Hills Station day book kept by Henry Ford until March 1866, the farm diaries of Pareora and Holme Stations, October 1862 – December 1873, Canterbury Museum Documentary Research Centre, 7-8 September 1866; September 1877.
67 Frank Mathias Journal, 1 October 1859 to September 1861, Hocken Library, 10 September 1860.
wrote, 'it was a most magnificent sight'. The following year, when working for Rolleston, Mathias and another station hand mustered sheep off a block and then went back and fired it. He commented that they lit a backfire 'to guard the snowgrass as Rolleston did not want it burnt'. That hardly suggests 'indiscriminate burning'.

The Levels Station was taken up by the Rhodes brothers in 1851. When they sold the run in 1865, 60,000 of its 153,000 acres, nearly forty per cent of the country, remained unburned and only lightly stocked, probably because the sheep would not push into it. William Soltau Davidson, working for the new owners, burned this area carefully over a three-year period. At each firing, firebreaks were burned first to control the course of the main burn. In 1870, nineteen years after the run was first established, 7,000 acres remained untouched by the lucifer match.

John Alfred Sutton purchased Waitangi Station in late 1886 and the present owners hold diaries recording the day to day activities on the run for sixteen years of the twenty-five years from 1887 to 1912. The diaries show that burning took place on only twenty days over that time on Waitangi and the small amount done was all in the last days of July or the months of August and September. Burning on run blocks was recorded on only six days in sixteen years and on each occasion it was carried out by the owner or manager. The rest of the burning was to control the spread of scrubby weeds, in particular sweet briar, and most of this was on paddocks or small blocks near the homestead. It is apparent that fire in this low rainfall country - Waitangi's annual average rainfall is between 457mm (18 inches) and 558

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68 Mathias, I May 1860; 29 September 1860.
69 Mustering is a term for gathering and shifting mobs of sheep or cattle on run country with the use of working dogs.
70 Mathias, 18 September 1861.
72 Waitangi Station Diaries, 16 September 1887; 10, 13 August 1900; 31 August, 14 September 1901; 9 August 1905.
mm (22 inches) - did not involve large-scale tussock burning to create a fresh pick for the sheep in spring, but was used to clear overgrown areas and to control weeds. The table below illustrates that the burning on Waitangi could not be described as ‘reckless’, ‘unseasonal’, ‘ruthless’ or ‘indiscriminate’.

TABLE: 3.1. All the entries on burning on Waitangi Station from the station diaries, 1887-1912

<table>
<thead>
<tr>
<th>Year</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1887</td>
<td>September 3</td>
<td>Self – burning swamp</td>
</tr>
<tr>
<td></td>
<td>September 16</td>
<td>Self – over ewe ground and burning</td>
</tr>
<tr>
<td>1889</td>
<td>August 1</td>
<td>Self – lit 1 or 2 fires on the flat</td>
</tr>
<tr>
<td>1891</td>
<td>July 31</td>
<td>Self – burning briars</td>
</tr>
<tr>
<td></td>
<td>September 10</td>
<td>Self – clearing and burning briars</td>
</tr>
<tr>
<td>1893</td>
<td>July 26</td>
<td>All hands burning briar and laying toxa [rabbit poison]</td>
</tr>
<tr>
<td>1900</td>
<td>August 10</td>
<td>Self – burning at spring</td>
</tr>
<tr>
<td></td>
<td>August 13</td>
<td>Self – through Little and Pig Valleys burning</td>
</tr>
<tr>
<td>1901</td>
<td>August 14</td>
<td>Self – at Gorge burning</td>
</tr>
<tr>
<td></td>
<td>September 14</td>
<td>Self – through Gorge burning rough gully</td>
</tr>
<tr>
<td>1905</td>
<td>August 2</td>
<td>Self – burning</td>
</tr>
<tr>
<td></td>
<td>August 9</td>
<td>Self – over Coal Creek burning</td>
</tr>
<tr>
<td></td>
<td>August 31</td>
<td>Self and Condon burning scrub [this had been grubbed]</td>
</tr>
<tr>
<td></td>
<td>September 4</td>
<td>Self and Condon burning scrub [this had been grubbed]</td>
</tr>
<tr>
<td></td>
<td>September 6, 8</td>
<td>Man burning scrub after grubbing it out</td>
</tr>
<tr>
<td></td>
<td>September 14</td>
<td>Self – burning scrub [this had been grubbed]</td>
</tr>
<tr>
<td>1906</td>
<td>July 27</td>
<td>Self – burning near turnips</td>
</tr>
<tr>
<td></td>
<td>August 6</td>
<td>Self – burning near turnips</td>
</tr>
<tr>
<td></td>
<td>August 9</td>
<td>Self – burning on Buscot [briar]</td>
</tr>
</tbody>
</table>

**Burning on Mt Peel**

The final diary used for this paper is from John Barton Acland’s 100,000 acre Mt Peel Station. From it I have looked at burning over a ten-year period from January 1877 to December 1886. The first point to note is that almost all the burning was done in the months of August, September and October. Only once, on 2 November 1885, did any burning take place later in the year. Springtime burning had several advantages. There was usually

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73 MB 44. Acland Family Papers, Box 4, Macmillan Brown Library, University of Canterbury, Christchurch, New Zealand. All the references for Mt Peel used in this section of the essay come from this source.
plenty of moisture in the soil for regrowth to come away readily, whereas on sunny country soil moisture levels were too low in summer for plants to recover after burning and burned areas could remain blackened and bare until autumn rains freshened up the country. Another advantage of springtime burning was that the days were short and the early onset of dew helped to prevent fires burning on into the night. Consequently, fires lit at this time of the year were relatively easy to control. Runholder E.C. Studholme wrote that it was ‘very noticeable how fires, unless burning very strongly, will die down at about four o’clock in the afternoon during early spring, although there may be no apparent moisture in the air’. 

At first glance it appears that the amount of burning that took place during this spring burning season on Mt Peel was excessive. Over the ten years there are, on average, nineteen references each year to burning. For example, in 1883 burning took place on seventeen days between 15 August and 15 October. However, on closer reading, a pattern emerges that a lot of this was on specific, selected sites and they were small-scale fires. On 15 August 1883 McLeod burnt on the Little Mt Peel Spurs. A month later sheep were mustered off the block. Clearly, the burning must have been very localised otherwise these sheep would have been at risk. This example of burning on a block while it was still stocked was common practice on the station. Another example comes from 18 August 1885 when a man was sent to burn a block called the Razor Back. Ten days later 2,700 ewes were mustered off the same country. That a good deal of the burning was localised can be gleaned from the language used in the text: burning took place on the Isolated Hill, or in Burke’s Flat, implying that it was intended that only parts of these blocks be burned.

Another example that illustrates that burning was localised, site specific and small-scale was that fires were often lit immediately after rain or snow when large-scale fires would have been impossible. In August 1883 it rained on three consecutive days, yet two days later a man was sent out to

74 Studholme, 96.
burn on the Ram Spur. Later in the same month it snowed on the twenty-ninth with dull conditions and hail the following day. Yet on the thirtieth and the thirty-first a man was again sent out burning. A week later it snowed over night, but burning took place the following day. From this distance it is difficult to comprehend what burning under these conditions might have achieved, but clearly, these burns were not intended to set large areas of country alight.

Burning provided an important tool in the management of run properties and fires were lit for a range of specific purposes: to clear fence lines and drains, to clear ground before ploughing, to get rid of gorse trimmings, and before sowing grass seed. These reasons are identified in the table below.\(^75\) A major reason for burning was to clear areas of scrub. In July 1881 a man was sent to burn fern and lawyer on the Ram Spur. A month later another burn was carried out on the same block. In October there was more burning on the Ram Spur. The following March Godwin was sent to cut a track through the fern on the lower part of the block. Clearly, the growth of fern and lawyer on the block created a problem for stock and, when burning failed to clear the scrub, the job had to be done by hand, which was more labour intensive and time consuming, and was obviously a last resort. This is a rare example of repeated burning carried out within the same tract of country (see TABLE: 3.3 which shows the distribution of ‘burns’ on blocks of Mt Peel), although the fires were obviously small and localised to the problem area.\(^76\)

There are numerous references where burning was used to clear ground before sowing grass seed. On 7 October 1882 Stevens burned and then four days later sowed grass. On the twelfth he burned again and the following day sowed grass seed. In August the following year Stevens burned the Lower Ram Spur; a fortnight later he sowed grass seed on the block. This practice of burning before hand-sowing seed had several benefits: it cleared the ground so that seed could fall on the soil where it could germinate; it

\(^75\) TABLE 3.2, p.107.
\(^76\) TABLE 3.3. Mt Peel, blocks recorded as burned, 1877-1886, p. 111.
destroyed ground cover and so reduced competition, at least in the short term, for the young grass seedlings; and importantly, the minerals released by the incineration of the existing vegetation cover were beneficial for the germinating seedlings.

**TABLE: 3.2. Reasons for burning on Mt Peel, taken from the station diaries**

<table>
<thead>
<tr>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>To open up new country for access for sheep</td>
</tr>
<tr>
<td>To open up new country for grazing for sheep</td>
</tr>
<tr>
<td>To clear scrubby weeds, in particular: fern, matagouri, spaniard, bush lawyer</td>
</tr>
<tr>
<td>To clear ground before sowing grass seed</td>
</tr>
<tr>
<td>To clear ground before erecting fences</td>
</tr>
<tr>
<td>To clear ground around existing fence lines</td>
</tr>
<tr>
<td>To clear ground before draining</td>
</tr>
<tr>
<td>To clear ground around existing drains</td>
</tr>
<tr>
<td>To clear ground before ploughing</td>
</tr>
<tr>
<td>To get rid of tussocks and other vegetation removed from ground before ploughing</td>
</tr>
<tr>
<td>To remove rank and overgrown vegetation to encourage sheep into less favoured areas</td>
</tr>
<tr>
<td>To remove scrub to make mustering easier</td>
</tr>
</tbody>
</table>

One of the reasons for the large number of burns carried out on Mt Peel is that it is in a forty-five inch rainfall district where woody weeds, scrub and trees grow readily. Since burning has become unacceptable as a management tool fern, gorse, broom and other weeds have taken over areas that, photographs from the nineteenth century show, were once clean tussock country. The regular small-scale burning was an effort by the station’s management to keep the country open for sheep to graze. This supports the findings of Whitehouse who observed that recent photographs indicate a

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77 See accompanying photographs, pp. 113-114.
marked increase in scrub, in particular matagouri, in the upper Waimakariri following restrictions on burning from about 1950.78

Discussion

The orthodox view of the burning carried out by the early runholders has been judgemental and has lacked objectivity. Pastoralists have been criticised for firing the country all year round; they burned without any apparent reason; they burned annually; and their burning was indiscriminate. The analysis of these diaries brings into question the validity of this criticism. Apart from the initial firing of the country when it was first explored, almost all of the fires in the diaries occurred in late winter or spring. Even Lady Barker wrote about the burning season being from September to November.79 Thus the evidence from the diaries show that discrimination was applied to the timing of burning: in some years no burning was carried out at all; in years when there was burning it was carried out in the season that minimised the risk of fires getting out of control and when the conditions were ideal for plants to recover.

The criticism of 'annual' burning in the literature appears to be ambiguous, perhaps deliberately so: it could imply that pastoralists burned every year, or that the same country was burned every year. Regardless of the confusion created by the term, the diaries illustrate that neither implication is valid. Only one of the runs researched here, Mt Peel, burned 'annually' and, as TABLE: 3.3 shows, the same country was not burned repeatedly, year after year. Again, the diaries point to tussock burning as being carried out with discrimination. Moreover, a comparison of burning on Mt Peel with Waitangi Station in the nineteenth century mirrors exactly what Cumberland found in the 1940s: in drier areas burning was very limited; it was more frequently resorted to in damper situations.80

78 Ian E. Whitehouse, “Erosion in the eastern South Island high country,” 17.
79 Lady Barker, 225.
80 See pp.89-90.
The accusation that the pastoralists burned for no reason is wide of the mark. Burning was a tool that was used deliberately on selected sites for specific reasons. TABLE: 3.2 demonstrates that on Mt Peel there were at least ten distinct reasons for burning. This does not include burning to protect their stock from fires that got out of control on neighbouring runs. It did not seem to have been a problem at Mt Peel, although it certainly was an issue of concern on other runs researched for this thesis.

The impact of burning on the vegetation of the rangelands of New Zealand's South Island remains highly contentious. However, there is no doubt that burning, in association with grazing, rabbit plagues and introduced weeds, has irrevocably changed the vegetation cover of the region. The tall-tussock grasslands, which were susceptible to the combination of burning and grazing, were quickly transformed into short-tussock grasslands. Intertussock plants that provided much of the grazing for sheep in the early years were eaten out or failed to thrive in the new environment. Zotov has argued that this loss of inter-tussock plants and the expansion of short-tussocks, which are unpalatable to sheep, forced pastoralists to burn more frequently. After burning the tussocks sprouted highly nutritious and palatable young shoots. As this new growth matured it became increasingly unpalatable and so it needed to be fired again. Thus he argues that repeated burning became an acquired behaviour resulting from the change in the vegetation that was itself a result of the early burning of the range.81

The diaries used in this study do not support this view. The evidence from Harry Ford's diary, from The Levels, and from Waitangi suggests that burning was not regular enough or extensive enough to supply the large sheep flocks on the runs with a continuous supply of fresh green tussock regrowth. On Mt Peel burning was carried out much more regularly, but again there is nothing in the diaries to show that the burning was on a great enough scale to provide the station's flock with fresh feed - particularly, when it is borne in mind that for the ten-year period under consideration in

81 Zotov, 224.
this essay, the station carried on average over 43,500 sheep annually. Moreover, as Pyne has shown, regular spring burning was a traditional practice that the pastoralists brought with them from Britain. It did not need to be acquired; it was part of an existing system of management.

**Conclusion**

The diaries used in this chapter do not provide an exhaustive account of burning in the rangelands of New Zealand's South Island, but the evidence from them suggests that Lady Barker's 'exceeding joy of burning' was not typical of the attitude of the early runholders as has been suggested by many writers. Condemnation of burning by pastoralists, much of which has been based on anecdotal evidence, has been pervasive for many years. This chapter provides an alternative to that view. The evidence from the ten stations used for this chapter supports the findings of Hoy and Isern, and Holland and Hargreaves. These runholders were discriminating in their use of fire.

The orthodox explanation of the transformation of the rangelands posits that the interaction of burning, overstocking and rabbits created a degraded landscape during the pastoral era. Some argued that without burning and overgrazing with sheep the rabbit irruption could not have happened. The next two chapters examine the first rabbit irruption in detail and test this explanation of rangeland depletion.
TABLE: 3.3. Blocks recorded as burned on Mt Peel, 1877 to 1886

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>1877</th>
<th>1878</th>
<th>1879</th>
<th>1880</th>
<th>1881</th>
<th>1882</th>
<th>1883</th>
<th>1884</th>
<th>1885</th>
<th>1886</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round Hill</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orari Country**</td>
<td>*</td>
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<td>*</td>
<td>*</td>
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</tr>
<tr>
<td>Razor Back</td>
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<tr>
<td>Forest Spurs</td>
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<tr>
<td>First Gully</td>
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<td></td>
<td></td>
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<tr>
<td>Stew Point</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Manuka Spur</td>
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<td></td>
<td></td>
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<tr>
<td>Ram Spur</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bunkles Flat</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Horse Spur</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Isolated Hills</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third Gully</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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These are blocks that were specifically named in the diary as being burned. There are other references to burning where blocks are not named and therefore the burning cannot be quantified: e.g. shepherds ‘up the run burning’, or ‘in the backcountry burning’.

**Orari Country** took in about 40,000 acres on the dark side of the Mount Peel Range and included the Forks Block between the Hewson and Phantom Rivers. The table shows that burning took place on this country in 8 years out of the 10 years that have been recorded. Several factors need to be taken into account:

1. The Orari accounted for a huge spread of country, a third of the 100,000 acre station. It could never have been burned in a single year.
2. The Orari, being on the cold side of the Range, held snow and moisture that would have limited the scale of any burning done during the late winter/early
spring. The snow cap along the tops would have prevented any fire burning in to the higher country, while the frost and moisture would have made large-scale burns difficult, if not impossible. The records for this ten-year period show that the Orari was burned only in August or September.

3. Stock were wintered on the Orari and Forks country every year and were certainly present when burning took place. This suggests that burning was targeted to specific areas and not ‘indiscriminate’.
Round Hill in 1890s, when it was periodically burned, showing tussock cover with some fern and scrub.

Station staff using a traction engine to cut and bag chaff.

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Round Hill in 2003 – overgrown with exotic and native shrubs, and wilding trees in places. Note the gorse in flower on top of the hill. No burning has taken place for many years. Sheep are no longer able to graze the block.
Rabbits have been identified as one of the three key agents that brought about a profound transformation of the rangelands of the South Island in the nineteenth century - the other two being 'indiscriminate' burning of the grasslands and overstocking with sheep. Each of these issues has been contentious, but the role of rabbits in the process of landscape change, particularly in the semi-arid regions of the South Island, has caused heated debate that continues to this day. In the context of this thesis, which explores the role of pastoralism in the transformation of the rangelands, burning and overstocking were clearly part of farming practice, whereas rabbits might be seen to be simply another biological invader that thrived in its new environment. Pastoralists at the time of the first rabbit plague held the view that rabbits were outside the natural course of their farming operations; they were a problem that was not of the pastoralists making, but one that brought enormous costs, and accordingly they needed government support to help control the pest. In fact, in the first two decades of the first rabbit irruption the problem was seen as largely an economic one: the loss of production and the cost of control for pastoralists, and the loss of rents by the government which leased the land to them. The decline in the carrying capacity of affected runs, of course, indicated vegetation depletion, although it was rarely considered in those terms. However, beginning in the mid-1890s, this changed and critics began to argue that it was pastoral practice that actually created the environment that enabled rabbits to thrive, and since then the relationship between pastoralism, rabbits and land degradation has been a central theme in the literature on land history in the South Island of New Zealand.

The key issue here is to what extent did pastoral practice create the environment that led to the explosion of rabbits and the resulting depletion of land.
the vegetation in the South Island’s rangelands up to 1912? The next two chapters try to answer this question. This chapter analyses the chronology, geography and impact of the rabbit plague on the rangelands and affected pastoral runs. The dynamics of the spread of rabbits is explored in the context of their behaviour and natural habitat. The chapter also examines the failure of control measures to stem the spread of the pest.

The orthodox explanation of the first rabbit plague

A general discussion on the rabbit in Australia suggests that the reasons for their spread can now only be conjectured about. Similarly P.C. Bull, when discussing the early spread of rabbits in New Zealand, wrote ‘it is very difficult to get a clear idea of exactly what happened’. Yet there have been plenty of writers prepared to speculate on the reasons for the first rabbit irruption in this country and most of them offer a very simple analysis of the phenomenon: it was the pastoralists who made the rabbit plague possible through their practices of indiscriminate burning and overstocking with sheep.

The evidence to support this contention comes from two main sources: from personal observations, made after the fact, and from data demonstrating declining stocking rates. Cockayne in 1919, Thomson in 1922 and Zotov in 1938 all concluded from what they had seen that the tussock grasslands must have been depleted before the irruption of rabbits, and they are the most widely quoted sources for this argument. Zotov claimed to ‘have made special observations on the distribution of rabbits’ and to have ‘conversed with many settlers’, and from his observations he found ‘that [rabbits] are very few in number where the vegetation is fairly healthy. However, directly one reaches depleted areas rabbit burrows are to be seen in their thousands’.

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Zotov made his observations about sixty-five years after the beginning of the rabbit plague and about forty years after it had peaked. By 1938 rabbits remained widespread, but they had withdrawn from less favoured sites and massed in the most favoured habitats, the semi-arid areas of Marlborough, the Mackenzie Basin and Central Otago. He observed settled populations of rabbits whereas the first rabbit plague involved an irrupting population moving into a ‘virgin’ landscape. This thesis will argue that the dynamics were quite different.

With the limited evidence he had Zotov wrote that ‘the rabbit is not itself a major agent of depletion, and that at least without the aid of sheep and especially of fire it would not have exerted any influence on the vegetation’.5 He went on to say that rabbits do not invade, and, in fact, barely maintain their existence in ‘normal grassland vegetation’. These are remarkably bold claims that have not been subject to rigorous examination, yet Zotov has been widely followed by others writing on the topic of the first rabbit plague. K.A. Wodzicki accepted Zotov’s argument when discussing the deterioration of the land.6 The 1987 report of the Hughes Commission, that investigated the proposal to introduce myxomatosis into New Zealand, referred to Zotov to support its claim that ‘[t]he tall or short tussock associations would have provided an inhospitable habitat for rabbits, whereas the depleted grasslands provided an ideal habitat’.7

Leonard Cockayne held a similar view to Zotov, but was more circumspect in his conclusion. He recognized that ‘overstocking’ by rabbits may render a sheep run valueless, but also pointed out that much of the depletion of the vegetation in Central Otago was ‘not altogether the effect of’ the rabbit. There has been indiscriminate burning and more or less overstocking with sheep. But the climate is the driest in New Zealand, and this to no small extent is also responsible for the state of affairs in Central

5 Zotov, 228A.
Cockayne acknowledged the role of fire and sheep grazing along with rabbits in vegetation depletion, but introduced a caveat restricting the depletion to the semi-arid regions. Zotov, Wodzicki, the Hughes Commission, and many others have not been so careful and there has been a pattern where writers have considered the rabbit plague in the context of the worst affected area, Central Otago, but then generalised the same results for all the tussock grasslands.

The orthodox argument, then, is that the management practices of the pastoralists - burning and overstocking with sheep - created a habitat that enabled rabbits invade the rangelands. Critics of the pastoralists’ practices cite O’Connor’s work on changes in the stock loading in the semi-arid district of Vincent County as evidence of overstocking. From his calculations O’Connor concluded that the stock loading of the native grasslands in the county declined by sixty per cent within twenty-five years of sheep numbers reaching their peak about 1880. The Hughes Commission referred to O’Connor’s work to support its claim that overgrazing triggered severe rabbit infestations. A. S. Mather, a visiting Scottish geographer, used Buchanan’s comments on burning and O’Connor’s work to conclude that the indiscriminate use of fire and overstocking with sheep led to the initiation of land degradation in Central Otago before the irruption of the rabbit pest. Rachael Egerton wrote an essay on rabbits in 1993 and used Mather’s article as a reference for her statement that ‘the condition of the land was already deteriorating before the arrival of the rabbits, and it was its poor condition which made it an even more ideal habitat for the rabbit’. There is a pattern here of uncritical acceptance of sources which smacks of poor scholarship.

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10 Hughes Commission, 32.
Chapters Four and Five will demonstrate that rabbits, during phases where their numbers explode, are capable of modifying open country through heavy grazing and burrowing. Chapter Four will argue that sheep numbers were no: in decline, even in the semi-arid zone, before the arrival of rabbits. Moreover, in the semi-arid parts of the South Island rangelands rabbits found a habitat which bore many similar features to their natural environment; they were pre-adapted to this landscape. Case studies used in Chapter Five will show that there were considerable variations in the spread of rabbits and in their impact, despite the fact that rangeland stations followed similar sheep ranching practices. I contend that the first rabbit irruption was almost inevitable once rabbit populations became established, regardless of the sheep ranching methods practiced in the pastoral era.

Three key characteristics of the first rabbit plague

Perhaps the most striking feature of the first rabbit irruption and the one that has received most comment were the numbers of advancing rabbits and the speed at which they extended their range. The language that has been used conveys some idea of this spectacle. Burdon wrote that ‘their enormous numbers burst upon man’s realisation’, and that rabbits ‘swarmed into Tapanui’. R.M. Burdon, High Country. The Evolution of a New Zealand Sheep Station (Auckland: Whitcombe and Tombs, 1938), 133.

Wodzicki had rabbits ‘pouring south into the Amuri district’. Wodzicki, 110.

James Begg, an amateur historian, described rabbits as passing over the country ‘like a prairie fire’. George M. Thomson, The Naturalisation of Animals and Plants in New Zealand (Cambridge: Cambridge University Press), 89.

Author Joan Druett wrote of the rabbits moving into the Amuri as ‘hordes descending south from Marlborough’. Joan Druett, Exotic Intruders. The Introduction of Plants and Animals into New Zealand (Auckland: Heineman, 1983), 152.

This moving wave of rabbits spread at about fifteen kilometres a year, a remarkable rate when we consider the dynamics of the expansion of the range of rabbits later in this chapter. E.Stodart and I. Parer, Colonisation of Australia by the Rabbit (Canberra: CSIRO, 1988), 15.
Another feature of the first rabbit plague, less dramatic but more problematic, was that as the moving front passed on it left behind a resident population of rabbits against which landowners were forced to wage a long and continual battle. Begg’s analogy comparing the spread of rabbits to a prairie fire portrays some idea of the desolation left behind by both phenomena. However, after a prairie fire the land will soon recover given suitable conditions. After the moving wave of rabbits had gone through the pest remained to cause on-going devastation. Where established populations of rabbits remained, different sets of dynamics affected rabbit numbers and their impact on the vegetation and the landscape in different localities.

Closely associated with both of these features is another characteristic of the first rabbit plague which was that rabbits in vast numbers pushed into areas that are now considered outside the normal rabbit habitat. Rabbits reached plague proportions in high rainfall areas of western Southland and the moist, heavy country of south and west Otago. From Central Otago rabbits spread over the main divide and swarmed in the Wills and the upper Haast river valleys - areas where ‘indiscriminate burning’ or over stocking with sheep had not occurred and where there is an annual rainfall in excess of 2,500 mm a year.

The rabbit and its natural habitat

In order to understand the rabbit plague in New Zealand we need an idea of the habitat to which the rabbit is naturally adapted. The European rabbit, *Oryctolagus cuniculus*, originated on the Iberian Peninsula. The region’s Mediterranean climate is unpredictable and the rabbit has adapted to cope with dry seasons and take advantage of good seasons. Australian

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19 Thomson, 90.

biologists Rogers, Arthur, and Soriguer have described the rabbit as 'a biological opportunist bound by ecological constraints, particularly those of terrain, climate, and predation'.\(^{21}\) They proposed that rabbit populations can only flourish where the soil is suitable for establishing burrows, or where rocky outcrops provide the animals with protection from predators.\(^{22}\) The influence of climate is through vegetation and hence nutrition which governs the reproductive activity of rabbits. In seasons when food is plentiful or where there is an extended growing season rabbits will produce several litters of young, and young born early in the season may themselves breed later in the season. In years of severe drought rabbits may not breed at all. The constraint of predation affects young rabbits in particular, as they are vulnerable to an array of predators, as well as parasites and disease, which help to control the population of rabbits in the environment of southern Spain.

Research in Australia supports the view that rabbits thrive best in sandy soils, where they can burrow, or in scrubby country and rocky outcrops where they are protected from predators.\(^{23}\) Rabbits live in a defined range where they mark out territorial boundaries. This range will expand in times when feed is scarce, such as in periods of drought, or when winter restricts vegetation growth.\(^{24}\) In the context of the dispersal of rabbits and the rabbit plague in New Zealand, research suggests that the territorial nature of rabbits means that they rarely move away from their home range, although rabbits that become lost may move large distances.\(^{25}\) Those rabbits that do shift away from their home range are subordinate or unattached adults, or young rabbits that have been ejected from burrows to make way for the next generation of young. These behavioural characteristics of rabbits and an understanding of their original habitat can provide an insight into the


\(^{23}\) Myers, et al, “The rabbit in Australia,” in Thompson and King, 120


dynamics by which several small localised populations in Marlborough and Southland became a destructive plague.

The dynamics of the spread of rabbits in the South Island

Several writers have emphasised how difficult it was to get rabbits established when they were first introduced to New Zealand. Wodzicki suggested that this was because some of the first liberations were fancy breeds that were ill-adapted to living in the wild; however, even the common European rabbit initially struggled to establish itself.\(^2^6\) The population from which the rabbit plague in Southland and Otago originated became established in an ideal rabbit habitat: sandhills covered by a grassy sward that provided excellent conditions for burrowing and ample feed; there were only two native predators, the Australasian harrier (*Circus approximans*) and the weka (*Gallirallus australis*), and neither took adult rabbits, but preyed only on the young. Yet even with these advantages the initial phase of increase was slow. It may have been wetter seasons in 1864 and 1865 (see CHART: 4.1) that helped to keep the rate of increase low as high rainfall affects rabbit mortality either directly, through flooding of burrows, or indirectly, by lowering the animals’ resistance to disease.\(^2^7\)

Bull proposed that the slow build up of the population simply followed the logistic curve that is typical of many animal populations.\(^2^8\) In this model there is a slow initial increase as the population struggles to adapt to the environment and where life is precarious. Once the population reaches a certain level the constraints that provide a brake on the small population no longer remain effective so there follows an extremely rapid increase that continues until the population encounters ‘environmental resistance’, including food shortages, lack of suitable shelter, disease and the effects of crowding. As a result the rate of increase stalls and the population growth curve levels off. Bull argued that this pattern accounted for the slow increase

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\(^2^6\) Wodzicki, 107.

\(^2^7\) CHART: 4.1 Invercargill Rainfall, 1864 to 1880, p.153.

\(^2^8\) Bull, 56.
in the rabbit population in Southland until about the early 1870s. A similar pattern unfolded in Marlborough and Kaikoura, where rabbits had been released in 1858 and 1862 respectively, but were not reported as becoming a problem until the mid-1870s.

By the end of the 1860s rabbits had become well established in the coastal sandhills between Invercargill and Riverton. In 1871, 1872 and 1873 rainfall in the district was below the annual average and at this time the grasses that held the sandhills together were grazed out and the sand became subject to wind blow. We know that the rabbit range extends when feed is scarce and that, although adult rabbits rarely shift their range, in this case the destruction of their habitat would have been a trigger for them to spread. Rabbits moved up the river beds on to the plains inland from the coastal sandhills. Here, despite the dry seasons, the plentiful feed would have led to a high reproductive rate and the dry conditions would have resulted in a high survival rate amongst the young rabbits. Moreover, hawks and wekas would have had little effect on the burgeoning rabbit population. The young, being turned out of the burrows to make way for the next generation, would have been forced out of their home range and on to new territory. In this way the rabbit population increased and spread.

The rainfall through the middle years of the 1870s was average or a little below which suggests that conditions must have been good for breeding and mortality would not have been high, so that the momentum of the increase continued. Dry years in 1879 and 1880 may have helped increase the range of the rabbit territory, but the reproductive rate would not necessarily have declined as the population could always expand into ‘fresh’ country. By this time the rabbit population had moved well into the high growth phase that Bull described and, with females able to produce perhaps

29 Bull, 56.
30 Appendix to the Journals of the House of Representatives of New Zealand, 1876, I-5, 6.
31 A Runholder, “Rabbits in New Zealand,” Chamber’s Journal, 58 (1881), 410.
fifty young in a year, there was nothing to constrain it. The rabbits were always able to move into new territory where there was plenty of feed; tall tussock and matagouri scrub, and in Central Otago the rocky outcrops, provided shelter; the natural predators were few and would have been unable to make any impression as rabbit numbers multiplied. There is no evidence that disease had appeared as a problem as the rabbits spread on to healthy new country.

Cuthbert Cowan, who had Okaiterua Station on the Oreti River about seventy kilometres from Invercargill, first noticed rabbits on his property early in 1872. In his evidence to the Select Committee of the House of Representatives of 1876 Cowan stated that he did not take much notice of them at first; however he complained that in ‘the last eighteen months … the nuisance assumed immense proportions’. Captain William Fraser of Earnscleugh Station, on the south side of the Clutha River at Clyde, claimed in his evidence to the committee that in the middle of 1873 ‘it would have been a day’s sport to shoot half a dozen rabbits’ on his run, but that they had increased within a very short period. Several releases of rabbits had been made in the vicinity of Lake Wakatipu in earlier years, but historian Peter Chandler argues that it is doubtful that they survived and the rabbit irruption of the 1870s probably came from the pest spreading up the Mataura River and the Oreti/Von catchments. By 1875 rabbits were ‘becoming numerous’ at Mt Nicholas Station and had reached the head of the lake. By 1881 observers noted that rabbits were increasing in the country immediately south of the Waitaki River in North Otago, and the agricultural and pastoral reports from the Otago counties published in the Otago Witness show that rabbits had become widespread through all parts of Otago and Southland by 1884.
In 1887 John Baker, Commissioner of Crown Lands toured the Mackenzie Country, the Upper Waitaki and North Otago to assess the rabbit problem in relation to the value of rentals of the Canterbury Crown lands for the runs which were to be re-let in 1890. He found parts of the Upper Waitaki swarming with rabbits and wrote ‘I do not think that even in Southland I ever saw them in denser numbers than in the Omarama country’. He went on to speculate that neither the Ahuriri nor Ohau Rivers were likely to stop them spreading into Canterbury. Rabbits had already established themselves at the head of Lake Ohau and had reached Glentanner Station on the western side of Lake Pukaki. Down the Waitaki Valley, by 1887, rabbits had crossed the river, the boundary between Otago and Canterbury, and were reported to be ‘very thick’ on Te Akatarawa Station and were spreading on to Waitangi Station.

In Marlborough rabbits had been released at various sites from the late 1850s and by 1887 they had devastated thousands of acres of rangeland and were moving out from these areas to invade new country. William Smith, a runholder from Kaikoura, recalled silver-grey rabbits being released in the district about 1862, although they did not become a problem for several years. By 1876 they had spread throughout the district, although from evidence given to the 1884 Joint Committee on the Sheep and Rabbit Act it appears that they never achieved the densities on the wetter front hills that they did in drier zones inland. G.F. Bullen, who held a station near Kaikoura, claimed that rabbits never took possession of the country because ‘they were never allowed to’. Similarly, Sir Norman Campbell of Cloudy Range Station claimed that rabbits were never very numerous on his country, but knowing what had happened elsewhere he set about getting rid of them as best he could.

North of Kaikoura common brown rabbits had been liberated inland from Blenheim in 1858 and, according to Wodzicki, another release was

38 AJHR, 1887, C-16, 1.
39 AJHR 1887, H-18, 6.
40 AJHR 1876, I-5, 6.
41 AJHR 1884, I-5, 123, 124.
made in 1865.\textsuperscript{42} Within a few years rabbits had become established throughout the Wairau and Awatere valleys and were spreading into the Clarence Valley. In 1881 Joseph Ward of the Wairau valley stated that a run he knew had carried 10,000 to 12,000 sheep in the past, but rabbits had destroyed ‘everything’ forcing the property to be totally de-stocked.\textsuperscript{43} By 1887 rabbits from this region began to encroach into the western part of the Amuri district, while silver grey rabbits from Kaikoura moved into the eastern Amuri. With rabbits invading from the north and the south it seemed inevitable that Canterbury would also succumb: the Mackenzie was overrun in the 1890s; in 1903 newspapers reported that rabbits were increasing alarmingly in the Selwyn and Ashburton districts; and, after a mild winter in 1905, rabbits reportedly swarmed over the Port Hills near Christchurch.\textsuperscript{44} However, apart from the semi-arid Mackenzie country, the depredation caused by rabbits in the first rabbit plague was insignificant in Canterbury compared to their impact in Marlborough, Otago and Southland. In subsequent irruptions some parts of Canterbury did not escape so lightly. Peter Newton related that when the Hon. W. Nosworthy took over Mesopotamia in 1917 it carried 23,000 sheep. However, the explosion of rabbits that occurred after World War I reduced the station’s sheep flock to 5,000 by 1921.\textsuperscript{45}

**The rabbit irruption and its impact on the pastoral production of the rangelands**

The rabbit irruption in the South Island in the last three decades of the nineteenth century, and periodic outbreaks since, has left parts of the country so devastated that they have not recovered. The most severe and lasting damage occurred in the driest regions: Central Otago, the Upper Waitaki, the Mackenzie Country and inland Marlborough. In moist regions there has been a considerable recovery of the biomass, although it has not necessarily been

\textsuperscript{42} Wodzicki, 108.
\textsuperscript{43} *AJHR*, 881, 1-6, p.14.
\textsuperscript{44} *Timaru Herald*, 1910, 27 July; *Otago Witness*, 18 March 1903; *Otago Witness*, 30 August 1905.
\textsuperscript{45} Peter Newton, *High Country Journey* (Wellington: Reed, 1952), 65.
made up of the same suite of plants that formed the pre-rabbit vegetation. Pastoralists at the time gauged the impact of rabbits not so much in terms of changes in the vegetation, but in economic terms: in reduced stock numbers and declining productivity, and in increasing costs.

There is no evidence from contemporary sources that sheep numbers or sheep productivity had declined before the rabbit irruption. Wodzicki, whose paper is widely quoted in the literature on the rabbit plague, does not make this point explicitly, but his chronology of the irruption and the timing of the decline in stock numbers support this contention.46

Some of the contemporary examples presented to illustrate the declining productivity of the country after the incursion of rabbits demonstrate that the carrying capacity of runs fell dramatically and other measures of productivity also declined. Cuthbert Cowan claimed the pest reduced his sheep flock from 16,000 to 7,000.47 Another measure of declining productivity was the reduced ability of the country to fatten stock. A run that three years earlier carried 16,000 sheep and had fattened 2,300 in a year soon ran barely 5,000 with scarcely any of them fit to be killed.48 Runholders reported a marked decline in the percentage of lambs surviving on affected runs. In 1875 in the Western District of Southland the natural increase was twenty per cent, rather than the usual sixty-five to seventy per cent. Wool production also fell: a drop from 250 bales to 150 in one case and in another a drop from 900 bales to 750.49 Not only did the quantity of wool produced decline, but so did its quality. In the London wool trade the term ‘rabbity’ began to be used to denote the short and wasted wool grown on stations overrun by rabbits.50

There are numerous examples of the explosion in rabbit numbers and their impact on the productivity of the rangelands. Across the Oreti River

46 Wodzicki, 121.
47 AJHR, 884, 1-5, 140.
48 AJHR, 876, II-10, 4.
49 AJHR, 876, II-10, 4.
50 AJHR, 881, I-6, 8.
from Cowan on Castle Rock Station the flock was reduced from 50,000 to 20,000 and the loss to the owners estimated at £5,000 a year. In a single year rabbiters took 300,000 rabbit skins off the run. Kawarau Station, owned by the New Zealand and Australian land Company, had 244,000 rabbit skins taken off it in 1884 and 283,000 in 1885. The lambing percentage dropped from seventy to forty-five, the death rate of the total flock rose from 3½ to 10½ per cent, and the wool cut per sheep fell by 1½ pound.

The stations near Lake Wakatipu seem to have been particularly hard hit by the incursion of rabbits. Taylor White, who held the 75,000 acre (30,400 hectare) Mt Nicholas Station in partnership with his brother, recalled that the run easily carried 20,000 well-fed sheep in their time. The Whites sold to J.A. and H.K. Hodge and their partner Mc Ardell in 1874 and, according to White, within four years of the first rabbit being killed on the station the new owners were practically ruined by rabbits. In 1888 the station carried only 2,000 sheep. At the head of Lake Wakatipu John Butement held North Station and before rabbits appeared he depastured 40,000 sheep on the station’s 138,050 acres (55,900 hectares). Rabbits grazed out the flats and depleted the country where the station wintered its sheep. Sheep numbers declined from 37,000 in 1880 to 17,600 in 1886. The following year Butement was bankrupted and the New Zealand Loan and Mercantile Agency Company Limited that held the mortgage took possession of the various runs that made up the station. The company was unable to find a purchaser to take up the runs, so it abandoned them.

The 1880s saw thousands of acres of leasehold land abandoned as a result of the rabbit irruption. Between 1877 and 1884 lessees gave up seventy-five runs in Otago, sixty of them in the Wakatipu-Lakes region. By

52 Country Journal Vol. 12, No.1 (January 1888), 23.
54 Chandler, 13.
55 AJHR Sheep Returns
56 Chandler, p.13.
1885 only 51,200 acres in four blocks had not been re-let, but the rest had been leased out at reduced rentals, at a significant loss of potential income to the Crown.\textsuperscript{57} An 1887 report on runs abandoned because of rabbits found that 1,346,554 acres had been given up in Otago with the resulting loss of revenue to the government being £32,803. The Land Board re-let the greater portion of this area at considerably reduced rentals. However, twenty-three runs making up 414,000 acres remained unoccupied at the time the report was tabled.\textsuperscript{58} A report on Southland claimed no runs had been thrown up in that district because of rabbits, but when the runs had been re-let in 1883 it was at the existing price of two pence per acre. The report suggested that without the rabbit plague the new rate would have been double that figure and considered that it was a loss to the Government of £15,000.\textsuperscript{59} The claim that no runs had been thrown up in Southland because of rabbits is questionable, and there is plenty of evidence to the contrary. W.G. Rees, who managed Galloway Station for Robert Campbell, gave evidence to the Rabbit Nuisance Committee in 1881 that Campbell had abandoned 250,000 acres in Southland due to the depredation of rabbits.\textsuperscript{60} Moreover, after the auction of leases in 1887 several runs in the Marurun and Manapouri areas remained unoccupied.\textsuperscript{61}

**Attempts at controlling the rabbit irruption**

Runholders and government agents employed a remarkably wide range of measures in an attempt to control rabbits during the period of the first rabbit plague as desperate pastoralists and farmers endeavoured to protect their livelihoods from the depredations of the pest. Wodzicki has stated that the spread of rabbits 'induced a rather haphazard application of various methods of control rather than the direct destruction of the rabbit'.\textsuperscript{62} I contend that landowners used the best methods available at any particular time and that when new methods of control were shown to be effective they

\textsuperscript{57} AJHR, 1885, C-9, 1-3.  
\textsuperscript{58} AJHR, 1887, C-17, 1-2.  
\textsuperscript{59} AJHR, 1887, C-17, 1-2.  
\textsuperscript{60} AJHR, 1881, 1-6, 9.  
\textsuperscript{61} Otago Witness, 11 March 1887, p.17.  
\textsuperscript{62} Wodzicki, 128.
very quickly adopted them. The rabbit plague was a new phenomenon so there were no existing precedents that could be readily adopted; it was largely a matter of trial and error to find methods that worked. Moreover, even when the ‘killer policy’ (see page 152) was introduced in 1947, the large scale control operations, backed by the authority of the state, failed to achieve its aim of destroying the last rabbit. This raises the issue of the efficacy of the measures that were used to control rabbits. This section will show that despite the energy and expense that went into attempts at control, pastoralists, farmers and government agencies failed to stem the irresistible tide of invading rabbits. In fact the next chapter discusses the theory that the rabbit irruption and its subsequent decline was part of a naturally occurring cycle that had little to do with the actions of the pastoralists or their control measures.

Initially the only methods that pastoralists had recourse to were the traditional ones of dogging, digging out, shooting and trapping. Stations engaged large gangs of men to undertake this work. One station in Southland was reported to have thirty men and 600 dogs employed directly in the work of destroying rabbits.\(^\text{63}\) However, the use of dogs to chase down rabbits soon came to be seen as counter-productive: rabbits that escaped were often chased onto new country so that dogs were seen to spread the problem, rather than contain it. Moreover, it can be imagined that with numerous packs of dogs working on a station the sheep were constantly disturbed. B.P. Bayly, Chief Inspector of Sheep for the Otago District, claimed that the unsettled stock were ‘enfeebled … to such a degree that they were in no condition to withstand the unusually severe winter’ of 1878.\(^\text{64}\) There is no doubt that the disturbance to stock would have resulted in a decrease in their productivity and there may have been substance to Bayly’s claim about the weakened sheep succumbing to heavy snowfalls, but it must be remembered that sheep losses were high throughout the South Island back country that winter, even where rabbits had not yet become a problem. Digging out burrows and trapping caused less disruption to the grazing pattern of the sheep, but they

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\(^\text{63}\) AJHR, 879, H-9, 26.
\(^\text{64}\) AJHR, 879, H-9, 26.
are labour intensive methods that did not cope with the unparalleled increase in rabbit numbers.

Rabbits overran Captain J.W. Raymond’s Avondale run on the Aparima River in the 1870s. It became obvious to him that the current methods of rabbit control were ineffective and he developed a recipe for phosphorized grain that proved to be much more successful. Raymond’s method was not new; it was an improvement on earlier experiments to develop a poison to kill rabbits that had not been particularly effectual. Raymond’s discovery came too late to save himself, as the impact of rabbits forced him off his run. His recipe was circulated by newspapers and over time others made subtle changes to it: some preferred oats and others wheat as the bait for the phosphorus; some used rhodium or sugar to entice rabbits to eat the grain, as the phosphorus had a bitter taste, and others did not. Despite these minor variations in its preparation the poison was the most widely used control method through the 1880s.

In 1880 runholders Cargill and Anderson used phosphorized wheat on Mt Benger and supplied neighbouring settlers with the poison. It was also used throughout the Dunstan district. The manager of Hawksburn employed forty men to poison rabbits in 1880. Some prepared the poisoned grain, others packed it out to men who laid it out, and teams picked up and skinned the dead rabbits. The Otago Witness reported that they collected about 20,000 skins a month off the station. In three months eighty rabbiterers laid 121,000 pounds of poisoned oats on the New Zealand Agricultural Company’s estates in Southland and collected 130,000 skins. The station’s manager estimated that over a five year period one skin had been brought in for every pound of poison laid.

The early results of using phosphorized grain proved so successful that some predicted that the rabbit pest would soon be a thing of the past. The

65 Otago Witness, 12 June 1880, p.7.
66 Otago Witness, 2 October 1880, p.7.
67 Otago Witness, 17 September 1886, p.17.
Roxburgh correspondent of the *Tuapeka Times* made that bold claim in 1880. Even such an authority on agricultural matters as William Jenner thought the poison would see the end of the rabbit as a problem for farmers. After a tour of the Waimea Estate in 1881 he wrote: ‘Grain poisoned with phosphorus is a sure destroyer, and if its use be persevered in for a short time, the pest will not be known on the Estate’. How wrong he was.

There were several problems with phosphorized grain that limited its efficacy. It was soon apparent that on very hot days in summer the phosphorus set fire to the grass. Minor fires were reported in New Zealand, but disastrous fires that broke out in Victoria in 1900 were attributed to the use of phosphorus poison. Another problem with phosphorized grain was that rabbits would not eat it in summer months unless feed was scarce. Consequently, it could only be used in winter, which meant that throughout the breeding season landholders had to resort to dogging, digging out, shooting, trapping or doing nothing until the winter came around again. A third drawback with the method was that sheep that had been hand fed tended to eat the poisoned grain and die. It was estimated that 1,000 sheep had been poisoned in the Clutha district within the first months of the winter poisoning programme in 1885. Sheep on open run country were usually not hand fed, so they were less likely to be poisoned in this way. Another disadvantage to using poisoned grain was that it killed hawks and possibly weka, the only native predators that preyed upon rabbits in New Zealand. Other birds were also poisoned, and it may have been a cause in the decline of native ground dwelling birds that lived in the bush fringes.

The breakthrough that Captain Raymond had made with phosphorized grain had been to establish a method where the poison was thoroughly mixed with the grain and at a proportion where it was both palatable and lethal to rabbits. The grain was either boiled or mixed with hot water, depending on

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71 *Otago Witness*, 1 March 1900, p. 5.
72 *Otago Witness*, 25 July 1885, p. 15.
the preference of the operator, and the ingredients had to be mixed in an airtight drum. If care was not taken the poison could be a costly failure. This was another limitation with the measure. The problem was exacerbated in the mountainous areas of the Lakes district where, because of the steep terrain it was difficult, if not impossible in some parts, to mix the poison and get it out where it was needed.

The limitations of phosphorized grain encouraged a search for more effective and easier to apply measures for killing rabbits. Phosphorus and pollard, arsenic and chaff, arsenic and grain, strychnine and jam, and strychnine and apples were just some of the different methods used to kill rabbits. Phosphorized pollard was the most successful and widely used of these. It was developed in Australia and a recipe published in the *Otago Witness* in 1894. Some pastoralists argued that it had a significant advantage over phosphorized grain in that rabbits would take it in summer. Landowners soon tried the new technique and within months A.D. Bell of Shag Valley Station improved on the original recipe with outstanding results. One informant claimed ‘It is the greatest success we ever had with any poison.’ S.A. Sutton of Waitangi Station found phosphorized pollard so successful that he saw it replacing traps and dogs as a measure of controlling rabbits in summer.

However, as with phosphorus and grain, phosphorus and pollard had its problems. Stock ate it readily if they could get access to it and the loss of 1,700 sheep on Shag Valley Station early in 1895 was attributed to poisoned pollard. Rabbit inspectors in Otago advocated the use of pollard poisoning and advised that it could safely laid by using an adze to lift a sod and then placing the bait under the turf. The fresh soil attracted the rabbits to the poisoned bait, but stock could not get at it. Another problem with phosphorized pollard was that it was dangerous to mix as poisonous fumes

74 *Otago Witness*, 13 September 1894, p. 7.
75 *Otago Witness*, 31 January 1895, p. 8.
76 *Otago Witness*, 25 July 1895, p. 17.
77 *Otago Witness*, 4 April 1895, p. 7.
78 *Otago Witness*, 17 October 1895, p. 6.
were released during the process. To circumvent this problem Thomas Grieve of Bushy Park invented a machine to mix the poisoned dough, roll it into strips and cut it into bait sized cakes; and pollard distributors, which could lay 50,000 poisoned pellets a day, were manufactured in Sydney. Over the years other appliances were patented to mix pollard and phosphorus and by the end of the decade it had become the favoured poisoning method used in Otago and Southland for destroying rabbits.

Various proprietary poisons were marketed to kill rabbits, with the most successful probably being Toxa. To advertise its product the Toxa Manufacturing Company announced a competition in February 1895 for the most rabbits killed using a two pound tin of their poison. Toxa required no mixing and was easy to lay and, like phosphorized pollard, rabbits took it readily in summer. It also had the advantage that it could be safely laid where stock were running. However, it was more expensive than poisoned pollard, and this higher cost was compounded by the problem that rabbits refused to take it after it had been laid for three or four days.

Gassing rabbits in their burrows provided another means of destroying the pest. Some pastoralists used bisulphide of carbon sporadically from the outset of the rabbit plague and there is a report of it being used successfully on Castle Rock Station in 1879. It proved most effective in heavier soils as the gas tended to dissipate in sandy or porous soils. The method of application was simple: a wad of cotton or tufts of grass saturated with sulphide were pushed into the burrow and the burrow was immediately closed up. Understandably, this process proved to be labour intensive and the gas was unpleasant for the operator. There were also problems with the availability and cost of the chemical, so fumigation was not a preferred method of control in the early years of the rabbit plague. Two patented
fumigators were trialled in Dunedin area in 1883, but without any marked success.\textsuperscript{84}

However, when machines were improved in the early 1900s gas became more widely used. The Essoloo Rabbit Exterminator worked as a fumigator and pumped gas into rabbit holes, and was trialled in South Otago in 1905. The locally developed H-W exterminator, which sprayed liquid bisulphide directly into the burrow, was advertised in 1907.\textsuperscript{85} The Department of Agriculture advocated the use of bisulphide of carbon and demonstrated the process at Hillend Station in 1907. The \textit{Otago Witness} claimed that three weeks after the demonstration there was not a rabbit to be found on 'what was once the worst infested part of the whole station'.\textsuperscript{86} The station owners were so impressed with the results they planned to exterminate rabbits on Hillend by using wire netting to subdivide the property into manageable blocks and using carbon bisulphide to destroy the pest.\textsuperscript{87}

The Trustees of the Masterton Rabbit Destruction District in the North Island promoted the use of wire netting as an aid in the destruction of rabbits as early as 1881.\textsuperscript{88} By 1886 it was widely accepted that rabbit proof fencing was a useful 'adjunct to keeping the pest within bounds'; however, they were not recognised as legal fences under the Fencing Act.\textsuperscript{89} This limitation precluded a landowner from erecting a rabbit proof fence on a boundary and recovering a share of the cost from his neighbour. The most important reason for the slow uptake of wire netting fencing was its cost. Yet despite this there are numerous examples where station owners were prepared to accept the outlay in order to protect their country from the incursion of rabbits. H. S. Valentine, the manager of the vast Waimea Estate, had already erected rabbit proof fencing by 1886 to stop rabbits coming down from the open ranges.

\begin{footnotes}
\item[84] \textit{AJHR}, 1883, H-18, 4.
\item[85] \textit{Otago Witness}, 13 September 1906, p.20; 11 December 1907, p. 6.
\item[86] \textit{Otago Witness}, 3 October 1907, p. 9.
\item[87] \textit{Otago Witness}, 3 October 1907, p. 9.
\item[88] \textit{AJHR}, 1881 I-6, 18.
\item[89] \textit{AJHR}, 1886, H-19, 2.
\end{footnotes}
onto the better country. The management of Moa Flat had erected wire netting and it reported that 'a large portion of the property' had been fenced in by 1886. Rowley and Hamilton took up Avondale Station after Captain Raymond had been forced off the run by rabbits. They ring fenced the whole 26,000 acre (10,500 hectare) estate with rabbit netting and so reduced the rabbits that, by 1886, they lifted the sheep carried from 7,000 to 18,000, the number carried before rabbits became a nuisance.

Rabbit proof fencing gained official approval when the 1886 Joint Rabbit Nuisance Committee brought forward its report. They recommended that forty miles of rabbit fence should be erected in the Tasman Valley forthwith, and that materials should be procured to extend the fence another forty miles to the Hakataramea River. This fence was intended to protect the Mackenzie Country and Canterbury from the encroachment of rabbits from North Otago and the Upper Waitaki. The committee proposed a levy on every sheep carried between the Waitaki River in the South and the Waipara River in North Canterbury to pay for the cost of the fence. The Tasman Valley fence was completed in 1888. A year later the Hurunui Rabbit Board completed a rabbit fence south of the Hurunui River to protect the district from rabbits invading from Kaikoura and Marlborough. By 1891 another rabbit fence was erected by the Amuri and Hurunui Rabbit Boards that extended eighty-four miles from the head of the Waiau River to the sea. This fence was designed to separate the Amuri from Marlborough and Kaikoura and was a remarkable undertaking as it traversed some rough and difficult hill country. The rabbit fence in South Canterbury was also completed by 1891. It extended from Mt Cook to the Waitaki River at Kurow, a distance of over eighty miles. It was hoped that these two fences would protect Canterbury from the rabbit plague. However, when the Secretary of Agriculture, John D. Ritchie, inspected the South Canterbury fence in 1893

90 AJHR, 886, 1-5, 7.
91 AJHR, 886, 1-5, 37.
92 Otago Witness, 6 August 1886, p.17; AJHR, 1886, 1-5, 47.
93 Otago Witness, 16 December 1887, p.15.
94 AJHR 1889, H-13, 4.
95 AJHR, 891, H-22.
96 AJHR, 891, H-23.
he found ‘a great many traces of rabbits along the whole length on both sides of the fence’. The fence had failed to halt the advance of rabbits and in the remaining years of the 1890s they overran the Mackenzie Country.

Despite the failure of the South Canterbury rabbit fence the Liberal Government remained adamant that rabbit proof fences were essential in the fight against rabbits. The Minister of Lands, John McKenzie, argued that they were the only true solution to the problem as, once each property was fenced off, those who were too lazy to control their rabbits would only harm themselves and not their neighbours. The Chief Inspector of Stock, T. A. Fraser, agreed with McKenzie that wire netting was ‘undoubtedly the best solution to the rabbit problem in infested districts’, although he conceded that it was an expensive option ‘and beyond the means of many’. In an article on controlling rabbits published in 1912 in the Department of Agriculture’s journal J.W. Deem stated that the ‘erection of rabbit-proof netting fences on the boundaries and on as many subdivisions as circumstances ... [would] permit’ represented the ‘first and most important step’ where rabbits were numerous.

The ‘natural enemy’

The paucity of native predators was presented as a reason for the spread of rabbits in New Zealand. Many pastoralists, especially those in remote or rugged mountain areas, argued that introduction of the so called ‘the natural enemy’ provided the only long-term solution to the problem. The natural enemies to which landowners looked were those from ‘Home’: ferrets, weasels and stoats. Some did cast their net wider to find other predators, notably the mongoose, that might be useful in the destruction of rabbits. G.F. Bullen, a Kaikoura runholder, imported nine or ten mongooses

97 AJIR, 1893, H-21, 8.
98 Otago Witness, 14 April 1898, p.4.
99 Otago Witness, 3 November 1898, p.6.
100 Journal of the Department of Agriculture, Vol.5, No.6, 602.
101 Otago Witness, 6 October 1883, p.6.
in the mid-1870s. It appears that they survived in the wild for some time, as one was later caught in a trap set for rabbits, but they did not breed. The Government also imported mongooses and sixteen were released in Southland in 1876/7. There is no record of them after that; clearly they did not acclimatise successfully. Cargill and Anderson released numerous ferrets and mongooses on their runs Mt Benger and Beaumont near Moa Flat. The ferrets thrived, the mongooses did not. There were other enthusiasts for the idea of introducing mongooses, including Robert Cuthbertson, a former chairman of the West Oreti Trust, who submitted to the 1881 Rabbit Nuisance Committee that mongooses should be imported from British Columbia and India. However, enthusiasm for the predator did not last long. When the Otago Witness reported in 1884 that 600 or 700 mongooses were about to be released in the Riverina in New South Wales to control rabbits the paper made the terse observation, ‘It was hoped that the cure will not eventually be found to be worse than the disease’.

Two other predators were recommended to the 1886 Joint Committee on the Sheep and Rabbit Acts: Chief Livestock Inspector Bayly proposed the importation of the American marten from California, and McDonald, the Livestock Inspector from Southland, suggested that the eagle should be released in New Zealand to control rabbits. The committee members were clearly sceptical about the ideas, which did not get off the ground.

There was much more enthusiasm for the introduction of mustelids as a cheap and efficient means of destroying rabbits, but there was also considerable opposition to the proposal. The 1876 Select Committee proposed that a grant should be made by the government to import ferrets, stoats and weasels ‘as a natural check’ on the rabbit population. However, those who presented submissions to the committee were far from unanimous

\[\text{References:}\]

102 AJHR, 1884, 1-5, 122.
103 Journals and Appendix to the Journals of the Legislative Council of New Zealand, 1877, No.23.
104 AJHR, 1886, 1-E, 34.
105 AJHR, 1881, 1-6, 17.
106 Otago Witness, 22 March 1884, p.7.
107 AJHR, 1886, 1-5, 19, 47-8.
108 AJHR, 1876, 1-5, 2,3.
in their support for the perceived benefits of the natural enemy. William Smith, a runholder from Kaikoura, thought that weasels and stoats would go after birds rather than rabbits, but thought that ferrets were very useful. Cuthbert Cowan held an opposite view. He found ferrets far too slow and, from his experience in Scotland, he decided that weasels were more likely to be effective. Mr Robinson, who had experience of rabbits in the Western District of Victoria had no faith at all in the benefits of ferrets, saying: ‘I think it has never been found that they interfere very much with the increase of rabbits, and I do not think you will ever get rid of the nuisance in that way.’

The debate about the benefits of the natural enemy against the rabbit became very heated in the early eighties. Pringle F. Stoddart wrote a letter to the Otago Witness in 1882 bitterly denouncing J.M. Ritchie who had urged the release of ferrets, stoats and weasels in Otago. He argued that Ritchie and the squatters wanted to release these ‘vermin’ because they begrudged the expense of killing rabbits by poison. He went on to say: ‘I predict that if they are introduced not only will all the game disappear, but the native birds will all be killed out.’ The editorial position of the paper dismissed Stoddart’s argument, writing: ‘The loss of every head of game in the country would be a cheap price indeed to pay for clearing the land of rabbits. We could live really without the former, but we cannot live with the latter.’

The submissions to the Rabbit Nuisance Committee and the views expressed in the Otago Witness sum up the main arguments opposing the release of ferrets, weasels and stoats as predators of the rabbit. Some saw them as a threat to native birds, and a threat to introduced game birds, such as pheasants and quail. It was even argued that they would be a threat to lambs. Others thought that they would be of little benefit in controlling rabbits, suggesting once a ferret had killed and fed it would curl up and

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109 AJHR, 1876, I-5, 7.
110 AJHR, 1876, I-5, 17.
111 AJHR, 1876, I-5, 11.
112 Otago Witness, 5 August 1882, p.8.
113 Otago Witness, 5 August 1882, p.8.
sleep, and would not prey upon rabbits for the sake of killing them.\textsuperscript{114} Thus, it was argued that ferrets would have little effect in reducing the burgeoning rabbit population.

The pastoral interest and its supporters saw the ‘natural enemies’ as a cheap solution to the rabbit nuisance, and in rough country, the only solution, despite the cost to the native wild life. The \textit{Otago Witness} summed up this position in an opinion piece in 1886, writing: ‘There is no doubt that the extensive importation of the natural enemies has its drawbacks ... but the good work they will effect in a few years in dislodging bunny from his mountain fastnesses in such districts as Lake Wakatipu ... will more than repay the expense necessitated. I certainly cannot view with equanimity the almost certain prospect of seeing the native non-flying birds – such as the weka, kiwi, &c - [exterminated], and yet I suppose this is inevitable’.\textsuperscript{115}

By the mid-eighties the debate had become entirely academic, as thousands of mustelids had been released by that time. One of the early enthusiasts for ferrets was G.F. Bullen who released them in about 1874 when it was still illegal to do so.\textsuperscript{116} In 1877 the Government imported sixteen ferrets into Otago.\textsuperscript{117} However, Bullen, the Government and other importers experienced problems in shipping the mustelids, which were susceptible to distemper. Bullen’s first shipment of 600 all died, and only two ferrets and two weasels out of 700 were landed on his next attempt.\textsuperscript{118} In 1883 the Government landed 367 out of 1456 ferrets.\textsuperscript{119} Joseph Ward and a group of Marlborough runholders had a similar experience when they shipped 600 and landed only three ferrets and two weasels.\textsuperscript{120} Despite the high death rates both the Government and private individuals continued to import ferrets, weasels and stoats through the 1880s. A return of natural enemies imported

\textsuperscript{114} \textit{Otago Witness}, 20 June 1885, p.13.
\textsuperscript{115} \textit{Otago Witness}, 30 July 1886, p.7.
\textsuperscript{116} \textit{AJJR}, 1884, I-5, 122; \textit{AJJR}, 1881, I-6, 17.
\textsuperscript{117} \textit{Journal and Appendix to the Journals of The Legislative Council of New Zealand}, 1877, No.23.
\textsuperscript{118} \textit{Journal and Appendix to the Journals of The Legislative Council of New Zealand}, 1877, No.23.
\textsuperscript{119} \textit{AJJR}, 1883, H-18, 6.
\textsuperscript{120} \textit{AJJR}, 1881, I-6, 14.
for the years 1884, 1885 and 1886 shows 18,333 were landed, but this was probably a conservative figure.  

In order to circumvent the cost of importing ferrets and to overcome the high losses during shipping the government and private individuals established breeding stations to increase their numbers. The Government had its own breeding stations established by 1881 and gave ferrets to private individuals for release.  

In 1888 the Stock Department contracted to supply 21,760 ferrets by 31 March 1889, although it was acknowledged that it was unlikely that even half this number could be supplied by that date. As well as running its own breeding stations the Government also used private individuals to breed ferrets under contract. In 1888 3,600 ferrets had been bred under contract in the South Island, 2,755 in Otago alone. T.R. Tanner of Riversdale, Southland set up as a ferret breeder in 1884 and by 1894 he claimed to have bred nearly 12,000 ferrets for the Government and for station owners. Some station owners set up their own breeding programmes. G.F. Bullen bred ferrets from the mid-seventies and was liberating 200 a year by 1884 and we know that he was but one of many.

With the Government, private breeders and some station owners actively breeding up ferrets for release we have no idea how many were liberated, but we do know that they were let loose in almost every region east of the main divide from the early 1879s until at least the late 1890s. Just some examples of releases of rabbit predators from Marlborough to Southland can be seen in the following list: 1884, Richmond Brook and Flaxbourne Stations in Marlborough bred ferrets and turned out about 800 each per year; 1885, sixty seven weasels were released on Roy’s Peninsula, Lake Wanaka; stoats were turned out on several occasions near Lake Hawea; twenty eight weasels and fourteen stoats were let go at Lake Wakatipu; and

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121 AJHR, 1886, 1-5, 80.
122 AJHR, 1881, H-18, 6.
123 AJHR, 1888, H-31, 1.
124 AJHR, 1888, H-14, 3.
125 Otago Witness, 26 April 1894, p.6.
fifteen weasels on the Waiau River, Wallace County. In 1888 Government agents released ninety-four stoats and 205 weasels in the Clarence River area, and the Amuri Rabbit Board liberated 1,000 stoats and weasels, 1,000 ferrets and 400 cats near the Waiau River. The following year 600 stoats and weasels, 800 ferrets and 400 cats were let go in the Amuri District. In 1890 we know of 7,230 ferrets being released throughout Otago. However, as A Wechsman, Sub-Inspector of Livestock based at Gore, acknowledged in his 1889 report, it was impossible to say how many ferrets were released in his district because large numbers were bred there and were disposed of privately.

![TABLE: 4.1 showing the number of ferret breeders surveyed in the South Island 1885](image)

<table>
<thead>
<tr>
<th>District</th>
<th>Number of breeders</th>
<th>Under Govt. contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blenheim</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Kaikoura</td>
<td>5 + 4 runholders</td>
<td></td>
</tr>
<tr>
<td>Timaru</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Palmerston</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Dunedin</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Naseby</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Clyde</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Queenstown</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Tapanui</td>
<td>3 on large scale</td>
<td></td>
</tr>
<tr>
<td>Balcutha</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Gore</td>
<td>Many private</td>
<td>4</td>
</tr>
<tr>
<td>Invercargill</td>
<td>Several landowners</td>
<td>4</td>
</tr>
</tbody>
</table>

Pastoralists and the Department of Agriculture remained enthusiastic supporters of the natural enemies throughout the period from the early 1870s to the turn of the twentieth century, but opposition to them continued. In 1887 meetings were held in North Otago to discuss the benefits of the natural

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126 Otago Witness, 22 March 1884, p.7; AJHR, 1885, H-16, 2.
127 AJHR, 1888, H-14, 2, 6.
128 AJHR, 1889, H-13, 4.
129 AJHR, 1890, H-9, 5.
130 AJHR, 1889, H-13, 7.
131 AJHR, 1885, H-16, 4-7.
enemies. A motion from the Duntroon meeting condemning the introduction of the natural enemies was passed unanimously, while at Redcastle, near Oamaru, a large majority passed an amendment worded: ‘That the Government be asked to refrain from importing ferrets, stoats and weasels, as those animals, if turned adrift in the country, would become greater pests than the rabbits’.132 ‘Colonus’, a columnist for the Otago Witness, noted in 1895 that: ‘Ferrets and weasels appear to be on the increase, but they do not as yet seem to have had much effect on the [rabbit] pest’.133 By 1898 even ‘Agricola’, who had been an enthusiastic advocate of the natural enemies, conceded that landowners could not rely on them alone to control rabbits, and that as their numbers increased they were likely to become a pest.134 The change in the attitude towards ferrets is seen in the following comment in the Otago Witness in 1905:

A Marlborough runholder advertises for tenders to supply ferrets, “from 250 up to 750 annually for five years”. In view of the popular belief that the ferret as a rabbit exterminator has been found of little value, while it is of much more harm in other directions, the announcement quoted will cause surprise. It may also revive the agitation against the multiplication of ferrets and similar vermin that agitated the country a decade ago.135

The paper that had been a strong supporter of the introduction of ferrets, weasels and stoats, and a damning critic of those opposed to the policy, now admitted that those critics had been right all along and it was happy to see the debate, which it at one time inflamed, subside. From where we stand now Stoddart’s argument back in 1882 looks sound. The stake that landowners were prepared to gamble for a cheap solution to the immediate problem posed by rabbits was the destruction of New Zealand’s ground dwelling birdlife. That is a topic beyond the scope of this thesis, but it is of

132 Otago Witness, 3 June 1887, p.7.
133 Otago Witness, 9 May 1895, p.13.
134 Otago Witness, 20 January 1898, p.5.
135 Otago Witness, 30 August 1905, p.7.
note that by 1887 the mustelids, in places, had already had a significant impact on the weka population. One critic of their introduction claimed that the birds had disappeared from Otematata station by that time.\textsuperscript{136}

**Commercialisation as a measure of rabbit control**

If the debate over the importation and release of the natural enemies as a measure of rabbit control was lively, the debate over the commercialisation of rabbits as a control measure was so fierce, particularly in Otago and Southland, that the *Australasian Pastoralist’s Review* remarked that ‘at the present moment a kind of civil war is raging in the southern parts of New Zealand over this question of rabbit exportation to European markets’.\textsuperscript{137} Essentially the split that divided the two sides in this civil war was whether the use of trapping was an effective measure for controlling rabbits. The anti-commercial side claimed that preserving rabbits preserved the rabbit; those who backed commercialisation argued that rabbits could never be exterminated, but could be contained by trapping them for their meat or skins.

The commercialisation of rabbits as an industry began with earliest concerted attempts to control the pest and over 36,000 skins were exported in 1873. This was when trapping was one of the main means of containing the pest. The introduction of phosphorised grain worked in well with the rabbit fur trade as the rabbits took the bait readily in winter when skins were at their best. TABLE 4.2 (page 150) shows the enormous increase in the number of skins exported: in 1883, ten years after the establishment of the trade, nearly ten million skins were exported. The industry peaked ten years later in 1893 when just over seventeen million rabbit skins were shipped overseas. Without doubt by far the largest proportion of these skins was taken from poisoned rabbits, where the carcase was of no value.

\textsuperscript{136} *Otago Witness*, 3 June 1887, p.7.
\textsuperscript{137} *Otago Witness*, 10 May 1900, p.5.
Some entrepreneurs saw rabbit meat as a potential industry. Indeed, during the early debate over the introduction of the natural enemies, the issue even appeared in ‘Home’ newspapers. The Globe advised preserving rabbits in cans and sending them to Britain, ‘to convert an evil into a profitable industry’. In 1881 a meat works opened at Woodlands, twelve kilometres north of Invercargill, to can rabbit meat for export. The business did not prove to be very profitable, so it had little bearing on rabbit control. However, by 1890 there was renewed interest in meat preserving, with a plant established at Croydon by the Gore Meat Preserving Company, another opened in Clinton and one was planned for Heriot. Clearly, trapping for meat preservation and poisoning could not be carried on concurrently and, with the rabbit inspectors insisting on land owners undertaking winter poisoning programmes, the plants were forced to stop production between 31 May and 31 August. Since the output of the factories was relatively small, Croydon canned about 2,500 rabbits a day, and the fact that the rabbits were caught in the districts close to the canning plants there was little tension between anti and pro commercial lobbies.

However, with the establishment of the rabbit freezing industry in 1894 and its rapid expansion thereafter, the debate between these two groups soon escalated. In 1894 ‘Agricola’, writing in the Otago Witness, argued that systematic trapping for rabbit preserving factories would easily keep rabbits within reasonable bounds. He claimed that there were ‘few who want to see them completely exterminated’ and that the ‘senseless and expensive system cf poisoning’ should be stopped altogether. Within a few months ‘Drover’, the other long-time columnist for the same paper, came out with the opposite opinion. He argued that rabbits were a pest and that canning factories and the sale of rabbits as food should be banned. His solution to the

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139 Otago Witness, 16 April 1881, p.7.
140 Otago Witness, 9 January 1890, p.7; Country Journal, Vol.16, No.5 (September 1892), 403-5.
141 Otago Witness, 24 April 1890, p.8.
142 TABLE: 4.2, p.150 illustrates the growth of the rabbit freezing industry from just over 25,000 carcasses exported in 1894, to over two million in 1897, to 6,500,000 in 1890.
143 Otago Witness, 9 August 1894, p.6.
144 Otago Witness, 31 January 1895, p.5.
rabbit problem was the ‘utter extermination’ of the pest by a programme of poisoning carried on throughout the year. The Mataura Ensign summed up the problem in 1896 in an article that observed that the rabbit industry had provided employment for many men who would otherwise have been unemployed. It also regretted the waste of ‘tons and tons of valuable food substances left to rot upon the ground’ after large scale poisoning operations. Yet the paper acknowledged ‘that trapping does not tend to keep the rabbits in check to the slightest degree’ and that even poisoning ‘is in many localities barely sufficient to keep the pest in hand’. It concluded that there was ‘no chance of the regulations affecting the destruction of rabbits being modified under present circumstances’. The paper soon hardened its opinion and became an ardent supporter of the rabbit freezing industry and a vocal critic of the administration of the Rabbit Nuisance Act.

Proponents of trapping claimed that rabbits could never be exterminated, but trapping was effective in keeping the pest in check. Opponents countered that trapping scattered rabbits, killed the natural enemies and argued that trappers merely skimmed over the ground. Some station owners in Central Otago refused to allow trapping on their runs for these very reasons, maintaining that poison, netting and the natural enemies provided the only real solution to the rabbit nuisance. Another argument posited for trapping was that by 1900 the export of frozen rabbits had grown into an important industry which brought money into the small rural communities of Otago and Southland that would not otherwise be available. Others saw the export of frozen rabbits as direct competition with the sheep meat export trade. The Otago Witness pointed out that ‘When the people of Great Britain are eating rabbits they are not eating mutton’. Alfred Beavan complained to the Southland Times about the competition between rabbits and what he called ‘the farmer’s legitimate produce’, writing: ‘They occupy the trucks so that the farmer’s grain is left on the sidings; they fill up the freezing works and steamers so that the farmer’s mutton is left out. Then

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146 Otago Witness, 26 May 1898, p.5.
they come into competition with it in the Home market and take its place in consumption, so that the demand for mutton is less and the price lower than it otherwise would be.\textsuperscript{147}

Throughout the debate various writers compared the returns to the farmer and to the country from rabbits and from sheep and cattle. In 1912 E. Clifton gave the example of a property on which 5,000 rabbits had been trapped per year over a period of ten years. He argued that 5,000 rabbits were the equivalent of 1,000 sheep and that, whereas the return from the rabbits was £125 per year, the return from 1,000 ewes with their lambs and wool came to fifteen shillings per head, or £750. He went on to claim that, by failing to get rid of rabbits between 1898 and 1908 New Zealand had lost £1,500,000 sterling in income.\textsuperscript{148} An argument put forward in support of trapping was that the business provided employment in the depression years of the 1890s. A correspondent to the \textit{Mataura Ensign} noted: ‘Whatever may be said regarding the rabbit, I fancy he has been a good friend to thousands of our New Zealand workers’.\textsuperscript{149} This claim was countered by those who argued that if rabbits were cleaned out the increased productivity of the land would provide plenty of farm related employment for those involved in the rabbit trade. In essence, these were the arguments and counter arguments about the benefits of trapping that began with the establishment of the rabbit freezing trade in 1894.

Government policy, enacted by way of various rabbit acts that were enforced by the Agriculture Department through its stock inspectors, remained resolutely anti-commercial. It focused on the destruction of rabbits and regarded the best means to do this were poisoning, netting and the release of ferrets, weasels and stoats. Under the 1882 Act stock inspectors (also known as rabbit inspectors) had the power to force landowners to control rabbits on their properties and they had the power to bring those who

\textsuperscript{147} \textit{Otago Witness}, 30 June 1898, p.6.
\textsuperscript{148} \textit{Journal of Department of Agriculture}, Vol.4, No.1 (15 January 1912), 41-2.
\textsuperscript{149} \textit{Otago Witness}, 19 April 1900, p.5.
did not comply before the magistrate’s court where the fine for failing to control rabbits was up to £100.

The Minister of Lands, John McKenzie, toured the south early in 1898 and was ‘almost besieged’ by deputations wanting to discuss the rabbit question.\textsuperscript{150} The reporter for the \textit{Otago Witness} was impressed by McKenzie’s forthright response to those agitating for the rights of trappers, writing that the ‘Hon. John McKenzie has a backbone, and this is what all politicians have not got’ after McKenzie told an audience: ‘I have no hesitation in saying that trapping for export during three or four months of the year will not rid the colony of the pest. The professional rabbiter will not kill the goose that lays the golden egg’.\textsuperscript{151} McKenzie reinforced this position by suspending the Kurow Rabbit Inspector and his two agents for neglecting to enforce poisoning operations in their area.\textsuperscript{152}

Despite the position of the Government, agitation against the enforcement of the Rabbit Nuisance Act continued to increase. The system of rabbit inspectors had been established in 1881 and their powers were increased by the 1882 Rabbit Nuisance Act. Provisions in the 1882 Act enabled rabbit inspectors to organise the destruction of rabbits where landowners had failed to clear their land, with the landowner having to bear the cost of the work.\textsuperscript{153} Letter writers and leader writers in Otago and Southland newspapers complained about the ‘tyranny of the Rabbit Inspectors’ who insisted on enforcing poisoning programmes when trapping was being carried out. In early 1900 the \textit{Otago Witness}, the \textit{North Otago Times}, the \textit{Tuapeka Times}, the \textit{Mataura Ensign}, the \textit{Clutha Leader} and the \textit{Oamaru Mail} all expressed their opposition to the ‘arbitrary administration’ of the Rabbit Nuisance Act.\textsuperscript{154} The \textit{Oamaru Mail} claimed that ‘inspectors are becoming a greater nuisance than the rabbits’, while the \textit{Otago Witness}

\textsuperscript{150} \textit{Otago Witness}, 14 April 1898, p.4.
\textsuperscript{151} \textit{Otago Witness}, 10 March 1898, p.6.
\textsuperscript{152} \textit{Otago Witness}, 10 March 1898, p.5.
\textsuperscript{153} \textit{Otago Witness}, 5 September 1881, p.7; 9 September 1882, p.7.
\textsuperscript{154} \textit{Otago Witness}, 29 March 1900, pp. 4,5,14,15.
boldly asserted that the ‘rabbit export trade is the true solution of the rabbit pest’.\textsuperscript{155}

The prolonged campaign led to the 1901 Amendment to the Rabbit Nuisance Act that gave magistrates discretionary powers over the enforcement of the Act. This took the heat out of the debate over the powers of rabbit inspectors, but the debate over trapping continued, although not as vigorously as in previous years. In fact by 1907 some of the most vociferous proponents of trapping began to change their views. ‘Agricola’ decided that trappers only skimmed over the ground and that traps had cleared the ‘natural enemy’.\textsuperscript{156} The \textit{Clutha Leader}, which had been a determined supporter of trapping and had led the call for a petition against the powers of the Rabbit Nuisance Act, wrote: ‘It is a remarkable fact that the places where the professional rabbiter and professional trapper have been busily employed for years, and where they have made the biggest cheques, are the places where rabbits are most numerous today’.\textsuperscript{157}

One of the notable features of the commercialisation of rabbits in the period to 1912 was that the rabbit freezing industry and the skin trade were based almost exclusively in Otago and Southland. TABLE: 4.2 below clearly demonstrates the regional imbalance of the rabbit trade in the 1890s.\textsuperscript{158} Moreover, this regional imbalance persisted. For example in the year to 31 March 1907, of the 2,555,676 frozen rabbits exported from New Zealand all but 4,400 were shipped from Oamaru, Dunedin and Invercargill, with three-fifths of the total from the port of Bluff. Moreover, the 4,400 frozen rabbits not shipped through southern ports went through Timaru and Lyttelton, but were almost certainly processed in Otago. In the same period 5,145,152 skins were exported from the country and 4,961,057 of these came from Otago and Southland, with just over 4,200,000 being shipped through Dunedin.\textsuperscript{159}

\textsuperscript{155} \textit{Otago Witness}, 5 April 1900, p.5; 12 September 1900, p.4.
\textsuperscript{156} \textit{Otago Witness}, 24 April 1907, p.7.
\textsuperscript{157} \textit{Otago Witness}, 16 October 1907, p.8.
\textsuperscript{158} TABLE: 4.2. p. 150.
\textsuperscript{159} \textit{Otago Witness}, 27 November 1907, p.8.
TABLE: 4.2. Exports of rabbit skins, frozen rabbits and preserved rabbits from different regions of New Zealand in 1894 and 1898\textsuperscript{160}

<table>
<thead>
<tr>
<th>Region</th>
<th>1894 No.</th>
<th>1898 No.</th>
<th>Preserved cwt</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Island</td>
<td>828,613</td>
<td>330,344</td>
<td></td>
</tr>
<tr>
<td>Marlborough</td>
<td>265,508</td>
<td>59,814</td>
<td></td>
</tr>
<tr>
<td>Canterbury</td>
<td>193,708</td>
<td>54,676</td>
<td>844</td>
</tr>
<tr>
<td>Oamaru</td>
<td>60,297</td>
<td>23,658</td>
<td>571,041</td>
</tr>
<tr>
<td>Dunedin</td>
<td>10,583,969</td>
<td>5,578,601</td>
<td>732,306</td>
</tr>
<tr>
<td>Invercargill</td>
<td>2,336,190</td>
<td>560,841</td>
<td>2,946,555</td>
</tr>
<tr>
<td>TOTAL</td>
<td>14,267,258</td>
<td>6,607,934</td>
<td>4,251,596</td>
</tr>
</tbody>
</table>

Those who criticised trapping as a measure for controlling rabbits linked commercialisation with the on-going problem of the rabbit nuisance. ‘Drover’, writing in the \textit{Otago Witness} made this very point when he wrote:

There is no doubt that in districts where rabbit freezing for export is carried on rabbit farming or preserving for the season’s trapping for export largely prevails also ... At one time the Marlborough district was badly infested with rabbits, which threatened to overrun the country. At that time rabbit-preserving and tinning factories existed there, and not until the Rabbit Board was organised by the settlers and the tinning factories were abolished were they able to cope with the rabbit pest.\textsuperscript{161}

\textsuperscript{160} \textit{AJHR}, 1899, H-28, p.2.
\textsuperscript{161} \textit{Otago Witness}, 27 November 1907, p.8.
The Secretary of Agriculture, J. D. Ritchie, had made a similar observation nine years earlier when he pointed out that where trapping had been discontinued rabbits were being brought under control, whereas they remained a problem in Otago and Southland where trapping was vigorously carried on. He argued that if ‘the same energy were exercised in thoroughly poisoning the ground as in trapping, the results would be more permanent’.  

Newspapers from outside Otago and Southland also noted the connection between the on-going rabbit nuisance in those districts and the trapping industry. In 1900 and 1901 the *Canterbury Times*, *Lyttelton Times* and *Timaru Herald* all made stinging attacks on the commercial approach adopted south of the Waitaki and the failure of those regions to control rabbits. Pastoralists and farmers north of the Waitaki were also hostile to the commercial approach to rabbit control in the southern regions. A meeting of Marlborough pastoralists declared that trapping was ‘inimical to the interests of Marlborough’, and at the 1907 Agricultural Conference W. C. Buchanan complained that it ‘was notorious that almost the whole of [the rabbits and skins exported] came from Otago and Southland’ and he wanted steps taken to sort out the matter.

Despite the antipathy of the government and its agencies to the rabbit export trade and the growing awareness that trapping for commercial gain was ineffective as a means of controlling rabbits the rabbit skin and rabbit freezing industries continued until the passing of the Rabbit Nuisance Amendment Act in 1947. This legislation established the Rabbit Destruction Council and with it the ‘killer policy’ and the determination to ‘get the last rabbit’. The Act also planned the progressive ‘de-commercialisation’ of rabbits and rabbit products and an amendment to the Act in 1956 ended the

162 Otago Witness, 6 January 1898, p.6; 3 December 1898, p.6.
163 Otago Witness, 17 May 1900, p.15; 5 July 1900, p.5; 22 May 1901, p.7.
trade in rabbit skins and meat. The council never managed to achieve its aim of eradicating rabbits from New Zealand.

**Conclusion**

The first rabbit plague overwhelmed Southland, Otago and Marlborough both with the speed of the spread of rabbits and with their vast numbers. Once rabbits were acclimatised after their initial introduction they took advantage of the favourable conditions they found in the rangeland environment: few predators, a plentiful food supply, good cover for shelter and protection, and a healthy environment. After they moved out from the areas where they had been released the impact of the irruption took place remarkably quickly. Sheep numbers and the productivity of affected runs rapidly declined. The variety of measures that were introduced to control their spread, including the release of the ‘natural enemy’ and commercialisation proved to be ineffective. The costs to pastoralists and farmers, and the havoc wrought on the vegetation and landscape of the affected areas was disastrous.

The causes of the rabbit irruption have been laid squarely on the land and sheep management practices of the early pastoralists. Burning and overgrazing, it has been claimed, created the environment which enabled the pest to invade the rangelands. Yet there were anomalies in the first rabbit irruption that do not fit this line of argument. The plague petered out when rabbits were on the boundaries of the Canterbury region and it appeared to have little to do with control measures which had been tried and found wanting elsewhere. Moreover, there were considerable variations in the spread of rabbits and their impact even within the affected areas. The next chapter explores these variations in a series of case studies and argues that the rabbit plague resulted from the innate behaviour of rabbits and the nature of the rangeland environment.

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CHART: 4.1. Rainfall Invercargill, 1864 to 1880

Rainfall in inches:
- Actual (blue)
- Average (red)

Years: 1864 to 1880
CHAPTER FIVE
‘RABBITS ON THE BRAIN’

In July 1886 John Barton Acland wrote to Michael Mitton, his station manager, complaining ‘I have rabbits on the brain’.1 The following year he signed off a letter to his nephew in England, declaring ‘[w]ell this letter has been rabbit, rabbit, rabbit, but I have little else to say’.2 In that letter he had described the disaster in Otago that had resulted from the rabbit plague where flocks had ‘diminished to half or quarter their former number’; where one man had spent £3,000 a year killing rabbits and another £20,000 in five years; where one runholder had killed 300,000 rabbits; and one said he had one hundred men at work killing rabbits.3 Acland’s anxiety about rabbits was evident in many of his other letters written in the 1880s. Yet rabbits had not been a problem on Mt Peel and Acland himself admitted in 1887 that ‘for my own case I have no rabbits at present’.4 However, Acland, in his role as a member of the Legislative Council, had been a member of a parliamentary commission established to examine the rabbit plague. The evidence he heard made him very wary about the risk the pests posed if they reached his station. He wrote to his brother, Sir Thomas Dyke Acland, in July 1887 saying ‘if [rabbits] get a hold it means ‘ruin’ as from want of grass the flock diminishes besides the loss of wool and lambs … and the expense of fighting by men and dogs, traps, poison and co’.5

Acland’s letters illustrate the concern that the first rabbit plague caused for landholders throughout the rangelands of the South Island. Yet the pest did not spread uniformly across the region and the impact of rabbits varied on different stations, in different parts of the island and at different times. This chapter explores the dispersal of rabbits and its consequences for four runs in different regions of the rangelands to account for these variations. As

1 MB44, Acland Family Papers, Box 11, 30 July 1886, Macmillan Brown Library, University of Canterbury, Christchurch, New Zealand.
2 Acland Papers, Box 12, 13 July 1887.
3 Acland Papers, Box 12, 13 July 1887.
4 Acland Papers, Box 12, 13 July 1887.
5 Acland Papers, Box 12, 12 July 1887.
we have seen, the orthodox explanation of the rabbit irruption argues that the pest could not have thrived and spread had it not been for the pastoralists’ practices of burning and overgrazing. The use of the case studies in this chapter will assess whether this argument has the explanatory power to account for the rabbit plague. The chapter will demonstrate that other factors played a part in shaping the spread and impact of rabbits.

It has been noted that during the first rabbit irruption the pest thrived in areas that are not considered to be rabbit-prone. Moreover, some of the regions that were badly affected initially, recovered remarkably quickly from the devastation caused by explosion in rabbit numbers. Wallace County in Southland was overrun by rabbits in the 1870s; however, by the beginning of the 1880s stock numbers and productivity of some of the stations in the region had begun to recover. Rabbits and the 1878 snow reduced the sheep flock on Castle Rock Station from 50,000 to 20,000. Mathew Holmes then purchased the freehold of the station and began to develop it. CHART: 10.20 shows the property carrying 25,000 sheep in 1879 and thereafter numbers lifted slowly to reach 36,600 in 1896. In 1901 Holmes died and two years later the station was cut up and sold. The recovery at Castle Rock was bettered by its neighbour the Five Rivers Estate (CHART: 10.21) where sheep numbers more than doubled between 1879 and 1892. The reduction in rabbit numbers, cultivation, turnip culture, sowing down improved pasture species, and subdivision with post and wire fencing increased the stock loading on both stations. The development was not just about lifting numbers; the quality of the stock also improved. Holmes established a flock of Cheviot sheep at Castle Rock highly regarded by sheep breeders throughout the South Island.

The recovery of the vegetation in the district was, in fact, widespread with a correspondent commenting in 1890: ‘Country that I have seen entirely

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6 Appendix One: CHART: 10.20, Castle Rock sheep numbers, p.386. Note that the name of the station is now spelled Castlerock. However, Beattie and Hall-Jones both used Castle Rock and this appears to have been the early usage.

7 Appendix One: CHART: 10.21, Five Rivers sheep numbers, p. 387.

denuded of every kind of grass except the tussock appears to have quite recovered its original condition, even the anise plant, which was supposed to be quite destroyed, is making its appearance again.9 This is not to say that it was the end of the rabbit problem as, after a mild winter in 1900, newspapers reported that parts of the district which had been almost cleared of the pest were simply alive with young rabbits by the end of that year.10 It is apparent that although rabbit numbers fluctuated in subsequent years Wallace County would never again be overwhelmed by rabbits as it had been in the 1870s. This pattern of devastation and recovery was not unique to Wallace County and outside the semi-arid regions it emerged as the normal course as rabbits exploded in numbers and then declined.

Moa Flat and the rabbit plague

Moa Flat Station suffered badly from the increase in rabbits in the late 1870s and then later recovered. Before that it had been one of the largest and most productive stations in Otago. Moa Flat consisted of 80,000 acres (32,400 hectares) of freehold land, and the property took in a further 116,000 acres (47,000 hectares) made up of seven leasehold runs. John Fry Kitching undertook considerable development on the station. By 1878 he had 250 miles of fencing erected, 1,000 acres were cropped and 800 acres had been sown in turnips for sheep feed, and the station shone 120,000 sheep.11 But 1878 marked the end of the good years. The 'big snow' of that year, when snow lay for six months, and the floods that followed the thaw, killed 60,000 sheep. Then came the rabbits. In 1880 Kitching went out and William Joseph 'Big' Clarke took possession of the station. The continued encroachment of rabbits forced him to abandon most of the mountain leases.12 W. Quin described the decline of Moa Flat in an article published in 1882:

9 Otago Witness, 17 April 1890, p.7.
10 Otago Witness, 26 December 1900, p.4.
In the fertile valley of the ... Clutha River, the natural vegetation was, in times gone by, extremely luxuriant; and possessed of a splendid climate, this valley carried stock in an almost equal proportion to the cultivated paddocks on the Taieri Plain. The rabbit plague has, however, so entirely altered the appearance of that part of the country, that it is almost unrecognisable. Hills and gullies that used to present a scene of perfect sylvan beauty, with variegated pasture, intermixed with sparkling streams flowing from alpine snow-capped ranges, and literally covered with sheep, now look like a deserted waste, as though some gigantic deluge has swept vegetation from off the face of the earth.

[A] large estate [Moa Flat], over which it has been frequently my lot to traverse for years past, now grazes 40,000 sheep, in miserable condition, and yet, before the advent of the bunny, 120,000 were mustered yearly, in good order.13

Quin’s vivid description of Moa Flat after its devastation by rabbits was one of the earliest and most graphic accounts that we have of the impact of the rabbit plague on the landscape of Otago. Where most commentators provided statistics detailing losses in productivity to emphasise the extent of the rabbit plague, Quin provided a tragic picture of a wasted land. Yet he was at pains to assert the veracity of his portrayal of the countryside, writing: ‘readers residing at a distance from the plague-infested spot, will, I have no doubt, imagine that my colouring is overdrawn ... but such is not the case.’14

The drop in the carrying capacity of Moa Flat from 80,054 sheep in 1879 to 36,155 in 1883, a decline of nearly fifty-eight per cent in five years, is represented in CHART: 10.19.15 However, that chart also shows that sheep numbers recovered from the low point of 1883 to nearly 60,000 in 1886.

15 Appendix One: CHART: 10.19 Moa Flat sheep numbers, p.385.
Moreover, sheep numbers were maintained at a consistent level until the
management of the station began the subdivision of the property in the early
1900s. Furthermore, not only were sheep numbers maintained through this
period, the productivity of the sheep improved and the station received top
prices for its wool and surplus stock.  

The battle against rabbits on Moa Flat began in Kitching’s time when
he employed nearly 100 men for four months in 1879 to clear the pest from
his land. After Kitching lost the battle Clarke took it up. In 1881 William
Fraser, a neighbouring runholder, reported that eighty-five men were
employed trying to control rabbits on Moa Flat, but the pest increased in
numbers. The station also began a programme to erect wire netting fences
to subdivide the country into manageable blocks where rabbits could be
controlled more easily and to separate the improved freehold country from
the unimproved leasehold. In 1886 Vincent Pyke, the local Member of
Parliament, reported that a large portion of the property had been fenced off
with rabbit netting. Trapping with large gangs of men continued until 1895
when the rural press reported that the station had discarded trapping and
instigated a poisoning programme using phosphorised pollard, after a
thorough test of its efficacy. This method of control was successfully
demonstrated when six men picked up 1,200 dead rabbits in a day after
pollard had been laid. The rabbit control measures on Moa Flat were
apparently successful as in 1905 Quin wrote that ‘[b]unny was there in
places, but never in sufficient numbers to cause anxiety’.

Moa Flat had a significant advantage over the semi-arid region of
Vincent County to the west that helped to account for its recovery: it lay
within the south-western rainfall belt. The report of the Commission

17 Appendix to the Journals of the House of Representatives of New Zealand, 1881, I-6, 6.
18 AJHR, 1881, I-6, 6.
20 AJHR, 1886, I-5, 37.
21 Otago Witness, 7 March 1895, p. 6.
22 Otago Witness, 12 September 1895, p.5.
23 AJHR, 1886, I-5, 36.
established to enquire into the condition of pastoral lands of the South Island in 1920 noted this effect and observed the ‘well-grassed’ country on the Moa Flat side of the Clutha River, and ‘on the opposite side … the depleted part of Central Otago’. The higher rainfall made the country less ideal for rabbits and enabled the vegetation to recover after rabbit numbers declined.

**Earnscleugh Station and the rabbit plague**

The examples from Wallace County and Moa Flat demonstrated the recovery that took place in areas outside the severely rabbit prone semi-arid country. By contrast Earnscleugh Station, in Vincent County and in the very heart of the intractable rabbit area of Central Otago, provided one of the most dramatic examples of the devastation that resulted from the rabbit irruption of the nineteenth century. A.C. Strode leased the 80,000 acre (32,400 hectare) station in 1860 and Captain William Fraser joined him the following year. It remains a particularly ‘sweet’ block of country well suited to raising Merino sheep and growing some of the finest wool in New Zealand. However, the very attributes that make it ideal for running high quality fine-woollen sheep also make it an ideal habitat for rabbits. Fraser described his run as ‘dry hilly country’ lying between 600 feet (180 metres) and 5,000 feet (1500 metres) in altitude, and with light and rocky soil. The climate is semi-arid with the station receiving about 360 mm of rain annually and having a water deficit for at least six months of the year. The area receives high sunshine hours and much of the property is warm, north facing country rising from the Clutha River to the tops of the Obelisk Range. The soils on the lower altitude country have been characterised as having a high risk of

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25 The Agricultural Pests Destruction Council described the severity of the rabbit problem in different regions as: intractable, severe, and rabbit prone. Earnscleugh Station is in the heart of the intractable area of Alexandra/Clyde/Cromwell. John Bamford and Associates, Environmental Impact Report on a Proposal to Introduce Myxomatosis as another Means of Rabbit Control in New Zealand, 1987, see map.
27 AJHR, 1876 I-5, 9; 1886, I-5, 64.
rabbit infestation, while the risk on soils on the higher parts of the station is moderate.\(^{29}\)

Fraser claimed that miners introduced rabbits on to the station to provide a source of cheap food. In evidence to the Rabbit Nuisance Committee in 1876 he stated that initially they were not a problem and that thirty months earlier it would have been a good day’s sport to shoot half a dozen.\(^{30}\) However, soon afterwards Fraser was forced to begin a programme of systematically destroying the pests. In 1876, the first year of his war on rabbits, 5,000 were killed; his men then destroyed 20,000, 40,000, and 80,000 in consecutive years. In 1880 he took 160,000 rabbit skins off the property. Fraser reckoned that this probably accounted for at least 400,000 rabbits as great numbers died in their burrows after taking poison.\(^{31}\)

Methods employed to destroy rabbits changed over time. Initially Fraser used teams of men with guns and dogs, but he found that they had little effect on burgeoning rabbit numbers. He tried bisulphate of carbon, but settled on grain poisoned with phosphorus as the best method, arguing that it was ‘the only one to have any effect at all’.\(^{32}\) To follow up the winter poisoning Fraser employed gangs of men in summer to trap and dig out remaining rabbits. Fraser also tried the ‘natural enemies’ and started breeding ferrets on Earnscleugh in the early 1880s. He released the first lot in 1884 and another 100 in 1886.\(^{33}\) Campbell and Egerton claimed Strode and Fraser liberated ferrets in 1875, but that was not the case.\(^{34}\) Five ferrets were taken to Earnscleugh in June 1875, but it is clear that they were not released into the wild.\(^{35}\) Instead they were used by rabbiters to flush out rabbits that took to their burrows to evade their persecutors.

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\(^{29}\) Hughes Commission, 41.

\(^{30}\) AJHR, 876, 1-5, 9.

\(^{31}\) AJHR, 881, 1-6, 6.

\(^{32}\) AJHR, 881, 1-6, 4.

\(^{33}\) AJHR, 886, 1-5, 64.


\(^{35}\) Otago Witness, 19 June 1875, p.16.
Fraser complained to the 1886 Joint Committee on the Rabbit and Sheep Acts that, in spite of the effort and expense he put in to killing rabbits on his station, he suffered from repeated rabbit invasions from the unclaimed crown lands and commonages on his boundaries where the Government was supposed to keep the pests in check. He felt that the Government's use of contractors to control the rabbits on that country had proven ineffectual, whereas landholders in the district, under the guidance of the rabbit inspector, had co-coordinated their poisoning operations to good effect. He had thirty-six men employed poisoning in the winter of 1886 and intended to keep them trapping in the summer, yet he struggled to keep up with the plague.

The impact of rabbits on Earnscleugh is demonstrated by the dramatic decline in sheep numbers in CHART: 10.16. Fraser battled on against the rabbit through the 1880s and early 1890s and tried to maintain his sheep flock. The sheep returns show that in 1886, ten years after the initial explosion in the rabbit population on the station, the property carried 23,000 sheep, only a thousand or two fewer than it had carried at the time of the outbreak. However, this was at the cost of declining productivity, as by 1881 the average wool weight shorn per sheep had dropped from between seven to eight pounds to between six and six and a half pounds. By 1894 the cost of fighting rabbits and the declining profitability of the station got the better of him and Fraser sold to W.S. Laidlaw. In 1897 with his flock down to 12,500, just over half the number of sheep carried in 1879, Laidlaw abandoned the leases of Earnscleugh, but kept a small freehold farm on the Earnscleugh flat. Unable to find anyone to take up the runs, the Government took over the fight against rabbits on Earnscleugh, yet had no more success than Fraser and Laidlaw.

A writer to the Southland Times claimed that the Government spent £1,500 poisoning on the property in a single year and that the rabbits were

\[ \text{Appendix One: CHART: 10.16, Earnscleugh sheep numbers, p.382.} \]
\[ AJHR, \ 881, 1-6, 6.} \]
In addition to the poisoning operations the Government experimented in establishing improved grasses on Earnscleugh. In 1898 between seven and eight tons of grass seed was sown on the station, but only germinated where the conditions were most favourable. Unfortunately, the plants that did germinate did not survive because rabbits grazed them out and even scratched up the roots for food. This is one of the earliest attempts by central government to re-grass areas devastated by overgrazing in New Zealand and served as a forerunner to nearly a hundred years of such experimentation.

In 1902 Stephen Thomas Spain took up the Earnscleugh lease. In his first five months he employed thirty-two men who killed over 250,000 rabbits. In his effort to control rabbit numbers Spain paid above average rates as an incentive to his rabbiters. When £1 per 100 skins was the going rate he paid twenty-five shillings, and when rabbits were scarce he paid £1.13.6 per 100, to keep rabbit numbers as low as possible. Despite Spain’s determined approach to controlling rabbits even he failed to meet the rigorous standards demanded by the rabbit inspectors. Early in 1905 the court found him in breach of the Rabbit Nuisance Act and fined him £10, with £1/10s costs.

Spain slowly began to build sheep numbers on Earnscleugh. He started with 1,455 sheep in 1902 and built up to 12,030 five years later. Spain maintained the productivity of the flock as numbers lifted and an observer described the clip in 1907 as being ‘exceptionally heavy’. Apart from the year 1909 when the sheep flock suddenly increased to 19,500, Spain maintained his flock at around 12,000 for the years 1907 to 1912. This was about half the numbers carried on the station thirty-five years earlier at the time of the outbreak of the rabbit plague. The 1909 figure is an aberration; it may have been a mistake in the stock returns or a special set of

38 Otago Witness, 20 October 1898, p.20; 26 July 1900, p.5.
39 Otago Witness, 23 August 1900, p.5.
40 Otago Witness, 25 December 1907, p.22.
42 Otago Witness, 25 December 1907, p.22.
circumstances, but it was clearly beyond the carrying capacity of the station at that time.

The impact of rabbits on Earnscleugh provides an example of those runs in the worst affected areas of Otago and Southland where the cost of rabbiting, the decline in sheep numbers and the loss of productivity forced the runholders to throw up their leases. When the leases were taken up again the stocking rates were invariably lower than they had been in the years before the rabbit irruption. However, Earnscleugh is not typical in that the timing of the collapse came much later. Runholders in the Lakes district and Southland were overwhelmed by rabbits soon after the initial invasion and the leases in these regions were given up in the 1870s and 1880s. At Earnscleugh, Fraser waged a war against rabbits for eighteen years before succumbing to them, and Laidlaw battled on for another four years before throwing up the leases of the run in 1898. This twenty-two year period between to onset of the rabbit plague on Earnscleugh and the abandoning of the leases was probably due to a combination of factors - including Fraser’s financial strength, his determination and the fact that Earnscleugh was a favoured run in terms of its natural endowment. Yet even with these advantages rabbits brought financial ruin to the runholders and ecological destruction to the property.

**Waitangi Station and the rabbit plague**

Waitangi Station is another property in a rabbit prone area and, although not as overwhelmed by rabbits as Earnscleugh, the battle against the pest took an enormous toll on the station’s resources. John Alfred Sutton purchased Waitangi Station in late 1886.43 At that time the station took in 51,968 acres (21,500 hectares) of mostly steep hill country running from the Waitaki River in the south to the high tops of the Kirkliston Range at over 6,000 feet (1,860 metres). Rainfall normally is between 18 (457 mm) and 22

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inches (558 mm), but in dry years can be as low as 13 inches (330 mm).\textsuperscript{44} The soils on the lower country have been classified as having a high risk of rabbit infestation with the medium altitude country having a moderate risk.\textsuperscript{45}

Sutton’s purchase of Waitangi coincided with the arrival of rabbits on the property and the station diaries provide an insight into the on-going day-to-day battle that runholders fought against the pest. In 1887, his first year on the station, Sutton used his own staff rabbiting. It appears they spent about thirty-seven man days on rabbit control: digging out, poisoning, and probably shooting. For this effort the diaries recorded 126 rabbits killed, but this was unlikely to be an accurate tally. Waitangi also had two visits from Black, the Rabbit Inspector, who spent two days on the run during his second visit.\textsuperscript{46}

Two years later the effort to control rabbits had been considerably stepped up. During much of the last two weeks of June, almost all of July and for two weeks in August 1889 the station staff laid phosphorized oats.\textsuperscript{47} Conservatively, this took up about 102 man days. The poison recipe consisted of 160 pounds of oats to nine gallons of water, to which was added twenty-five sticks of phosphorus.\textsuperscript{48} The poisoned grain was then put into bags for the staff to lay on the block that was being poisoned. After laying the poison over a whole block the men would then go around and pick up the dead rabbits to be skinned. Unfortunately, tallies of rabbits picked up and for skins sent away are not consistent enough to provide any useful guide to the number of rabbits killed. There was one visit from the rabbit inspector that year. In 1889 Sutton resorted to the release of ‘the natural enemy’; early in October thirteen ferrets were let loose on the station.\textsuperscript{49}

Despite these efforts it is clear that rabbit numbers continued to increase. In 1890 rabbiting took up 219 man days and from 14 May to 17

\textsuperscript{41} John Sutton, personal comment, Waitangi Station, 1 November 2005.
\textsuperscript{42} Hughes Commission, 48.
\textsuperscript{43} Waitangi Station Diaries, 14 March 1887; 18 September 1887.
\textsuperscript{44} Waitangi Station Diaries, 1889.
\textsuperscript{45} Waitangi Station Diaries, 25 June 1889.
\textsuperscript{46} Waitangi Station Diaries, 4 October 1889.
June Sutton employed seven men full time poisoning and picking up. From the end of June to the end of December, when time was available, he sent men out shooting or to spot poison particular areas. In 1891 he stepped up the battle and employed two government contract gangs from 27 April. Each gang consisted of six men, and one gang worked through to 2 July, while the other continued until 21 July. The diaries provide no details of the days on which these gangs worked or if they took weekends off. However, since they were camped out in tents while they stayed on Waitangi it is probable that they worked most of the time. It is therefore likely that the government gangs spent over 900 man days rabbiting on Waitangi in 1891. Sutton also employed a rabbiter to shoot and dig out holes in January, February, August and October. The station records show just under 9,000 skins sent off for the year, but this must have been only a small proportion of the rabbits killed.

In 1892 a government gang spent forty-four days poisoning on Waitangi between 28 May and 11 July, and a further nine days in early August, with station hands involved outside those times. The following year government rabbiteres spent 504 man days on the station and station staff 272 days. In July of 1893 Sutton tried Toxa, which must have been successful as he continued to use the proprietary poison. In 1895 he tried phosphorised pollard with success. In July of that year a letter appeared in the *Otago Witness* claiming that phosphorised pollard killed about two sheep to one rabbit and that Sutton had lost stock as result of using the poison. Sutton replied that he was more than satisfied with pollard and that he saw it replacing dogs and traps used to control rabbits during the summer. Moreover, he thought that he would not have lost ten sheep compared to between 10,000 and 15,000 rabbits killed by the method.

50 *Waitangi Station Diaries*, 21 July 1893.
51 *Otago Witness*, 11 July 1895, p.16.
52 *Otago Witness*, 25 July 1895, p.17.
TABLE: 5.1 Man days spent rabbiting on Waitangi Station, the number of visits by rabbit inspector(s) and days they spent on the station, from 1887 to 1906\textsuperscript{53}

<table>
<thead>
<tr>
<th>Year</th>
<th>Man-Days rabbiting</th>
<th>Rbt Inspector Visits</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1887</td>
<td>37</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1889</td>
<td>102</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1890</td>
<td>219</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1891</td>
<td>928</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1892</td>
<td>NA</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>1893</td>
<td>776</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1895</td>
<td>898</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>1899</td>
<td>1,059</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>1900</td>
<td>2,182</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>1901</td>
<td>1,465</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>1905</td>
<td>1,219</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1906</td>
<td>835</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Despite the time and money spent on rabbit destruction on Waitangi, in January 1899 the rabbit inspector and his agent threatened to take Sutton to court if he did not do more.\textsuperscript{54} In response, over 1,000 man days were spent rabbiting on the station, including the use of a government gang for nineteen days in February and again between 11 May and 1 October. Station hands laid pollard and trapped when not busy at other work. In 1900 two gangs of government rabbiters and station hands spent over 2,100 man days pollarding, poisoning with phosphorised grain, laying Toxa, and trapping. Yet in spite of this effort, after inspecting the station over two days in December, the rabbit inspectors warned Sutton that rabbits remained very bad ‘everywhere’ and threatened him with court proceedings.\textsuperscript{55} The following February Sutton was fined £100, the maximum penalty under the Rabbit Nuisance Act, for not doing enough to destroy rabbits on Waitangi.\textsuperscript{56}

When it is considered that the usual fine for failing to comply with the Act was £10, and that I have seen few fines in excess of £20, Sutton’s penalty

\textsuperscript{53} Waitangi Station Diaries.
\textsuperscript{54} Waitangi Station Diaries, 10 January 1899.
\textsuperscript{55} Waitangi Station Diaries, 8 December 1900.
\textsuperscript{56} Waitangi Station Diaries, 5 February 1901.
seems extreme, particularly in the light of the work that had gone into rabbiting on the station in recent years. Does it indicate that rabbits were completely out of control on the station?

There are no statistics for the number of rabbits killed on Waitangi over time to help illustrate a pattern to the rabbit plague on the run. We do know that in the Mackenzie Country, to the immediate north of Waitangi, rabbits increased enormously through the early 1890s then numbers declined from the end of the decade. The table of man hours spent rabbiting on Waitangi shows an increase in the activity from 1891 and a marked increase between 1899 and 1905. However, we do not know if this was the result of an increase in rabbit numbers, the increased determination of Sutton to control the pests, a result of increased pressure by the rabbit inspectors, or a combination of these. We do know that in 1900 and 1901 Sutton was under a good deal of pressure from government agents to do more to destroy rabbits on Waitangi.

It may be that sheep numbers can provide a guide to rabbit numbers on Waitangi. CHART: 10.14 shows that sheep numbers dropped after 1895 with a marked decline between 1900 and 1905, the very period when the fight against rabbits was at its fiercest. Until the rabbit irruption sheep numbers on the property had been remarkably steady. Edmund Gibson took up Waitangi in 1857 as part of a larger station called Akatarawa. In 1870 Akatarawa was subdivided and from that time Gibson ran Waitangi as a separate property. The flock varied between 25,000 and 27,000 for the following sixteen years and when Sutton purchased Waitangi he took over 27,000 sheep. He began developing the flats and fencing the hill country soon after purchasing the station and in 1891 he leased a 2,500 acre block called the Buscot from his neighbour Robert Campbell, who held Te

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57 *AJHR, 15-38 1891,* "Prosecutions by Stock Department for neglecting to destroy rabbits." The highest fine was £15 including costs.
58 *Timaru Herald, 27 July 1910,* p.3.
60 Robertson, 17.
61 Robertson, 18.
Akatarawa. The Buscot is a sweet block of easy downs and flats that
carried over 2,500 sheep. As a result of these developments Sutton increased
sheep numbers until they peaked at 30,000 in 1893. After the bad snow of
1895 the flock at Waitangi fell below 25,000 for the first time since it had
been run as a separate station. Sheep numbers held at about 21,000 until
1900 when they dropped below 20,000, and the decline continued until 1904,
when they reached a low figure of 14,300. Thereafter sheep numbers lifted
and between 1906 and 1912 the station carried between 18,000 and 20,000
sheep. Moreover, in subsequent years, as long as rabbits were kept under
control, the sheep flock at Waitangi was maintained at about 20,000.

Several key points in the relationship between rabbits, sheep numbers
and vegetation depletion arise out of this brief outline of the rabbit plague on
Waitangi. Before the rabbit plague the stock loading on Waitangi was steady
at between 25,000 sheep and 27,000 for sixteen years. It is clear that the
period when sheep numbers declined on Waitangi, between 1895 and 1906,
were the very years that the battle against the rabbits was at its height.
Thirdly, after the explosion of rabbits in the 1890s and early 1900s the
carrying capacity of Waitangi was permanently reduced by about one fifth.
Moreover, Sutton had spent a huge amount of time and money in an effort to
control rabbits on his run. Yet despite his losses Waitangi was not
overwhelmed by rabbits as Earnscleugh had been. Runholders in Canterbury
were more fortunate than Sutton and Fraser and a comparison with Mt Peel
illustrates the benefit of its ecological and economic advantages.

**Mt Peel and the rabbit plague**

John Barton Acland expressed concern about the threat that rabbits
could present even before the irruption of the pest in Southland and
Marlborough in the 1870s. Rabbits had been released on an island in the
Rangitata, about fifteen miles down river from Mt Peel Station, in 1858 and

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62 Robertson, 25; 51.
64 Appendix One: CHART: 10.14.
65 Robertson, 57.
thrive there. Acland referred to the place as the ‘rabbit island’ and in June 1863, with his neighbour, Ben Moorhouse, and a visitor, he rode down to try to clean out some of the pests. After that rabbits were hardly mentioned in the diaries or correspondence of the station in the next twenty years. Indeed, other pests were considered much more of a problem, in particular pigs.

Mt Peel was regarded as a bad place for wild pigs and Acland paid a bounty to his staff for killing them. Pigs were seen as a nuisance because they were thought to kill and eat young lambs and for the damage they caused by rooting up good gazing land. In 1875 two of the hands brought in 182 pigs tails for which they were paid one shilling a tail. The following year the station paid a bounty for 407 pigs and 65 keas. Keas were reported to feed on the kidney fat of live sheep and often the sheep subsequently died from the wounds or from blood poisoning. The problem seemed to be particularly bad in certain districts: in the mountainous country at the head of lakes Wakatipu and Wanaka, where sheep losses were reported to be as high as twenty per cent, and the headwaters of the Rangitata. For many years the issue of keas as sheep killers was hotly debated, but there is no doubt that some keas do prey on sheep, especially in the winter months. Acland noted in a letter in June 1886 that ‘the keas are thinning the sheep on Burke’s Flat and Razorback. Sandie [Alexander McLeod, the Head Shepherd] is out late and early but cannot hear a sound, yet in the morning one or more [are] dead with a small hole, not to be found without looking for it, in the back’. Hares were also a problem at times because of the amount of feed they consumed, and in the late 1880s they were found in their thousands on the station.

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67 Acland Papers, Box 7, 2 June 1863.
68 Acland Papers, Box 59, F3, 3, 30, 39.
69 Acland Papers, Box 59, F 3, iv, 35, 38.
70 AJHR, 884, H-3, ii.
71 Acland Papers, Box 11, 30 June 1886.
72 Acland Papers, Box 11, 17 October 1886.
The first time Acland paid out a bounty for rabbits was in 1884 when eight were killed by John McLeod.\textsuperscript{73} The table below illustrates that rabbits presented only a minor problem for Mt Peel, at least into the early years of the 1890s. However, Acland remained wary of the threat that they posed. In May 1885 his son, Henry, killed a couple of rabbits in one of the gullies west of the station buildings. Acland wrote to his eldest son that he was sorry that rabbits were now on the run, but it was lucky that they had been found and that they would ‘now hunt the place well’.\textsuperscript{74} In the following months he had station hands out rabbiting when they were not required for other work.

<table>
<thead>
<tr>
<th>Year</th>
<th>Pigs</th>
<th>Keas</th>
<th>Hares</th>
<th>Rabbits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1875</td>
<td>182</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1883</td>
<td>407</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1889</td>
<td>124</td>
<td>40</td>
<td>1,025</td>
<td>87</td>
</tr>
<tr>
<td>1892</td>
<td>194</td>
<td>53</td>
<td>289</td>
<td>226</td>
</tr>
</tbody>
</table>

Many runholders in Canterbury expressed their concern about rabbits and the destruction the pests had caused in Marlborough, Southland and Otago. Charles Tripp, Acland’s former partner at Mt Peel, was more concerned than most. He has seen the damage done by rabbits for himself when on a holiday in Southland and became a vocal campaigner to stop rabbits spreading into Canterbury. Tripp was an inveterate letter writer and Acland, being a member of the Legislative Council and chairman of the 1886 Joint Committee on the Rabbit and Sheep Acts, as well as being a neighbour, often bore the brunt of Tripp’s disquiet. In March 1886 Acland wrote to his son saying ‘[w]e have been overflowing with Rabbit Inspectors ... whether Mr Tripp will be satisfied or not I cannot say, but the last man prophesies

\textsuperscript{73} Acland Papers, Box 59, F3, iv, 38.
\textsuperscript{74} Acland Papers, Box 11, 12 May 1885.
\textsuperscript{75} Acland Papers, Box 59, F3, 3, 35, 49; F3, 3, iv.
The following month in another letter Acland wrote '[w]e have had another Rabbit Inspector here [Sutton]... probably on account of Uncle Tripp’s letters'.

As a result of his visit Sutton, the Rabbit Inspector for the Ashburton district, issued a report in 1886 describing the spread of rabbits in the upper Rangitata and upper Orari country. He described rabbits as being numerous on Mount Harper, on the north bank of the Rangitata River, and plentiful on parts of Mesopotamia, whereas he found none on the Rangitata side of Mt Peel, although one was seen on the Orari side of the station. Sutton also found traces of rabbits on Tripp’s run.

In 1885 inspectors found a population of rabbits on high unclaimed Crown Land between Mesopotamia and Richmond Station. Government rabbiters were sent in to destroy them in the autumn of 1886 and managed to kill 1,400 before the men were driven out by winter snows. Acland was happy to see the job done, but expressed concern that the shooting might have spread the rabbits. It was at this time that Acland wrote to Michael Mitton with his complaint that he had ‘rabbits on the brain’. He was particularly concerned about the possible spread of rabbits from Mesopotamia and told Mitton: ‘you must have a man constantly ... keeping a rabbit boundary which is more important than a sheep boundary and if the man stops the first pair of rabbits getting onto Ben McLeod his year’s wages will be well spent’.

At this time station staff did the rabbiting on Mt Peel in their own time, although when work was slack a man or two was sent out to kill rabbits. However, a new manager, Oliver Scott Thomson, started 1 January 1894 and under his management rabbit destruction on the station became more organised. Whether this was because rabbits were increasing or because he

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76 Acland Papers, Box 11, 28 March 1886.  
77 Acland Papers, Box 11, 5 April 1886.  
78 Acland Papers, Box 11, p.296.  
79 Acland Papers, Box 11, 5 April 1886; 2 June 1886.  
80 Acland Papers, Box 11, 30 July 1886.
came from the Amuri district and had seen the damage that rabbits could do is hard to know. In March 1894 Scott Thomson employed two men as full time rabbiters when not employed as packmen for mustering and shearing. He paid them fifteen shillings a week plus found, three pence for rabbit skins, a penny for a pair of hares ears, two shillings and six pence for kea beaks, and four pence for pigs’ tails.  

Early in April 1894 Scott Thomson spent two days riding over the run checking for rabbits. He found signs of rabbits in places, but clearly there was no major problem. This was confirmed a day later when the two rabbiters came in with eleven rabbit skins after twenty-one days’ work. This sort of result became typical through the next few years and represents a low return for a high outlay. It also illustrates the determination of Acland and his manager to keep the pest under control in spite of the cost involved. Scott Thomson summed up their attitude in a letter saying ‘[w]here there are any rabbits at all there is always a certain amount of anxiety. At the far end of the run which we call Forest Creek has always been considered rather dangerous for rabbits as there is nothing to hinder them from coming from the McKenzie [sic] country, and being a rough block, should they once get a good hold would be hard to keep down’.  

In May 1895 the two rabbiters spent thirteen days at Forest Creek and got eighteen rabbits and two keas. In January they hunted the Coal Block for nine days and killed thirty-one rabbits. In October 1897 they spent fifteen days at Forest Creek killing seventy-five rabbits. The following year the two men spent six weeks on the worst rabbit country on the station and got only 110 rabbits. Scott Thomson commented that he did not think rabbits were on the increase and he meant ‘keeping at them to prevent them getting the upper hand’. 

81 Acland Papers, Box 51, 19 March 1894.  
82 Acland Papers, Box 51, 10 April 1894  
83 Acland Papers, Box 57, 28 May 1898.  
84 Acland Papers, Box 52, 11 May 1895.  
85 Acland Papers, Box 52, 24 January 1896.  
86 Acland Papers, Box 52, 14 October 1897.  
87 Acland Papers, Box 57, 1 August 1898.
In spite of Scott Thomson’s prediction the tallies of rabbits killed did increase over the years, yet compared to Earnscleugh and Waitangi the returns were insignificant. For example, in 1899 in 115 man days the rabbiters killed only 668 rabbits on Mt Peel. In April that year they tried poison grain as a control method on the station for the first time. Until then rabbit numbers had been so low that the traditional measures of trapping, dogging and shooting had been adequate to control the increase. However, despite the relatively low rabbit numbers the rabbit inspectors remained diligent in their administration of the Rabbit Nuisance Act and Mt Peel had annual inspections from as early as 1883, when rabbits were hardly seen on the station.

In May 1901 the Rabbit Inspector sent up two men to poison Stew Point, the Coal country and the Isolated Hills. The job took nearly seven weeks with the inspector expressing his satisfaction with the results. Scott Thomson seemed a little cynical about the need to do the job and when he inspected Stew Point a week before the poisoners finished he commented tersely that he saw two live rabbits and a few dead ones. This did not represent a great return for six weeks work. It did, however, fit the picture that rabbits were not the problem on Mt Peel that they were in southern districts. In September 1901 the two station rabbiters spent ten days out on the Orari country and killed 100 rabbits. The following month they were at Forest Creek for ten days and got only seventy. Sutton at Waitangi would have been delighted with such a result on his most rabbit prone block.

Yet in early 1902 the rabbit inspector again notified Scott Thomson that he had to clear rabbits off Stew Point. Scott Thomson replied that he had a rabbiter on full time who had been working on the block in recent months. He sent the man out again to do the block and in a week he got thirty-seven rabbits, most of which were younger ones that he had dug out of burrows. Several months later Mt Peel again came into the sights of the Rabbit

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88 Acland Papers, Box 52, F1.5.
87 Acland Papers, Box 53, 7 May – 22 June 1901.
90 Acland Papers, Box 53, 15 June 1901.
91 Acland Papers, Box 57, March 1902.
Inspector and seven men were sent out to poison the back country, then to work their way down Forest Creek and on to the Rangitata country. This was a poisoning programme on a larger scale than anything employed before on Mt Peel and Scott Thomson complained to the inspector that ‘there are less rabbits on our country than the last few years ... it is rather hard that I should be going to considerable expense to keep the rabbits down and all the time they are coming up the Rangitata river bed’.

In April 1905 Mt Peel again encountered trouble with the Rabbit Inspector who threatened Scott Thomson with court action over his non-compliance with the Rabbit Nuisance Act. Scott Thomson wrote to Henry Acland about his intention to send out six men with a packer to poison the Big and Little Forks, and then after mustering they would do Forest Creek and Ben McLeod, saying, ‘[t]his ought to give them a good clean out, and with Cordy [the station rabbiter] and another man I have got keeping at them immediately after we ought to get them down. I dare say however we will have to go in for a spring poison as well. Of course it will cost money, but it will have to be done’.

This pattern of large scale poison programmes using outside labour, followed up by one or two station rabbiters who trapped, dug out, shot and spot poisoned rabbits became the system that Mt Peel adopted to control rabbits. The wages book for the station from 1907 to 1913 shows gangs of between five and fifteen men employed for up to ten weeks laying pollard on the property. Whether it was because of these control measures, or because much of Mt Peel did not provide a suitable habitat for rabbits, or because the peak of the rabbit plague had passed, rabbits never overwhelmed the station in the period up to 1912. This is reflected in the stock loading. It will be demonstrated in Chapter Six that although sheep numbers did fall after 1895, it was not due to the impact of rabbits. The factors responsible for the decline included the loss one of the leasehold blocks, the precarious financial

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92 Acland Papers, Box 57, 2 June 1902.
93 Acland Papers, Box 57, 1 April 1905.
94 Acland Papers, Box 59, 37-216.
95 Chapter 6, CHART: 6.1, Mt Peel sheep numbers, p.226.
position of John Barton Acland which forced Scott Thomson to sell capital stock, and the deliberate decision taken by the manager to under-stock the property. Accordingly, the vegetation on Mt Peel up to the time of subdivision in 1912 never suffered the intense and sustained attack by rabbits that occurred in the Mackenzie Country, North and Central Otago, and Southland.

These case studies demonstrate that different dynamics were involved in different areas of the South Island during the first rabbit plague. Rabbits overran Wallace County, Moa Flat, Earnscleugh, and Waitangi, but not Mt Peel. The stations in Wallace County dropped in sheep numbers after the onset of the rabbit plague but recovered after rabbit numbers fell. By the end of the century the stocking loads of some runs surpassed pre-plague levels. On Moa Flat sheep numbers did not fall until rabbits overwhelmed the property. Although they did not recover to pre-rabbit levels once rabbits were controlled, there seems little question that productivity of the sheep improved on the station which remained highly regarded. At Earnscleugh, Fraser tried to hold sheep numbers after rabbits invaded the run but the productivity of the sheep declined. The resulting devastation proved so severe that, after a period when the station was totally de-stocked, the carrying capacity could not be maintained at fifty per cent of the pre-rabbit level. Sheep numbers on Waitangi remained at a relatively consistent level for sixteen years before rabbits invaded the station. The impact of that invasion reduced the long term carrying capacity of the station by about one fifth. Rabbits did not overwhelm Mt Peel and, although sheep numbers declined after 1895, sheep productivity continued to improve. These case studies do not provide enough evidence to draw a definite conclusion, but the data begs the question: was the depletion of the rangeland in the pastoral era due to the rabbit plague, rather than the management practices of the pastoralists? Another issue raised here is that rabbit numbers seemed to reach a peak then decline on the runs in Wallace County, Moa Flat and even Earnscleugh regardless of the efficiency of control measures. This important issue is dealt with in the following section.
The passing of the plague

A significant feature of the first rabbit irruption was that, after devastating parts of the Amuri district, and large areas of Marlborough, Otago and Southland, it petered out as it approached Canterbury. The plague barely affected the region between the Waipara and Rangitata Rivers, and most of South Canterbury east of the Mackenzie Country and the Hakataramea Valley. Gibb and Williams claimed that rabbits reached peak numbers around 1890.\(^96\) They provided no reference for this, so I assume that they have made this assumption from the data of skins exported, which peaked in 1893. I would argue that 1895 was probably the turning point for the first rabbit plague, when numbers really began to decline. Thereafter the momentum of the spread slowed and at the same time rabbits withdrew from some of the country that they had colonised in Southland and Otago, but remained in considerable numbers on more favourable areas. This phenomenon raises questions about the dynamics of the plague itself: how can we account for the sudden irruption in rabbit numbers and then the surprisingly rapid passing of the plague?\(^9\)

There are no concrete answers to that question; however, using the knowledge that we have about the behaviour of rabbits in their natural habitat we can speculate on some of the reasons for the passing of the plague. Bull has hypothesized that the plague continued until it encountered ‘environmental resistance’, which included factors such as food shortages, lack of suitable shelter, disease and the effects of crowding.\(^97\) Rogers, Arthur and Soriguer have posited that terrain, climate and predation provided constraints on the reproduction of rabbits.\(^98\) By applying both theories to the rabbit population in the South Island rangelands in the 1890s we can make a case that explains the decrease in rabbit numbers.

\(^96\) Gibb and Williams, in Thompson and King, 162.
\(^98\) Rogers et al, in Thompson and King, 56.
By the mid-1890s the preferred habitats had already been populated, forcing younger rabbits into high rainfall zones like the Wills and Haast valleys where they were less likely to survive bad seasons. Even in Canterbury the heavier and wetter foothill country east of the Mackenzie was a much less favoured region than the dry inland hills and plains. Yet the absence of ideal terrain, on its own, cannot explain the decline in the momentum of the invasion. After all, in the 1870s and 1880s the rabbit horde had been able to alter the vegetation of the rangelands as it spread. However, other factors came into play at this time.

Climate worked against the continued expansion in the mid-1890s. The *Otago Witness* commented on the ‘marked diminution’ of rabbits throughout Otago in 1894 and attributed it to excessive rainfall the previous spring and early summer which had caused high mortality in young rabbits.\(^9\) The big snow of 1895 followed, destroying hundreds of thousands of rabbits in most of the areas where their numbers were highest. The Mackenzie Country was particularly hard hit, but Central Otago and the Canterbury foothills were also badly affected. This event would have resulted in a significant change in the dynamics of the spread of rabbits, as it brought into play the effect of predation. When the population was ever increasing predators could have a limited impact on rabbits as they could not breed as fast as their prey. However, once the 1895 snow reduced rabbit numbers, predators, and here we can include landowners and their rabbiters, could have a considerable impact on controlling rabbit numbers until the population built up to a level where it went beyond the constraint that predators could impose.

Disease was another factor that came into play. When the rabbit population was increasing and expanding into virgin country disease was unlikely to have been a problem for the pests. However, once rabbits began to live in densely populated settled groups disease became an important factor in the dynamics of reproduction and survival. A range of diseases and parasites came to New Zealand with their rabbit hosts, and coccidiosis and

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bladder-worm killed rabbits in the Wairarapa as early as the 1880s.\textsuperscript{100} Coccidiosis causes heavy mortality in young rabbits where the rabbit population is high. Bull has postulated that soon after rabbit numbers reached their peak parasitic infection suddenly increased and remained at a high level for a year or so, before slowly declining.\textsuperscript{101}

Once rabbits were forced to live within the constraints of a local environment different population dynamics worked in different regions. The effect of climate on nutrition, survival of the young, and survival of predators and diseases, as well as the suitability of soils for burrowing, or the availability of scrub and rocks for protection all shaped whether a particular district provided a suitable habitat in which rabbits could thrive or not. For example, Earnscleugh and Waitangi proved much more favourable habitats for rabbits than Wallace County, Moa Flat and Mt Peel Station.

An entirely different phenomenon, probably closely associated with an environmental cause, might account for not only the petering out of the rabbit plague, but also for the irruption itself. Both Bull and Wodzicki commented on the phenomenon where marked cyclical fluctuations in numbers occur over time in established rabbit populations.\textsuperscript{102} Professor Robert Wallace of Edinburgh University made the same observation after witnessing the rabbit plagues in Australia and New Zealand when he visited both countries in 1890. He later wrote:

There are times and seasons when animals, from some unknown cause, increase in extraordinary and exceptional numbers even in their own natural and original habitats and are subsequently reduced to their normal numbers in quite as mysterious a manner.\textsuperscript{103}

\textsuperscript{100} Gibb and Williams, in Thompson and King, 175, 176; \textit{AJHR}, 1888, H-18, pp.1-7. \\
\textsuperscript{101} Bull, 54. \\
\textsuperscript{102} Bull, 54; Wodzicki, 139. \\
\textsuperscript{103} Robert Wallace, \textit{The Rural Economy and Agriculture of Australia and New Zealand} (London: Sampson Low, Marston and Company, 1891), 313.
Wallace noted the examples of a plague of voles in the south of Scotland over a couple of years in the 1870s and a plague of rats in parts of England and Scotland in 1890. In both cases these plagues appeared suddenly and for no apparent reason, and passed almost as quickly. In the case of rabbits he commented that ‘[r]abbits tend to spread to new fields, and also to linger in certain parts where the surroundings are specially congenial to them’.\textsuperscript{104} Ecologist Charles Elton has explored similar cyclical patterns among lemmings in Europe and Canada and argued that the reasons for it are complex and unclear, although he was certain that climatic fluctuations played a controlling part.\textsuperscript{105}

Wodzicki found that in rabbit populations in New Zealand there has been a periodicity of just over eleven years between peak years.\textsuperscript{106} However, it appears that there could be a longer periodicity at work as well. The years of the first rabbit plague varied between regions, but it was at its worst in the 1880s, the next main irruption was in the 1920s, a third peak took place in the late 1940s and early 1950s, and the most recent explosion in rabbit numbers occurred in the late 1980s and 1990s. That outbreak was stopped by the illegal release of the rabbit calcivirus disease in 1997. Controlling the spread of rabbits during the first irruption proved more problematic. When the plague was at its peak it appears that none of the tools that landowners or government agents had available to them stopped the build up in numbers and the spread, until the plague began to lose its momentum.

Thus there were distinct phases after rabbits became established and these involved different dynamic patterns. The initial explosion in rabbit numbers and the rapid expansion in territory took place in different parts of the rangelands between the early 1870s and 1895. Following the peak of the plague rabbits withdrew from less favoured habitats and they congregated in the greatest numbers in their favoured semi-arid regions. Superimposed on that was a pattern of periodicity where rabbit populations passed through

\textsuperscript{104} Wallace, 321.
\textsuperscript{106} Wodzicki, 139.
cycles of increase and decrease. In less ideal rabbit habitats, where the existing rabbit populations remained at a low level, these periods of increase created a nuisance for landowners. In the semi-arid regions rabbit numbers remained high and the periods of increase lifted the population to extreme levels resulting in the on-going destruction of the vegetation.

**Rabbits and the decline in the stock loading**

By the middle of the 1890s newspapers began to comment on the barrenness of parts of Central Otago. The columnist ‘Drover’ blamed the rabbits alone for the destruction of the vegetation saying that ‘they have ... made some fine run country little better than a desert’. In 1894 ‘Agricola’ commented that the natural vegetation of the grazing lands of inland Otago had disappeared. He was one of the first writers to associate tussock burning, sheep grazing and rabbits as being instrumental in that process, and wrote that fire and the close-cropping by sheep ‘killed out the wild grasses, and what the sheep left the rabbits finished off’. His solution was the restoration of the land through cultivation and subdivision of the big stations so that the new generation of runholders would become sheep farmers. A similar solution was suggested by ‘Kea’ who remarked in 1895 that hundreds of thousands of acres in Central Otago and the Waitaki had become ‘a barren waste from the ravages of the rabbits, indiscriminate burning, and the dryness of the climate’. The answer he said was the cultivation of the land and to change the land laws to give security of tenure. Donald Petrie, a contemporary observer of the rabbit plague, thought that although there had been a slow process of degeneration of the vegetation in places in Vincent County before the rabbit irruption, it was exacerbated by the increase in their numbers. He commented that ‘[b]efore the rabbit-invasion began these hill-slopes [of Central Otago] carried a fairly rich and varied covering of tussock and other grasses, and, except on the steeper rock sun-baked faces, had not

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107 Otago Witness, 27 August 1896, p.5.
109 Otago Witness, 8 August 1895, p.16.
been seriously depleted even in the early nineties". However, he did note that after the arrival of rabbits the inevitable overstocking that followed, with rabbits and sheep, led to ‘the extermination of the grasses’.

There are several points that arise from these observations. Petrie, ‘Drover’, ‘Agricola’ and ‘Kea’ described the problem of the denudation of the sunny faces in the dry zones of Central Otago and the Waitaki. None of the contemporary observers commented that the same problem was found in other regions that had suffered from the rabbit plague. In the dry regions the continuous presence of high rabbit numbers, along with sheep, prevented the recovery of the vegetation. Outside the dry zones, once rabbits came under some semblance of control, the vegetation recovered, although not necessarily to its pre-rabbit condition. This contrast is supported by the stock loading data from Castle Rock and Five Rivers, stations outside the semi-arid zone. On Mt Peel rabbits had no impact on sheep numbers or their productivity at all.

The issue of the decline in the stock loading in association with the rabbit plague is complex. The decline in Vincent County, which takes in Earnscleugh and some of the most rabbit prone land in the South Island, coincided with the outbreak of the rabbit irruption. In fact, the decline in sheep numbers in all the districts that were overwhelmed by rabbits began with the arrival of the pest. Moreover, the stock loading on many stations in Canterbury, which were not affected by rabbits before 1912, did not decline at all. As Petrie observed, it was the combined grazing pressure of sheep and rabbits that took its toll on the tussock grasslands of Central Otago. The tussock grasslands in the region had undoubtedly undergone significant modification in the period before the rabbit plague, but there is no evidence that demonstrates that they were in ‘poor condition’, as has been claimed by Zotov and others.

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O'Connor has made the point that 'the pastoral industry was reluctant to adjust livestock numbers to the existing rabbit plague'. In many cases rabbits arrived so suddenly and in such numbers that properties were simply overwhelmed. However, many runholders did reduce sheep numbers as the vegetation became depleted. Examples from Castle Rock, Okaitarua Station, and Avondale from the previous chapter show that numbers fell soon after the appearance of the rabbit swarm. William Fraser, at Earnscleugh, is an example of a pastoralist who did try to hold numbers after the arrival of the rabbit plague. The 1880s and early 1890s were difficult economic times for pastoralists and farmers, and, for someone like Fraser, who faced the high cost of killing rabbits, falling productivity because of the rabbit infestation and declining wool prices, the issue was not just about the land, but also about economic survival. In the end the rabbits beat him.

Conclusion

The last two chapters have illustrated the profound impact that the rabbit plague had on some parts of the rangelands of the South Island after the early 1870s. The Government, their agencies and landowners fought a long battle to overcome the pest and by the turn of the twentieth century the great spread of rabbits had lost momentum. The cost to individual runholders had been high. Rabbits arrived at a time of declining profitability for pastoralists and killing rabbits cost money. The downturn in wool prices, the reduction in the carrying capacity of the land, the decline in the productivity per sheep, and the direct costs of rabbit destruction forced some off their runs. For others the struggle to survive meant they had no capital left to invest in improvements. In the semi-arid regions the battle developed into a long term siege that continues to the present. Rabbits, by their nature, are fitted to thrive in this region with its unpredictable climate and seasons of poverty and plenty. The devastation of the landscape in this region is unlikely to recover for many generations.

The cause of the plague has been attributed to the indiscriminate burning and overstocking supposedly practiced by pastoralists. Bold claims, based on scanty evidence, assert that those practices depleted the vegetation and that allowed the rabbits to invade the tussock grasslands. Yet there is no evidence to sustain Zotov’s theory that rabbits needed pre-existing bare ground in order to colonise new country. There is plenty of evidence, however, that rabbits moved readily into tussock country. Contradicting Zotov’s claim, Bull has proposed that a large rabbit population could modify the surrounding country and make a suitable habitat for themselves.\textsuperscript{113} Evidence from Australia supports this assertion. Rabbits introduced onto islands off the Australian coast have completely destroyed or transformed the vegetative cover, without the aid of burning or sheep.\textsuperscript{114} The spread of rabbits into the Wills and Haast valleys which had never been burned or grazed by sheep adds weight to Bull’s argument. After rabbit numbers had reached a critical level, they were able to invade tussock country without any difficulty, particularly during periods of drought. Burning and grazing did not need to bare off the country as Zotov and the Hughes Commission claimed. I contend that, considering the innate capacity of rabbit populations to take advantage of the abundant feed, the cycles of dry seasons, and the predator free environment, the sheep ranching methods of the pastoralists had little to do with the explosion in rabbit numbers that began in the 1870s. It also appears possible that all the effort and expense that went into controlling rabbits may have done little more than slow the momentum of the first rabbit irruption, which eventually petered out due to natural, but as yet unexplained causes.

\textsuperscript{113} Bull, 56.
\textsuperscript{114} Myers, et al, in Thompson and King, 143.
MAP: 5.1. Rabbit Problem Areas, 1980's.

TASMAN SEA

Upper Waitaki

Mackenzie Country

Alexandra, Clyde, Cromwell

Kaikoura

SOUTH PACIFIC OCEAN

△ - Intractable

△ - Severe

John Bamford Associates
CHAPTER SIX
OVERSTOCKING, OVERGRAZING, SHEEP NUMBERS AND STOCK LOADING

The transformation of the rangelands during the pastoral era has usually been accounted for by three causal factors: indiscriminate burning of the vegetation, overstocking with sheep, and the rabbit plague. Chapter Three demonstrated that criticism of the burning practices of the early pastoralists has been based on anecdotal evidence rather than an analysis of actual practice. The evidence from the station diaries examined for this thesis shows that pastoralists used fire as a management tool with discrimination. The two previous chapters surveyed the impact of rabbits on parts of the rangelands and argued that rabbits were pre-adapted to the semi-arid environment of Central Otago and the Mackenzie Country. Once established the rabbit plague became almost inevitable, regardless of the management practices of pastoralists. This chapter deals with the issue of overstocking, how it has been assessed in the past, and its outcomes.

The effective balancing of stock numbers to the stock feeding potential of the vegetation is a skill learned by observation and experience. The number of stock that any given block of land can feed (or carry) is governed by a range of variables that can change from season to season and from one year to the next. Across the South Island rangelands, be it the mild strip along the Marlborough coast or the hardest high country run, spring is the season when there is normally the greatest abundance of feed. If in spring a pastoralist stocked to a level to match this abundance his country would be overstocked for the rest of the year. At other times of the year the feed might not grow at all. In the high country, for example, feed might not grow for six months of the year. Between mid-May and Mid-September low ground temperatures restrict grass growth, while in mid-summer high evaporation/transpiration rates can limit growth, particularly on the lower sunny country.
Agricultural scientist McMeekan observed that grazing management is a compromise between the immediate interests of the sward and those of the livestock ‘for the productive survival of both’. Thus the art of stock feeding is to balance stock requirements with the known annual feed growth pattern while not overtaxing the vegetation. This can be achieved in a combination of ways: by saving the surplus spring feed as hay or silage, which can be fed out when there is no other feed; or by using different parts of a run at different times of the year, thereby building up and saving a feed bank. For example, stock can be taken off lower sunny country in summer and autumn, and that feed saved for the winter, by removing them to higher altitude and shady areas, which grow feed through the summer, but are too cold in winter. A good stockman is able to match feed with the changing demand of livestock through the season. A ewe feeding a lamb requires a much higher level of nutrition than she needs after the lamb has been weaned, whereas a wether only grows wool, so it can be fed at a lower level. A hogget needs to be fed well while it is growing in order to achieve its potential as a productive adult.

This is all self-evident and straightforward stock and land management. Management becomes complicated when the seasons do not follow the normal pattern and throughout the South Island rangelands that can be a common occurrence. Drought is a regular visitor to the whole region and in certain areas - in particular coastal Marlborough, North Otago, the Mackenzie Country and Central Otago - summer drought is often a normal part of the seasonal cycle. Not infrequently droughts can become severe and protracted. There is a truism that says rain makes the grass grow; in a prolonged drought nothing grows. It is not uncommon to go from a good spring when a run is understocked to a drouthy summer where the same run can become overstocked in a matter of weeks, without any increase in stock numbers. A farmer’s management needs to be flexible enough to react quickly in order manage this change in the stock loading; he can maintain

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stock numbers and feed out saved surpluses, such as hay, silage or grain, or he can reduce the stock loading by selling off stock, or he can find off-farm grazing for them, or he can combine the three options. If the farmer does not do enough to lighten the stock load the property will become progressively overstocked.

Overstocking, then, is a management decision; overgrazing is the outcome of that decision. Factors other than climate can also influence whether or not a property becomes overstocked. Competition from pests can reduce the amount of feed available for stock. Rabbits, hares and some insect pests compete with sheep for feed and that can result in lifting the stock loading to unsustainable levels. In the pastoral era the first rabbit plague that ravaged different parts of the rangelands between the early 1870s and the late 1890s lifted the stock loading to many times the level that the country could carry, which resulted in severe overgrazing and the long term depletion of the vegetation, particularly in dry zones.

Another factor that can influence overstocking is the economic strength of the farmer. O'Connor concluded that, at times, pastoralists have tried to counteract the effect of falling product prices by increasing their stock numbers.² He found that, counter to the overall trend showing a decline in stock numbers, between 1921 and 1935 stocking loads on native grassland went up in years that followed falls in the Pastoral Product Price Index. Quite simply, farmers hold stock when sale prices are low, thereby putting more pressure on their stock and land than they otherwise would.

A significant influence on overstocking is lack of skill or the poor reading of the situation by the manager of a property, or the unrealistic assessment of the stock carrying capacity of a particular property. These points have particular implications for the early years of the pastoral era when many of the pastoralists lacked practical experience in large-scale

sheep ranching and when they were learning to read their new environment. The orthodox analysis has postulated that, faced with an apparent abundance of pasturage, the early pastoralists over-estimated the carrying capacity of the country and failed to adjust their stock numbers as the pasturage declined. Overstocking resulted in overgrazing which led to the depletion of the vegetation and finally the degradation of the land.

**The eruptive model of pastoralism**

Changes in animal numbers have often been used as a means for assessing vegetation depletion in rangeland environments. Melville, in her prize winning book *A Plague of Sheep*, used the ecological model of ungulate irruptive oscillation to analyse the impact of pastoralism on the New World ecosystems of Mexico and New South Wales. The model had been developed to explain the population pattern that occurs when herbivorous mammals are introduced into a new habitat. The abundance of feed in the new environment encourages the animals to breed prolifically and their numbers increase exponentially until they overshoot the capacity of the plant communities to sustain them; their population crashes; they then reach an accommodation with the reduced subsistence base at a lower level. The impact of such an irruption changes the plant communities beyond recognition: there is a reduction in the height and density of the vegetation and a simplification of species diversity, with the most palatable plants disappearing from the mix and being replaced by less favoured species. Melville has applied the model to the introduction of domesticated ungulates, in this case sheep.

O’Connor used a similar model to evaluate the impact of sheep grazing on the vegetation cover in the South Island rangelands. He centred his analysis on Lake and Vincent counties in Central Otago. O’Connor found that the eruptive phase of the pastoral expansion took place within the first

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4 Melville, 7.
twenty years of the country being stocked; and this peak ‘was almost entirely
gained by chewing into the native pasturage’. After reaching a peak there
was a short phase where numbers remained at a high level before they began
a long steady decline. In Vincent and Lake counties O’Connor found a
decline of sixty per cent in the stock carrying capacity of native grasslands in
the years between 1881 and 1905. According to O’Connor, the decline in
sheep numbers, after the period of their rapid expansion, indicated that
overstocking had occurred and had resulted in rangeland deterioration.

O’Connor’s study has not been replicated elsewhere in the South
Island so it provides a useful insight into stock loading pattern on
unimproved tussock grasslands. However, there is a problem with the
methodology that relates to his use of stock units: sheep have been accounted
for as one stock unit and cattle and horses as four. Counting all sheep as a
stock unit over this period, regardless of their sex, age, or productivity, is, in
effect, dealing with them as sheep numbers. This is a problem that I now
intend to deal with at some length.

The irruptive oscillation model applied by Melville and O’Connor
comprises two distinct parts: firstly, that stock numbers on their own can be
used as a tool to measure the carrying capacity of the land; and secondly, that
a decline in sheep numbers was indicative of depletion of the vegetation
cover. There are problems with both of these propositions.

Sheep numbers and stock loading

The reliance on using sheep numbers alone as a tool for appraising the
carrying capacity of land has inherent weaknesses. Some farmers have found
that by reducing sheep numbers they have actually increased the amount of
meat and wool that they have produced off their land. Changing to more
productive breeds, or increasing the size of sheep, or changing the structure

5 O’Connor, “The Use of Mountains,” 208.
6 O’Connor, “The Use of Mountains,” 209.
7 O’Connor, “The Use of Mountains,” 208.
8 Waitangi Station, John Sutton personal comment, 1 November 2005.
of the flock can change the stock loading on the land. This cannot be measured by using sheep numbers alone as an assessment tool. Farmers, agricultural scientists and others have long recognized this limitation and use a stock loading analysis to assess how much feed a particular flock may require. It is obvious that different classes of sheep utilize different amounts of feed and this can change through the year. For example a young sheep might eat less than an adult; a ewe that is feeding a lamb requires more and better quality feed than a wether that is kept just for its wool. There have been several models used to elucidate different values for different classes of stock; the one used here was proposed by Coop, an agricultural scientist. This method of assessing the stock load is based on a ewe with a liveweight of 55 kg (120 pounds) that rears one lamb through to weaning. This is known as a ewe equivalent or one stock unit. The following table compares different classes of stock against a ewe equivalent, which gives us a much better picture of feeding requirements than a simple tally of overall numbers.

### TABLE: 6.1. I.E. Coop – Table of ewe equivalents

<table>
<thead>
<tr>
<th>Class of stock</th>
<th>Live weight in lbs</th>
<th>Ewe Equivalents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewe (Merino)</td>
<td>80</td>
<td>0.8</td>
</tr>
<tr>
<td>Ewe</td>
<td>100</td>
<td>0.9</td>
</tr>
<tr>
<td>Ewe (Standard)</td>
<td>120</td>
<td>1.0</td>
</tr>
<tr>
<td>Ewe</td>
<td>140</td>
<td>1.1</td>
</tr>
<tr>
<td>Wether</td>
<td>80-90</td>
<td>0.6</td>
</tr>
<tr>
<td>Hogget</td>
<td>50-90</td>
<td>0.7</td>
</tr>
<tr>
<td>Ram</td>
<td>160</td>
<td>0.8</td>
</tr>
<tr>
<td>Beef Cow</td>
<td>1000</td>
<td>6.0</td>
</tr>
</tbody>
</table>

The table below shows three possible stocking options all running 3,000 sheep, yet the stock loading, measured in Coop's stock units, ranges from 1800 to 2,700. The first column represents a small run on good country, perhaps on the upper plains or downlands, which comfortably winters ewes and replacement hoggets. The second column might be a harder hill farm with less wintering country, so it runs fewer ewes and has a wether flock that winters on the less safe parts of the run. The third column represents a cold

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back country run which can only safely winter wethers and has to buy in its replacement stock. This illustrates that the use of sheep numbers, as a means of assessing the stock loading of any given property, is far too simplistic a measure.

**TABLE: 6.2. Example of 3 stocking loads using ewe equivalents for different classes of stock**

<table>
<thead>
<tr>
<th></th>
<th>3,000 sheep</th>
<th>3,000 sheep</th>
<th>3,000 sheep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewes = 1 su</td>
<td>2000 = 2000 su</td>
<td>1000 = 1000 su</td>
<td>nil</td>
</tr>
<tr>
<td>Wethers = .6 su</td>
<td>nil</td>
<td>1000 = 600 su</td>
<td>3000 = 1800 su</td>
</tr>
<tr>
<td>Hoggets = .7 su</td>
<td>1000 = 700 su</td>
<td>1000 = 700 su</td>
<td>nil</td>
</tr>
<tr>
<td></td>
<td>2700 stock units</td>
<td>2300 stock units</td>
<td>1800 stock units</td>
</tr>
</tbody>
</table>

This example illustrates how stock numbers and stock loading can vary on different properties according to their natural resources. There are also factors that affect the stock loading on a single run over time. Changing values for different types of wool influenced runholders to change away from light-framed Merinos to heavier cross-bred sheep. The development of refrigeration encouraged runholders to breed sheep for meat rather than for the fine wool market where prices were in decline. This led to a shift to increasing breeding ewes and a reduction in wether numbers. Climatic factors also influenced pastoralists to change the stock loading on their runs. In the high country a series of snowy winters, which led to high and costly sheep losses, encouraged some to stock their runs more conservatively, while a run of dry seasons led to a similar re-evaluation of the sheep loading in other areas.

Data from Mt Peel Station demonstrates that sheep numbers alone do not reflect the stock loading over time. In the years between 1857, when the station was first stocked, and 1912, sheep numbers changed considerably; so did the size of the sheep, their breed, and the structure of the flock. This section demonstrates that a sheep in 1912 was quite a different animal, in productive terms, to a sheep in 1857.
Sheep numbers and stock loading on Mt Peel, 1856 to 1912

According to the theory of irruptive oscillation, after the introduction of herbivorous mammals into a new habitat, the rise and decline of sheep numbers on Mt Peel should follow a pattern with a rapid increase in numbers for the first twenty years after the run was initially stocked, a short plateau phase, then a gradual decline as the sheep population reduced the height and density of the vegetation and the species diversity.

The chart below shows the actual sheep numbers on Mt Peel (in blue) between 1857 and 1911 with the five-year moving average (in pink). At best there is only a tenuous similarity with the eruptive model. There is a steep early rise in sheep numbers, but the plateau is extended and the drop off is apparent but not steep or prolonged.

CHART: 6.1. Sheep numbers on Mt Peel and 5-year moving average of sheep numbers

Numbers increased rapidly in the 1860s and early 1870s. In 1873/4 the flock reached 40,000, two years later in 1875/6, twenty years after sheep were first brought onto the run, the flock passed 44,000. In a twenty-two year period between 1873 and 1895 Mt Peel shored on average 43,205 sheep annually, with numbers peaking at 46,291 in 1886/7, thirty years after the

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10 MB44, Acland Family Papers, Boxes 50, 52, 57, 63, 65, 72, Macmillan Brown Library, University of Canterbury, Christchurch, New Zealand. See p.226 for full sized chart. Note that I have taken sheep numbers from the annual shearing tallies. These do not always match the sheep return numbers which were collected in March or April, when there were still trading stock being held, and before winter when there was often high losses.
station was first stocked. The big snow of 1895 ended the high plateau of sheep numbers on Mt Peel when losses accounted for 18,200 sheep, or thirty-five per cent of the flock and numbers never recovered to the highest levels of the 1880s and early 1890s.

So how does this pattern fit with the eruptive model? Using only sheep numbers as a measure it could be argued that, because Mt Peel was a particularly good property, the plateau phase lasted longer than on less favourable runs, but that the outcome was the same and in the end the fertility of the soil declined, the vegetation became depleted and the sheep numbers dropped. However, measures of production other than sheep numbers reveal that the output of the station continued to increase throughout the period under review. Moreover, the fall in sheep numbers on Mt Peel after 1895 can be accounted for without recourse to the argument that it was driven by overstocking and subsequent deterioration of the vegetation.

**Measures of productivity on Mt Peel**

CHART: 6.2. Wool Weight as a measure of productivity. Actual weights per sheep (in blue) and 5-year moving average

The chart above shows that from 1858 to 1899 the weight of wool shorn per sheep steadily increased. In 1858 the average wool cut per sheep was a low figure of 2.3 pounds, probably because of the high number of young stock that had been purchased to establish the flock. By the 1860/1

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11 Acland Papers, Boxes 50, 52, 57, 63, 65, 72. See p. 227 for full sized chart.
shearing wool weight increased to 3 pounds per head, by 1873/4 it reached 5
pounds per head, and in 1885/6 wool cut per sheep passed 6 pounds. In 1891
it reached a peak of 7.35 pounds, although 1897/8 was not far behind this
with 7.33 pounds per sheep. So we have through this period a rising level of
wool production per sheep. This is not indicative of a station on the verge of
environmental collapse.

CHART: 6.3. Wool Production. Actual wool weights (in blue) and 5-year
moving average\textsuperscript{12}

The sum of wool cut per head and sheep numbers gives us the overall wool
production from Mt Peel from 1870 to 1898. Although there were variations
between years, which were almost certainly due to the effect of climate,
overall wool production steadily increased on Mt Peel from 1870 to 1898.
The dip at the end of the period was due to the impact of the 1895 snow,
when the station lost 18,200 sheep and the sheep that survived were in poor
condition. However, indications are that overall wool production on the
station soon recovered from this disaster.

Another statistic showing a steady increase in productivity at Mt Peel is the
number of lambs marked on the station in the years from 1862 to 1911. As
we know, a ewe that raises a lamb requires a lot more feed than a wether or a
ewe that is dry. The numbers of lambs marked steadily increased throughout
the period, apart from the dip caused by the 1895 snow. The increase in the

\textsuperscript{12} Acland Papers, Boxes 50, 52, 57, 63, 65, 72. See p. 238 for full sized chart.
number of lambs from the end of the 1880s indicates Mt Peel’s response to the establishment of the frozen meat trade, when the station set out to produce lambs for the burgeoning store sheep market.

CHART: 6.4. Lambs marked. Actual numbers and 5-year moving average\textsuperscript{13}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{mt_peel_lambs_marked.png}
\caption{MT PEEL LAMBS MARKED}
\end{figure}

All of these measures: wool weight per sheep, overall wool production of the station, and the number of lambs marked are evidence of increasing productivity on Mt Peel. They do not indicate that over fifty years of grazing sheep on the property had led to the depletion of the vegetation, as predicted by the irruptive oscillation model.

**Flock structure on Mt Peel**

The change in the flock structure over time on Mt Peel also changed the stock loading on the station. We have already seen that sheep numbers is a poor measure of the stock loading of a property and the following two charts emphasize this point.

CHART: 6.5. Actual ewe numbers and 5-year moving average\textsuperscript{14}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{mt_peel_ewe_numbers.png}
\caption{MT PEEL EWE NUMBERS}
\end{figure}

\textsuperscript{13} Acland Papers, Boxes 50, 52, 57, 63, 65, 72. See p.229 for full sized chart.
\textsuperscript{14} Acland Papers, Boxes 50, 52, 57, 63, 65, 72. See p.230 for full sized chart.
The change in the balance between ewes and wethers represented a response to several factors, but most significantly to the changing requirements of the marketplace. In the early years the station needed a high proportion of ewes to build up the flock. Once the station was fully stocked it became necessary to keep only enough ewes to maintain existing numbers. From the late 1860s until the development of the frozen meat trade in 1882 there was almost no demand for surplus stock, so it made no sense to breed more sheep than you needed. Wool provided the only income through this time, and since wethers grow more wool than ewes, given the same level of feeding, the station built up its wether flock and reduced its ewe flock. Thus ewes made up fifty percent of the flock in 1874, whereas by 1879 over fifty-one percent of the flock were wethers while the percentage of ewes had dropped to thirty. This policy changed after the establishment of the frozen meat trade. The charts show a rapid decrease in the number of wethers kept and an increase in the number of ewes retained, so that by 1906 the Mt Peel flock consisted of fifty-two percent ewes, and only twenty-one percent wethers.

TABLE: 6.3. Change in balance of ewes and wethers at Mt Peel

<table>
<thead>
<tr>
<th>YEAR</th>
<th>% of EWES</th>
<th>% of WETHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1875</td>
<td>50</td>
<td>28</td>
</tr>
<tr>
<td>1879</td>
<td>30</td>
<td>51</td>
</tr>
<tr>
<td>1906</td>
<td>52</td>
<td>21</td>
</tr>
</tbody>
</table>

Acland Papers, Boxes 50, 52, 57, 63, 65, 72. See p.231 for full sized chart.
### TABLE: 6.4. Comparison of stock numbers with stock units on Mt Peel

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Mated E @1 su</th>
<th>Dry Ewe @0.7 su</th>
<th>Wethers @0.6 su</th>
<th>Hoggets @0.7 su</th>
<th>Others 0.7 (*0.8)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1875/6</td>
<td>11,000</td>
<td>10,835</td>
<td>12,282</td>
<td>5,222</td>
<td>4,729</td>
<td>44,076</td>
</tr>
<tr>
<td>1875/6 SU</td>
<td>11,000</td>
<td>7,585</td>
<td>7,369</td>
<td>3,655</td>
<td>3,310</td>
<td>32,919</td>
</tr>
<tr>
<td>1892/3</td>
<td>15,952</td>
<td>3,340</td>
<td>16,506</td>
<td>6,218</td>
<td>3,809</td>
<td>45,825</td>
</tr>
<tr>
<td>1892/3 SU</td>
<td>15,952</td>
<td>2,338</td>
<td>9,903</td>
<td>4,352</td>
<td>2,162</td>
<td>35,211</td>
</tr>
<tr>
<td>1910/11</td>
<td>17,410</td>
<td>4,004</td>
<td>9,876</td>
<td>9,581</td>
<td>324</td>
<td>41,195</td>
</tr>
<tr>
<td>1910/11 SU</td>
<td>17,410</td>
<td>2,803</td>
<td>5,925</td>
<td>6,706</td>
<td>259*</td>
<td>33,103</td>
</tr>
</tbody>
</table>

This table uses Coop’s ewe equivalent figures to compare stock numbers and stock units on Mt Peel from 1875 to 1911. It illustrates how the change in the structure of the flock changed the stock loading of the property. Over this thirty-six year period overall sheep numbers declined by 2,881, yet the stock loading, as measured in stock units, increased by 184 sheep. Notice that the major changes are in the number of ewes mated and the decline is in wether numbers.

**Increased body weight of sheep**

Another measure that needs to be taken into account when assessing the stock loading on Mt Peel is any increase in the size of the sheep over time and its influence on the feed demand on the run. After all bigger sheep eat more feed. Merinos in the early years were small sheep: they weighed less than fifty pounds and cut two to three pounds of wool. Breeders in both Australia and New Zealand soon set about improving their sheep and by the 1890s it had become common for Merinos to weigh eighty pounds or more, an increase of sixty percent over the liveweight of sheep in the 1850s. So if a

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16 Acland Papers, Boxes 50, 52, 57, 63, 65, 72.
run carried, say, 10,000 sheep in 1860 and only 8,000 in 1890 the ‘numbers model’ would suggest that deterioration of the vegetation was having an impact on the flock. Yet if the sheep had increased in size by sixty percent then the run, in 1890, would be carrying 12,800 equivalents of the 1850s sheep - an increase in the stock load, not a decrease. Unfortunately, we have little information on the weight of the Mt Peel sheep, so we cannot accurately reconstruct what changes were taking place.

However, there are clues that the sheep did get bigger over the years of the study. For example, the rise in wool cut per head, from just over two pounds to over seven pounds, is a good indication of that increase. In the mid-1960s Coop studied two flocks of Halfbreds and two flocks of Merinos for the effects of liveweight on fertility and wool production. He found that ‘[on] average, each 10 lb increase in liveweight is associated with two-thirds of a pound increase in fleece weight’. Using Coop’s rule a five pound increase in wool suggests an increase in liveweight of the Mt Peel sheep in the order of about sixty-six pounds. If we assume a low liveweight to match the low wool cut of two pounds, then the sheep at the outset were say thirty-five pounds; whereas, by the turn of the century the average liveweight of the sheep could have been about one hundred pounds.

The shift to cross breeding would have also had a significant impact on the size of sheep. Although stock breeders in the nineteenth century knew nothing of Mendelian genetics they did understand the value of hybrid vigour. They were fully aware that the first cross of two breeds grew faster and bigger and was more productive than either of the parent breeds. Sheep farmers began using English breeds over the base Merino flock early in the settlement of New Zealand. In the South Island, a shift away from Merinos was underway in the 1870s and the tempo of change increased markedly after the establishment of the frozen meat trade.

At Mt Peel, English Leicester rams were first used over Merino ewes in 1884, and by 1896 nearly half of the Merino flock were mated to rams of English breeds. In 1910 nearly 31,800 of the 41,000 sheep on the run were crossbreds; that represented over seventy-seven percent of the flock. This shift in breed away from Merinos would have resulted in an increase in the live weight of the sheep and an increase in the stock loading on the run. To illustrate the point let us look at the table below.

For the years 1875/6 I have assumed a body weight for the mated ewes of sixty pounds and based the values for the other classes of sheep on that figure. In the years 1892/3 I have estimated the weight of the mated ewes at eighty pounds and in 1910 at one hundred pounds. It is the last column that really tells the story here. Total sheep numbers declined by 2,881, but, using my estimated live weights, ewe equivalents increased by 8,357.

TABLE: 6.5. This table builds on TABLE: 6.4. It shows sheep numbers and adjusts the ewe equivalent (stock unit) values to account for changes in body weight.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Mated E</th>
<th>Dry Ewe</th>
<th>Wethers</th>
<th>Hoggets</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1875/6</td>
<td>11,000</td>
<td>10,835</td>
<td>12,282</td>
<td>5,222</td>
<td>4,729</td>
<td>44,068</td>
</tr>
<tr>
<td>1875/6 SU</td>
<td>7,700</td>
<td>5,417</td>
<td>4,912</td>
<td>2,611</td>
<td>2,364</td>
<td>23,004</td>
</tr>
<tr>
<td>1892/3</td>
<td>15,612</td>
<td>3,340</td>
<td>16,506</td>
<td>6,218</td>
<td>3,340</td>
<td>45,825</td>
</tr>
<tr>
<td>1892/3 SU</td>
<td>12,489</td>
<td>2004</td>
<td>8,253</td>
<td>3,731</td>
<td>2,285</td>
<td>28,481</td>
</tr>
<tr>
<td>1910/11</td>
<td>17,410</td>
<td>4,004</td>
<td>9,876</td>
<td>9,581</td>
<td>324</td>
<td>41,195</td>
</tr>
<tr>
<td>1910/11 SU</td>
<td>15,669</td>
<td>2,802</td>
<td>5,925</td>
<td>6,706</td>
<td>259</td>
<td>31,361</td>
</tr>
</tbody>
</table>

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18 Acland Papers, Box 52.
19 Acland Papers, Box 63.
20 Acland Papers, Boxes 50, 52, 57, 63, 65, 72.
The table demonstrates that there was probably a marked increase in ewe equivalents carried on Mt Peel from the early 1880s as the station moved into cross breeding and carrying more ewes to take advantage of the opportunities offered by the frozen meat trade. The figures I have used suggest there could have been a thirty-six per cent increase in the stocking load on Mt Peel during the time that sheep numbers decreased by 2,873. Thus an increase in the body weight of the sheep, their increased productivity and the change to the structure of the flock more than made up for the decrease in numbers after the 1895 snow.

This finding is speculative to a degree, but we know that throughout Canterbury and Otago sheep were getting bigger due to improved breed selection, cross breeding, and better feeding. We also know that the Mt Peel sheep were well regarded. The manager, Oliver Scott Thomson, wrote in 1901 that ‘the Mt Peel sheep are getting a good name amongst both farmers and dealers’. He went on, ‘so far we have made a record [price] for sheep in these parts and also I think anywhere in Canterbury, having got a pound a head net on the place for 1,000 halfbred ewes’. Clearly, for the station to achieve a record price for its sale stock they must have been as at least well grown as other sheep on the market.

**Accounting for the decrease in sheep numbers on Mt Peel after 1895**

It would be a mistake to see the failure of the station to rebuild numbers in the years immediately after the 1895 snow as evidence of overstocking in former times with consequent depletion of the vegetation. There are other reasons to account for the reduction in overall numbers on Mt Peel after 1895. In part, it was a response to a deliberate policy to stock the property more conservatively. Oliver Scott Thomson made this point explicitly in a letter in May 1898, saying that the run could carry another 2,000 sheep, but he felt it was always better to be understocked.22

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21 Acland Papers, Box 57, Station Letterbooks, F2,3, 27 February 1901.
22 Acland Papers, Box 57, Station Letterbooks, 23 May 1898.
Another factor to account for the reduction in sheep numbers was the loss of some valuable wintering country. The lease of Run No.3, which Mt Peel held, came up for auction in 1900. Acland could not bid for the run under the regulations of the Land Act, which were designed to reduce land monopoly and enforce the notion of one man/one run. The lease was purchased by a neighbour, Francis Barker, who was unable to stock it because he could not afford to pay the high prices that were ruling for sheep at that time; so Mt Peel rented it for the following year. However, Barker took over the run at the beginning of 1901 and Mt Peel lost 2,700 acres of safe wintering country. This reduced its stock carrying capacity.

A third reason for the reduction in stock numbers was the precarious financial situation of John Barton Acland throughout the 1890s. This culminated in a crisis in 1898 when he came close to losing the station. These financial difficulties and the high prices for sheep in 1899 encouraged Scott Thomson to sell sheep that were capital stock to help reduce the station’s indebtedness. This, of course, reduced the number to be carried on the station.

Inclement weather in the early 1900s also took its toll on sheep numbers. Several severe snow storms in early spring had Scott Thomson writing in December of 1902 that he had ‘never had such a bad lambing’. The following winter was also a bad one, with heavy snow arriving in the middle of May. At shearing time in January 1904 the station was 6,000 sheep short. Another big snow in 1908 caused widespread sheep losses throughout the South Island back country and Mt Peel shore 8,000 fewer sheep the following summer.

Thus the loss of wintering country, Acland’s financial difficulties in the late 1890s and high sheep losses due a series of adverse seasons

\[23 \text{ Acland Papers, Box 57, Station Letterbooks, 1 March 1901.} \]
\[24 \text{ This issue is dealt with in more detail in Chapter 8.} \]
\[25 \text{ Acland Papers, Box 57, Station Letterbooks, 12 June 1899.} \]
\[26 \text{ Acland Papers, Box 57, Station Letterbooks, 8 December 1902.} \]
\[27 \text{ Acland Papers, Box 57, Station Letterbooks, 18 January 1904.} \]
combined to prevent Mt Peel’s sheep numbers returning to their high levels of the early 1890s. There is nothing in the station records to suggest that a process of vegetation depletion had any influence on the stock loading fifty-five years after Mt Peel had first been stocked.

**The irruptive model and Mt Peel**

The model of ungulate irruption applied to the introduction of sheep into New South Wales and New Zealand relied on sheep numbers as a means to assess changes in the stock carrying capacity of land. The data from Mt Peel demonstrates that sheep numbers, without the support of other production figures, is a crude tool to measure the stock loading. The relationship between the carrying capacity, sheep numbers and the stock loading is a complex one. Moreover, a decline in sheep numbers does not on its own necessarily indicate the depletion of the vegetation. Sheep numbers did not recover to former peak levels on Mt Peel in the years after the 1895 snow, but at the same time other measures of production continued to increase, including wool weights, overall wool production, the numbers of ewes mated and the number of lambs marked. So while stock numbers declined the stock loading on the station actually rose.

There is evidence to indicate that in some districts the tussock grasslands did undergo depletion during the pastoral era. However, the model of ungulate irruption on its own is unable to account for the changes that took place. If we really want to understand the environmental history of our grasslands we need an approach that encompasses the complexity of the relationship between the pastoralists, their livestock and the land.

The obvious problem with applying a model designed to account for the introduction of a wild mammal population to a new habitat to a domesticated animal population, in this case sheep, is that the domestic animals are deliberately manipulated by pastoralists and farmers. They can

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do this by selective breeding for desired traits such as increased wool weights and higher reproductive rates which require improved feeding levels; they can manipulate the quantity and quality of the feed through grazing management and burning management; they can applying inputs such as fertiliser, improved plant species, and fencing; and they can save feed in the form of forage crops and hay. This was done at Mt Peel and it also happened throughout the rangelands.

Contemporary accounts of overstocking

Overstocking received a good deal of criticism in the agricultural press from the late 1860s, by which time the runs were considered to be fully stocked and the lack of an outlet for surplus sheep became painfully obvious to pastoralists. A letter published in the Christchurch Press in 1869 raised this issue. It noted the ‘rapid and continued decline in the price of sheep’, and with ‘[m]any runs practically now overstocked’ some runholders were ‘only too anxious to get rid of their abundance at almost any price’. The establishment of boiling down and meat preserving works provided a limited market for surplus sheep, but it was not until the frozen meat trade became established after 1882 that the natural increase of sheep on farms and stations found a ready outlet.

Mt Peel was still stocking up until about 1874 when the flock reached 44,000. Thereafter the station’s management dealt with the problem of the lack in demand for sheep by concentrating on wool production and limiting the natural increase. From the mid-1870s the station increased the wether flock and reduced ewe numbers. It produced only enough lambs each year to replace those sheep that had died through old age or misadventure. It is unlikely that Mt Peel was unique in adopting this approach when the demand for sheep collapsed.

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29 Press, 8 February 1869, p.3.
However, even the attempt to hold sheep numbers at a constant level could mean that in difficult seasons, unless there was a deliberate policy to understock, a property could quickly become overstocked. This linkage between good and bad seasons and understocking or overstocking is found regularly in the agricultural press. 'Ovis', in the New Zealand Country Journal, summed it up concisely in 1897, writing 'with dry weather comes overstocking – it is practically impossible to avoid it.' Accordingly, in 1886 with drought taking its toll on crops and pastures in North Otago, one writer thought that '[o]verstocking may account somewhat for the severity of the dry weather being felt so soon in the grass paddocks.' After a dry summer in most districts in 1895, which had followed an 'exceptionally heavy lambing' the previous spring, 'Ovis' reported that the country was 'stocked to its utmost carrying capacity and it is to be feared that before winter is over it will be found that it is considerably overstocked'.

Conversely, there were many comments about the country being understocked during good seasons. In 1881, the year before the Dunedin sailed with its first shipment of frozen meat and when the country was supposedly stocked to capacity, the Country Journal commented on the 'abundance of feed' and noted that 'most of the “stations” are insufficiently stocked'. By the early 1890s the numbers of sheep killed and shipped for the frozen meat trade had an impact on the stocking load particularly in Canterbury, which dominated the trade though this period. In August 1900 we read that ‘Canterbury is … considerably understocked’ and had been so for the last four years. Moreover, it was not just the farms that were fattening stock for the frozen meat trade that were understocked. The Otago Witness reported that the sheep returns for 1900 showed a decrease of 33,085 sheep in the South Island as a result of the export trade. The writer

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30 New Zealand Country Journal, Vol.21, No.5 (September 1897), 394.
34 Otago Witness, 2 August 1900, p.7; 30 August 1900, p.4.
commented on the situation saying that ‘[i]t is not as though the runs were overstocked; on the contrary’.  

Thus it was apparent in the contemporary agricultural press that the variability of the climate and periodic dry seasons accounted for some of the overstocking that received so much comment. Another factor that influenced overstocking was the management skills of farmers. In general, according to the press, small farmers were regarded as less competent than large operators. The *Timaru Herald* observed that a ‘large per centage [sic] of the small farms in the southern districts are owned by men who, in the first instance, are not practical farmers’. In an article on the shift from grain growing to the establishment of pasture for sheep farming after the establishment of the frozen meat trade, the *Otago Witness* noted the difference in management practices between large and small farmers, writing ‘[e]xcept on the large estates the importance of permanent pastures has not been sufficiently apparent to farmers’. The *Country Journal* made numerous comments regarding the issue of the management skills of small farmers. In 1894 ‘Ovis’ complained that the small farmer ‘lacks systematic management’; two years later he was at it again, writing that the ‘management of small flocks is not good’; and in 1897 he noted that ‘generally speaking medium and large flocks are better managed’. Part of his explanation for this situation was the rapid increase of small flocks after the subdivision of the large estates. Consequently, many new sheep farmers were coming into the business with ‘next to no experience’ and, he could have added, often with limited capital.  

**Pastoralists, cultural values and overstocking**

Despite contemporary accounts that claimed the management of larger properties was superior to that of small farms, the criticism of overstocking

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35 *Otago Witness*, 13 March 1901, p.4.  
36 *Timaru Herald*, 5 April 1871, p.2.  
38 *Country Journal*, Vol. 18, No. 5 (September 1894), 371; Vol. 20, No. 6 (November 1896), 511; Vol. 21, No. 2 (March 1897), 105.  
has been most vociferous about the stations in the tussock grasslands. A question that arises from the claims is why would pastoralists overstock their land when the consequences were depleted vegetation and declining productivity of the stock? Three obvious answers to this are: they misread the carrying capacity of the land; their intention was to make a quick profit and return to Britain, so how they treated the land was of no relevance to them; or they were simply incompetent at the business.

I contend that the first generation of pastoralists were improvers, by and large, who set out to establish sustainable, long-term businesses. Chapters Seven and Eight will show that they spent a considerable time and effort in improving their stock and they spent a good deal of money and effort in improving their land. The deliberate overstocking of the land would have negated this work and expenditure. A large majority of them did not return to live in Britain, so they were not just fly-by-night sojourners after a quick profit. Moreover, the thesis will demonstrate that, outside the semi-arid districts that were overwhelmed by rabbits, the productivity of the land was maintained or continued to increase until such time as the properties were subdivided.

An established line of argument in the history of pastoralism in New Zealand is that many runholders came out to make a fortune from the business and then return to England with the profits.40 George Duppa, who arrived in Nelson in 1841 and later established the St Leonards run in the Amuri District, and Samuel Butler are famous examples of men who made handsome profits from sheep ranching. Butler doubled his capital between 1860 and 1864. The implication here is that those who came to make a quick profit in a short time were less likely to care for the land than those who viewed the business as a long-term enterprise. In fact, the sojourners were a minority in the pastoral era. Of 245 individuals who took up runs in Canterbury between 1843 and 1865, 172, or seventy per cent, died as New

Zealand residents. There are numerous examples of men like George Rutherford who took up Leslie Hills Station in the Amuri District, John Hall, Acland and Tripp, John Cracroft Wilson and John Grigg who came to New Zealand with the intention of staying. It was not in their interests to overstock or deplete the land that they saw as their legacies to their families.

There has also been a good deal of debate about the backgrounds and motives of the early pastoralists in the South Island rangelands. Eldred-Grigg described them as ‘almost completely upper class and upper-middle class’ Englishmen who set out ‘to recreate aristocratic English life in the colony’. McAlloon does not agree with this analysis, arguing that the early pastoralists were ‘forward looking rural capitalists, not backward-looking feudal lords’ who set out to increase their ‘individual and family wealth’. Indeed, McAlloon has stressed that farming was very much a business proposition and that pastoralists at the time thought that success in the business was based on sound training and hard work.

Bowler, in his study of the Victorian era, argued that a fundamental belief of Victorian society was the conviction that individual effort was a driving force of progress. In Australia, Watson concluded that the ‘chief idol’ of the early squatters on the Darling Downs was financial success and that ‘rested on one foundation, hard physical labour’. Butler noted the same values in Canterbury when he arrived in 1860, writing ‘people here are busy making money; that is the inducement which led them to coming in the first instance, and they show their sense by devoting their energies to work’. These values of hard work, enterprise and wealth creation created the

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44 McAlloon, No Idle Rich, 52.
entrepreneurial spirit in Victorian society, whether in Britain or its Empire, which was reflected in attitudes of the first generation of pastoralists in the South Island rangelands.

Moreover, a passion for the business of sheep farming is found in the writing from the time. Butler described the first evening he spent in Christchurch with a group of pastoralists whom he described as 'shaggy, clear-complexioned, brown and healthy-looking'. He was, at first, enthralled by their conversation:

The all-engrossing topics seemed to be sheep, horses, dogs, cattle, English grasses, paddocks, bush, and so forth. From about seven o'clock in the evening till about twelve at night I cannot say that I heard much else. I was rather startled at hearing one gentleman ask another whether he meant to wash this year, and receive the answer 'No'. I soon discovered that a person's sheep are himself. If his sheep are clean, he is clean. He does not wash his sheep before shearing; but he washes; and, most marvellous of all, it is not his sheep which lamb, but he 'lambs down' himself.

Word of mouth was one way in which ideas on farming were passed between established pastoralists and newcomers. More formal systems were also established to disseminate information amongst the sheep owning community. The cadet system, where neophytes paid for their apprenticeships on stations in order to gain practical experience in the business, was established at the outset of pastoralism in the rangelands. Butler was sceptical about the value of the cadet system, but Acland and Tripp, who were both cadets before taking up Mt Peel, thought it worked well. Acland suggested that '[t]he best course for a man to adopt who

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48 Butler, 33.
49 Butler, 33-34.
50 Butler, 69-70; John Barton Acland, Notes on Sheep-Farming in New Zealand with a short notice of the Canterbury Province (London: W. Clowes and Sons, 1858), 7; Tripp, 4, 8-9.
intends sheep-farming is to reside six or twelve months at a sheep station, where he will learn the business, and probably gain some experience without paying too dearly for it.\textsuperscript{51}

Agricultural and Pastoral societies were formed in Canterbury in 1853 and 1859 and in 1863 they were succeeded by the Canterbury Agricultural and Pastoral Association which ran annual shows from that time. Similar associations were established throughout the South Island. In 1877 the Canterbury association established the \textit{New Zealand Country Journal} to disseminate information to farmers and pastoralists. Farmers’ clubs were another means of spreading information, with the first club in Canterbury being established in 1858. In the same year the club organised the first ploughing match in the province.\textsuperscript{52} Farmers clubs often organised demonstrations of the latest machinery, such as reapers and binders, and steam ploughs. The enthusiasm for new ideas and new technology was a feature of the times. A note in John Barton Acland’s letterbook emphasised this point: ‘men and women came out from Great Britain to do the work … to reproduce the England of their youth in every [respect] and not only that but also to carry on in the new country every new invention which was brought out in the old’.\textsuperscript{53}

The point here is that pastoralists were part of a community where there were systems for disseminating information and where there was a genuine enthusiasm for the business. They were also part of a society that believed that the world could be improved by hard work and technical innovation. It may have been that in the early years some did misread the environment and the carrying capacity of the country. Indeed, this thesis deals with the learning process that took place in the pastoral era whereby sheep ranchers came to terms with the landscape and climate of the region. Of course, in the early years the stocking rate was low, as it took some time to build up sheep numbers. Mt Peel was first stocked with sheep in 1857, but

\textsuperscript{51} J.B.A. Acland, 7.
\textsuperscript{52} \textit{Lyttelton Times}, 18 September 1858, p.2.
\textsuperscript{53} Acland Papers, J.B. Acland Letterbook 1885-1887, 451.
did not reach its long-term sheep load until the mid-1870s. This was plenty of time to learn to balance sheep numbers with the interests of the vegetation. There was no advantage for men like John Barton Acland to overstock or overburn their land; it was much more in their interest to establish sustainable and viable enterprises that they could pass on to their descendents.

Assessing the sheep loading on the ground

This section explores the stock loading of some South Island counties and some individual stations to gauge the changes that took place over time. It uses data from the annual sheep returns published in the Appendices to the Journals of the House of Representatives to measure these changes. In this chapter I have argued at length that sheep numbers without other production data is a poor tool for assessing the stock loading on any given property. Unfortunately, we do not have production figures from most of the stations in the pastoral era other than the sheep returns. The best we can do, then, is to use the only available data, while acknowledging its limitations.

Questions have been raised about the accuracy of the sheep returns, particularly for the sheep rate period, 1879 to 1907.\(^{54}\) It had been argued that sheep owners may have deliberately understated their actual sheep numbers to avoid paying the tax. However, as the Timaru Herald noted, after the abolition of the sheep tax, the returns were ‘not materially affected’ and there was ‘no abnormal jump’ in sheep numbers.\(^{55}\) Layton’s doctoral thesis supported this view and concluded that the response rate to the returns was possibly above ninety-five per cent in the sheep rate period and that understatements to avoid sheep rates were ‘quite small’.\(^{56}\) Thus it is credible to accept the sheep returns as reasonably accurate, and, in the absence of more detailed information, they are all that we have as a guide to stocking


\(^{55}\) Timaru Herald, 7 August Supplement 1909.

\(^{56}\) Layton, 194, 197.
levels in the rangelands. Although it has to be acknowledged that stock production figures, where they become available, could significantly change the assessment of the stock loading.

The table below shows three Canterbury counties, three Otago counties and one from Southland. It illustrates that the precipitous decline in sheep numbers in Vincent and Lake counties was not matched elsewhere. It is likely that parts of the Upper Waitaki and the Mackenzie basin would follow a similar pattern to that seen in the two Central Otago counties, but these regions were part of larger districts and any decline in numbers that they suffered was covered by increases elsewhere.

| TABLE: 6.6. Changes in sheep numbers by selected counties 1879 to 1910 |
|-----------------|---|---|---|---|---|---|---|
|                | 1879 | % Change | 1890 | % Change | 1900 | % Change | 1910 | % Change overall |
| Selwyn         | 537,276 | ▲18.6 | 637,202 | ▲1.6 | 647,419 | ▲28.8 | 795,153 | ▲48 |
| Ashburton      | 508,262 | ▲38 | 701,845 | ▲5.2 | 738,816 | ▲27 | 938,750 | ▲84.7 |
| Waitaki        | 425,132 | ▲50.38 | 639,353 | ▼13.85 | 550,763 | ▲7.6 | 592,724 | ▲39.4 |
| Vincent        | 529,469 | ▲2.2 | 541,209 | ▼2.6 | 526,948 | ▲12 | 590,666 | ▲11 |
| Waitaki        | 496,994 | ▼16.67 | 414,150 | ▼29 | 294,153 | ▼5.6 | 277,630 | ▼44 |
| Lake           | 373,964 | ▼61.8 | 142,823 | ▼11.75 | 159,603 | ▼51.88 | 242,401 | ▼35 |
| Wallace        | 190,287 | ▲123 | 424,537 | ▼3.36 | 438,821 | ▼18.78 | 521,254 | ▼178.8 |
| TOTAL          | 3,061,384 | ▲14.36 | 3,501,119 | ▼4.2 | 3,356,523 | ▼17.94 | 3,958,608 | ▼29.3 |

There are several striking features in this table. Firstly, the collapse in sheep numbers in Lake County occurred in the decade of the 1880s when the rabbit plague was at its worst in that region. The county experienced a slight recovery in the following decade and then between 1900 and 1910 sheep numbers lifted by over fifty per cent. Only in the largely semi-arid region of Vincent County did numbers decline in each decade. Another point of interest is that the decade of the 1890s saw an overall decline in growth across the whole region. Wool returns remained low throughout the decade and meat prices were poor until late in the period. This was a time of

57 Appendix to the Journal of the House of Representatives, Sheep Returns, 1880, H-9; 1901, H-23.
agricultural depression and the slowing in growth suggests that farmers and pastoralists were not able to invest in fertiliser, cultivation and fencing. Climatically it was also a difficult period. The 1895 snow killed many thousands of sheep, and a two-year drought in Canterbury, and North and Central Otago late in the decade caused sheep owners to lighten the stocking loads on their properties.

TABLE 6.7. Sheep numbers and the percentage change in sheep numbers on 20 stations from Marlborough to Southland over a 22 year period, 1879 to 1901

<table>
<thead>
<tr>
<th>RUN</th>
<th>Altitude at Homestead</th>
<th>Rainfall mm</th>
<th>1879</th>
<th>1901</th>
<th>% Change [1879 - 1901]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flaxbourne</td>
<td>30 metres</td>
<td>650</td>
<td>60,707</td>
<td>47,026</td>
<td>▼ 22.5</td>
</tr>
<tr>
<td>Molesworth</td>
<td>893</td>
<td>640</td>
<td>28,727</td>
<td>35,526</td>
<td>▲ 23.6</td>
</tr>
<tr>
<td>Mt Parnassus</td>
<td>106</td>
<td>30,369</td>
<td>37,380</td>
<td>▲ 23</td>
<td></td>
</tr>
<tr>
<td>Leslie Hills</td>
<td>240</td>
<td>900</td>
<td>17,536</td>
<td>22,830</td>
<td>▲ 30</td>
</tr>
<tr>
<td>Glens of Tekoa</td>
<td>360</td>
<td>1,100</td>
<td>16,000</td>
<td>17,700</td>
<td>▲ 10.6</td>
</tr>
<tr>
<td>The Terrace</td>
<td>210</td>
<td>900</td>
<td>28,781</td>
<td>29,698</td>
<td>▲ 3</td>
</tr>
<tr>
<td>Springfield</td>
<td>244</td>
<td></td>
<td>19,600</td>
<td>25,719</td>
<td>▲ 31.2</td>
</tr>
<tr>
<td>Mt Somers</td>
<td>457</td>
<td></td>
<td>8,932</td>
<td>10,000</td>
<td>▲ 11.95</td>
</tr>
<tr>
<td>Mesopotamia</td>
<td>510</td>
<td>950</td>
<td>21,837</td>
<td>20,081</td>
<td>▼ 8</td>
</tr>
<tr>
<td>Orari Gorge</td>
<td>285</td>
<td>1,200</td>
<td>40,253</td>
<td>40,547</td>
<td>▲ 0.7</td>
</tr>
<tr>
<td>The Mistake</td>
<td>720</td>
<td>750</td>
<td>11,000</td>
<td>7,000</td>
<td>▼ 36</td>
</tr>
<tr>
<td>Grampian Hills</td>
<td>600</td>
<td>500</td>
<td>19,700</td>
<td>16,893</td>
<td>▼ 14.2</td>
</tr>
<tr>
<td>Holme/Pareora</td>
<td>150</td>
<td>650</td>
<td>40,527</td>
<td>60,000</td>
<td>▲ 48</td>
</tr>
<tr>
<td>Waitangi</td>
<td>270</td>
<td>460</td>
<td>27,003</td>
<td>17,720</td>
<td>▼ 34</td>
</tr>
<tr>
<td>Morven Hills</td>
<td>460</td>
<td></td>
<td>135,593</td>
<td>72,894</td>
<td>▼ 46.2</td>
</tr>
<tr>
<td>Earnscleugh</td>
<td>200</td>
<td>360</td>
<td>24,000</td>
<td>Nil</td>
<td>▼ 100</td>
</tr>
<tr>
<td>Galloway</td>
<td>200</td>
<td>360</td>
<td>75,000</td>
<td>31,218</td>
<td>▼ 58</td>
</tr>
<tr>
<td>Gladbrook</td>
<td>180</td>
<td>500</td>
<td>23,566</td>
<td>24,441</td>
<td>▲ 3.7</td>
</tr>
<tr>
<td>Moa Flat</td>
<td>80</td>
<td>750</td>
<td>80,054</td>
<td>59,888</td>
<td>▼ 25</td>
</tr>
<tr>
<td>Castle Rock</td>
<td>200</td>
<td>900</td>
<td>24,600</td>
<td>34,500</td>
<td>▲ 40</td>
</tr>
</tbody>
</table>

The table above, showing changes in sheep numbers on twenty stations from Marlborough to Southland, illustrates the marked variation in the increase and decline in sheep numbers between properties, just as TABLE: 6.6 shows

58 *AJHR*. Sheep Returns. See Appendix: Two, for sheep returns for the Amuri, Canterbury and South Canterbury; Appendix: Three, for sheep returns for Otago, North Otago, Central Otago and Southland; Appendix: One, shows charts for each station in this table;
a similar variation across the seven counties. Is it possible to account for this variation?

TABLE: 6.7 illustrates that the stations with the most dramatic decreases in sheep numbers were located in the semi-arid parts of Vincent County and the Waitaki Valley. Sheep numbers on Flaxbourne in coastal Marlborough also declined. In the Mackenzie Country the combination of altitude and low rainfall provide for a short growing season and the district is subject to occasional extreme show events. The fall in sheep numbers on The Mistake matched that of some runs in the very dry zones. Outside those areas some stations recorded significant increases in sheep numbers over this period. TABLE 6.7, when analysed in conjunction with the charts in Appendix One showing sheep numbers for each of these stations over an extended period, provides graphic evidence of the different patterns of stocking rates on these runs.

The appendix and table together show that, in general, there were five different outcomes for the stock loading on stations in the pastoral era. In the worst cases there was a complete or serious collapse of the stocking load. This was most evident on Earnseleugh, Morven Hills and Galloway in the semi-arid region of Vincent County. Flaxbourne, Molesworth, the Grampian Hills, Waitangi and Moa Flat also show a drop in sheep numbers that was followed by a readjustment of the stocking load at a lower level. Some stations, despite showing fluctuations over time, at the end of the period held similar numbers to those they had held at the start. Leslie Hills provided the best example of this, and Mesopotamia, Orari Gorge and Gladbrook displayed a similar pattern. Another group in this sample, including Mt Parnassus, Glens of Tekoa, Mt Somers, Pareora and Castle Rock stations, increased their sheep numbers over time. It is notable that, although these properties can be subject to dry periods, they are in areas where rainfall is usually reliable. The fifth group, consisting of The Terrace, Springfield and The Mistake, demonstrated erratic shifts in sheep numbers.
A: The Terrace and Springfield the swings in sheep numbers did not represent overstocking and a subsequent decline in the productivity of the vegetation. Rather, Duncan Cameron at Springfield and John Hall at The Terrace adjusted their sheep numbers according to changing demands in the marketplace. Cameron increased or reduced his sheep flock depending on the relationship between crop and sheep prices. One year he sowed down 5,500 acres in crop.⁵⁹ He also fattened sheep for the frozen meat trade which reduced his flock numbers. Springfield remained one of the most highly regarded properties on the Canterbury plains until it was broken up in 1908.

The Terrace was another highly regarded property and was renowned for the quality of its flock. The erratic pattern of sheep numbers seen in CHART: 10.6 was John Hall’s response to the opportunities provided by the frozen meat trade; it was not due to any loss in the productivity of the land.⁶⁰ A report on The Terrace in the Country Journal in 1889 noted that the station usually carried a flock of 30,000 sheep, but ‘owing to heavy drafts for freezing’ in 1888 it had shorn 27,473.⁶¹ The article reported that all the sheep were grass fed and that one third of the station had been sown in ‘English’ grasses, with the balance in ‘tussock’. The high productivity of The Terrace was recognised in an article in 1893 about Canterbury stations that cut heavy clips of wool. Hall’s 26,784 sheep averaged 7 lb 13½ oz of wool, representing one of the highest clipping Merino flocks in the province.⁶²

Despite that apparent erratic pattern of sheep numbers shown in the appendix, The Terrace and Springfield remained highly productive properties throughout the pastoral era. The same could not be said of The Mistake Station in the Mackenzie Country. The property, which is now known as Godley Peaks, runs from 720 metres (2,400 feet) to over 2,250 metres (7,500 feet) above sea level. Although rainfall is more than adequate for growing pasture at 750 mm the growing season is short due to the station’s altitude, which also makes the run subject to heavy snowfalls that resulted in

⁵⁹ L.G.D. Acland, 111.
⁶⁰ Appendix One: CHART: 10.6, p. 372.
calamitous sheep losses. Moreover, there is a limited area suitable for cultivation so that the flock relied completely on the native pasturage. The station was badly affected by rabbits in the 1890s and this combined with losses in snow years shaped the erratic trend line in sheep numbers seen in CHART 10.11. The trend line in sheep numbers for The Mistake is one of the few outside Vincent County to demonstrate the sort of decline seen on Galloway and Earnscleugh.

Flaxbourne is representative of the stations where sheep numbers declined and then held at a lower level. It was the first sheep station taken up in the South Island and took in a huge area of easy to steep hill country along the Marlborough coastline and included considerable areas of river flats. The annual rainfall averages 650 mm, although the region is subject to occasional severe and prolonged droughts. In the late-1870s and early-1880s rabbits overran Flaxbourne and at one point the station was described as the ‘rabbit warren of the South Island’. By the early 1890s the station management appeared to have rabbits under control and in 1905 Flaxbourne was reported to be ‘wonderfully clean’. The average stock loading on the station between 1879 and 1904 was 52,334 sheep. The fourteen per cent decline in sheep numbers between 1879 and 1890 was almost certainly due to the impact of rabbits. It appears that the station’s carrying capacity was permanently reduced as sheep numbers never recovered to former levels after that time. The decline of 9.4 per cent between 1890 and 1904, when the Crown took the station for subdivision, was nothing like the dramatic decline seen in Vincent County. The trend line showing the five-year moving average for sheep numbers does not indicate long-term overstocking with sheep, but more of an adjustment to the stock loading to account for the impact of the rabbit plague.

In contrast to Flaxbourne, the overall trajectory of sheep numbers on the Glers of Tekoa showed an upward trend. Tekoa is a hard high country

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63 Appendix One: CHART:10.11, p. 377.
64 Otago Witness, 19 April 1905, p.6.
65 Otago Witness, 19 April 1905, p.6.
run in a high rainfall zone. The homestead lies at 360 metres (1,200 feet) above sea level and the run takes in steep and rugged hills with little land suitable for agricultural purposes. In the thirty-one years between 1879 and 1910 sheep numbers increased by 21.5 per cent. This increase may be accounted for, in part, because during this period the run was not overrun by rabbits. The sheep off the Glens of Tekoa were well regarded and fetched good prices at sales relative to neighbouring runs. At the 1901 Amuri Ewe Fair Glens of Tekoa ewes, straight off tussock country, outsold ewes off much easier properties. Two-tooth halfbred wethers off the same property topped the sale for that class of sheep. The rising trend in sheep numbers and these examples of the high quality of the stock indicates that the run was neither overstocked nor over-grazed.

CHART: 10.10 demonstrates that on Orari Gorge Station the only time that the sheep flock dropped below 40,000 in the thirty years between 1879 and 1909, was in 1880 after the station had struggled through a bad winter.

Through the 1880s and early 1890s the flock numbers were particularly high, but after suffering big losses in the 1895 snow the owners chose to stock the property more conservatively. In 1891 the flock peaked at 49,905 sheep; the pasturage that sustained them consisted of 63,400 acres of native pasture, 2,424 acres of sown pasture, and 920 acres in oats, turnips and rape. The improved area accounted for about five per cent of the total area of pasturage. The station had first been stocked in 1857, so clearly the native pasturage still carried a large proportion of the flock fifty-two years later. Rabbits had little impact on Orari Gorge and there is no evidence of the run being overstocked. Consequently, the stock loading trend did not follow the decline seen in Lake and Vincent counties.

The trend line for sheep numbers on Gladbrook in the Strath Taieri district, east of Vincent County, shows more variation than the chart for

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66 Otago Witness, 13 March 1901, p.16.
67 Appendix One: CHART: 10.10, p. 376.
Leslie Fills.\textsuperscript{69} However, sheep numbers were at the same level in 1908 as they had been in 1879 and about that time the station lost land to freehold purchasers. The station consisted of 30,000 acres of leasehold and 8,000 acres of freehold land. Including 1885, when the sheep flock was listed in the sheep returns at 14,722, which is almost certainly an error, the station carried on average 22,857 sheep annually. Sheep numbers peaked in 1893, thirty-four years after the station had been initially stocked. CHART: 10.18 shows that numbers gradually declined from that peak, but not as precipitously as the irruption model has proposed. Cultivation to grow winter feed for the stock became increasingly important with first turnip crop being sown in 1875, well before the outbreak of rabbits on the station.\textsuperscript{70} In 1884 a correspondent of the \textit{Otago Witness} visited Gladbrook and reported that 3,500 acres of the freehold land had been cultivated with the balance improved by draining and surface seeding.\textsuperscript{71} He also noted that the natural grasses on the leasehold were in good condition, ‘as they [had] at no time recently been overstocked’.\textsuperscript{72} By the mid-1890s the cultivated country had been increased to take in about 5,000 acres.\textsuperscript{73} The average rainfall for the district is about 500 mm (twenty-two inches) a year, and although the hills are subject to occasional heavy snow falls, it is rare for snow to lie for long on the \textit{lats}.\textsuperscript{74} Rabbits remained a threat through the 1880s, but sheep numbers recovered after rabbit population declined. Gladbrook was owned by the partnership of John Roberts and William Murray and the station’s stock were highly regarded. It had a famous Merino stud and a polled Angus stud and remained a highly productive property throughout its history.

So what can we take from the tables and these thumb-nail sketches of these runs? Firstly, as has been noted throughout the thesis, there was a marked variation in response to long-term sheep grazing between regions and between runs. There is also an obvious correlation between rabbits and a

\textsuperscript{69} Appendix One: CHART: 10.18, p. 384.
\textsuperscript{71} \textit{Otago Witness}, 3 May 1884, p. 6.
\textsuperscript{72} \textit{Otago Witness}, 3 May 1884, p.6.
\textsuperscript{73} Thompson, 38-39.
\textsuperscript{74} Thompson, 3-4.
decline in sheep numbers. The three runs in Vincent County, Morven Hills, Earnseleugh and Galloway, being the most dramatic examples of this. Further, it is clear that over time sheep were being run increasingly on pasturage where inputs had been applied. Pareora Station is an example of a property where a major increase in sheep numbers occurred on the back of on-going development, whereas Gladbrook held numbers by developing its better country, which suggests that the feeding level of the unimproved pasturage was declining. In contrast, the lift in sheep numbers on the Glens of Tekoa was almost all on the native grassland.

It is also timely at this point to remember the lesson from Mt Peel: sheep liveweights and productivity were increasing on most of these stations over time. At Morven Hills, where sheep numbers had declined precipitously, 48,000 Merinos sheep cut on average 9½ pounds of wool in 1907.\textsuperscript{75} Moa Flat regularly was able to sell wethers that had wintered on the natural pasture fat off shears.\textsuperscript{76} The lambing on the station in the years preceding subdivision was close to 100 per cent.\textsuperscript{77} It seems likely that pastoralists adjusted the stocking level of their runs according to the productive capacity of their land. Where sheep numbers increased or were held at an even level it is highly probable that the overall productivity of these properties increased. Where sheep numbers fell, the increased productivity of the sheep went some way to making up for the decline in numbers. Thus, just counting sheep does not give us the information we need to understand changes in the stocking loads on runs in the pastoral era.

**Refrigeration and its impact on South Island sheep numbers**

Having assessed the stock loading at county and individual property levels, this section analyses sheep numbers across the South Island in the context of the development of the frozen meat trade. Government statistics show that sheep numbers peaked in Canterbury at 4,958,560 in 1886 and did

\textsuperscript{75} Otago Witness, 27 February 1907, p.20.
\textsuperscript{76} Otago Witness, 8 February 1905, p.25.
\textsuperscript{77} Otago Witness, 8 February 1905, p.25; 23 December 1903, p.16.
not attain that figure again before the end of 1912. In Otago and Southland sheep numbers reached 4,446,855 in 1886 and did not surpass that figure until 19.0 when the sheep population was tallied at 4,586,733. At face value it could be inferred that the three regions had exceeded their maximum sustainable stocking loads by 1886 and thereafter there was a readjustment of the stocking rate at a lower level. Indeed, historians Tom Brooking, Robin Hodge, and Vaughan Wood suggest that sheep farming reached its environmental limits in the South Island about 1900.

However, the reduction in sheep numbers can be accounted for in other ways. Low prices in the frozen meat trade in the mid-1880s and the simultaneous collapse in wool prices encouraged farmers on the plains to revert to cropping. The demand for sheep fell and sheep prices dropped to low levels. A drought in Canterbury and parts of Otago in late 1886 and early 1887 compounded the problem. Consequently, in 1887 over 600,000 sheep were boiled down in Canterbury alone. On its own, this would have had only a temporary impact on sheep numbers; but, when the South Island’s role in the frozen meat trade is also taken into account, the stagnation in the region’s sheep population is easily explained.

TABLE: 6.8 below illustrates the dominant position of the South Island in the export of frozen meat through the 1890s and into the first decade of the twentieth century. The increase in the production of export carcases was dramatic. Between 1895 and 1900 the number of carcases exported from South Island ports increased by 45.5 per cent. Over the next decade the increase was in the order of 43.7 per cent. In order to produce this increase many farmers sold ewe lambs as well as wether lambs for export, which meant that fewer young ewes were available to build up the breeding ewe flock. In eight years, from 1897 to 1904, South Island breeding ewe numbers remained relatively static at about 4,600,000. In 1905 breeding

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80 Otago Witness, 29 April 1887, p.7.
ewes increased to over 5,000,000 and in 1909 they passed 6,000,000. Therefore there was little opportunity for sheep numbers to increase in the South Island since farmers were selling capital stock to the frozen meat trade.

TABLE: 6.8. Exports of frozen sheep and frozen lamb carcases from South Island regions and New Zealand for 1895, 1900, 1910

<table>
<thead>
<tr>
<th></th>
<th>Frozen Sheep</th>
<th>Frozen Lamb</th>
<th>Total carcases</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Island</td>
<td>916,620</td>
<td>668,148</td>
<td>1,584,768</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1,603,311</td>
<td>759,224</td>
<td>2,362,535</td>
</tr>
<tr>
<td>S. Island % of total</td>
<td>57 %</td>
<td>88 %</td>
<td>67 %</td>
</tr>
<tr>
<td>1900</td>
<td>Frozen Sheep</td>
<td>Frozen Lamb</td>
<td>Total carcases</td>
</tr>
<tr>
<td>South Island</td>
<td>1,304,141</td>
<td>1,002,484</td>
<td>2,306,625</td>
</tr>
<tr>
<td>New Zealand</td>
<td>2,145,287</td>
<td>1,202,836</td>
<td>3,348,123</td>
</tr>
<tr>
<td>S. Island % of total</td>
<td>60 %</td>
<td>83 %</td>
<td>68 %</td>
</tr>
<tr>
<td>1910</td>
<td>Frozen Sheep</td>
<td>Frozen Lamb</td>
<td>Total carcases</td>
</tr>
<tr>
<td>South Island</td>
<td>672,493</td>
<td>2,642,370</td>
<td>3,314,863</td>
</tr>
<tr>
<td>New Zealand</td>
<td>2,000,131</td>
<td>3,858,003</td>
<td>5,858,134</td>
</tr>
<tr>
<td>S. Island % of total</td>
<td>33.6 %</td>
<td>68.5 %</td>
<td>56.6 %</td>
</tr>
</tbody>
</table>

A remarkable feature of the frozen meat trade in the pastoral era was the pre-eminence of Canterbury in the business. In 1899, 48.7 per cent of all mutton and lamb carcases exported from New Zealand to Britain came from the region. In the first six months of 1900 Canterbury accounted for fifty-one per cent of all frozen carcases exported from New Zealand. The high number of sheep exported from Canterbury taxed the ability of the region’s sheep population to maintain itself. The numbers of non-stud breeding ewes increased from 2,500,000 in 1900 to 2,850,000 in 1905, but remained at that level through to 1912 when 2,835,000 were recorded.

81 AJHR, 1910, H-23, 8.  
83 Otago Witness, 15 March 1900, p.5; 24 July 1901, p.16.  
84 AJHR, 1912, H-23B.
From 1900 sheep were regularly imported from other districts to be fattened on Canterbury pastures and crops.\textsuperscript{85} ‘Tens of thousands’ of sheep were imported from the North Island in 1901 and many thousands entered the province from Otago and Southland.\textsuperscript{86} In 1905 the \textit{Otago Witness} reported that Canterbury farmers imported from the North Island, on average, 20,000 sheep a week for a period of over two months to maintain sheep numbers and to meet the demand from the frozen meat trade.\textsuperscript{87} Clearly, depletion of the vegetation did not account for the lack of increase in Canterbury’s sheep numbers; rather it was the drive to profit from the frozen meat trade.

The impact of frozen meat trade and periodic droughts as well as extreme snow events in 1888, 1895, 1903 and 1908 easily account for the stagnation in sheep numbers between 1886 and 1912 in Canterbury, Otago and Southland. Between 1895 and 1910 the number of carcases exported from South Island ports increased by 109 per cent. This growth does not indicate that the vegetation of the South Island had been depleted by long-term overstocking. Moreover, it again emphasises that caution must be used when looking at sheep numbers alone as a measure for evaluating the stock loading on the land.

**Rabbits and overstocking**

The most marked declines in sheep numbers on the stations listed in TABLE: 6.7. took place on runs in semi-arid districts where rabbits had been at their worst. On Galloway sheep numbers declined dramatically. The table shows a fifty-eight per cent drop for the station, but CHART: 10.17 demonstrates that the flock reached its lowest point of 20,973 in 1904, after the bad winter of 1903.\textsuperscript{88} This was a seventy-two per cent drop from the 1879 figure of 75,000. Thereafter sheep numbers increased only marginally until 1912.

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\textsuperscript{85} \textit{Otago Witness}, 13 February 1900, p.13; 2 August 1900, p.7.
\textsuperscript{86} \textit{Otago Witness}, 27 March 1901, p.14; 24 April 1901, p.5; 7 August 1901, p.9.
\textsuperscript{87} \textit{Otago Witness}, 26 April 1905, p.20.
\textsuperscript{88} Appendix One: CHART: 10.17, p. 383.
Waitangi Station was another run that suffered badly from the first rabbit plague and TABLE 6.7 shows a thirty-four per cent decrease in the sheep flock by 1901. Thereafter, the flock continued to decline and reached its lowest point in 1904 at 14,305, which was forty-seven per cent down from the 27,003 sheep that the station had carried in 1879. Unlike Galloway, sheep numbers recovered slowly on Waitangi and the station continued to carry a flock of about 20,000 sheep well into the 1930s.

Stations in the Mackenzie Country were ravaged by rabbits in the 1890s. CHART: 10.11 illustrates the impact of severe winters and rabbits on The Mistake Station.89 The station lost a third of its flock in the 1895 snow and numbers continued to decline, reaching their lowest point of 6,500 in 1903 and 1904. The flock recovered to reach over 13,000 before the 1908 snow reduced it to 9,500. In this harsh environment the vegetation had been slow to recover from the damage that rabbits had inflicted on the lower winter country.

One of the most dramatic examples of the impact of rabbits was the collapse in sheep numbers that took place on Earnscleugh. In 1890 the run carried 24,000 sheep; in 1898 it carried 234. This outcome clearly resulted from a long period of overstocking. In 1880 William Fraser told the Rabbit Committee of the House of Representatives that he had taken 160,000 skins off Earnscleugh and estimated that this probably accounted for over 400,000 rabbits as many died in their holes and could not be found after they had been poisoned.90 Wodzicki has calculated that ten rabbits eat the same amount of feed as a 120 pound breeding ewe.91 Using this figure and Fraser’s estimate of rabbits killed, Earnscleugh carried 40,000 stock units in rabbits alone in 1880. Moreover, it is quite clear from the decline in wool weights that Fraser’s Merinos were not the equivalent of a full stock unit at that time. If we estimate the sheep at eighty pounds liveweight, which would be generous, it would have Earnscleugh carrying in excess of 60,000 sheep.

89 Appendix One: CHART: 10.11, p. 377.
90 AJHR, 881, I-6, 6.
equivalents in rabbits. On top of this the station carried 22,000 sheep in 1880. It is fair to say that with the rabbits alone Earnscleugh was badly overstocked and with the sheep on top of that the stocking load was simply unsustainable.

In regions where rainfall was more reliable and where the growing season was longer stations that had been overrun by rabbits recovered to varying degrees. At Five Rivers and Castle Rock sheep numbers and productivity increased after the rabbit eruption declined. At Moa Flat, Gladbrook and Flaxbourne the impact of rabbits had forced a readjustment in the stock loading. At Gladbrook and Moa Flat an increase in cultivation for winter feed helped make up for a decline in the productivity of the natural pasturage on the lower sunny country, although both runs continued to rely on the native grasses for the majority of the feeding requirements of the flock.

Stations that had escaped the worst ravages of rabbits showed little sign of having overreached their stock loading. Mesopotamia in TABLE 6.7 shows an eight per cent drop in sheep numbers between 1879 and 1901; whereas taking a longer run of data, as seen in CHART: 10.9, the station increased sheep numbers by 11.5 per cent in the period up to 1910.92 Moreover, this was all on the natural pastureage. It appears that, during the pastoral era, runs outside the rabbit infested zones had reached a compromise between sheep numbers and sheep productivity. The long term trend of sheep numbers from runs like Leslie Hills, Mt Parnassus, The Terrace, Springfield and Castle Rock, along with the evidence that we have from Mt Peel of increasing stock performance, suggests that when these properties were subdivided they showed no indication that the productivity of the vegetation had declined.

92 Appendix One: CHART: 10.9, p. 376.
Conclusion

From the available data it appears that deliberate overstocking of the rangelands for short-term gain was not widespread during the pastoral era. There was probably short-term overstocking during periods of drought when pastoralists and farmers were slow to make adjustments for feed shortages or where there was simply no outlet for surplus sheep. Outside the semi-arid regions the vegetation recovered well after drought. Over the period of the pastoral era there is strong evidence that the productivity of sheep increased. Unfortunately, this has not been accounted for in the model that uses sheep numbers alone to evaluate the stock loading over time. Overstocking was most marked on stations that were overwhelmed by rabbits. In semi-arid regions the rabbit plague led to gross overstocking of the pasturage and resulted in long-term deterioration of the vegetation. Elsewhere the impact of rabbits led to a downward adjustment of sheep numbers that indicated a reduction in the productivity of the natural pasturage; however, the stock loading was able to be successfully maintained at the lower level. On runs that were unaffected by rabbits there is no evidence of overstocking; indeed, the stock loading was maintained or increased up to the time that these runs were subdivided.
TABLE: 6.9. Sheep numbers in Canterbury and Otago/Southland 1858 to 1912\(^3\)

<table>
<thead>
<tr>
<th>Year</th>
<th>Canterbury</th>
<th>Otago/Southland</th>
</tr>
</thead>
<tbody>
<tr>
<td>1858</td>
<td>495,580</td>
<td>223,597</td>
</tr>
<tr>
<td>1861</td>
<td>877,369</td>
<td>693,843</td>
</tr>
<tr>
<td>1864</td>
<td>1,567,733</td>
<td>1,535,469</td>
</tr>
<tr>
<td>1867</td>
<td>2,496,097</td>
<td>2,989,772</td>
</tr>
<tr>
<td>1871</td>
<td>2,965,701</td>
<td>3,731,445</td>
</tr>
<tr>
<td>1874</td>
<td>3,325,630</td>
<td>4,326,988</td>
</tr>
<tr>
<td>1878</td>
<td>3,560,301</td>
<td>4,446,023</td>
</tr>
<tr>
<td>1881</td>
<td>3,519,404</td>
<td>3,952,022</td>
</tr>
<tr>
<td>1886</td>
<td>4,958,560</td>
<td>4,446,855</td>
</tr>
<tr>
<td>1891</td>
<td>4,307,732</td>
<td>4,291,464</td>
</tr>
<tr>
<td>1895/6</td>
<td>4,716,558</td>
<td>4,365,661</td>
</tr>
<tr>
<td>1896/7</td>
<td>4,301,300</td>
<td>3,995,496</td>
</tr>
<tr>
<td>1897/8</td>
<td>4,379,249</td>
<td>4,021,065</td>
</tr>
<tr>
<td>1898/9</td>
<td>4,072,687</td>
<td>3,961,459</td>
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<tr>
<td>1899/1900</td>
<td>4,040,456</td>
<td>3,715,485</td>
</tr>
<tr>
<td>1900/1</td>
<td>3,951,008</td>
<td>3,746,750</td>
</tr>
<tr>
<td>1901/2</td>
<td>4,318,887</td>
<td>3,987,011</td>
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<tr>
<td>1902/3</td>
<td>4,341,542</td>
<td>3,965,342</td>
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<tr>
<td>1903/4</td>
<td>4,176,236</td>
<td>3,632,765</td>
</tr>
<tr>
<td>1904/5</td>
<td>4,031,681</td>
<td>3,360,743</td>
</tr>
<tr>
<td>1905/6</td>
<td>4,486,275</td>
<td>3,547,768</td>
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<tr>
<td>1906/7</td>
<td>4,485,950</td>
<td>3,788,280</td>
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<td>1907/8</td>
<td>4,325,719</td>
<td>3,859,974</td>
</tr>
<tr>
<td>1908/9</td>
<td>4,487,218</td>
<td>4,317,939</td>
</tr>
<tr>
<td>1909/10</td>
<td>4,627,769</td>
<td>4,586,733</td>
</tr>
<tr>
<td>1910/11</td>
<td>4,620,609</td>
<td>4,563,435</td>
</tr>
<tr>
<td>1911/12</td>
<td>4,311,255</td>
<td>4,607,309</td>
</tr>
</tbody>
</table>

\(^3\)Statistics of New Zealand for the Year 1912 (1913), 530-1.
Chart: 63 MT Peel Wool Production

Actual weights and 5-year moving average
Actual numbers of lambs marked and 5-year moving average.

CHART: 6.1. MT Peel Lamb's Marked.

LAMBS
CHAPTER SEVEN
TRANSFORMING THE LANDSCAPE:
FENCING, CULTIVATION, OVERSOWING AND DRAINAGE

The orthodox analysis of the history of pastoralism and its interplay with the rangeland environment of the South Island is, in Cronon’s terms, declensionist.¹ Kerr in 1992 and Mark in 2004 listed a long line of papers and reports, dating back to Buchanan in 1865, that ‘commented on the actual or impending degradation of the tussock grasslands’.² O'Connor agreed that exploitative pastoralism caused the depletion of the native grasslands, but noted that its impact resulted ‘in great diversity of landscape outcomes’, depending on ‘differences in natural resources’ and from ‘different qualities of invading plants, animals and humans’.³

This chapter argues that the transformation of the rangelands of the South Island through the application of fencing, cultivation, oversowing, and drainage was deliberate and managed. By 1912 the lowland tussock grasslands had been converted from an open rangeland to a mosaic of cultivated paddocks subdivided by fences, hedges and shelter belts of trees. In the hill country and even some mountain lands oversown grasses and clovers had replaced native plants that had been reduced by burning and grazing by sheep. However, the introduction of these practices had unforeseen consequences, as some plants that had been deliberately introduced began to spread and take over large tracts of country, while other plants that arrived as contaminants in seed or on the coats of livestock

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became invasive weeds. In the semi-arid and mountain lands rabbits and the harsh climate provided a disincentive for pastoralists to embark on development in the ways that runholders on easier country did. Moreover, it is apparent, with hindsight, that by the end of the pastoral era parts of the rangelands had probably reached their productive limits within the context of contemporary knowledge and technology.

O'Connor has contended that there was a distinct difference in the practices of pastoralism and pastoral farming. Pastoralists, he says, ‘farmed sheep or land’, they ‘did not farm land under sheep’; moreover, ‘when at different times in different places they began to farm land, they ceased to be pastoralists ... [but became] pastoral farmers’. This chapter will demonstrate that pastoral farming was an early development in the South Island rangelands. This development can be understood in the context of the improvement ideology that permeated Victorian society.

The timing, extent and definition of the concept of the agricultural revolution in Britain have been the subject of considerable debate. Nevertheless, in the nineteenth century a marked increase in agricultural productivity occurred through the application of science and technology to the business. Indeed, there was a fundamental belief in the potential of science to promote agricultural progress. Pastoralists in New Zealand were part of the exchange of ideas: information from the marketplace shaped the products that they produced and the way they prepared them for the market; new technology and ideas, both from abroad and from within New Zealand, shaped farming practices in the rangelands.

**The sequence of intensification in the rangelands**

I have proposed in this thesis that there were five recognisable phases in the process of intensification of land use in the pastoral era. Although he

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was less explicit in distinguishing the phases, historian Jim Gardner's analysis of the pastoral age suggested a similar pattern of progressive development. The five phases can be identified in the following sequence: a period of rapid pastoral expansion where land was claimed, burned and stocked; a time of consolidation involving improvements such as homesteads, woolsheds, stock handling facilities, and the establishment of a few cultivated paddocks to grow feed for horses and milch cows; a development phase involving fencing, drainage, broadcast sowing of 'English' grasses, and cultivation; refrigeration, the turnip 'revolution', and the quest for permanent pastures; and finally the subdivision phase. This model is intended as a conceptual guide to the process of development. It also needs to be acknowledged that not all runs went through all of these phases. Some did not progress past stage two. For others the process began at the outset.

On Acland and Tripp's second exploring trip to Mt Peel Acland took along a bag of clover seed. The two friends burned the vegetation as they explored the country on the south side of the Rangitata River. Later, Acland spread the clover seed over the burned country as they made their way back down the valley. By this action Acland signalled that his intention was not exploitative pastoralism, but pastoral farming through the augmentation of the feed supply. Thus at the very outset Acland combined facets of phases one and three of the model.

Another pastoralist who embarked on the process of improvement during the earliest phase of pastoral expansion was John Hall. He recorded that he had been 'distributing' grass seed on his run, The Terrace, on 30 June 1853. At that time Hall and his two brothers had just taken over the run from Mark Pringle Stoddart. The station consisted of 12,140 hectares

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7 MB44. Acland Family Papers, Box 7, 17-20 October 1855, Macmillan Brown Library, University of Canterbury, Christchurch, New Zealand.
8 Rakaia Terrace Station Journal, 30 June to 14 June 1854, Canterbury Museum Documentary Research Centre, 30 June 1853.
(30,000 acres) and Hall had taken over 1,870 sheep. Clearly, it was not the lack of feed that encouraged Hall to improve the natural pasturage; it was much more likely that Hall was, by nature, an improver. Another example of this took place in June and August 1853 when Hall had his men planting kowhai, koromiko, willows and other trees.

It would be a mistake to imagine that the transition from the utilisation of the unimproved natural pasturage to pastoral farming followed a seamless progression of increasing intensification. As O'Connor has rightly observed, the shift to pastoral farming took place at different times and in different places. There were a variety of reasons for this. One explanation lay in the limitations or opportunities provided by differences in the natural resources of the runs. Off-station financial backing or the ability to borrow capital could provide an incentive for runholders to undertake the move to pastoral farming. Perhaps the most important factor of all in the drive towards pastoral improvement was simply the attitude of the individual runholder. Some went for it ‘neck and crop’ regardless of the cost, while others were laggards who lacked the resources or the vision to undertake the risk of large-scale development. In the end both exploitative pastoralism and pastoral farming have left their imprints on the landscape of the South Island rangelands.

This chapter explores the transformation of the rangelands through fencing, cultivation, oversowing, and the intensification that followed the establishment of the frozen meat industry. It supports the findings from Holland’s and Hargreaves’ study of The Point that pastoral farming was a system of land use that began early in the pastoral era.

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10 Rakaia Terrace, 30 June, 3, 5, 10 August 1853.
11 ‘Neck and crop’ was the term used by James Little, the founder of the Corriedale sheep breed to describe the approach with which he set about improving his sheep, *New Zealand Journal of Agriculture* (15 February 1940), 136.
Early fencing systems before the introduction of wire

Post and rail fencing was one of the earliest methods adopted for enclosing paddocks. The first fencing on Orari Gorge was five miles of posts and four rails erected by Robert Smith. He had helped establish Mt Peel with Acland and Tripp and leased Orari Gorge from 1859. John Hall was another who used post and rail fencing, with the timber cut out of nearby bush. The fences were erected to protect the station’s garden and to divide off small paddocks that were being cultivated for oats, barley and wheat for home use.

Like Hall, Acland and Tripp had chosen their stations well, as both Orari Gorge and Mt Peel had pockets of native bush and there were large stands of native forest close by. Stations on the plains and in the semi-arid country were not so fortunate. In the early years many notices appeared in newspapers advertising post and rails for fencing. Post and rail fencing proved too expensive to be used for fencing large sections and generally it was used for fencing gardens, cultivated paddocks and stock yards.

Sod fences and live fences were cheaper alternatives and so were more widely used in the early years. Ditch and bank fences were preferred in places where timber was scarce. An advertisement in the Lyttelton Times in 1851 described a ditch and bank fence as being a ditch three feet deep and five feet wide at the top, narrowing to a foot wide at the bottom, with a three foot high bank formed by the spoil. Hence the fence was six feet high when newly constructed. In time, of course, the bank tended to settle and collapse so hedges often had to be planted to help hold it together and to add height. Gorse was a particular favourite for this purpose as it proved to be fast growing, but sweet briar and various thorns were also used. In 1851 a ditch and bank fence cost thirteen shillings and nine pence per chain to construct.

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14 Rakata Terrace, 30 June to 9 June 1853.
15 Lyttelton Times, 6 September 1851; 8 March 1856; 25 April 1860.
16 Lyttelton Times, 26 July 1851, p.1.
and, according to Tripp, such a fence cost fourteen shillings in 1862.\(^{17}\) Although he did caution that where the ground was at all stony it might double or treble that sum.

In 1862 Acland hired three men to put up a half a mile of ditch and bank fence on a hill near the station buildings to enclose a paddock of about 1,000 acres to hold sheep at shearing time.\(^{18}\) In June 1867 Acland and his manager, Adam Irvine, laid out an eighty chain (1,610 metre) ditch and bank fence to create a paddock on the ‘home run’ and employed a man to construct it.\(^{19}\) It is highly likely that gorse was planted on both of these fences and by 1880 gorse had started to become a problem on the station.

There were variations on ditch and bank fences. Sometimes a ditch was dug on each side of the bank and an alternative to planting a hedge was to add a post and two-rail fence on top of the bank.\(^{20}\) Another modification to this method of fencing was the construction of sod walls. In July 1864 a notice in the *Lyttelton Times* advertised for ‘some good men’ to do a mile to three miles of sod wall and as late as 1872, well after introduction of lightwire fencing, Henry Ford employed three Irishmen to construct sod fences on Holme Station.\(^{21}\) Similarly, on Mt Peel sod fencing was still being constructed eight years after the first wire fence had been erected on the station. In 1876 a fencer named Hayward contracted to build a sod wall to enclose a new paddock for eleven shillings and sixpence per chain plus one shilling and three pence a chain for planting gorse.

Perhaps the most popular fences of all in the days before the introduction of wire fencing were live fences. They had several advantages

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\(^{17}\) *Lyttelton Times*, 26 July 1851, p.1; C. G. Tripp, *Lecture given by the late C.G. Tripp of Orari Gorge, Canterbury, at Silverton, Devon, 1862* (Wellington: Ferguson and Osborn, 1926), 8.

\(^{18}\) Acland Papers, Box 7, 21 September 1862.

\(^{19}\) Acland Papers, Box 4, 1-4 June, 11 July 1867.

\(^{20}\) *Lyttelton Times*, 7 August 1852, p.9.

\(^{21}\) *Lyttelton Times*, 7 July 1864, p.4; Henry Ford Diary, Typescript of Grampian Hills Station day book kept by Henry Ford until March 1866, the farm diaries of Pareora and Holme Stations, October 1862-December 1873. Canterbury Museum Documentary Research Centre, 31 July 1872.
for both pastoralists and farmers: they were relatively cheap to establish as
the material cost was much lower than it was for post and rail fencing and
they did not require the intensive labour input necessary for the construction
of ditch and banks fences and sod walls; and on the treeless rangelands they
provided much needed shelter from the prevailing winds. The disadvantages
of live fencing included the time it took to establish the plants in order to
provide an adequate fence, and they required on-going maintenance. Hedges
needed to be trimmed regularly to maintain a close, tight form, otherwise the
plants opened up as they grew and gaps developed where sheep could push
through the fence. With hindsight we now know that the most serious
problem with live fences was that some of the most popular plants used for
fencing, in particular gorse, broom and sweet briar, soon became problem
weeds throughout the country.

Gorse, various types of thorn, broom and sweet briar were imported
from both Britain and the Australian colonies from the beginning of
settlement. There was also a brief interest in the Osage Orange from America
as a plant for live fencing.\textsuperscript{22} John Hall planted gorse, broom and quicks as
well as trees in 1853 and 1854.\textsuperscript{23} At Mt Peel planting gorse had been a
regular activity, but by the mid-1870s the station diaries illustrate the
increasing ambivalence with which people were coming to view these plants.

Gorse planting was on-going on Mt Peel in the late 1870s with the last
recorded planting in June and July 1882.\textsuperscript{24} By that time gorse, broom and
sweet briar had already become problem plants. In June 1875 Michael
Mitton, the station manager, employed a man to clear gorse and in April and
July the following year clearing gorse was an on-going job.\textsuperscript{25} In May, June
and July 1878 stubbing gorse and broom had become a regular chore when
nothing more pressing was happening on the station and, from then, the
amount of time put into the job steadily increased. By 1883 trimming gorse
and thorn fences as well as ‘grubbing’, ‘stubbing’, ‘chipping’ and cutting

\textsuperscript{22} \textit{Lyttelton Times}, 28 May 1853, p.5.
\textsuperscript{23} Rakaia Terrace, 30 July, 1 August 1853; 19 January 1854.
\textsuperscript{24} Acland Papers, Box 50, June/July 1882.
\textsuperscript{25} Acland Papers, Box 4, 21-28 June 1875; April, July 1876.
gorse, broom, sweet briar and other weeds had become increasingly time consuming, taking place every month from March to December in that year. This work was carried out in every month of 1888 and at times it appeared that these were full-time jobs for several men. By then it was clear that gorse had got out of control in many parts of the station. In 1890 and 1892 Acland sent men to grub the plant on the Orari River side of the range and in November 1892 John McLeod, a son of Sandy McLeod the head shepherd, was taken on full time at a pound a week to grub gorse. On Forest Spur gorse had become so dense that in July 1893 two men were sent to cut a track through it.

In 1885 Mitton decided to start removing some of the gorse fences and had men working at this throughout September, October and November. Through January, February and March 1887 he employed men to take out another substantial gorse fence which was then replaced by wire fence. Mitton did not say why he decided to remove these fences, but it is not surprising considering the amount of work that went into maintaining live hedges and the problem of the hedging plants spreading.

Despite these efforts to control the plant, by 1925 gorse was well in control of some parts of Mt Peel. At that time botanist H.H. Allan noted that the weed infested a large area of the Rangitata River bed and also formed ‘a striking feature of certain hill-slopes’ on the Rangitata face of the station and the thickets were still spreading. The source of this infestation was the ditch and bank fence constructed on Round Hill in 1862. Allan found that the plant failed to thrive above about 500 metres but spread so aggressively below that elevation that it overwhelmed almost all competition.

26 Acland Papers, Box 50.
27 Acland Papers, Box 50, 8 September; Box 51, 16 May and 1 November 1892.
28 Acland Papers, Box 51, 4 July 1893.
29 Acland Papers, Box 50.
30 Acland Papers, Box 50, 11 January to April 1887.
As early as 1868 a correspondent to the *Press* had warned readers about the threat of gorse, claiming that ‘it has already become a perfect pest’.\(^{32}\) He had observed young plants growing in the middle of large fields and spreading along the roadsides. By this early stage gorse and broom had already spread onto the open river beds in Canterbury. W. Quin, who wrote occasional articles on farming in Otago and Southland for the *New Zealand Country Journal*, noted the gorse infestation in Canterbury in 1892. He thought that gorse and other noxious weeds were bad enough in southern districts, but found them ‘not a patch on South Canterbury’.\(^{33}\) Hedges had not been planted as extensively in Otago and Southland as they had been in Canterbury but when they had been planted it had been done almost exclusively with gorse.\(^{34}\) After the arrival of the rabbit plague in Otago and Southland hedges were seen as a liability as they provided cover for the pest, so in both regions farmers tore them out and replaced them with wire fences.\(^{35}\)

The *Tapanui Courier* was less sanguine about the gorse problem in the district than Quin. In 1887 the paper noted that gorse had become a curse rather than a blessing and blamed careless landowners for letting it spread. In times of flood gorse seed had spread along creek banks where it had formed ‘impenetrable plantations’ and landowners found it ‘almost as hard to clear as rabbits’.\(^{36}\) Despite the cost and effort required to clear the weed the paper was adamant that ‘the gorse must go’.\(^{37}\)

By the mid-1880s live fences had fallen out of favour with pastoralists and farmers. William Morgan claimed that ‘it would have been better had no live fences ever been planted’ as their roots exhausted the soil, they took up room and shelter trees provided better protection from weather than hedges.\(^{38}\)

\(^{32}\) *Press*, 6 October 1868, p.3.
\(^{36}\) *Otago Witness*, 1 July 1887, p.8.
\(^{37}\) *Otago Witness*, 1 July 1887, p.8.
He might well have added that they were time consuming to maintain and that hedging plants spread to take over large tracts of land. The introduction of gorse, broom, sweet briar and thorns for hedging plants and their consequent spread has left an enduring impact on the landscape of the South Island rangelands.

Wire fencing

The development of light wire fencing introduced technology that ultimately changed the shape of sheep farming management in the rangelands. Posts and rails were expensive, ditch and bank fences, sod walls and stone fences were very labour intensive to construct and live fences were labour intensive to maintain, consequently they were used almost exclusively to enclose gardens and paddocks while the open range remained unfenced. Wire fencing enabled pastoralists and farmers to enclose the open range by securing their boundaries and dividing their country into blocks for easier management of their sheep.

As early as 1851 an advertisement appeared in the *Lyttelton Times* for wire fencing and standards to enclose a fifty-acre section.\(^\text{39}\) In the same paper in 1854 two firms advertised sheep netting for sale and in 1856 galvanised iron fencing wire was advertised.\(^\text{40}\) This early wire was difficult to handle as it was of a heavy gauge and only came in short runs, with the result that it was hard to erect and to keep strained.\(^\text{41}\) In 1855 Henry Bessemer patented the process that led to the mass production of steel that resulted in improved fencing wire in the 1860s. From about 1864 advertisements for large quantities of wire, usually four, five or six gauge, and iron standards became commonplace in newspapers.

One of the earliest examples of wire fencing being erected on a pastoral property occurred in 1863 when St Leonards Station in the Amuri

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\(^{39}\) *Lyttelton Times*, 6 September 1851, p.1.
\(^{40}\) *Lyttelton Times*, 4 February 1854, p.4; 11 March 1854, p.4; 9 July 1856, p.1
advertised for ‘men accustomed to the work’ to put up several miles of wire fencing. The following year the Rhodes brothers advertised for tenders to erect five miles of boundary fence on The Levels Station. They specified that the fence was to consist of five wires with iron standards nine feet apart and ten strainer posts to each mile. The wire would have been almost certainly a heavy gauge iron type. This model of fence was commonly erected on run country before the cross breeding of sheep became fashionable, and later became known as a Merino fence. Surprisingly, for all their reputation as being half-wild, Merinos did not put the same pressure on fences as British breeds and were less likely to push through or go over them.

By 1865 wire fencing was becoming more widely adopted. In that year Blue Cliffs Station and Holme Station put up five to six miles of fence on their boundary and Henry Ford, the manager at the Grampian Hills, had six and a half miles of wire fencing erected. John Grigg, who took up Longbeach in 1864, was not one to do things half-heartedly and in 1866 he called for tenders for the construction of twenty miles of wire fencing on his run.

These examples show that by the mid-1860s wire fencing technology was being readily adopted in the South Island, however the shift away from the old methods was not completely clear-cut. In 1863 St Leonards called for contractors to erect wire fencing on the run and four months later let a tender for the construction of ditch and bank fencing. Similarly, in 1867 Henry Ford had two groups of contractors working at Holme Station, one lot erecting wire fencing and the other sod fences. In Otago the old and new methods were blended. Agricola, writing in the Otago Witness, claimed that in the open tussock country in the 1870s the farmer’s fence was ‘a three-sod

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42 Lyttelton Times, 23 May 1863, p.6
43 Timaru Herald, 15 October 1864, p.5.
45 Press, 17 September 1866, p.2.
46 Lyttelton Times, 26 May 1863, p.6; 26 September 1863, p.2.
47 Henry Ford Diary, April to 8 October 1867.
wall and ditch with three No. 9 wires on top supported with iron standards' with gorse planted along the bank.48

Increasingly, however, on the pastoral runs wire fencing replaced the old methods and there are some compelling examples of the uptake of the technology. By 1871 Tripp had thirty miles of wire fencing on Orari Gorge and by 1874 this had doubled to sixty miles.49 In 1874 Clent Hills Station in the Ashburton Gorge was advertised for sale with twenty-five miles of fencing, while Alford Station in the Canterbury foothills was put up for sale with fifty-one miles.50 Blue Cliffs had ninety-three miles of fencing erected when Robert Heaton Rhodes purchased the station in 1878.51 This consisted of twenty-seven and a half miles of wire fencing on the station boundaries, thirty-one miles subdividing blocks and paddocks, six miles fencing off plantations of trees, and one mile of wire fencing on sod walls at the homestead, making sixty-five and a half miles of wire fencing. In addition there were twenty-eight miles of sod fences on Blue Cliffs.52 However, it is unlikely that any other run in the South Island rangelands could match Moa Flat Station which had 250 miles of fencing in place by the middle of 1879 and the work was still progressing.53

The map of Sir John Hall’s Terrace Station illustrates the extent of the subdivision that had been established on some runs by the turn of the twentieth century.54 This map was created to demonstrate the shelter planting on the Terrace, but it also illustrates the degree to which fencing had transformed some stations from runs to large paddock farms. This very point had been predicted by the Timaru Herald as early as 1873 when it noted the development taking place in parts of South Canterbury. The paper described how runholders had turned ‘paddock farmer[s] on a large scale’, working

\[\text{References:}\]

48 Otago Witness, 2 March 1904, p.7.
50 Press, 21 January 1874.
51 Woodhouse, Blue Cliffs, 28-32.
52 Woodhouse, Blue Cliffs, 28.
their land ‘by judicious subdivision – by the useful wire fences – to carry far more stock than it does when left open for stock to range over at will’.55

**Wire fencing on Mt Peel**

When Alexander Hewson mustered on Mt Peel in 1864 the station was unfenced apart from the paddocks at the homestead.56 Six men with two dogs mustered the whole 100,000 acre station which at that stage ran a flock of 18,000 sheep. The first fences on Mt Peel were post and rail, and ditch and bank. The first wire fence was erected near the new homestead, Holnicote, in 1868.57 By 1912 the station had been well subdivided into twenty blocks and forty-six paddocks.58 The rate and shape of this subdivision is the subject of this section.

TABLE: 7.4 shows the progressive development of paddocks on Mt Peel from 1860 to 1900. Unfortunately, Dugald Livingston who replaced Oliver Scott Thomson as manager at Mt Peel late in 1905 did not maintain the diaries as had his predecessors, so from that time there is no information about on-going development on the station. Another problem arising from the diaries is that often when fencing was being erected the writer did not say what paddock or block was being created. Therefore the chart shows paddocks when they were first named. It may well have been that some of these paddocks had been established earlier than they appear in the chart, but there is no way of substantiating that.

What the table does illustrate was increased intensity of development from the mid-1880s. Between 1871 and 1881 eleven named paddocks were established on Mt Peel, whereas, between 1886 and 1900 thirty new paddocks were formed. This intensification in land use represented a response to a change in farming policy largely resulting from the introduction of refrigeration. With a decline in prices for fine wool and the

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55 *Timaru Herald*, 4 July 1873, p. 4.
56 A. Hewson, 9.
57 Acland Papers, Box 4, 6 August 1868.
58 TABLE: 7.4, p.269; TABLE: 7.5, p.270.
prospect of improved prices for young sheep suitable for fattening for the freezer trade, and old ewes to be sold for lamb breeding down country, cross breeding became fashionable on many pastoral properties including Mt Peel. This move to cross breeding increased the number of classes of sheep that needed to be separated out at certain times of the year. The move to trying to fatten sheep necessitated more cultivation to grow turnips and improved grass paddocks; this too required more subdivision.

Similarly, TABLE: 7.5 reveals an increase over time in the number of blocks on the range country. Initially many of these blocks were simply the names of places on the run and the management of the station relied on natural boundaries or boundary keepers to hold the sheep on particular areas. From the early 1870s the process of subdividing hill blocks with wire fencing began with the Razor Back being fenced in 1872, and the Horse Spur and Raro Spurs in 1874. The 1889 map prepared for the 1890 general auction of South Canterbury leasehold runs illustrates the considerable amount of fencing that had been done on the hill country to that time.59

The map shows that over the back of the Mt Peel Range there was a boundary fence between Mt Peel and Clayton Station that ran up the Walker Spur and along the Phantom River below the Big Fork Block. Further downstream at the confluence of the Hewson, Phantom and Orari Rivers there was a set of sheep yards. This area was originally called Watersmeet by Acland, but over time that name fell out of use. The Camp Gully Hut and yards were three miles up the Hewson River from Watersmeet. In 1891 a fence was erected just upstream from the Camp Gully hut to Coal Hill, joining a fence that went down the Rangitata face and subdivided Coal from Upper Sew Point.60 In all there were five main blocks on the Orari side of the station: Big Fork, Little Fork, Tin Hut, Thatcher's and an area of rough country east of Mt Peel Creek. The Big and Little Forks were subdivided by a fence that ran from the boundary fence at the Phantom to the Hewson River

59 Acland Papers, Box 88, Pastoral Runs in the Canterbury Land District (1889). MAP: 2.2, p.81.
60 Acland Papers, Box 51, 20 February 1891.
at the Quartz Hut. The fence then continued up over a saddle on the main range before dropping down to the Stew Point yards and paddocks.

On the Rangitata side of the station considerably more subdivision took place. A boundary fence ran between Mt Peel and Mesopotamia Station at Forest Creek, but apart from that the Forest Creek and Ben McLeod country was completely unfenced down to the Stew Point yards. A long fence ran along the ridge of the Front Range from above the Stew Point yards over Coal Hill and took in the head waters of Boundary Creek and Rawles Gully to the head of Lynn Creek. Below this another long fence ran from the swamp at the bottom of Coal Creek, subdividing Upper Stew Point from the Isolated Hills, and after subdividing off the Razor Back and the top of Parson it joined the fence that ran along the ridge of the Front Range.

Along the front country from the eastern boundary with the forest reserve the blocks were Forest, the Horse Spur, Parson, the Razor Back and Little Razor Back, Lower and Upper Stew Point, the Near and Far Isolated Hills and Coal. The paddocks and cultivated country were on the flats and terraces below these hill blocks. The Mothering Paddock had been subdivided off the bottom of the Horse Spur east of Lynn Creek. On the other side of the Lynn is the station complex. Round Hill lies between the Lynn and the homestead, and below Parson. The Burke’s Flat paddocks and the Terrace are on a terrace above the homestead and Thew’s and the Roadside paddocks run along Chapman’s Gully. Between Chapman’s and Rawles gullies are Rawles and Chapman’s paddocks and Rawles yards.

**Fencing and the intensification in the management of sheep on Mt Peel**

The increase in fencing on Mt Peel was a reflection of the increase in sheep numbers and an increase in the different classes of sheep that needed to be managed separately, particularly after the station progressed into cross breeding. Until 1869 the Mt Peel flock was carried on the Rangitata country from the forest reserve at the eastern boundary to Forest Creek on the western boundary, where Sandy McLeod served as the boundary keeper. The
first muster of the Orari country was recorded in December 1869 when the station ran about 30,000 sheep.\textsuperscript{61}

For the next fifteen years the sheep management on the station remained quite simple with the ewes run on the Rangitata country for most of the year, the wether flock had the run of the Orari and the high country, and the young sheep were wintered on turnips and the hill blocks near the homestead, and summered on the Forest Creek Forks, a block between Rata Creek and Forest Creek.\textsuperscript{62} Most of the fencing through this period was done to create paddocks and was linked with cultivation to grow turnips and ‘English’ grasses.

Through the decade of the 1870s the Mt Peel flock increased to over 44,000 sheep, and in 1883 the station began to increase the number of ewes it kept. However, with these higher sheep numbers and the increase in cultivation, footrot became a serious animal health problem in the early 1880s. It probably resulted from a combination of these three factors - the increase in overall sheep numbers, the increased number of breeding ewes, and footrot - that led to a change in the way the station was managed. In February 1884 the ewes and lambs were pushed out from the front blocks of the Razor Back, Horse Spur, and Ram Spurs on to the open range of the Mt Peel country. The following month the lambs were weaned at the Orari yards for the first time. In April 1884 the main mob of ewes were mated on the Orari country while selected ewes were mated on the paddocks and hill blocks on the front country. As cross bred sheep came to make up an increasing proportion of the flock the grass paddocks and improved hill blocks were set aside for them. The Merino ewe flock spent much of the year in the Orari and late summer on the Mt Peel Range; the decreasing number of Merino wethers summered in the Butler’s Forks and high on the Ben McLeod range and wintered on the Mt Peel Range; the young Merino sheep wintered on the Isolated Hills and summered on the Forest Creek Forks.

\textsuperscript{61} Acland Papers, Box 4, 31 December 1869.
\textsuperscript{62} Maps show Rawtor Creek, but local usage changed it to Rata.
The shift to cross breeding put a good deal of pressure on the existing fencing on Mt Peel in several ways. When Oliver Scott Thomson took over the manager’s position in January 1894 he found that the early fencing, which had been erected to control Merino sheep, was often ineffective at keeping the larger and stronger cross bred sheep where they were meant to be. The old Merino fences were too low, and some of the fences on the front spurs did not encircle a block, but simply ran into the bush and stopped. Crossbred sheep went over and around these fences, whereas Merinos stayed inside them. However, money was tight on Mt Peel in the 1890s and Scott Thomson’s appeal for more fencing on the hill country could not be met.

In 1898 he again requested money for more fencing. He wrote to Dalgety and Company, who administered the station at that time, complaining that the property could not be managed to its best advantage because it lacked enough subdivided blocks. He had put in about five miles of fencing in the time he had been at Mt Peel but most of that had been to create more paddocks. He complained that with separate Merino and crossbred flocks he needed twenty-five miles of new fencing to manage all the different classes of sheep. Scott Thomson then set out the advantages that would accrue from this subdivision: it would make the run more easily worked; it would make mustering more straightforward; it would enable him to keep different classes of sheep separate with the result that they would do better; it would assist in keeping snow losses to a minimum; and it would save labour currently spent on boundary keeping.

He gave the example of how three miles of fencing would give him three separate blocks of country whereas at present he had to employ one and sometimes two boundary keepers for three or four months to prevent the sheep from moving from one block to another. One of these blocks was

63 Acland Papers, Box 13, 29 September 1894.
64 Acland Papers, Box 51, 4 October 1894.
65 See Chapter 8, p.309, to account for the involvement of Dalgety and Company in the administration of Mt Peel at this time.
66 Acland Papers, Box 57, 29 August 1898.
Some of the best country on the run', he wrote, and could fatten 1,500 to 2,000 sheep. The cost of the fence, he claimed, would soon be recovered by saving on the labour bill.

It is easy to sympathise with Scott Thomson when you see a breakdown of the flock structure from the time. In March 1899 he had 49,979 sheep on the station in over a dozen different classes: there were 5,747 crossbred sheep consisting of lambs, two-tooth ewes and two-tooth wethers; 18,833 half-bred sheep including lambs, two-tooth ewes and mixed age ewes, as well as a half-bred wether flock; the Merino flock numbered 25,088 sheep and was made up of lambs, two-tooth ewes, mixed age ewes, and cull ewes, with a mixed age wether flock and a mob of cull wethers. There was also a mob of 311 rams. At that time there was fifty-seven miles of wire and standard fencing on the leasehold runs. Unfortunately, Scott Thomson did not provide the details of the amount of fencing on the freehold land, where most of the development had taken place.

Scott Thomson retired at the end of 1905 and Livingston took over the manager’s position. The change in manager seemed to loosen the purse strings of the administrators as Livingston marked out a new fence on the hill country within a month of taking up his new position. The new line started at the existing fence that subdivided the Tin Hut block from the Big Fork block. It ran up the hill on to the top of the range then continued down the front face west of Rata Creek to a swamp where the creek ran into the Rangitata River. Livingston thought it a good line as it followed a leading ridge without rocks and creeks. He ordered 4,200 iron standards, sixty-five T-iron intermediate posts and six tons of wire to complete the fence that he had chained out as being seven miles and ten chains (11.464 kilometres) long.

This new fence created a discrete block fenced on three sides with the fourth boundary being the Rangitata River. After the subdivision of Mt Peel

67 Acland Papers, Box 57, 15 March 1899.
68 Acland Papers, Box 57, 7 August 1899.
69 Acland Papers, Box 57, 17 January 1906.
70 Acland Papers, Box 57, 3 February 1906.
this block became known as Rata Peaks Station. Of the five small grazing runs and one pastoral run that were subdivided off Mt Peel Station and auctioned in 1912 only Rata Peaks and Ben McLeod had anywhere near secure boundaries. Stew Point, Coal Hill, Whiterock and Waikari Hills all had unfenced boundaries, with each other and with Mt Peel Station. In July 1911 Livingston ordered 20,000 standards and 360 T-irons as well as other fencing material which was enough to erect over fifty-four miles of fence. It is likely that this fencing material was purchased as part of the subdivision process in order to make each new run a discrete property.

The changes in fencing technology and the intensification in fencing on Mt Peel is representative of the process of development on rangeland country in the pastoral era. The progression began with post and rail fencing to create gardens and stock yards, and sod fences planted with hedging to create the first paddocks. The introduction of wire fencing enabled runholders not only to enclose more paddocks, but also to subdivide the open range. Scott Thomson had set out an excellent summary of the advantages of this subdivision in his letter of 1898 in which he requested funds for more hill fencing: it made the management of the station more straightforward; it reduced the amount of labour required; and it enabled the management to keep the stock on safe country in winter.

He might also have noted that fencing enabled runholders to save feed and to utilise different parts of their stations at different times of the year. Adult sheep were put out onto the high country in summer which allowed the lower sunny country to be spelled for wintering. Shepherds shifted young sheep around the paddocks and fenced-up lower hill blocks, getting the best of the grazing, which gave them the chance to grow. Fencing also allowed better utilisation of feed. On the open range sheep naturally congregated on the sweeter parts, leaving dark country to grow rank and unpalatable. That compelled runholders to burn in order to open up the overgrown areas and to

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71 Acland Papers, Box 88, Map, 20 February 1912, showing runs to be offered for sale by public auction. Map: 2.3, p.82.
72 Acland Papers, Box 57, 3 July 1911.
encourage sheep on to them. Fencing off sunny and shady country and forcing sheep on to smaller blocks of country meant that they grazed blocks more evenly. In all, fencing had a profound affect on the management of pastoral runs and on the landscape of the rangelands in the pastoral era.

**Enhancing the feed supply by cultivation**

Fencing enabled pastoralists to better control the grazing pattern of their sheep; cultivation and oversowing helped to increase the quality and quantity of that grazing. As with fencing, cultivation technology and methods progressed during the pastoral era.

Cultivation was an integral part of the early pastoral expansion, although it was only practiced on a small scale. There were obvious reasons for this. Runholders were out to make their money from exporting fine wool which was in demand, rather than from grain production for which there was only a limited market. Moreover early cultivation methods were very slow. Ground to be broken up at first had to be burned then ploughed using bullock teams. Commonly these were made up of six bullocks, a single furrow plough, a ploughman and a bullock driver. The process often required stones, cabbage trees, flax and the unburned crowns of tussock to be removed by hand, so that only small areas could be developed at any one time.

Nevertheless many pastoralists broke up ground to grow cereal crops for their own use. The Hall brothers sowed small acreages of wheat, oats and barley on the Rakaia Terrace Station in the spring of 1853. Interestingly, the Halls had started out using horses as draft animals, but changed to bullocks for cultivation and haulage work after the horses had struggled to drag timber out of the bush. At the neighbouring station, Rockwood, the

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73 A. Hewson, 10.
74 Rakaia Terrace, 11 August, 29 August 1853.
Phillips family sowed barley and oats in the spring of 1855. Acland’s diary records oats being sown on ploughed land in October 1859. He had returned to England during 1857 and 1858 so it is possible that cultivation began at Mt Peel at an earlier time than this but was not recorded.

The beginnings of what became a standard rotation were worked out in these early years of the pastoral expansion. Turnips were sown on the newly turned sod as winter feed for young sheep, followed by a cereal crop or successive cereal crops, and then ‘English’ grasses. The Hall brothers sowed down a paddock with a mix of grass and turnips in the spring of 1853 and the following year sowed grass on a paddock after oats had been taken off it. At Rockwood Henry Phillips undersowed sowed clover on the oat paddock, and grass with barley in November 1855, so that when the crop was harvested the clover and grass would already be established.

From these early beginnings the area of cultivated country steadily increased. In 1865 an article in the Australasian commented that runholders in the South Island were ‘making extensive changes, by substituting English grasses for the native kinds’. Data from the 1865 census (TABLE: 7.1.) provides some qualified support for this claim. It shows the increase in fencing and the increase in cultivation from 1855 to 1864. Over fifty per cent of the cultivated area was sown in grasses.

<table>
<thead>
<tr>
<th>Year</th>
<th>Land Fenced (Acres)</th>
<th>Under Crop (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1852</td>
<td>5,000</td>
<td>1,200</td>
</tr>
<tr>
<td>1858</td>
<td>22,926</td>
<td>13,935</td>
</tr>
<tr>
<td>1865</td>
<td>342,416</td>
<td>70,000</td>
</tr>
</tbody>
</table>

75 Rockwood Station Diary, 1855 to 1857, Documentary Research Centre, Canterbury Museum, 25-26 October 1855.
76 Acland Papers, Box 7, 13 October 1859.
77 Rakaia Terrace, 6 October 1853, 19 June 1854.
78 Rockwood Station, 27 November, 29 November 1855.
79 The Australasian, 14 February 1865.
80 Southern Provinces Almanac, 1853, 28; 1860; 1866, 56.
With wool prices in decline pastoralists and farmers looked for new ways to make their properties profitable. In 1867 an experimental shipment of wheat and flour was made from Temuka, in South Canterbury, to England. In time, this led to a boom in the production of wheat for export that transformed the landscape of the plains and downlands of Canterbury and North Otago. Technological and economic forces combined to stimulate this shift in focus from fine-woolled sheep to corn. The development of more rugged locally designed and manufactured ploughs, more suited to local conditions than imported English and Scottish ploughs, made the work easier. The spread of the rail network in Canterbury allowed grain growers to get their crops to the ports more readily and improvements in shipping enabled the crop to be shipped to England where, for a time, there was a ready market.\(^1\)

While the big stations of lowland Canterbury and North Otago embarked on wheat growing as a profitable enterprise, it was also part of an ecological transformation of the lowland rangelands. According to O’Connor, the native pasturage that had sustained the rapid expansion of pastoralism had reached its productive limits by the late 1870s. Large scale cultivation associated with the wheat bonanza enabled runholders to economically replace it with ‘English’ grasses.\(^2\) In 1873 the *Timaru Herald* noted that south of the Rangitata thousands of acres of coarse tussock were ‘giving way to the cultivated grasses’ which increased the carrying capacity of the land ‘from three to nine fold’.\(^3\) The Windsor Park Estate in North Otago harvested grain crops off 2,000 acres in 1874, producing 50,000 bushels of wheat, 12,000 bushels of oats, and 8,000 bushels of barley, most of it destined to be shipped to England.\(^4\) The land was then to be sown down in grass. In 1880 the same property had 2,800 acres in crop including 600 acres sown in turnips and rape for feeding sheep.\(^5\)

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\(^3\) *Timaru Herald*, 4 July 1873, p.2.

\(^4\) *Timaru Herald*, 23 February 1874, p.4.

\(^5\) *Otago Witness*, 27 March 1880, p.6.
By the early 1880s the scale of cultivation on the rangelands had increased enormously. In 1880 Te Waimate had 5,000 acres sown in wheat and laid down 5,000 acres of new grass on the previous year’s stubble, bringing the total area of the run in grass to 15,000 acres. The Waimea estate in Southland had 25,000 acres of cultivated country sown in grass, turnips and cereal crops in 1880. In Otago over half of the Greenfield Estate’s 24,000 acres had been cultivated by the end of 1880. The owner’s policy was to never take more than one crop of cereals before sowing the block in turnips or rape and then in grass. In 1880 2,500 acres of turnips had carried 20,000 sheep for three months to fatten them for the Dunedin market.

These statistics show that turnip farming was well established by the late 1870s. The Country Journal wrote in 1877 that ‘[m]ost of the fat sheep brought forward have been turnip-fed, a branch of farming that is now universal in Canterbury’. In addition to their qualities as fattening feed for sheep, farmers used turnips as a restorative crop in the progression from native grassland to improved grassland. Turnips were often sown on the newly turned sod. After they were fed off, the land was cross ploughed and sown in a cereal crop. They were sown again after a cereal crop had been taken to restore the land before it was sown into pasture. The heavy concentration of sheep feeding on the turnip crop returned nitrogen to the soil, which benefited the subsequent crop. This system of land use gave runholde’s in the South Island an advantage when the British market for frozen meat was opened in the early 1880s.

The adoption of improved methods was so widespread in the South Island rangelands that P.B. Boulton, Chief Inspector of Sheep, reported in 1878 that ‘which remain pure and simple “squattages,” [sic] are 48 in number, situated in the Wanaka, McKenzie [sic], Upper Ashburton, Upper Rakaia, Upper Waimakarari [sic],

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86 Otago Witness, 16 October 1880, p.7.
87 Otago Witness, 27 March 1880, p.5.
88 Otago Witness, 20 November 1880, p.6.
and Upper Hurunui Districts. These districts are dominated by mountain lands less suited ecologically to the changes taking place on the plains, downlands and easier hill country in the region. Yet even on a mountainous run like Mt Peel the easier country was increasingly given over to cultivation from the mid-1870s.

**Cultivation on Mt Peel**

As has already been noted, Mt Peel grew oats on cultivated ground in 1859 and possibly earlier. This became an on-going practice on the station. Ground that had been cultivated for growing oats was sown down in pasture that was made into hay. Acland made the first reference to hay making on Mt Peel in 1870. In 1871 Acland ordered a mowing machine, which suggests he planned to increase the amount of hay made. The first reference to growing turnips appeared in December 1875 when Mitton purchased a ‘sowing machine’; turnip sowing commenced three days later and continued until the end of the month. The turnips were used for wintering the young sheep. In 1877 Mitton noted that 5,400 lambs were put on to a turnip break late in May. Each paddock of turnips was divided into sections, called breaks, with sheep netting. This prevented the sheep trampling and wasting the crop. As each break was eaten off a new section was opened up. Often the shells of uneaten turnips that the sheep could not get at were grubbed up to make them available, so that there was very little wastage.

As the area to be cultivated increased the work was let to contract ploughmen. In 1876 a contract was let for breaking in new ground at twelve shillings per acre. Before the job commenced station hands spent days digging out cabbage trees and clearing tussocks and stones from the area to be ploughed. This new paddock on the Terrace was fenced off as it was ploughed.

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91 Acland Papers, Box 4, 7 January 1870.
92 Acland Papers, Box 4, 6 to 31 December 1875.
93 Acland Papers, Box 4, 9 to 29 August 1876.
By 1880 Mt Peel had established an annual cycle of agricultural work that began in early spring with the arrival of contractors to plough new ground for the season’s crops. The timing of sowing varied with the season, but the usual pattern was for oats to be the first crop sown, sometimes as early as August. Grass seed was normally in by the middle of November; then followed the first turnip sowing. The sowing times for turnips was staggered so that the entire crop did not reach maturity at the same time. There was often a month or more between putting in the first paddock of turnips and the last. In January and February contractors were employed to mow oat and hay crops and station staff brought them in. In some years they made part of the oat crop into oaten hay.\textsuperscript{94} Following the harvest the oat paddock was lightly cultivated and sown down in grass in March or April.

Mt Peel followed the common practice of sowing rape with grass seed when paddocks were laid down. The rape was break-fed in the same manner as turnips, but used for quality summer feed to fatten sheep. In early March 1879 a mob of wethers were put on to a paddock of rape. Later the mob was drafted and the fattest sheep delivered to Washdyke, on the outskirts of Timaru, where a boiling down works had been established in 1869 and a factory for tinning meat for export was opened in 1870.\textsuperscript{95}

**Oversowing the rangelands**

Cultivation was a means of replacing native plants with more desirable species. Land was ploughed to bury plants and seeds that might compete with the new crop and to create a fine firm seedbed to provide suitable conditions for the sown seeds to germinate and grow. The drawbacks were that cultivation was expensive and in some conditions, such as on hill country and in stony areas, it was not practicable to work the ground. In these situations oversowing - spreading seed by hand on the surface of the ground - was the only method available to pastoralists and farmers to enhance the feed supply.

\textsuperscript{94} Acland Papers, Box 50, 5 February 1885, February 1886,

\textsuperscript{95} Acland Papers, Box 50, 3 March, 8 April 1879; Woodhouse, 6.
We have already seen that Acland sowed clover seed after burning when exploring Mt Peel in 1855 and Hall had spread grass seed at the Terrace in 1853, so it is clear that oversowing constituted part of the effort by pastoralists to improve their country from the outset. On Mt Peel the practice of spreading grass seed on the range country had been established as part of the annual cycle of work by the middle of the 1870s. It is possible that it was part of the annual round before this time, but the station diary reported little detail on day to day work until Michael Mitton replaced Andy Irvine as manager at the start of April 1873. From that time until Oliver Scott Thomson retired at the end of 1904 the diaries hold reasonably thorough accounts of the day to day activities on the station.

In April 1874 Mitton sowed grass seed at the Long Fence and the following month had a man sowing grass in the Receiving Paddock.96 In the early spring of 1876 a man burned Round Hill and the next day sowed grass seed on the block.97 This became standard practice on Mt Peel in subsequent years. In January 1879 Mitton first recorded that the station staff cut cocksfoot for seed. Thereafter this was recorded annually until January 1893, but as oversowing cocksfoot continued to be recorded it is likely that they continued to harvest cocksfoot after that date. It is difficult to know how much oversowing was done, but in some years it was clearly extensive. In 1878 grass was sown on fourteen days between 14 and 31 October, from 1 to 9 November and on 30 and 31 December – twenty-four days in all.98

Cocksfoot appeared to be the favoured grass for oversowing on Mt Peel and elsewhere, but it was not the only species used for the practice. In 1890 John Acland, who had taken over the manager’s position when Mitton had died suddenly in July 1888, sowed an acre of prairie grass.99 With such a small area sown it is likely that it would have been for seed production. It was not recorded whether it was successful or whether the seed was used for oversowing or drilling in cultivated paddocks. In the spring of 1897 two men

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96 Acland Papers, Box 4, 15 April, 28 May 1874.
97 Acland Papers, Box 4, 18, 19 August 1876.
98 Acland Papers, Box 50, back page of 1879 diary.
99 Acland Papers, Box 52, 28 April 1890.
sowed a paddock of crimson clover.\textsuperscript{100} As in the case of the prairie grass, it is likely that the clover, sown on its own, was intended as a seed crop and it is possible that it was to be used for oversowing on the hills.

It seems clear that burning and oversowing on the rangeland on Mt Peel provided a reasonably successful means of enhancing the feed supply on the run where cultivation was not a feasible option. A useful example of the efficacy of the practice came from the 15,333 acre Kinlock Estate, Little River, which had been oversown with cocksfoot and clover and carried two sheep to the acre.\textsuperscript{101} The following table shows that oversowing was widespread throughout Marlborough, Canterbury and Otago/Southland between 1880 and 1911. It is notable that for every acre of cultivated grassland there were just over four acres of oversown grassland 1911 in Marlborough, whereas in Otago/Southland this figure was reversed as there were nearly four-and-a-half acres of cultivated grasses to every acre of oversown land. In Canterbury there were nearly three acres of cultivated grasses for every acre of oversown country.

This variation can be accounted for by differences in landscape between the regions. Marlborough is predominantly hilly country with less extensive easily cultivated country than Canterbury and Otago/Southland. Moreover, the vegetation on the region’s hills was more open than those of the higher rainfall parts of the southern regions and therefore more suited to oversowing. The lower rate of oversowing in Otago and Southland can also be attributed to ecological factors. In the semi-arid parts of Central Otago, oversowing proved unsuccessful because in dry seasons the seed either could not strike nor the seedlings survive. The high rabbit population in those regions would have also taken a heavy toll on any seedlings that did manage to strike. In wetter parts, particularly in Southland, the heavy vegetation cover on the flats and easy hills meant that there was too much competition for oversowing to be successful and cultivation proved necessary to remove the heavy tussock cover. Canterbury had large areas of plains and downlands

\textsuperscript{100} Acland Papers, Box 52, 13 October 1897.
\textsuperscript{101} Otago Witness, 21 June 1905, p.22.
suited to cultivation, but there were also extensive areas of open hill country in the Amuri and along the foothills where there was adequate rainfall for oversowing to be successful.

**TABLE: 7.2. Area (acres) of cultivated pasture and oversown pasture in Marlborough, Canterbury and Otago Southland**

<table>
<thead>
<tr>
<th>Year</th>
<th>Marlboro’ Cultivated</th>
<th>Canterbury Cultivated</th>
<th>Otago/Sthld Cultivated</th>
<th>Marlboro’ Oversown</th>
<th>Canterbury Oversown</th>
<th>Otago/Sthld Oversown</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>15,991</td>
<td>542,972</td>
<td>357,880</td>
<td>36,935</td>
<td>172,166</td>
<td>111,278</td>
</tr>
<tr>
<td>1885</td>
<td>35,175</td>
<td>1,012,964</td>
<td>830,804</td>
<td>82,195</td>
<td>202,271</td>
<td>157,767</td>
</tr>
<tr>
<td>1890</td>
<td>50,323</td>
<td>1,093,920</td>
<td>1,053,421</td>
<td>111,639</td>
<td>218,933</td>
<td>158,310</td>
</tr>
<tr>
<td>1895</td>
<td>63,521</td>
<td>1,384,950</td>
<td>1,303,670</td>
<td>162,350</td>
<td>329,082</td>
<td>221,926</td>
</tr>
<tr>
<td>1900</td>
<td>91,292</td>
<td>1,419,466</td>
<td>1,436,698</td>
<td>200,570</td>
<td>350,405</td>
<td>293,177</td>
</tr>
<tr>
<td>1905</td>
<td>98,964</td>
<td>1,511,335</td>
<td>1,521,614</td>
<td>283,134</td>
<td>431,329</td>
<td>299,425</td>
</tr>
<tr>
<td>1911</td>
<td>100,255</td>
<td>1,455,519</td>
<td>1,566,875</td>
<td>421,888</td>
<td>507,446</td>
<td>352,749</td>
</tr>
</tbody>
</table>

**Draining the swamps**

According to Geoff Park, drainage has reduced New Zealand’s freshwater wetlands from 670,000 hectares to about 100,000 since the beginning of European settlement. This decline, in the order of eighty-five per cent, is one of the most dramatic known anywhere in the world. Swamps were a significant feature of the South Island rangeland landscape, particularly along the coastal fringe in Canterbury. In the general Christchurch region an unbroken stretch of wetlands extended from Rangiora to Lake Ellesmere and the lower reaches of the Rakaia River. Another large area of swamp was found in the Ashburton district around the mouths of the Ashburton and Hinds Rivers and extending to the Rangitata outlet. In South Canterbury there were extensive coastal swamps near Temuka and Waimate. Further south a large wetland area was found in the lower Taieri south of Dunedin, and Southland had considerable swamplands between the mouth of

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102 *Statistics of New Zealand, 1870 to 1912.*

the Mataura River and Invercargill as well as numerous smaller wetlands near some of the rivers.104

The drainage of wetlands had been an integral part of the agricultural revolution in Britain from the second half of the eighteenth century and settlers in New Zealand were aware of the potential productivity of developed swamps. Drainage began very soon after the first settlements were established in Canterbury. John Macfarlane, a Border Scot, arrived in the district in November 1850 and took up the Loburn run the following year. It was not a good choice. In 1862 he sold it and purchased a block of the Rangiora swamp which he set about draining.105 Macfarlane had seen large scale drainage and land development near his home in Scotland and knew the potential of the country. The reclaimed land was well suited for cropping, and raising and fattening cattle and Coldstream became a successful and valuable property.

The most famous story of drainage in New Zealand in the nineteenth century belonged to John Grigg. Between 1864 and 1871 he established Longbeach on 31,000 acres of what was predominantly swamp land lying adjacent to the coast between the Ashburton and Hinds Rivers.106 In 1867 he began the process of drainage on the station by cutting open ditches at regular intervals. Once the drying out process was underway he burned the country and oversowed it with clover and grass. As he refined the system Grigg began using tile cross drains between the ditches and built a factory to supply tiles for the work.107 In time he drained about 25,000 acres on Longbeach in this way. After consolidating the land he cultivated it for cropping, growing green feed and sowing down permanent pasture. In the 1878-80 season 3,000 acres were in grain, 1,400 acres under mangels and

107 John Small and Gilmour Blee, Miles of Tiles. A Journey through Longbeach and Surrounding Districts History (2d. ed., Ashburton: Longbeach and Districts Historical Committee, 1999), 46.
turnips, rape, and potatoes, with 300 acres mown for hay. The estate carried up to 3,600 cattle, and 12,000 sheep, as well as 3,000 pigs.\footnote{Country Journal, Vol.4, No.4 (July 1880), 232.}

Drainage proved important in land development in Southland where runholders and farmers responded to the decrease in rabbit numbers and the development of refrigeration by increasing the area of country that they drained using tiles and the mole plough.\footnote{Country Journal, Vol.16, No.5 (September 1892), 445.} John Fowler had developed the mole plough in England in 1850 to drain water through the soil profile in heavy clays and the innovation proved to be very effective in some Southland areas.\footnote{Michael Lane, History of Steam Ploughing, 1998, <http://www.steamploughclub.org.uk/history.htm> (11 December 2006).}

The drainage of wetlands on Mt Peel bore no comparison with that of Longbeach or Southland, but there were several swamps on the run, particularly at the bottom of the terraces. As the station developed, work was done to drain them. Initially, when conditions suited the wetlands were burned. During a very dry season in 1862 Acland took the opportunity to burn a swamp and cleared the vegetation completely. In 1864 he fired a wetland he called Turkey Swamp.\footnote{Acland Papers, Box 7, 13 December 1862; Box, 4, 27 July 1864.} Burning would have cleared off the rank vegetation, but would have not made the swamps more productive as they would have recovered quickly in wet seasons. By the mid-1870s the station had resorted to ditching to drain wet areas, as by then the diaries recorded that clearing ditches had become a regular chore for workers on the property. In 1874 the manager Michael Mitton recorded ditching and clearing ditches in January, February, July, August, and December, and grass seed was sown in a swamp in August of that year.\footnote{Acland Papers, Box 4, 15 August 1874.} The following March he hired contract drainers to drain as swamp in the Lower Paddock.\footnote{Acland Papers, Box 4, 17 March 1875.} Thereafter the diaries regularly recorded references to drains being dug or cleaned out, occasionally they were burned and often they were oversown with grass seed. It is likely that so much time was spent on the job of
draining because the wetlands were a nuisance for the management of the station by creating obstacles for the easy movement of stock and they were a health hazard for footrot prone Merinos. Acland would have also known that swamps made for very productive grass growing country once drained and seeded.

**Refrigeration and land development**

Refrigeration has often been identified as a trigger for the development of new techniques and methods in farming practice.¹¹⁴ I would argue that these changes were evolutionary rather than revolutionary and that the fundamental techniques that allowed South Island pastoralists and farmers to take advantage of the frozen meat trade were already well established before 1882.

The agricultural round as practiced on Mt Peel was similar to that found throughout the South Island rangelands, with local variations in timing and types of cereals grown due to differences in climate. In Canterbury wheat became the most commonly planted cereal crop, but in the cooler climates of Otago and Southland oats soon became more popular. The use of turnips and rape for wintering and fattening was widespread. This system was well established before the development of refrigeration. In fact the table below shows that although the total combined area of cultivated land and permanent pasture increased six fold in thirty-seven years, from just under one million acres in 1875 to nearly six million in 1911, the greatest percentage increase took place in the five years from 1875 to 1880. The years from 1875 to 1885 marked the dramatic transformation of the easier country of the rangelands from native tussock to introduced cereals, green feed and 'English grasses'. Thereafter the area of land improved through cultivation and oversowing increased progressively but at a less dramatic scale of increase.

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TABLE 7.3. Change in area (acres) of cultivated land or land sown in permanent pasture in Canterbury in quinquennial periods from 1875 to 1911, and the combined total from Marlborough, Canterbury, and Otago/Southland

<table>
<thead>
<tr>
<th>5-Year Period</th>
<th>Total Grain</th>
<th>Green Feed</th>
<th>Permanent Pasture</th>
<th>Total Area Improved</th>
<th>Total Area Imprvd Marlborough, Canterbury, Otago/Southland</th>
</tr>
</thead>
<tbody>
<tr>
<td>1875 - 1880</td>
<td>+171%</td>
<td>+249%</td>
<td>+139%</td>
<td>+145%</td>
<td>+124%</td>
</tr>
<tr>
<td>1880 - 1885</td>
<td>-14%</td>
<td>+54%</td>
<td>+70%</td>
<td>+36%</td>
<td>+56%</td>
</tr>
<tr>
<td>1885 - 1890</td>
<td>+26%</td>
<td>+12%</td>
<td>+8%</td>
<td>+10%</td>
<td>+14%</td>
</tr>
<tr>
<td>1890 - 1895</td>
<td>-38%</td>
<td>+7%</td>
<td>+30%</td>
<td>+13%</td>
<td>+15%</td>
</tr>
<tr>
<td>1895 - 1900</td>
<td>+34%</td>
<td>+44%</td>
<td>+3%</td>
<td>+10%</td>
<td>+13%</td>
</tr>
<tr>
<td>1900 - 1905</td>
<td>-1%</td>
<td>+5%</td>
<td>+10%</td>
<td>+8%</td>
<td>+9%</td>
</tr>
<tr>
<td>1905 - 1911</td>
<td>+8.5%</td>
<td>+15%</td>
<td>+1%</td>
<td>+6%</td>
<td>+10%</td>
</tr>
</tbody>
</table>

The data in the table illustrates that the establishment of the refrigerated trade in 1882 did not introduce a radical change in the system of land use in the rangelands; rather it instigated the intensification of already established methods. This evolution was probably due to the time it took for the meat trade to become really profitable for pastoralists and farmers. The initial excitement after the success of the first shipment of frozen meat in 1882 soon turned to despondency as prices for the product declined in the English market and remained low for the rest of the decade. In 1883 prime New Zealand mutton sold in Britain at seven pence a pound, thereafter it fell every year to reach three and three-quarter pence in early 1889. However, over this same period, shipping and other charges had been reduced from four pence a pound to two-and-a-half pence in early 1889 and with the British market taking all the meat that New Zealand could export some confidence began returning to sheep farmers.

Mt Peel management responded to this new opportunity by embarking on a programme of cultivation and subdivision from about 1886. Mitton established new paddocks, grew more turnips and sowed down more grass.

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115 *Statistics of New Zealand*, 1870 to 1912.
The station also increased its cross breeding programme that had begun before this time.  

Waitangi Station had grown oats and hay for horses and house cows before 1890, but the extent of the cultivation increased significantly from that time. There is no doubt that the increased cultivation represented a response to opportunities provided by the frozen meat industry, as Sutton purchased his first long-wooled rams, fifty Leicesters, about the same time. The first large-scale sowing of turnips took place in November 1891 and the following year 8,000 lambs were wintered on the crop from late April to mid-September, whereas in former years they had wintered on the hill country. In 1893, four teams of contractors ploughed from late in July; they sowed oats in mid-August, followed by grass and rape, and finally turnips in November and December. This pattern of oats, turnips, and grass and rape became the standard rotation adopted on Waitangi over the next decade or more.

By the early 1890s pastoralists and farmers in South Otago and Southland responded to the expanding frozen meat industry by breaking up more tussock country. Once the flats were cultivated and drained they turned to the broad ridges on the surrounding hills, and one observer commented that ‘sheep feed is grown on what at one time was considered mountain tops.’ As in Canterbury, farmers relied heavily on turnips for winter feeding, but with more hay and chaff saved to supplement the crop. Southern farmers also grew rye corn to fill the ‘gap’ between ‘the end of the turnips and beginning of the grass’.

Perhaps the most marked change in farming practice following the introduction of the frozen meat industry was the increased use of fertiliser,
made possible by its greater availability and the reduction in its price. Various fertilisers had been available on the New Zealand market well before 1882 but they were not widely used in the South Island. The *Lyttelton Times* advertised Peruvian guano in 1864 and the *Timaru Herald* advertised bone dust in 1869. However, farmers and pastoralists relied on the natural fertility of the soil and the use of turnips or other green feeds as restorative crops rather than on fertilisers to maintain productivity. By the early 1880s there had been increasing concern reported in the agricultural section of the press about the impact of repeated cropping on the fertility of soils. The frozen meat industry was seen as providing a solution to this problem by shifting emphasis from cereal cropping to livestock production.

Livestock farming relied on grass and clover pastures that were seen as less likely to cause deterioration of the soil. By the mid-1880s a rotation of a wheat crop, then turnips followed by several years of pasture before the land was broken up again to begin a new cycle had become common in Canterbury. However, even this rotation could not sustain the fertility of the land. It became obvious that turnip crops and grass and clover pastures required fertiliser to be productive. 'Ovis' commented on this point in the *Country Journal* in 1888 writing '[o]n the great bulk of the land in this country it is hopeless to expect the formation of permanent pasture of any value without the aid of topdressings.' The same writer also noted the necessity of fertilising the turnip crop which he claimed acted as the foundation of the agricultural system of the country. He went on the say that 'in former years a large proportion of the turnip crop was grown on land newly broken up from the tussock' and therefore did not need artificial fertilisers, but this was no longer the case.

125 *Lyttelton Times*, 18 October 1864, p.8; *Timaru Herald*, 13 October 1869, p.3.
A by-product of the refrigerated meat industry solved the problem of the availability of relatively cheap artificial fertilisers. A phosphate works had been established in Christchurch in 1882; however, its production was limited by the lack of bones for processing. As killing increased at the freezing works, bones became more readily available and the production of super-phosphate and its use increased. In particular, the use of fertiliser when drilling turnips became common practice, with the *Country Journal* recommending mixing two hundred weight of bone dust with four or five hundred weight of super-phosphate as an ideal sowing rate.

Mt Peel station began using manure on turnips in 1890 with one-and-a-quarter hundred-weight sown with the crop. The following year Acland had two men mixing bone dust and super-phosphate to be sown with turnips and later in the year he had manure spread on a paddock of rape. In the spring of 1891 252 acres had been sown in oats, turnips and grass, and rape and grass, with manure sown with or spread on the latter two mixes. Thereafter they spread manure with every crop of turnips sown on the station.

**Concluding discussion**

This chapter has described the transformation of the rangelands through the input of resources, energy and technology in the form of fencing, cultivation, oversowing and drainage. The seeds of pastoral farming were sown very early in the history of the pastoral expansion in the South Island. From the outset it was apparent that some pastoralists took a long-term view of the development of their properties. They not only set out to increase the productivity of their land, but also to do it in ways that were sustainable. The process of development shifted through a series of phases from simple to the increasingly complex as new technologies, new ideas, and new opportunities arose.

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131 *Otago Witness*, 10 February 1883, p.6.
133 Acland Papers, Box 50, 2 December 1890.
134 Acland Papers, Box 51, 21 January, 29 December 1891.
The adoption of the ideology of improvement by pastoralists varied across the rangelands according to a range of factors: differences in environment; physical and financial resources; and the nature of their management abilities all played a part. By 1912 pastoral farming had become the dominant system of land use on the plains, downlands and easy hill country from Marlborough to Southland. The *Otago Witness* observed in 1904 that 'the pastoralist had been pushed back to the hilltops in many parts of the South Island'.\(^{135}\) As early as 1878 Boulton, the Chief Inspector of Sheep for Canterbury, thought that the properties that remained reliant on the natural pasturage without any other inputs were found only in the harsh semi-arid country and the remote high country.\(^{136}\) The reasons for this were economic, ecological and technological.

In Central Otago, particularly in Vincent County, the low rainfall and the rabbit infestation precluded the oversowing so widespread in other parts of the country. With rabbit proof fences protecting the flats, productive lucerne paddocks were developed, but these could not make up for the declining productivity of the surrounding hill country. In the hard hills and mountains of Marlborough, Canterbury and Otago the short growing season, snow risk, and cost of transport made development marginal. Not until aerial oversowing and topdressing was introduced in the 1950s could pastoralists in this class of country embark on the sort of development that pastoralists on easier country had done seventy years earlier. Moreover, pastoralists in many parts of the tussock grasslands could not grow productive grasses successfully because they could not establish legumes to fix nitrogen. In the 1950s and 1960s Walker and Ludecke demonstrated that sulphur, phosphorus and molybdenum deficiencies restricted legume growth.\(^{137}\)

Deficiencies in trace elements also limited pasture growth in lowland regions. The quest to maintain permanent pastures became an obsession in the agricultural press from the mid-1880s, with the focus shifting from plant

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species to management practices and then to fertiliser usage. The debate over sowing rates of seed and suitable mixes of grasses and legumes continued well past the end point of this thesis. The native grass grub also took a heavy toll on pastures, particularly in Canterbury. The difficulty of maintaining permanent pastures meant that the plough remained an essential implement on lowland farms as run-out pastures had to be cultivated and put through a rotation of a cereal crop, turnips, then back to pasture.

An unintended consequence of the managed development of the rangelands was the introduction of a variety of weed species, many of which remain problem plants in the modern landscape. Plants introduced for live fences such as gorse, broom and sweet briar invaded extensive areas of hill country. Elsewhere ragwort, several varieties of thistle, as well as unproductive barley grass and brome grasses have become established in the South Island countryside. In large areas of the Mackenzie Country tussocks have been replaced by Hieracium and this invasive weed continues to spread through other parts of the high country, turning the distinctive landscape of tussock grasslands into a forlorn green-grey desert.

Looking back many critics have found it easy to focus on the negative consequences of the impact of the development of the South Island rangelands. They forget that the success of pastoral farming by 1912 proved crucial in the turn around of the country’s economic fortune after the long depression of the eighties and early nineties. Pastoralists and farmers fashioned changes to the landscape in an effort to increase the productivity of the land and they succeeded. In 1912 animal and agricultural products accounted for eighty-two percent of New Zealand’s exports. Wool was the single biggest earner at over £7 million, with frozen meat exports earning nearly £4 million; together these two items accounted for forty-six per cent of New Zealand’s export earnings. The country did, indeed, ride on a sheep’s back. The next chapter explores changes in the breeding of those

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139 *Statistics of the Dominion of New Zealand for the Year 1912* (1913), 263, 264.
sheep, what factors influenced that breeding, and the interplay between sheep breeding and the rangeland environment.

### TABLE: 7.4. Paddocks at Mt Peel 1856 to 1904, showing dates when they were first referred to in the diaries

<table>
<thead>
<tr>
<th>Year named in diary</th>
<th>Month</th>
<th>Paddock</th>
<th>Fenced / Subdivided</th>
</tr>
</thead>
<tbody>
<tr>
<td>1856</td>
<td>Garden</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1862</td>
<td>Shearing Paddock</td>
<td>Ditch and bank</td>
<td></td>
</tr>
<tr>
<td>1865</td>
<td>Lower Paddocks</td>
<td>Ditch and bank</td>
<td></td>
</tr>
<tr>
<td>1867</td>
<td></td>
<td></td>
<td>Jack’s ditch and bank</td>
</tr>
<tr>
<td>1871</td>
<td>August</td>
<td>Tew’s Pdk</td>
<td></td>
</tr>
<tr>
<td>1873</td>
<td>April</td>
<td>Calf Pdk</td>
<td></td>
</tr>
<tr>
<td>1873</td>
<td>August</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1873</td>
<td>November</td>
<td>Rawle’s Paddock</td>
<td></td>
</tr>
<tr>
<td>1874</td>
<td>May</td>
<td>Ram Paddock</td>
<td>Subd March 1880</td>
</tr>
<tr>
<td>1875</td>
<td>July</td>
<td>Unnamed at Horse Spur</td>
<td></td>
</tr>
<tr>
<td>1875</td>
<td>August</td>
<td>Burke’s Flat</td>
<td>1883 Upper and Lower 1885 more subdiv.</td>
</tr>
<tr>
<td>1876</td>
<td>June</td>
<td>Terrace Paddock</td>
<td></td>
</tr>
<tr>
<td>1879</td>
<td>May</td>
<td>English Grass Paddock</td>
<td>Subdivided 1887</td>
</tr>
<tr>
<td>1880</td>
<td>September</td>
<td>Upper English Grass Pdk</td>
<td></td>
</tr>
<tr>
<td>1881</td>
<td>June</td>
<td>Bunkle’s Flat</td>
<td></td>
</tr>
<tr>
<td>1886</td>
<td>April</td>
<td>Top Plough Pdk</td>
<td></td>
</tr>
<tr>
<td>1887</td>
<td>April</td>
<td>Haystack Pdk</td>
<td></td>
</tr>
<tr>
<td>1889</td>
<td>May</td>
<td>Pass Pdk</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>Plough</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>Razor Back Flats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1890</td>
<td>April</td>
<td>First Plough</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>60 Acres Block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>Killing Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1891</td>
<td>March</td>
<td>Dip Pdk</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>Stew Point Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>Mothering Pdk</td>
<td>Subdivided 1897</td>
<td></td>
</tr>
<tr>
<td>1892</td>
<td>Cow Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1893</td>
<td>February</td>
<td>Second Plough Pdk</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>Upper Pass Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>Grass Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>Forest Flat Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>40 Acre Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1894</td>
<td>February</td>
<td>Clover Pdk</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>Hospital Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1895</td>
<td>October</td>
<td>Roadside Pdk</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>Upper Roadside Pdk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year named in diary</td>
<td>Month</td>
<td>Paddock</td>
<td>Fenced / Subdivided</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
<td>-----------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>1895</td>
<td>October</td>
<td>Lower Roadside Pdk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>October</td>
<td>Woolshed Flat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>November</td>
<td>Rawle’s Grass Pdk</td>
<td></td>
</tr>
<tr>
<td>1897</td>
<td>February</td>
<td>Coal Pdk</td>
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<td>April</td>
<td>Rawle’s Tussock Pdk</td>
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<td>Terrace Pdk</td>
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<td>October</td>
<td>Third Burke’s Flat Pdk</td>
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<td>November</td>
<td>Station House Pdk</td>
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<td>1900</td>
<td></td>
<td>Top Grass Pdk</td>
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</table>

TABLE: 7.5. Named areas and fenced blocks on Mt Peel with dates when they were first referred to in the diaries

<table>
<thead>
<tr>
<th>Block</th>
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<tr>
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<td>1855 September</td>
<td>1871 December</td>
<td>1880 August</td>
</tr>
<tr>
<td>Second Gully</td>
<td>1855</td>
<td>1888</td>
<td></td>
</tr>
<tr>
<td>Third Gully</td>
<td>1855</td>
<td>1873 June</td>
<td>First and Third Gullies</td>
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<tr>
<td>Isolated Hills</td>
<td>1856</td>
<td></td>
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<tr>
<td>Lower Run</td>
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<tr>
<td>Upper Run</td>
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<tr>
<td>Coal</td>
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<td>Rawle’s Gully</td>
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<td>Boundary Creek</td>
<td>1860</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Round Hill</td>
<td>1869 August</td>
<td>1870</td>
<td>1888</td>
</tr>
<tr>
<td>Orari Watersmeet</td>
<td>1869 December</td>
<td></td>
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</tr>
<tr>
<td>Razor Back</td>
<td>1872 April</td>
<td>1875</td>
<td></td>
</tr>
<tr>
<td>Ben McLeod</td>
<td>1873 November</td>
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</tr>
<tr>
<td>Stew Point</td>
<td>1873 November</td>
<td></td>
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</tr>
<tr>
<td>Camp Gully</td>
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<td>Horse Spur</td>
<td>1874 February</td>
<td>1874 Split off First Gully</td>
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<td>Big Forks</td>
<td>1874 March</td>
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<td>Little Forks</td>
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<td>The Range</td>
<td>1874 June</td>
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<td>1874 October</td>
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<td>1882 March Lower Ram Spur</td>
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<td>Forest Creek Forks</td>
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<td>August</td>
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<td>September</td>
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<tr>
<td>Walker's Spur, the</td>
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<tr>
<td>boundary with Clayton</td>
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<td>Station</td>
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<tr>
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<td>February</td>
<td>1891</td>
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<td>Tin Hut</td>
<td>1892</td>
<td>October</td>
<td></td>
</tr>
<tr>
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<td>1892</td>
<td>October</td>
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<tr>
<td>Triangle</td>
<td>1895</td>
<td>January</td>
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<tr>
<td>Thatcher's Block</td>
<td>1895</td>
<td>July</td>
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</tr>
<tr>
<td>Rata</td>
<td>1906</td>
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</table>
MAP: 7.1. Fencing on The Terrace Station 1898.
Early station buildings on Mt Peel. Note the storehouse built on poles to keep out rats. This method was copied from Maori and settlers adopted the Maori word whata to describe the buildings. The whata appears to have been constructed of milled timber and has a corrugated iron roof. The house next to it was probably an earlier building as it has been constructed from slab timber and thatched. The third building appears to be either of rammed earth or has been plastered. It also has a thatched roof. The high ridge of the Mt Peel Range, with pockets of snow cover, can be seen in the background.

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140 Mt Peel Station photographs, Macmillan Brown Library.
John Barton Acland called the big house at Mt Peel Holnicote after the estate held by the family in Somerset. Construction started in January 1865 and the house was completed in January 1866. It was built of bricks that were made on site. Note the post and rail fence. The big hills in the background are clean, open tussock country. The face of Round Hill behind Holnicote is covered in scrub and bush, while the top of the hill is open tussock.

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Acland was an enthusiastic gardener. He imported trees and plants from England and Australia, as well as planting out native species. The magnificent garden that is found at Mt Peel today is a tribute to his foresight.
Looking westwards towards Mt Peel Station from the road gate on the station's eastern boundary. The hills on the left and the flats are on Mt Peel. Note how the country is mostly open tussock with very little shelter. The high hill with a cap of snow is on the Harper Range that lies across the Rangitata River from Mt Peel Station and above the gorge.

142 Mt Peel, Coll. No.1995/2, AC296, Macmillan Brown Library.
CHAPTER EIGHT
SHEEP BREEDING IN THE PASTORAL ERA:
SHAPING SHEEP TO SUIT THE LAND

Many of the processes that have been explored so far in this thesis have been about establishing sheep on the land and improving their feeding. Land appraisal by pastoralists, surveyors and other explorers determined whether the land would be suitable for sheep. Burning provided access to the land for sheep. Shepherding, boundary keeping and later fencing improved the management of sheep. Cultivation to grow fodder crops and pasture, and oversowing improved the quantity and quality of feed for sheep. In short, aside from a brief period during the grain bonanza of the 1880s, the primary focus for the land use in the rangelands of the South Island in the pastoral era was raising sheep.

This chapter assesses the interplay between sheep breeding and production, and the rangeland environment. As we have seen, pastoralists deliberately modified the landscape to facilitate sheep production. Conversely, the pastoralists also modified their sheep in order that they better suited the local environment, or more precisely the different local environments found within the rangelands. Commonly, it has been argued that changes in sheep breeding were made in response to economic factors, in particular the introduction of the frozen meat trade. While it is correct that the demand from the marketplace had a profound influence on shaping sheep breeding so did the local environment, and pastoralists were aware from the outset that different types of sheep did better in different environmental zones. Sheep breeds that were run in regions to which they were unsuited suffered from animal health problems and were less productive than when run in areas for which they had been bred. The classic example of this was the susceptibility of Merino sheep to footrot when they were confined on heavy country. As a result of sheep breeding during the pastoral era, by 1912 different breeds had become established in different areas.
Merino breeding

Merinos from the Australian colonies of New South Wales and Port Phillip were the sheep breed originally imported into the rangelands. Historians and historical geographers have been overly generous in their assessment of these sheep: Olssen claimed that ‘New Zealand runholders had easy access to the finest Australian merinos and a lot of sound advice on how to maintain the purity of their flocks’; Horsfield contended that ‘there was no shortage of well-bred, low price sheep available for shipment across the Tasman’; while Canadian geographer A.H. Clark saw the Merino as ‘this great gift of the earliest years’. The reality was that the Merinos imported from Australia in the 1840s, 1850s and the 1860s were not the high quality sheep for which Australia became famous later in the nineteenth century.

Sheep breeders in New South Wales had concentrated on breeding for the fineness of the wool with little regard for other factors such as wool weight and the size and soundness of the animal. H.B. Austin, an Australian historian of the breed, commented that ‘[f]or many years, fineness was an absolute fetish. So long as the wool produced was 80s or 90s nobody bothered about what the sheep cut.’ Thomas Shaw, who had been brought to Australia by Robert Campbell, a leading merchant and wool grower, to improve the quality of the country’s sheep and wool, published his findings in 1849 in a pamphlet titled The Australian Merino. He had two major criticisms of sheep breeding in Australia. Breeders who had concentrated on fineness in the end found that ‘they had neither quantity, quality, nor constituton’, while those who had indiscriminately used British breeds in an attempt to remedy these faults produced what Shaw called ‘a mongrel

2 H.B. Austin, The Merino Past, Present and Probable (Sydney: Grahame, 1947), 64. The term 80s and 90s refers to the old Bradford system of measuring the fineness of wool. Under this system 70s and above was regarded as fine Merino.
breed.

Frederick Weld, one of the earliest pastoralists in New Zealand, wrote scathingly about the quality of sheep imported from Australia in the 1840s saying that they 'were nothing but drafts from inferior flocks, in which form, constitution, and, as a consequence, the weight of fleece, have been sacrificed, either by careless breeding, or by a blind indifference to everything but obtaining a small quantity of very fine wool.'

Historians writing about the Australian influence in New Zealand sheep breeding have also ignored the impact that the environment had on the sheep for, despite their breeding, these Australian imports grew longer, stronger and heavier fleeces in the South Island rangelands than they did in New South Wales. As early as 1851 Weld noted that Merinos in New Zealand cut more wool than Australian Merinos, on average four pounds per head as opposed to about two and a half. Consequently, breeders in New Zealand never concentrated on fineness alone as a criterion for selecting their sheep, with the result that their sheep maintained size and vigour.

Of course there were sheep breeders in the Australian colonies who had maintained and even improved the quality of their sheep. It was these men, along with Thomas Shaw and his son Jonathan, who were instrumental in developing new types of highly productive Merinos that were adapted to the different environmental zones of Australia. An article published in the *Otago Witness* in 1883 noted the recent improvement in the Australian Merino: '[d]uring the last twenty years merino sheep have been so greatly improved ... that they can scarcely be recognised as belonging to the same class of animals formerly known under the name but a few years ago. Twenty years ago merino sheep weighing from 50lb to 60lb were considered unusually fine; but at the present time 100lb is not considered heavy'.

The writer went on to say that as well as getting bigger the sheep grew longer stapled, more even, denser and, as a result, heavier fleeces than in former

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5 Weld, 2; Mark Pringle Stoddart made the same observation in the *Lyttelton Times*, 5 July 1851, 6.
years. He also made the observation that ‘the improvement in the Australian merino has been brought about by a few of the more energetic and wealthy of our sheep-breeders’.7

The article could well have been describing the trajectory of sheep breeding in New Zealand. While it is likely that during the rapid expansion of pastoralism in the 1850s and early 1860s many runholders were more concerned with building sheep numbers than with the quality of their flocks, it was also evident that many intended to improve their sheep. New Zealand Merino breeders were part of an international Merino industry, and not just the Australian branch of it. The advertising pages of the Lyttelton Times in the late 1850s and early 1860s had numerous notices for Merino sheep imported from Saxony, Prussia, Silesia, France, Russia, England and America, as well as the Australian colonies.

The most famous Merino breeder in New Zealand was George Rich who founded a stud flock at Mt Eden, Auckland, and later shifted part of it to Canterbury. His son F.D. Rich had the Moeraki run in North Otago and continued his father’s stud after George died on his return to England. George Rich had toured the leading Merino flocks of Europe in 1858 to source sheep that would add to the quality of his flock and his trip had been closely followed by the Sydney Morning Herald.8 Rich’s Merinos were so highly regarded that they were sought after by the master of the French Emperor’s flock at Rambouillet. In 1863 F.D. Rich sold a Merino ram in Melbourne for £300, a record price for a single sheep in Australia at the time.9

In May 1860 Acland met George Rich in Christchurch and persuaded him to visit Mt Peel to assess the quality of the flock. After crossing the flooded Rakaia River on the punt they found the Ashburton River impassable, so Acland took Rich inland to Mt Somers Station, which he held...

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7 Otago Witness, 13 October 1883, p.7.  
8 Lyttelton Times, 24 April 1861, p.3.  
9 Lyttelton Times, 21 January 1863, p.4.
in partnership with Tripp. According to Acland, Rich ‘gave a pretty good account’ of the Mt Somers sheep and, since they were the same breeding as the Mt Peal flock, Acland was well pleased.\textsuperscript{10}

The result of the effort put into breeding and selection had the \textit{Otago Witness} writing in 1883 that ‘New Zealand merinos may be said to have acquired a distinct type’.\textsuperscript{11} Between 1855 and 1878 the average wool weight per head over the entire New Zealand sheep flock nearly doubled, increasing from 2lb 5oz to 4lb 8oz.\textsuperscript{12} Between 1858 and 1878 the average wool weight of the Mt Peel flock increased from 2½ lb to nearly 5½ lb per sheep and in 1891 43,600 sheep on the station each cut, on average, 7lb 5oz. In the same year some of the big flocks in the South Island rangelands cut similar wool weights: 30,000 Merinos on The Terrace Station cut 7lb 13oz per head, the Horsley Down flock of 54,000 sheep averaged 7lb 4oz, and in 1906/7 48,000 Merinos on Morven Hills cut 9½lb wool per head.\textsuperscript{13} While it is true that wool cut could vary according to the season the overall trend through the pastoral era was for wool weights to increase. This can be seen on CHART: 6.2 for Mt Peel.\textsuperscript{14}

However, by the 1890s pure Merino sheep had come to represent a declining proportion of the South Island sheep flock. In 1895 there were nearly four million Merinos making up 35.45 per cent of all sheep in the South Island; by 1905 that had declined to just over two million Merinos or 21.88 per cent; and by 1912 there were only one and a half million Merinos in the island making up just under fourteen per cent of the total sheep flock.\textsuperscript{15}

\textsuperscript{10} MB44. Acland Family Papers, Box 7, 2 May – 5 June 1860, Macmillan Brown Library, University of Canterbury, Christchurch, New Zealand.
\textsuperscript{11} \textit{Otago Witness}, 9 June 1883, p.6.
\textsuperscript{12} \textit{New Zealand Country Journal: A Record of Information connected with Agricultural, Pastoral and Horticultural Pursuits and Rural Sports in New Zealand}, Vol.3, No.6 (November 1879), 371.
\textsuperscript{14} Chapter Six, CHART: 6.2, p.227.
\textsuperscript{15} \textit{Appendix to the Journals of the House of Representatives}, 1895, H-23; 1905, H-28; 1912, H-23B.
Cross breeding

Historians have seen the establishment and expansion of the frozen meat industry as the catalyst for the change in sheep type in New Zealand. The orthodox explanation, put simply, is that before refrigeration farmers ran Merino sheep for their wool; after 1882 they ran crossbred sheep for their wool and their meat. This chapter will demonstrate that experiments in crossing British breeds over the base Merino ewe flock began almost from the outset of organised settlement as a response to animal health, environmental and economic factors. Footrot, the failure of Merinos to produce well in heavy country and improved pastures, the increasing demand for combing wool by English processors, and the requirement for a larger framed, meatier and faster maturing type of sheep than the Merino for the local butchers’ market and for boiling down, all encouraged sheep breeders to experiment with cross breeding to improve their sheep. Indeed, it was the very success of these experiments in cross breeding that enabled South Island farmers to take advantage of the new market made available by the opening of the frozen meat trade with Britain in 1882.

Footrot was a primary reason for the early experiments in cross breeding. Footrot was the most serious sheep disease in the South Island rangelands from the late 1860s and it continues to be a major animal health concern for present day farmers who run fine woollen sheep. A 2001 survey of New Zealand Merino farmers cited footrot as the second most significant disease after gastrointestinal parasitism. Footrot has significant economic costs for farmers. Sheep become lame and are less inclined to graze with the result that they lose weight, grow less wool, have a lower lambing performance and are more prone to fly strike, which, if not treated, will lead

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to their slow and painful deaths. Over and above the costs from the loss of production the management of the disease is expensive in terms of the direct costs and the cost of labour.

Footrot is caused by the anaerobic bacteria *Dichelobacter nodosus*.\(^{18}\) All sheep breeds are susceptible to footrot, but Merinos are more prone than other breeds. Virulent strains of the disease are more pathogenic in Merinos than in British breeds and, after field trials, Egerton and others have reported that ‘the incidence, severity, duration, and extent of infection was higher among Merinos than in Border Leicester-Merino crossbreds’.\(^{19}\) Merino sheep originated in the semi-arid regions of the Mediterranean and were not exposed to the challenge of footrot, so did not develop resistance to the disease.

*D. nodosus* is able to survive for long periods within the hoof with no external signs that the hoof is infected, but it does not survive outside the host for more than seven days. The transmission of infection is determined by environmental conditions: moist conditions above ten degrees centigrade are a precondition for the development and spread of the disease. Increased stocking rates will increase the rate of disease spread. A long spell of dry conditions will result in a spontaneous cure, but some sheep will become hosts and carry the bacteria for years and on into the next challenge season.\(^{20}\)

The disease arrived in New Zealand with Merinos imported from the Australian colonies. Despite Australia's reputation for aridity, footrot was a serious disease in its colonial era and remains so today. William Youatt wrote in 1837 that ‘footrot seems to assume a character of its own in New South Wales ... [and] if neglected, it speedily becomes inveterate, and preys upon and destroys the animal. The losses occasioned by it in the early

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\(^{18}\) Mulvaney, 7.


\(^{20}\) Mulvaney, 16-19.
existence of the colony were frightful.\textsuperscript{21} Alfred Joyce, a squatter in the Port Phillip district, complained that footrot and scab cost him £3,000 in 1853 alone - this being made up of stock losses and the cost of treatment.\textsuperscript{22}

In New Zealand footrot was a problem from the outset in wetter regions in the North Island, although in Canterbury the disease does not appear to have been a problem on the large sheep stations. This difference probably resulted from the low sheep numbers in the early years and the management system where the sheep were not confined but allowed to run on open blocks, which meant that the disease could not spread readily. However, colonists on their small farms around the new settlements found Merinos poorly adapted to their heavier land. The Deans brothers, who ran sheep on the Canterbury Plains before organised settlement began, noted how quickly the hooves of their Merinos grew on the heavy country at their Riccarton farm. They decided that sheep farming might be more successful on the hill country to the west where the sheep’s hooves would be kept shorter on the stonier ground.\textsuperscript{23} By 1860 farmers were experimenting with cross breeding using sires of English breeds over Merino ewes. Newspaper advertisements and articles noted Cotswold, Hampshire and Southdown rams being used as sires in the region. In 1866 more Leicester, Cheviot and Romney Marsh sheep were shown at the Canterbury Agricultural and Pastoral Association Exhibition than Merinos.\textsuperscript{24}

Pastoralists on the stations of the open plains and mountain lands continued to run Merino sheep, but changing conditions that encouraged the spread of footrot began to have an impact on their farming operations. Sheep numbers built up remarkably quickly, so that by the end of the 1860s pastoralists judged the country in its native state to be fully stocked. From

\begin{itemize}
\item G.F. James, ed., \textit{A Homestead History, being the reminiscences and letters of Alfred Joyce of Plaistow and Norwood, Port Phillip, 1843 to 1864} (Melbourne: Melbourne University Press, 1942), p.139.
\item \textit{Lyttelton Times}, 10 November 1866.
\end{itemize}
about the same time the use of wire fencing and large-scale cultivation intensified on the Canterbury Plains, which led to sheep being run on increasingly confined blocks.

The use of turnips and replacing the native vegetation with introduced grasses and legumes combined to increase the stocking rates from perhaps a sheep to three acres to a sheep to the acre or better. This provided ideal conditions for the spread of footrot. A correspondent to the *New Zealand Country Journal* in 1879 emphasised this when he wrote: ‘It is impossible to keep the Merino on the bulk of our cultivated lands, for the simple and best of reasons – their feet are not adapted to moist lands, and that footrot is the result’. William Soltau Davidson, manager of The Levels station and one of the breeders instrumental in developing the Corriedale, wrote in his memoir:

The introduction of English grass pasture necessitated a change in the stocking of the properties, because merino sheep when grazed on cultivated land soon became afflicted with foot-rot. It was therefore necessary to adopt a long wooled [sic] breed and their crosses, which throve well on the English grasses.

Even on the hill and high country runs footrot became a problem as the more progressive pastoralists engaged in large-scale improvement programmes. Te Waimate provides an example of a station that embarked on a large development scheme of drainage, cultivation and fencing that led to increased sheep numbers, but also to devastating outbreaks of footrot. Owner E.C Studholme described the tedious job of treating 16,000 infected sheep in one winter. The station staff spent most of the winter months trying to cure the sheep by paring their feet and then running them through a trough containing a mixture of arsenic, bluestone, soda and water. Studholme gives us some insight into the labour intensive nature of footrotting sheep, writing:

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'footrot was a horribly monotonous job after one had been at it for weeks, and it was a great relief when the trouble disappeared for the time being'. 27

At Mt Peel Station we have already seen that fencing and cultivation constituted part of the established farming practice on the property from the time it was taken up. The flats and terraces in the vicinity of the homestead were ploughed and sown in turnips for wintering hoggets and later for fattening sheep, or sown into pasture for hay or grazing. Inevitably, this intensification resulted in severe outbreaks of footrot in the Merino flock in wet seasons.

The farm diaries from Mt Peel are not detailed enough to provide any idea of actual man-hours involved in treating footrot, but they do offer some idea of the extent of the problem. In 1873 the diary noted that the rams were being treated for footrot and from that time the disease was ever present in the ram flock. 28 It soon spread to other classes of sheep on the station. The table (below) shows that footrot was an ongoing problem through the eighties, although the disease went into remission with the onset of a series of dry years in 1889, 1890 and 1891. However, a wet year in 1892 launched another outbreak.

The treatment of footrot on Mt Peel seems consistent with other contemporary accounts dealing with the problem. Mitton and his staff inspected the feet of suspect sheep and isolated the lame animals. They pared the hooves to remove the infected tissue and then ran the sheep through a trough containing a solution of arsenic and bluestone to cure the infection. 29 Infected sheep were brought in regularly to have their feet ‘dressed’, but, despite these measures, it is clear that the cure rate for footrot was low. The problem only eased temporarily in dry seasons when the disease went into remission naturally.

27 E. C. Studholme, Te Waimate. Early station life in New Zealand (Wellington: Reed, 1940), 115-6.
28 Acland Papers, Box 4, 30 June 1873.
29 Acland Family Papers, Box 51.
### Table 8.1: Days recorded treating footrot at Mt Peel, 1880 to 1894

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</tbody>
</table>

* There are no diary entries 21 March - 2 May. This was normally a busy time for footrotting: checking sheep after weaning and preparing the rams and ewes for mating. In 1883 footrotting took place on 13 days over the same period.

+ These were dry years: 1889 Jan – Aug: 19 inches, Sept – Dec: 12 rain days
1890 38.71 inches, 1891 41.32 inches

Footrot posed a very real problem for pastoralists and farmers in the South Island rangelands. The flock was based on footrot prone Merino sheep and the intensification of farming methods and increasing stock numbers forced sheep into ever-closer contact and spread the infection. Despite their best efforts to cure their infected animals, sheep farmers found the problem insurmountable in all but the driest years. Naturally they looked for a long-term solution and that was to change their sheep breed. Yet, this became a highly contentious issue in the region from at least the early 1860s. Before going on to scrutinise that debate, we need to examine three other factors that encouraged sheep breeders to experiment in cross breeding.

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30 Acland Family Papers, Boxes 4, 51, 52.
The right sheep in the right environment

It has been noted that the ‘matching of sheep breed to environmental conditions was to become a national preoccupation’ in New Zealand. This quest began within the first decade of the establishment of pastoralism in Canterbury and Otago, probably in response to the growing awareness of the marked differences in environments across the rangelands. As early as 1859 a letter published in the *Lyttelton Times* suggested that crossing Cheviot rams over Merino ewes would produce a harder sheep that would be ‘better adapted for the cold, wet country south of Dunedin, than the pure merino’.32

This concern over finding the right sheep to suit a particular environment had its origins in Britain where local breeds had been developed that were adapted to local conditions: for example, the Romney Marsh suited low-lying land, the Lincoln was bred for heavy country and the English Leicester for lighter lands, while the Border Leicester was favoured on easier hills of the English/Scottish Border country and the Cheviot on the harder, colder parts. The *Spectator* underlined this concept in an article on the most profitable description of wool for New Zealand to produce, writing that the ‘nature of the pasture ... ought to determine the breed of sheep to be kept on it’. The *Mark Lane Express* made the same point in an article about farms and sheep in New Zealand. The article noted that with cultivation, fencing and drainage stocking rates would be lifted and, as a result, ‘[t]he class of sheep may hence be very much varied’, but it went on to emphasize that ‘[s]heep should always be adapted to the peculiarities of the country’.34

While it was apparently universally acknowledged that the sheep must suit the country the unanimity stopped there, as opinions varied about what breed was best for what types of country. John McBeath, writing in the *Country Journal*, argued that the Merino was the best sheep for hilly country,

32 *Lyttelton Times*, 12 October 1859.
33 *Lyttelton Times*, 11 June 1862, p.3
34 *Lyttelton Times*, 27 December 1864, p.3.
the first cross English Leicester/Merino halfbred was ideal for English grasses, while for heavy low-lying pasture the halfbred should be mated to a Lincoln to produce a three-quarter bred. Some thought the Southdown made for a better first cross than the Leicester, while others favoured the Romney Marsh. In Canterbury in the early 1870s the Leicester, Lincoln and Romney Marsh were the most popular English breeds at local ram sales and by the early 1880s Otago breeders favoured the Lincoln and Leicester, whereas in Southland the Romney was preferred.

Experimentation in crossbreeding to develop sheep for different environmental zones was part of the wider process of environmental learning that had been taking place in the rangelands since the beginning of settlement, and it was established well before the frozen meat industry was developed in 1882. Moreover the idea of creating a ‘district breed’ of sheep, that is, a fixed breed selected expressly to suit local conditions, became part of the wider debate on the future of sheep breeding in New Zealand. A writer in 1877 thought that, although the outcome was not at all certain, if the breeding was undertaken ‘with judgement and care each year the results will be evener and more satisfactory, until at last climate and selection will have completed the task’. As we will see later in this chapter, by 1877 several breeders had already embarked on the task of establishing a fixed in-bred halfbred. We need to first assess the other reasons that encouraged sheep breeders to move away from the pure Merino and experiment in cross-breeding.

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In the early years of cross breeding the terms halfbred and crossbred were used without distinction. However, as the practice became more widespread the term halfbred was increasingly used only for the first cross between a Merino and a Longwool, and the term cross bred was used for subsequent crosses, such as the three-quarter bred and beyond. A Longwool described British breeds such as the Leicester, Lincoln and Romney Marsh, in contrast to the Down breeds, such as the Southdown, which grew shorter and finer wool.


Changing demand for wool

High prices for fine Merino wool, resulting from the demand for the product from English, European and American woollen mills, drove the expansion of the pastoral industry in New Zealand. However, from the 1860s wool prices began a decline that, aside from a brief period in the 1870s, continued for the remainder of the century, and very fine Merino wool, which had been in high demand, for a time fell out of favour. Technical improvements in the wool processing industry in England and changes in fashion led to the expansion of the worsted industry, centred in the West Riding of Yorkshire. Worsted processors wanted ‘combing’ wool. This has a long staple and good tensile strength and can withstand mechanical combing without breaking. English woolgrowers could not meet the increasing demand for this type of wool, so the processors turned to the colonies for their fibre. Reports from the London wool sales in the Lyttelton Times from early 1860 began to stress that the worsted districts demanded ‘sound, shafy’ combing wool.38 An article in the Mark Lane Express, reprinted in Christchurch in 1864, argued that: ‘all the new sources of supply Australia, Tasmania, South Africa, New Zealand – furnish fine, soft, useful, short-stapled wool [while] the demand for long-grown wool increases year by year, and any country which possess facilities for the production of a wool endowed with qualities which are peculiar to wool of English growth seems far more likely to ensure a profitable market for its commodity that to adhering to wool of a shorter and finer type.’39

Businessmen from Bradford and Halifax formed the Wool Supply Association to encourage woolgrowers to change to long-woolled breeds. The Association made submissions to governments and sent letters and pamphlets to newspapers and periodicals as part of its promotional campaign. In December 1863 the Lyttelton Times published a letter from the Secretary of the Bradford Chamber of Commerce, who saw New Zealand’s future as a supplier of, ‘long-stapled fleeces, of a medium quality and length,

38 Lyttelton Times, 29 February 1860, p.4.
39 Lyttelton Times, 17 May 1864, p.4.
between the fine Merinos of Australia and the long-grown Leicester of [England]. The letter continued that if New Zealand farmers used English breeds instead of pure Merinos they would ‘produce a fleece better adapted to meet the growing wants of the manufactures of this country’.

Naturally, prices on the auction floors in London and Liverpool backed up this pressure on growers to change the wool type that they produced. A compelling example of the price advantage of combing wool over fine Merino can be found in prices received by The Levels Station. In 1868 Leicester rams were used over a line of Merino ewes; hogget wool from the resulting cross sold for sixteen pence per pound, whereas Merino wool from the station fetched nine pence. In addition to the price advantage, halfbred wool had a weight advantage over wool cut from pure Merinos. Holme Station in South Canterbury had a highly regarded Merino flock, yet in 1872 hoggets bred from the cross of a Leicester ram over Merino ewes cut nearly seven pounds of wool per head, whereas the Merino ewes clipped five and a half pounds.

In 1871 the Timaru Herald published a letter from an unnamed London wool broker that clearly laid out the advantages of halfbred sheep over Merinos: ‘The demand for half-breed wools at enhanced prices has attracted considerable notice, and is almost certain to continue ... and when the weight of fleece and carcase is considered it does not require much more to prove that this description of sheep will be much more paying than the Merino’. Moreover, the writer argued that because of its climate New Zealand was seen as the ‘chief and most successful producer of half-breds’. Clearly, from the 1860s an economic advantage could be won by producing wool from halfbred sheep. However, a spirited debate ensued in the region

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40 Lyttelton Times, 22 December 1863, p.4.
42 Henry Ford Diary, the farm diaries of Pareora and Holme Stations, October 1862 – December 1873, Canterbury Museum Documentary Research Centre, 22 September 1872; January 1873
43 Timaru Herald, 26 July 1871, p.2.
over the practicalities of this change. Before exploring that debate I want to look at the fourth advantage to be gained in cross breeding.

**Sheep fattening**

Merino sheep were unsuited for meat production. For centuries they had been bred only for the quality of their wool. They were small framed, lean, and slow to mature compared with British breeds like the improved Leicester and Lincoln. In Britain Merinos had been fashionable around the turn of the nineteenth century, but because of these very problems, and their susceptibility to footrot, they quickly fell out of favour with English farmers.

Farmers on the heavier country near Canterbury’s settlements had begun experimenting with cross breeding by at least the beginning of the 1860s, in part, to overcome the problem of footrot. Another reason was that they relied not only on wool for their income, but also on producing food for the local market and Merino sheep simply were not productive enough. In 1861 the *Lyttelton Times* ran advertisements for Cotswold-Merino ram lambs with the vendor claiming that in Australia this cross had been found to ‘improve the constitution, to increase and ripen the carcase, add greatly to the weight of wool and length and strength of staple’. At the Pastoral and Agricultural Show held in 1862 there were two classes for fat sheep: Robert Chapman won the class where sheep were required to be fattened on native pasture with a line of four year old Merino wethers, with the heaviest carcase weighing eighty pounds; Mrs Deans won the section where sheep were finished on enclosed ground with eighty pound Merino-Southdown halfbred wethers that were only ten months old. This proved to local farmers that the advantage of cross breeding for meat production was beyond dispute.

By the end of the 1860s the local demand for surplus sheep off the runs disappeared. Up to this time there had been a ready market for sheep as pastoralism expanded. By 1865 all of the country suited to extensive sheep

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44 *Lyttelton Times*, 12 October 1861, p.6.
farming had been taken up and by the end of the decade the runs, in their native state, were fully stocked. As gold petered out in the goldfields of Otago and Westland the miners drifted away and with them the large requirement for meat. Apart from the butchers’ market in the region’s towns the only outlets for surplus sheep were meat preservation and the boiling down works where sheep were rendered into tallow for export. As with meat production the lean and slow maturing Merinos did not have the size or condition to make rendering down profitable. As early as 1870 the *Timaru Herald* reported that halfbred sheep were being expressly bred for boiling down and meat preservation. In 1872 a commission agent, who bought and sold stock on behalf of farmers, reported that it was evident from the number of long-woolled rams being sold that stockowners were going in largely for crossbreds. While later in the same year a newspaper report noted that the ‘rapidly increasing area of land under English grass has convinced our farmers of the necessity of turning their attention to breeds other than the merino’.

**The great Merino debate**

Before the development of the frozen meat trade there were already compelling advantages in cross breeding over persevering with the pure Merino. Merinos were prone to footrot, their wool was becoming less competitive in the marketplace, they were not thought to be productive enough on improved pasturage, they were not suited to colder and wetter climates and heavier soils, and they were too slow to fatten for meat production or for boiling down. Yet the idea of cross breeding produced intense debate with enthusiasts for the Merino breed predicting disaster for the future of the sheep industry if the practice became widespread. After Mrs Deans’ success at the Pastoral and Agricultural Show with her Merino-Southdown halfbreds a writer in the *Lyttelton Times* warned: ‘The high price of butcher’s meat at present is an inducement to speculate in [crossing], and

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46 *Timaru Herald*, 7 December 1870, p.2.
47 *Press*, 9 March 1872.
48 *Press*, 29 October 1872.
the home demand for a longer stapled wool is also a stimulant to
experiments. The sheep farmer should pause before embarking in such an
experiment, as the practice is not sustained in theory. The first cross of the
Merino with the South Down may yield a sheep well adapted for the
purpose, but breeding from such would entail degeneracy and a mongrel
race. 49

A year earlier the *Lyttelton Times* had reprinted an article from *The
Spectator* that questioned the wisdom of New Zealand sheep breeders
shifting the focus of their production from short fine wool to long, stronger
wool. It asserted that it was impossible to establish a breed of sheep by
crossing two breeds and obtaining the merits of both. The article quoted a
paper by William Charles Spooner M.R.V.C. that had been published in *The
Economist*, where he emphasised: ‘Cross-breeding is merely a plan of
producing meat, for cross bred animals are only profitable when bred for the
butcher. *They cannot be perpetuated.*’ 50 Spooner went on to say that no one
should cross to establish a new breed, ‘unless he has clear and well defined
views of the object he seeks to accomplish, and has duly studied the
principles on which it can be carried out, and is determined to bestow for the
space of half a lifetime his constant and unremitting attention to the
discovery and removal of defects’. The article outlined another objection to
cross breeding: the resulting lack of uniformity in the character of the wool.
It stressed the maxim ‘like produces like’ and that claimed that crossing
produces ‘innumerable varieties, and not infrequently on the same sheep’.

The *Lyttelton Times* reprinted another article with a similar message in
1863. It was written by Professor Ran and had been published in the
Hohenheim weekly paper. Professor Ran was referred to as ‘one of the first
authorities in Europe on the subject of the weight of fleece and carcase of
sheep’. 51 His objection to cross breeding was that it was difficult to obtain a
large carcase and an abundance of wool together. Wool growth, he claimed,

49 Lyttelton Times, 13 May 1863, p.3.
50 Lyttelton Times, 11 June 1862, p.3.
51 Lyttelton Times, 20 May 1863, p.5.
occurred at the expense of carcase growth, and that farmers who were concerned with wool production should breed Merino sheep with a small to average frame, while those who wished to grow sheep with a large carcase must expect to grow less wool.

Thus we have the dilemma of sheep owners in the rangelands: the market and the problem of footrot encouraged them to change their type of sheep, while the theorists of the time told them it could not be done without risking the quality of their flocks. Yet, despite of the orthodox view that cross breeding with Merinos was doomed to failure, practical farmers in the region got on with the job of trying to solve the problems associated with the practice. It would seem that many tried to establish a two-flock system where Merino rams were used over part of the Merino ewe flock to maintain the base breed, and rams of British breeds were crossed over the rest of the ewes. The progeny of this cross produced ideal wool for the worsted trade and the wethers fattened quickly and to heavy weights, but what to do with the ewes from the cross? Nor did this system really deal with the footrot problem as the base breeding flock remained Merino.

**Experiments in cross breeding**

Cross breeding became a well established practice on the farms around the settlements of the South Island in the 1860s. Farmers purchased surplus Merino ewes off the runs and mated them to rams of English breeds. Some might keep the best ewe lambs from the first cross to be mated either back to a Merino ram or to a ram from a different English breed. Generally, this was as far as the crossing went as subsequent crosses expressed too much variation in the quality of the wool. Thus, the cross breeding system relied on the ready availability of Merino ewes off the big stations.

However, by the late sixties some of the larger sheep owners began experiments in cross breeding that were to lead to the complete reshaping of the sheep flocks of the rangelands. In 1867 The Levels Station imported Lincoln and Leicester rams from England and mated a cut of their Merino
ewes to Leicester rams in 1868 as an experiment. The results were so successful that in 1872 30,000 Merino ewes were put to Lincoln rams and by 1879, of the 79,497 sheep on the run only 6,300, less than eight percent, remained pure Merinos. The Studholme brothers purchased ninety Leicester rams in 1872, enough to mate 9,000 ewes. In 1875 Clent Hills Station, a run in the Ashburton Gorge, was advertised for sale with 19,500 sheep, of which 15,628 were cross bred. The breeding of these sheep at Clent Hills illustrate the problem of crossing. Merino ewes were mated to Lincoln rams to breed a halfbred sheep, which were subsequently mated to Lincolnse. The result of this system of crossing was increased variability in the wool of the progeny, and by going further away from the Merino it meant a loss in quality of the wool, while the progeny became bigger animals that required a higher level of feeding to grow them out and maintain them.

William Soltau Davidson, who managed The Levels, described the cross breeding problem:

While a supply of Merino ewes was available, excellent halfbred sheep were easily enough bred by crossing them with Lincoln or Leicester rams, but it was the after-breeding that was the difficulty. If the half-bred ewes were mated with Longwool rams the progeny – three-quarter-breds as we called them – were heavier sheep than we desired; while if merino rams were used the progeny were too small and were uneven in the wool. It was the half-bred sheep we wanted and nothing more or less.

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52 Noel Crawford, The Station Years. A history of the Levels, Cannington, and Holme Station, with special attention to the upper regions of the Pareora River, where they joined (Timaru: Noel Crawford, 1981), 36; Press, 16 March 1872.
53 Press, 16 March 1872.
54 Press, 3 July 1875.
55 Davidson, 23.
In an attempt to overcome these problems, in 1874 Davidson set out to breed an inbred halfbred that would breed true to type. He joined selected stud Lincoln rams to 1,000 ewes from the Levels Merino stud flock. The first mating produced about 450 ewe lambs from which Davidson selected 150 for the breeding programme. He went on to breed from the original parents until they became unproductive, while continuing the policy of heavily culling the progeny. In time the young halfbred ewes were mated with rams chosen from their own lot and this strategy of inbreeding continued, so that forty-four years later Davidson could write that the Levels Corriedale stud flock contained ‘no other blood than that originally adopted to create the type, which is now absolutely fixed’.

The person usually credited with establishing the Corriedale breed is James Little, a Scot who managed Corriedale Station in Otago. He started cross breeding experiments using Romney rams over 600 Merino ewes in 1868. The halfbred progeny were mated together and Little continued this programme with success until he moved to his own property, Allandale, in North Canterbury in 1878. There he started again with 2,000 selected Merino ewes, which he mated to Lincoln rams. From the progeny he selected twenty ram lambs that met the type he desired. These were later mated with selected ewes from the same cross.

As a result of the work of Little, Davidson and others the inbred halfbred became highly regarded throughout the low rainfall districts of New Zealand. The success of these experiments was also noted elsewhere. An article from the *Live Stock Journal* was reprinted in the *New Zealand Country Journal* in 1883 and recognised both the intellectual and practical breakthrough that these breeders had made. It criticised sheep breeders in New South Wales because they had been so swayed by the belief that cross breeding was doomed to fail that they had lacked ‘the courage to attempt any

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56 Davidson, 24-25.
57 Davidson, 25
59 Stevens, 8-10
experiments outside … the merino branch of the sheep-breeding industry’. The article went on to note: ‘There are, however, a few who, not misled by mere theories, are persevering with sheep such as are now attracting much attention in New Zealand. The breeders of New South Wales have nought to offer English consumers but lean, small-carcased merinos, while New Zealanders are able to compete with even the Southdowns by sending to the London Market well-fattened cross-breds’.60

Thus, by the time the frozen meat trade began sheep breeders in the South Island had made considerable progress away from the Merino to a half-bred type. Moreover, some had begun the task of developing a fixed breed that met local environmental conditions and the requirements of the wool and fat sheep trade. The progress that had been made in sheep breeding, in turnip culture, and in the regrassing of the plains and downlands with ‘English’ grasses gave pastoralists and farmers of the rangelands a considerable advantage in supplying fat sheep for the British market when the trade began in 1882.

Refrigeration and its impact on sheep breeding

The significance for New Zealand of the voyage of the Dunedin in 1882 with its cargo of frozen meat and dairy produce has been likened to the importance of 1066 and the Battle of Hastings for English history as key events that transformed each country.61 There is no question that the event set New Zealand’s economy on a new trajectory; where once the country’s surplus sheep were almost a liability, after the frozen meat trade was established they became, in time, the country’s most important export. The success of the frozen meat trade led to profound changes for the great pastoral runs of the South Island rangelands. With sheep producing returns

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61 Evans, A History of Agricultural Production and Marketing, 104.
from wool and meat it made small farming viable and was a factor in the move to ‘burst up’ the big estates under the Liberal government after 1890.62

It has already been illustrated in this chapter that, in the context of farming methods, the impact of the establishment of the frozen meat trade was evolutionary not revolutionary. Cross breeding became more widely practiced and Merino sheep became increasingly marginalised onto the hardest country. Turnips and other greenfeeds became more widely grown, but used for fattening sheep for the frozen meat trade rather than for wintering stock. Fertiliser became more widely used as blood and bones, the by-products of the freezing works, were cheaper than imported guano. Permanent pasture increasingly replaced grain crops as the most important component of the rotation. Thus the period between 1882 and 1912 saw the intensification of established methods and their fine-tuning, rather than any radical new developments. However, that should not be taken to infer that the period of experimentation and learning was over. In truth that was anything but the case. A study of sheep breeding shows that debates over the direction of cross breeding and the differences between commentators and theorists, and practical breeders concerning establishment of a fixed cross remained unresolved.

The marginalisation of the Merino

In 1882 the Merino remained the most numerous sheep breed in the rangelands and the valuable first cross halfbreds depended on availability of Merino ewes.63 Indeed, an article in the Press suggested that in Canterbury a system akin to that of the Border districts of England and Scotland would soon develop, where sheep owners in the hills would breed store sheep for farmers on the easy hills and flats to fatten on turnips.64 In the New Zealand case these would be Merino sheep run in the hills for their wool then sold as

62 Tom Brooking, _Lands For the People? The Highland Clearances and the Colonisation of New Zealand. A Biography of John McKenzie_ (Dunedin: University of Otago Press, 1996) deals with the politics of this major transformation of the estates of the plains and downlands in detail.
63 Photograph: 8.1. Merino Ram, p.316.
64 _Otago Witness_, 1 September 1883, p.7.
caste for age ewes to farmers to breed halfbreds for the frozen meat trade. And in the early years of the frozen meat trade that is what happened. The Country Journal in 1883 noted the demand for drafts of merino ewes off the big stations, writing 'it is no exaggeration to say that for the last ten years the enquiry for this class of sheep has not been so extensive as it has been during the season just over'. Acland confirmed this in a letter to his brother in 1885. After commenting that there was no interest in Merinos for freezing, the difference the trade made for him was that the Mt Peel cull sheep now sold for six shillings and eight pence rather than three to four shillings in previous years.

However, by 1890 many large flock owners had begun to breed and fatten halfbreds. This caused a considerable degree of concern; writing in the Country Journal, 'Ovis' thought it a questionable policy because 'an immense proportion of strictly Merino country [was] not suitable for halfbred lambs'. For the future success of the frozen meat trade he thought it imperative that a good supply of Merino ewes be maintained for cross breeding down country. Despite these concerns, the low prices for Merino wool and the strengthening of the frozen meat trade encouraged pastoralists in the high country to move away from Merinos, even where their local environments were not favourable to the business of fattening stock. After the high stock losses in the 1895 snow the hill runs were restocked 'almost exclusively' with crossbreds rather than with Merinos. In the Amuri, which was renowned for the quality of its Merino flocks, pastoralists went in for growing rape to fatten crossbred lambs rather than selling them as stores. With the continued breaking up of the tussock in Southland 'Tapanui' noted in the Country Journal that the Merino was growing 'scarcer every year and promises to become extinct with advancing cultivation'.

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66 Acland Papers, Box 11, 11 April 1885.
67 Country Journal, Vol.14, No.6 (November 1890), 455.
68 Otago Witness, 16 April 1896, p.12.
69 Otago Witness, 13 August 1896, p.4.
Establishing a ‘local’ breed

This chapter has argued that cross breeding had become well established before 1882 for environmental, animal health and economic reasons. Moreover, as more sheep owners turned to cross breeding, the Merino ewes on which the whole system was founded became a declining portion of the national flock. Without them the first cross halfbred that had been so well suited to all but the coldest and wettest parts of the rangelands, and that had produced ideal wool for the worsted trade and a meaty carcase for the meat trade, could not be bred. In Canterbury some breeders had worked on the task of establishing a fixed inbred halfbred, while in Southland breeders experimented with the Romney and Cheviot breeds to find a sheep that was productive in the harsher climate of the southern districts.

Despite the progress that had already been made by James Little and the Australian and New Zealand Land Company in fixing an inbred halfbred leading commentators and agricultural experts remained unconvinced about the prospects of such experiments. W.E. Ivey, the Director of the School of Agriculture at Lincoln, did not expect that such a sheep could be established.71 ‘Ovis’ from the Country Journal viewed these experiments sceptically: in 1887 he commented that claims about the success of fixing a Merino/long wool halfbred were ‘probably somewhat premature’; six years later he was no more enthusiastic, claiming that such breeding was as yet ‘in its infancy’; in 1897 he concluded that a fixed breed of sheep similar to the halfbred ‘has not become general and probably never will’.72 In the Australian Pastoralists Review J.S. Holmes had nothing good to say about the fixed halfbred sheep type and ‘Rusticus’ claimed it was ‘impossible to have fixity of type in a mixture of highly prepotent breeds with decidedly different characteristics, such as the Australian merino and English coarse-
woolled breeds have’. Essentially he claimed that the progeny could never ‘breed true to type for a length of time’.

Despite these criticisms breeders other than just Little and the Australian and New Zealand Land Company continued experimenting with fixing an inbred halfbred, including Charles Ensor of Mt Grey in Canterbury who established his flock in 1889, G.D. Greenwood of Teviotdale Station in North Canterbury, and James Stringfellow from Chertsey who began his inbreeding programme in the mid-1880s. By the mid-nineties Stringfellow and Little were showing their sheep at Agricultural and Pastoral shows and gaining favourable comments for them.

The name Corriedale had become commonly accepted to describe the inbred halfbred by 1896, although commentators and breeders from time to time debated whether or not the name was an acceptable one. There was also some debate over what constituted a Corriedale as different breeders had used different breeds of sire in developing their sheep, including the Lincoln, English Leicester, Border Leicester and Romney Marsh. This created considerable differences between Corriedale flocks in terms of their wool qualities and carcase conformation. In 1905 the New Zealand Sheep Breeders’ Association resolved the matter by deciding that ‘the name Corriedale should apply to sheep of any longwool and merino [cross] of not less than five generations’.

F.R. Marshall from the United States Department of Agriculture visited New Zealand in 1914 to assess whether or not the Corriedale should be imported into the United States ‘for breeding purposes’. He described

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73 Otago Witness, 6 February 1896, p.7.
75 Otago Witness, 14 November 1895, p.6.
76 Otago Witness, 28 May 1896, p.5; 11 June 1896, p.14; 21 August 1901.
77 Otago Witness, 9 January 1907, p.6.
78 Marshall, 1.
the character of the country where the breed was run in New Zealand as varying ‘from level and fairly rich artificial grass pastures to rough hills with altitudes around 3,000 feet, on which snow sometimes lies for several months at a time’.79 He could have added that they were favoured on lighter soils as they remained susceptible to footrot on wetter low-lying ground. The breed had become particularly popular in the North Canterbury and Marlborough hill country, the lighter parts of the Canterbury plains and in drier parts of Otago.80

Although the Corriedale was the first new breed of sheep developed in New Zealand there were other types of sheep modified to suit local New Zealand environments, but which did not come to constitute a formal breed. The cross between a Merino and a long wool sheep produced the halfbred and, as we have seen in this chapter, this was how cross breeding began in New Zealand. The Corriedale is an inbred halfbred and in the colonial period no one drew a distinction between the halfbred and the Corriedale. However, some breeders thought that continued inbreeding reduced the hardiness of the type by making it too removed from the Merino. They developed a sheep type known as the ‘Colonial’ Halfbred, usually by mating first cross Merino/longwool rams over halfbred ewes.81 By continually reintroducing a Merino influence the Halfbred is able to cope with harsher conditions than the Corriedale and has been run throughout high country and foothills of the South Island.82

In colder and wetter southern regions of the South Island rangelands, particularly after the widespread adoption of cultivation and the regrassing of the tussock lands with ‘English grasses’, Romney sheep replaced Merinos and the Merino halfbred. The Romney Marsh breed was native to the exposed, low-lying country along the coast of Kent, noted for its ‘cold and

79 Marshall, 21.
80 Photograph: 8.7. Corriedale Ram, p. 322.
81 William Perry, Sheep Farming in New Zealand (Auckland: Whitcombe and Tombs, 1923), 45.
bleak' winters and in summer the 'abundance of coarse wet fodder'.

Having been bred for these conditions the Romney Marsh was popular in parts of New Zealand for its resistance to footrot and it was seen as the only breed that could be raised profitably 'where the land [was] wet and the pasture rank'.

W. Quin had noted that the Romney was the 'favourite' sheep in southern districts in 1896, and in 1901 the *Otago Witness* reported that the Romney cross had become 'the vogue' in Otago and Southland because it had been 'found hardy and well adapted to the damper lands and colder southern climate'.

By 1912 a clear pattern of differentiation of sheep types had taken place according to local environmental conditions. The Merino that had been the dominant breed in the early days had been pushed back to the hardest high country and replaced by the Halfbred and the Corriedale on the easier high country, dry hill country and light plains of Marlborough, Canterbury and Otago. It should be noted that by 1912 cross breeding had become normal practice and the table below indicates the favoured breeds used for crossing in the different provincial regions. In Southland and the wetter parts of Otago the Romney Marsh cross had superseded the Merino because of its hardiness and resistance to footrot. Whereas in Canterbury the English Leicester had been the preferred sheep to put over the Merino because it produced a cross that grew a finer fleece than did the Lincoln cross. The English Leicester was also known to do well on lighter land than the Lincoln and this also accounted for its popularity on the Canterbury plains. The Border Leicester had been bred in the Border hills of England and Scotland and was harder than the English Leicester, which made it better suited for breeding sheep for the high plains and easy hills of Canterbury and the drier parts of Otago. The hardiness of the Border Leicester also made it popular on the lighter soils in Southland. The Lincoln breed that had been popular in the nineteenth century for crossing with the Merino had fallen out of favour.
as it produced the coarsest wool of the longwool breeds and consequently the Romney and the Leicester breeds replaced it. Thus environmental and economic considerations had shaped the breeding of sheep in different parts of the rangelands.

TABLE: 8.2. Stud sheep in South Island rangelands 1912, showing regional differences in breeds

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<tr>
<th></th>
<th>Merino</th>
<th>Romney</th>
<th>Lincoln</th>
<th>English</th>
<th>Border</th>
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</thead>
<tbody>
<tr>
<td>Marlborough</td>
<td>10,044</td>
<td>3,759</td>
<td>1,570</td>
<td>4,405</td>
<td>674</td>
</tr>
<tr>
<td>Canterbury</td>
<td>18,071</td>
<td>6,476</td>
<td>3,208</td>
<td>62,519</td>
<td>30,378</td>
</tr>
<tr>
<td>Otago - dry</td>
<td>11,312</td>
<td>7,358</td>
<td>1,551</td>
<td>3,250</td>
<td>11,817</td>
</tr>
<tr>
<td>Otago - wet</td>
<td>1,552</td>
<td>18,554</td>
<td>211</td>
<td>184</td>
<td>9,863</td>
</tr>
<tr>
<td>Southland</td>
<td>1,077</td>
<td>23,900</td>
<td>1,152</td>
<td>2,426</td>
<td>22,195</td>
</tr>
<tr>
<td>Total</td>
<td>42,056</td>
<td>60,047</td>
<td>7,692</td>
<td>72,784</td>
<td>74,927</td>
</tr>
</tbody>
</table>

Refrigeration, depression, sheep breeding and Mt Peel

The history of the two decades after 1882 at Mt Peel is illustrative of events and processes that were experienced throughout the South Island rangelands over that time. After the initial enthusiasm over the success of the Dunedin’s first shipment, prices for frozen meat in Britain soon fell to levels where there was no profit in the business for New Zealand farmers. At the same time wool prices continued to decline, although halfbred wool maintained a premium of about a penny per pound over Merino wool. The Mt Peel experience in this period also illustrates the shift from a Merino property, almost exclusively dependent on fine wool for its income, to a crossbred property where the sale of its surplus sheep made up an increasingly important part of the station’s returns, and, in fact, proved critical to the economic survival of the Acland family on the property.

John Barton Acland was a great supporter of the Merino breed. Fine Merino wool had produced good returns for the station in years gone by and

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88 Photograph: 8.2. Lincoln Ram, p.317.
89 AJHR, 1912, H-23B.
Acland had spent a lifetime trying to improve the quality of his wool. In a letter to his old friend Tripp following the 1887 shearing Acland described how his sheep had averaged 6½ pounds of wool per head, and commented that it was a 'very good weight and good wool'. He went on to say how much the sheep had improved 'of late years' and that 'Arthur Blakiston can tell you how beautifully even the fleeces come to the sorting table'. Even after Mt Peel began cross breeding Acland continued to support carrying a flock of pure Merinos. He recognised that they suited his high country, writing that 'some parts of our mountain are fitted for Merinos' and that pure Merinos were necessary to produce halfbred sheep. When he learned that Tripp planned to go out of Merinos altogether Acland wrote to dissuade him saying 'that far from Merino sheep becoming a thing of the past it is more than ever necessary that the breed should be kept up to the highest state of excellence that can be attained'.

Yet by the time of his death in 1904 crossbreds outnumbered the Merino flock which had been in decline for over ten years on Mt Peel. Some of the reasons for this change were common to many of the great pastoral stations, while other reasons were specific to Acland and his station. The 1880s and the first half of the nineties was a period of acute depression in New Zealand and a very difficult time for Acland. Low prices for wool, meat and store sheep were compounded by a series of difficult seasons. A protracted drought began in 1886 and extended into 1887. Farmers and graziers on the plains had no feed so the market for sheep off the stations, which was already tight, disappeared. A severe storm at the beginning of October 1887 caused high lamb losses, with Mt Peel marking only thirty-seven per cent of lambs instead of close to eighty. Heavy snow in August 1888 caused the loss of about 5,000 sheep on the station, and the big snow of 1895 reduced the flock by between a quarter and a third.

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90 Acland Papers, Box 12, Letter to C.G. Tripp, 25 February 1887.
91 Acland Papers, Box 13, Letter to Arthur Mills, 12 May 1894.
92 Acland Papers, Box 13, Letter to C.G. Tripp, 27 January 1892.
Despite Acland’s enthusiasm for the Merino breed, by the late eighties nearly a decade of low wool prices had drastically reduced the income of the station and its profitability. TABLE: 8.3 below shows that between 1860 and 1880 wool prices declined by 28.8 per cent and over the next five-year period they dropped a further 21.8 per cent. The trend line in CHART: 8.1 illustrates that wool prices continued a slow decline to reach a low point of 6.27 pence a pound in 1906.

<table>
<thead>
<tr>
<th>Year</th>
<th>Wool d/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1860</td>
<td>15.99</td>
</tr>
<tr>
<td>1865</td>
<td>14.28</td>
</tr>
<tr>
<td>1870</td>
<td>11.04</td>
</tr>
<tr>
<td>1875</td>
<td>14.98</td>
</tr>
<tr>
<td>1880</td>
<td>11.37</td>
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<tr>
<td>1885</td>
<td>8.69</td>
</tr>
<tr>
<td>1890</td>
<td>9.86</td>
</tr>
<tr>
<td>1895</td>
<td>7.57</td>
</tr>
<tr>
<td>1900</td>
<td>7.06</td>
</tr>
<tr>
<td>1905</td>
<td>6.27</td>
</tr>
<tr>
<td>1910</td>
<td>9.27</td>
</tr>
</tbody>
</table>

Merino wool fetched on average about a penny per pound less than crossbred wool and this is reflected in the Mt Peel wool returns. In 1886 Acland expressed relief that the average price the station received for its wool had lifted from 7½ pence a pound in 1885 to 8½ pence. He commented that if that price kept up ‘it will just do, but sheep farming is not what it was’. In another letter he reflected on the overall decline in wool prices, writing that ‘wool is looking up a little but we cannot expect that we shall ever again have the prices for wool and sheep which we used to enjoy in the palmy days of sheepfarming when I came out and in fact those who made hay while the sun shone and sold out when the high prices prevailed were ...

93 See CHART: 8.1, p.315.
95 Acland Papers, Box 11, Letter To Henry Acland, 17 July 1886.
the wisest'. In 1890 he wrote, 'I could probably about 14 or 16 years ago have sold out for perhaps double what I could now and those values are not likely to come again. In 1855 merino sheep were worth £1 to £2 [but are] now from 10 [shillings] down. I should be glad to get 3 [shillings] for my old sheep which must be got rid of somehow.'

During 1870s and early 1880s there was no outlet for surplus sheep so Mt Peel concentrated on producing wool. The Mt Peel flock reached 44,000 sheep in the early seventies and at that time Acland reduced the ewe flock and increased the number of wethers kept, and mated only enough ewes to provide replacements. Sheep sales were sporadic; in some years none were sold, whereas in other years several thousand were put on the market. In 1878 420 cull ewes were sold at two shillings and six pence each. The following year two mobs of wethers totalling 1,767 sheep were sent to the boiling cown plant at Washdyke; one of these mobs returned three shillings and eight pence a head. In 1882 5,860 wethers were sold off the station; nearly half went in February and the balance in December.

The station got a brief boost between 1883 and early 1885 when the frozen meat trade lifted sheep prices generally and Mt Peel sold nearly 9,900 Merino sheep at over six shillings a head. The fillip, however, was short lived as the returns from frozen meat exports declined. The Country Journal reported on the weakening stock market and expected prices to remain at a low level 'unless the prospects of the frozen meat trade brighten considerably' and until that time the 'boiling down vat' was the best outlook for surplus fat stock.

96 Acland Papers, Box 11, Letter to Henry Jenkinson, 15 August 1886.
97 Acland Papers, Box 12, Letter to Henry Acland, 21 January 1890.
98 Acland Papers, Box 50, 3 May 1878.
99 Acland Papers, Box 50, 5 March, 2 May 1879.
100 Acland Papers, Box 50, 22 February, 27 December 1882.
101 Acland Papers, Box 50, 21 February 1883; 29 March 1884; 3 January, 18 March 1885; Box 11, Letter To Agnes Mills, 26 March 1886.
102 Country Journal, Vol.9, No.2 (March 1885), 197.
The eighties had been tough for Acland and by the end of 1890 he had become depressed about the prospects for sheep farming. He wrote to his sister Agnes telling her how he had left Christchurch to avoid attending the Agricultural Show and reminisced about how he had been one of the ‘chief originators of the first show that ever was held in Canterbury in 1859’ but went on to say that ‘[t]his year however it appeared that walking about the ground all day was not exactly the thing for me’. 103

The difficulties that many farmers and graziers suffered at this time were made worse for Acland through the nineties by successive and related financial crises. Acland and Tripp had signed a joint guarantee for their nephew Leonard Harper for £30,000 in July 1891 and soon after Harper’s firm failed. 104 In early 1893 the bank called in the guarantee. Acland’s brother-in-law Arthur Mills made payment to the bank to reduce Acland’s liabilities, and Acland surrendered the mortgages over his freehold and leasehold properties and over the flock to Mills in March 1895. 105 The plan was for Acland to continue to ‘own’ Mt Peel and to repay Mills from any profits that the station might make. Mills died suddenly in 1898 and the London lawyers acting for his sons instructed the manager of Dalgety and Company to demand full payment of Acland’s debt or to sell Mt Peel. Christchurch lawyer and family friend of the Aclands, Arthur Rhodes, rescued Acland and Mt Peel by taking over the mortgage and paying off the debt to Arthur Mills’s sons. 106 This still left the station management with the task of paying off their debt to Rhodes as quickly as possible. John Barton Acland was in his mid-seventies by this time and he had been exhausted by the fallout from his guarantee to Harper. By the late nineties he had little further role to play in the direction of Mt Peel and left the task of reviving the station to the manager, Oliver Scott Thomson, Arthur Rhodes, and the manager of Dalgety and Company.

103 Acland Papers, Box 12, Letter to Agnes, 8 November 1890.
104 Acland Papers, Box 13, Letter to Parker, Dalgety and Co., 16 January 1893.
105 Acland Papers, Box 13, Letter to The Manager, Union Bank of Australia, Christchurch, 25 March 1895.
The move to cross breeding at Mt Peel began tentatively in 1884 when a few ewes were lined to a long wool ram.\textsuperscript{107} Thereafter the number of ewes mated to English Leicester rams increased, but very slowly. In 1887 six Leicester rams were used and, if they were put out at the same ram to ewe ratio as the other paddock sheep, the six rams would have been lined to about 350 ewes.\textsuperscript{108} The following year 1,095 ewes were mated to nineteen Leicester rams.\textsuperscript{109} However by 1890 continued low wool and sheep prices were really starting to take their toll on the station’s financial position and on Acland’s frame of mind. Moreover, the premium that halfbreds received over Merinos for wool and surplus sheep prices were becoming increasingly apparent even to Acland. In March 1890 he sold 4,216 old Merinos for an average price of two shillings and five pence, and complained that ‘the days of getting 10/- and upwards for old culls are over’; whereas later in the year he achieved thirteen shillings and sixpence for a line of 691 halfbreds.\textsuperscript{110} In September he noted that 179 bales of Mt Peel wool sold for an average price of eight shillings and six pence a pound; while at an earlier sale, Tripp’s Orari Gorge Merino wool had sold for eight shillings and four pence, whereas Tripp’s half bred wool achieved ten shillings and three pence. Acland commented, ‘this wool now seems to fetch a higher price than the Merino wool’.\textsuperscript{111} Later in the month he wrote to his son, Johnny, who had taken over the manager’s position at Mt Peel after Mitton’s sudden death, suggesting, ‘You might look forward somewhat to increasing the number of halfbreds’.\textsuperscript{112}

Johnny took his father’s advice and from that time cross bred sheep began to supplant the Merino on the developed paddocks and blocks on the lower run. The cross bred sheep out produced the Merinos on improved country and the economic returns clearly favoured them as well. In 1892

\textsuperscript{107} Acland Papers, Box 50, 2 May 1885.
\textsuperscript{108} Acland Papers, Box 50, 11 April 1887.
\textsuperscript{109} Acland Papers, Box 50, 1 May 1888.
\textsuperscript{110} Acland Papers, Box 12, Letter to Henry Jenkinson, 19 March 1890, Letter to Mary (his sister), October 1890.
\textsuperscript{111} Acland Papers, Box 12, Letter to Johnny Acland, 1 September 1890.
\textsuperscript{112} Acland Papers, Box 12, Letter to Johnny Acland, 11 September 1890.
10,000 ewes went to the Merino ram and 5,000 to Leicester rams.\textsuperscript{113} In the same year 2,811 Merinos were sold at an average of four shillings and five pence, while 2,311 halfbreds brought in ten shillings a head.\textsuperscript{114} Five years later, for the first time, more ewes were mated to Leicester rams (7,438 ewes including 1,728 halfbred ewes) than to Merino rams (6,420 ewes).\textsuperscript{115} Included in the stock sales for that year were 1,860 half and three-quarter bred sheep that averaged eight shillings and four pence a head, while 2,200 cull Merino ewes fetched eleven pence.\textsuperscript{116}

By the end of the 1890s it had become clear that the time of the Merino on Mt Peel was coming to an end and the station was experimenting on how far it should go with crossing and what type of sheep would best replace the original breed. In 1906 the Mt Peel flock totalled 41,065 of which sixty per cent were halfbred or three-quarter bred sheep.\textsuperscript{117} In 1910 cross bred sheep made up just over seventy-seven per cent of the flock of 41,195 and pure the Merinos had been reduced to 9,348.\textsuperscript{118} In 1912, with the government resuming 50,000 acres for closer settlement, Mt Peel held a sale to dispose of 25,000 sheep. In that sale the last of the station’s Merino sheep, 1,450 ewes and 500 wethers, were disposed of, according to the sale report.\textsuperscript{119}

Initially cross breeding was practiced on Mt Peel to produce a first cross halfbred, but as crossing progressed the station experimented with mating first cross ewes to Leicester rams to produce a three-quarter bred. Most of the progeny of this cross were sold, but some ewes were kept and mated to the Leicester again. In 1894, the year Oliver Scott Thomson took over from Johnny Acland as manager, 2,517 halfbred ewes were mated to halfbred rams.\textsuperscript{120} It is likely that these sheep were bred to remain on the improved paddocks where footrot had become endemic and to produce a

\textsuperscript{113} Acland Papers, Box 51, 7 May 1892
\textsuperscript{114} Acland Papers, Beginning of 1892 Diary.
\textsuperscript{115} Acland Papers, Box 52, 25 April 1897.
\textsuperscript{116} Acland Papers, Box 52, 6, 9, 10, 14 March 1897.
\textsuperscript{117} Acland Papers, Box 62, Stock Totals 1906 to 1915.
\textsuperscript{118} Acland Papers, Box 62, Stock Totals 1906 to 1915.
\textsuperscript{119} Timaru Herald, 1 March 1912, p.3.
\textsuperscript{120} Acland Papers, Box 51, 13 April 1894.
meatier and earlier maturing lamb for the meat trade. By 1906, with fewer Merinos being bred it had become obvious that continuing the first cross was not going to be possible for much longer and in that year the station purchased Corriedale rams from the Australian and New Zealand Land Company’s Hakataramea property.121 In 1910 Mt Peel’s ram flock consisted of 165 English Leicesters, 19 Border Leicesters, 125 Corriedales, 1 Lincoln and 23 Merinos.122 The likely scenario for this mix of ram breeds would have the English Leicester used over the remaining Merino ewes to produce a first cross halfbred, while the Corriedale rams would be used over halfbred ewes to continue that halfbred type without going back to the Merino. The remaining English Leicesters, the Border Leicesters and the Lincoln would have likely been used over some of the half bred ewes to breed a three-quarter bred for the paddocks. In this way Mt Peel tried to find types of sheep that suited the different country on the station: the halfbred and Corriedale for the native and improved hill country and the three-quarter bred sheep for the paddocks.

Running different flocks on the one property complicates day to day management and necessitates having plenty of paddocks and blocks, particularly at mating and lambing time, to keep the different mobs separate. To resolve this problem Mt Peel eventually settled on a Merino/Romney Halfbred after the subdivision of the property in 1912. However, even with this change of breed footrot remained an ongoing problem in wet seasons. In 1960, for example, a quarter of the ewe flock were treated for the disease, with the chore of footrotting proving time consuming, costly and ultimately futile.123 As a result, in 1966 a decision was made to change the breed type from the Halfbred to a straight Romney. Since that time footrot has not been an issue.124

121 Acland Papers, Box 57, Letter to H.D. Acland, 9 March 1906.
122 Acland Papers, Box 62, Stock Totals 1906 to 1915.
Conclusion

Grazing sheep was the primary land use in the rangelands of the South Island for most of the period between 1843 and 1912. The profitability of the business depended on managing many different variables: coping with contingent events such as drought, snow and flood; managing the land in order to provide feed for livestock; managing the sheep so that they were healthy and productive; and breeding sheep that were productive and profitable. Sheep breeding was an exercise in attempting to improve the productivity of the sheep, by matching the animals to the local environments in which they were run, and by modifying the breeding of the sheep as the environments in which they were run were modified. These adjustments, in turn, were made to meet changing demands in the marketplace.

The pastoral era began with Merino sheep being run from one end of the rangelands to the other, and ended with different breeds or different sheep types being run in different environmental regions. This process of matching sheep type to land type, which was embedded in sheep farming in the British Isles, was part of a wider process of environmental learning taking place in other facets of the business of pastoralism and pastoral farming in New Zealand.

Footrot, the decline in fine wool prices and the premium paid for longer, stronger wool for the worsted trade, and the establishment of the frozen meat trade, were all factors that led to the decline of the Merino. Local breeders experimented in establishing a dual purpose sheep that could grow a fleece sought by English buyers and a carcase that met the demands of the English meat trade. By 1912 they were well advanced in establishing three new sheep types that met these requirements and which were bred for different environments: the Corriedale, or inbred halfbred, the ‘colonial’ Halfbred and the New Zealand Romney.

Pastoralism is often portrayed as a rapacious business where pastoralists stripped the natural wealth of the land to create economic wealth
for themselves. This history of sheep breeding in the pastoral era, while
acknowledging the economic imperative, contends that pastoralists learned to
read the local environment and by doing so they shaped sheep types that
were both productive and suited to the country on which they grazed. These
experiments in sheep breeding illustrate an awareness of the need to work
within the constraints of the environment rather than the desire to impose an
unworkable system upon it. Moreover, it shows that pastoralists looked to
develop a sustainable industry that could remain viable over the long-term.
CHART: 8.1. QUINQUENNIAL WOOL PRICES for NEW ZEALAND, 1860 to 1910
This photograph is of an improved Merino and quite different from the small framed sheep that were first imported from New South Wales and Port Phillip in the 1850s and 1860s. Yet the Merino remained a smaller type than the other sheep breeds represented in this collection of photographs. The ram has wool from his nose to his toes. Although modern breeders prefer less face cover so that their sheep do not become wool blind, the extensive cover of wool over the body and legs remains a feature of the Merino breed. The fleece is noticeably shorter and denser than the wool on the other breeds here. Note the heavy dewlap, which is a distinguishing feature of the Merino.

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\textsuperscript{125} William Perry, \textit{Sheep Farming in New Zealand} (Auckland: Whitcombe and Tombs, 1923), frontispiece.
The Lincoln was the largest of the British Longwool breeds. It also grew the strongest wool. It was widely used for crossing over the Merino in the early years, but later fell out of favour because of its wool. Even after the establishment of the frozen meat trade wool remained an important product for New Zealand farmers. Wool from the Lincoln cross did not meet the same interest from the wool trade as did the wool from other crosses. The fleece on this ram is markedly longer and more open than the fleece on the Merino in the preceding photograph.

126 Perry, facing page 86.
The English Leicester was popular in Canterbury and parts of Otago for crossing over Merinos. The breed was suited to lighter land than the Lincoln. The Leicester cut less wool than the Lincoln but the wool was finer. Consequently, the Leicester became a preferred sire for breeding a halfbred type as the progeny fattened well and produced a high quality fleece for the worsted trade. Note the open face and bare legs compared with the Merino.  

\[127\] Perry, facing page 54.
The Border Leicester had been bred in the Scottish Borders from the English Leicester. It was hardier than the original Leicester and was popular in colder parts of Otago and Canterbury, and on lighter country in Southland. However, the Border Leicester cut less wool than the English Leicester, which made it less desirable for crossing to produce a halfbred. It has even less wool cover on the face and legs than the English Leicester. The Border Leicester was naturally more prolific than most other breeds and the progeny were fast to mature for the meat trade. As a result it was often used as a terminal sire to produce fat lambs for the frozen meat trade.

128 Perry, facing page 70.
The Romney’s ability to withstand cold wet conditions and to produce well on rank feed made it the most popular breed in New Zealand by the end of the pastoral era. By this time the New Zealand Romney had become a distinctly different type from the English Romney Marsh. English breeders concentrated on developing a big animal for meat production, whereas New Zealand breeders set out to produce a dual purpose sheep. The New Zealand Romney was smaller than the English type, but grew a much more valuable fleece. This ram is a tremendous example of the New Zealand Romney from the period. It carries a long, dense fleece. There is not too much wool on the face making it useful in rough country, and the legs are reasonably free of wool so that it could cope with wet and muddy conditions. The Romney also became popular for crossing over the Merino and produced a successful halfbred type.

129 Perry, facing page 22.
The halfbred in the colonial era was the result of the first cross using an English Longwool sire over a Merino ewe. In time, breeders developed a New Zealand or ‘Colonial’ Halfbred that suited the semi-arid, hard hill and high country of the South Island. The Merino influence is maintained in the Halfbred and is evident in the smaller size of this ram compared with the Longwool breeds in this collection. Although its wool is not as fine as the Merino, the Halfbred produces a high quality fleece that was popular in the Bradford wool trade. The Halfbred’s advantage over the Merino is that it has a higher lambing percentage and the lambs fatten more quickly.

130 Perry, facing page 134.
The Corriedale was the first sheep breed developed in New Zealand. This ram is a good example of the early Corriedale breed. It is a big robust type and very well woolled. The Merino influence in the breed is apparent in the dense, blocky wool cover, particularly over the ram’s shoulders, back and rump, which keeps out dust and weather preventing the valuable fleece from becoming discoloured and dirty. As with the Merino and Halfbred from the period, the Corriedale has more wool on the face and legs than the Longwools. The bigger frame of the Corriedale is from the Longwool sire and the result of selection for the trait. The Corriedale now rivals the Merino as the most popular sheep breed amongst sheep farmers throughout the world.

131 Perry, facing page 150.
CHAPTER NINE
CONCLUSION

The spread of pastoralism on to the rangelands of the South Island of New Zealand was a part of a much wider phenomenon where European people, livestock, techniques, technology and capital expanded across ‘new world’ landscapes. That expansion came at a profound cost to native peoples and to local environments. Environmental histories have highlighted the invasion of the ‘new’ world with aggressive ‘old’ world biota, and the imposition of a capitalist system where local resources became transformed into international commodities with serious consequences for local landscapes. Indeed, these are sorry tales.

In New Zealand the orthodox narrative of the pastoral impact on the rangelands of the South Island follows this discourse. Pastoralists misread the landscape, imposed an unsustainable system of land use, they quickly stripped the natural fertility of the soils and left the country depleted, eroded, and overwhelmed by pests and weeds. Much of the evidence that critics use to argue that sheep ranching methods led to the desertification of the land came from the semi-arid districts of Central Otago, the Upper Waitaki, and the Mackenzie Country. Yet these outcomes are often generalised to include all the ‘high country’ or all the ‘tussock grasslands and associated mountain lands’. In fact, the rangeland environment was much more complex than these critics allow and this complexity resulted in considerable variations in outcomes across the region.

The orthodox explanation of rangeland transformation

In a Hocken Lecture at the University of Otago in 2004 botanist Alan Mark presented an historical perspective of the tussock grasslands and
associated mountain lands. In his paper Mark set out the lineage of 'scientists and others' who have written about the deterioration of the vegetation of the rangelands: Buchanan (1868), Alfred Cockayne (1910), Leonard Cockayne (1919), George Thomson (1922), Vic Zotov (1938), Gibbs and Raeside, and Ken Cumberland (1945), and Chris Kerr (1992). Kerr's 1992 paper set out the same lineage with the notable inclusion of Donald Petrie (1912).

Buchanan, a self-taught botanist, is cited by Kerr as having described the 'deterioration of the tussock grasslands of Otago caused by repeated burning'. Both Kerr and Mark quote Buchanan's observation: 'Nothing can show greater ignorance of grass conservation than repeated burning, which is so frequently practised.' In fact, the correct quote is: 'Nothing can show greater ignorance of grass conservation than repeated burning of the pasture in arid districts [my emphasis] which is so frequently practised.' It is interesting that both Mark and Kerr chose to leave this important qualification out of their text. Buchanan did not dismiss burning out of hand; he thought it inappropriate in arid areas. Buchanan went on to say that the deterioration of the grasslands by fire had reduced the carrying capacity so that 'many of the runs require eight acres to feed one sheep.'

Botanist Donald Petrie was surprised by this comment from Buchanan saying that 'in the mid-seventies the sheep-runs of Central Otago were reputed to carry at least one sheep to four acres and the majority of them

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2 Mark, 2.
4 Kerr, 32.
5 Mark, 2; Kerr, 32.
7 Buchanan, 182.
carried one sheep to three acres or somewhat less. The paper in which Petrie made this observation is a critically important document in the land history of Central Otago, as he was one of the few commentators who saw and wrote about the transformation of the landscape of that region over an extended period. Not only was Petrie a careful observer, he was also a careful writer. He based his paper on his observations of the land and vegetation of Vincent County between 1875 and 1911, although he did note that it touched on ‘similar areas’ in Central Otago and the Mackenzie Country. Broad generalisations to include all the tussock grasslands from observations made in the semi-arid Vincent County were not for him.

Petrie made several important points in his analysis of the process of desertification that he observed in Vincent County:

1. ‘On the higher levels of the county and of the neighbouring districts the pastures have not undergone such serious deterioration as is shown at the lower levels.’

2. ‘The hill-slopes and the plateau lands carry a fertile soil that supports a considerable wealth of grasses wherever rainfall is sufficient and regular.’

3. ‘Or the lower alluvial terraces the soil is generally thin ... so that conditions are favourable to grass depletion.’

4. ‘In the lower areas, about Alexandra, Clyde, and Cromwell, ... the country was from the first of an arid character.’

5. ‘In areas of this character [the lower dry areas above] the more palatable and nutritious grasses have been undergoing a slow process of degeneration [due to repeated burning and the depasturing of sheep] even before the rabbit pest had established itself, and the appearance of this new factor greatly hastened their deterioration.’

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9 Petrie, 3.
10 Petrie, 2.
11 Petrie, 3.
12 Petrie, 3.
13 Petrie, 4.
6. ‘[T]he extermination of the grasses in this desert country is mainly due to eating out by overstocking, rabbits as well as sheep being included.’\[^{14}\]

Thus Petrie outlined the complex intersection of factors that led to the deterioration of the rangelands in parts of Vincent County, Central Otago and the Mackenzie Country: rainfall, altitude, aspect, soils, burning, sheep grazing, and rabbits. He observed that the deterioration of the vegetation was not universal across all landscapes in these regions and that in some areas of shallow soils and low rainfall the vegetation was thin before pastoral settlement took place. This is supported by Garvie, who noted in 1858 that the grass in places was ‘rather thin’ and consisted ‘almost entirely of a single species’\[^{15}\]. It was in these areas that Petrie noted that sheep ranching methods were reducing the vigour of the vegetation before the rabbit plague. Others have been much less careful in their analysis.

Thomson, a self-taught pioneer ecologist, wrote about the first rabbit plague and relied on Petrie for his information on the depletion of the vegetation in Central Otago.\[^{16}\] It is hard to know why Mark omitted Petrie from his lineage, but included Thomson. Perhaps it was because Thomson was more forthright in his comments, as can be seen in this quote: ‘Before their advent [rabbits], runholders who had possession of the arid regions ... were doing their best to denude the surface of the ground by overstocking with sheep and frequent burning.’\[^{17}\] Thomson provided no supporting evidence for this conclusion.

A.H. Cockayne, a biologist for the Department of Agriculture, criticised burning by pastoralists in an article published in 1910.\[^{18}\] He

\[^{14}\] Petrie, 8.
\[^{15}\] Alex, Garvie, “Report on the Reconnaissance Survey of the South-Eastern Districts of the Province of Otago, executed during the months of October and November, also February, March and part of April, 1857-8,” Otago Provincial Government Gazette, Vol.3 (January 1856-December 1859), 280.
\[^{17}\] Thomson, 92.
described burning taking place throughout the year and the same country
being burned twice within the same season. This paper is widely used to
support the argument that pastoralists used fire ‘indiscriminately’. Yet
Cockayne did not furnish any evidential support for his claims. Moreover,
his suggestion that the same piece of country could be burned twice within
the same season is unlikely; after the first burn there would not be enough
vegetation to carry a second fire.

Mark and Kerr both quoted the observation by ecologist Leonard
Cockayne in 1919 that indiscriminate burning had turned acres of tussock
grassland into ‘stony debris’. Interestingly, neither writer acknowledged the
work of Whitehouse and others who have used photographic evidence and
other dating techniques to demonstrate that erosion is a natural feature in the
high country, and that most scree slopes predate pastoral settlement.

Zotov’s 1938 paper on the South Island tussock-grasslands has been
widely used to support the case that sheep ranching methods were
responsible for the depletion of the vegetation and the erosion that ensued.
Annual indiscriminate burning, according to Zotov, was the primary cause of
the process of depletion. He went on to claim that ‘the rabbit [was] not in
itself a major agent of depletion’. He drew these conclusions after a nine-
week tour of the South Island made over sixty years after the outbreak of the
rabbit irruption, discussions with ‘old settlers’, ‘two sources of information’,
both unnamed, and his own reconstruction of the vegetation at the time of
settlement. He did admit knowledge of native plant species and
associations was inadequate, which would have made his reconstruction

19 Mark, 2. Kerr, 32.
20 Ian E. Whitehouse, “Erosion in the eastern South Island high country – a changing
perspective,” *TGML Review* no.42 (1984), 17; M.J. McSaveney and Ian E. Whitehouse,
“Anthropic Erosion of Mountain Land in Canterbury,” *New Zealand Journal of Ecology*
12 (supplement 1989), 159; I.E. Whitehouse and A.J. Pearce, “Shaping the Mountains of
21 V.D. Zotov, “Survey of the tussock-grasslands of the South Island of New Zealand,”
*Department of Scientific and Industrial Research Bulletin* (1938), 212A, 228 A.
22 Zotov, 212A, 216A, 224A, 228A.
difficult. There must be some question whether this evidence justified the conclusions that Zotov drew.

Cumberland’s research into contemporary burning by pastoralists on sixty South Island runs in his 1945 report was much more soundly based. He found that burning was ‘very rarely indiscriminate’.\textsuperscript{23} Yet, relying on the claims of Buchanan, Alfred and Leonard Cockayne, and Zotov, Cumberland concluded that in the nineteenth century annual burning was often the rule.\textsuperscript{24}

Cumberland’s dilemma, whether to accept the evidence of his own research or to accept the claims of the established authorities, illustrates the problems that lie in the lineage of these critics of sheep ranching practice: Mark refers to Kerr, who refers to Cumberland, who refers to Zotov, who refers to the Cockaynes, who refer to Buchanan. Quotes taken out of context, poorly referenced sources, lack of evidential support for claims, the extrapolation of data from a particular location to include all the tussock grasslands, and biased selection of evidence do not provide for a rigorous analysis.

Petrie stands out like a beacon here. His data came from his own observations made over a seventeen-year period. His analysis and conclusions derived from this data set, and they pertained only to the landscape that he had observed. Moreover, he was careful in the conclusions he drew. Yet even Petrie was misrepresented. Soil scientists Gibbs and Raeside claimed that he ‘named burning as the principal cause of erosion’ and that he saw overstocking by sheep and rabbits ‘to be a contributing factor, but not a prime cause of depletion’.\textsuperscript{25} Petrie actually wrote: ‘The hurtful effects of grass-burning have been seconded by a more important

\textsuperscript{24} Cumberland, 21.
factor [my emphasis] – continuous overstocking [by rabbits and sheep]'}. In the following paragraph he wrote: ‘For my part, I cannot doubt that the present desert-areas are mainly the result of overstocking’.

Mark, Kerr, Gibbs and Raeside, Cumberland and Zotov and others have argued that the impact of pastoralism on the rangelands of the South Island was, in effect, an ecological disaster. I contend that this is an incomplete and slanted story. This thesis has set out to test this account of the transformation of the rangelands.

Testing the orthodox narrative

This thesis is a settler history which has tried to understand the pastoralists in the context of their own time and place. It has argued that their economic, social, cultural and natural environments shaped the way the pastoralists operated. The pastoralists were capitalists keen to profit from running sheep on a low cost extensive sheep ranching system. Understandably, they used methods that they knew from home to manage their stock and the land. In order to run their enterprises profitably they also needed to learn to read their new environment. Their success in breeding sheep types to suit different landscapes is just one example of this process of learning and adaptation. As capitalists they were forced to respond to the changes in prices and changes in products demanded in the international marketplace. This led to the introduction of new management techniques and to the wholesale transformation of low country landscapes in particular. The mentalité of the pastoralists and their belief in progress and improvement underpinned these processes of experimentation and learning and responding to the marketplace. Moreover, many of them envisaged their enterprises as long-term ventures. Some did make a quick profit and then returned to Britain. The majority did not.

26 Petrie, 11.
A number of properties from different regions of the rangelands have provided evidence to test the declensionist argument, but much of the focus has been on Mt Peel Station. A few other stations have left consistent records of accounts of daily activities, but for the purposes of this thesis they all had problems. Orari Gorge’s archive had already been used for a book and a thesis which have been used in this study. The records from Waitangi provided some useful material but were not full enough for a more detailed study. Benmore in the Upper Waitaki has good records; however, the station was part of Robert Campbell’s pastoral empire and sheep were regularly shifted between his different stations, which resulted in sudden changes in the stock loading. Consequently, Benmore did not provide a useful case to make comparisons with other stations. Recently, the Glens of Tekoa archive has been transferred from the station to the Canterbury Museum Documentary Research Centre and this will provide a useful resource for future research. Thus by default Mt Peel has been the main source of material for this thesis.

**Mt Peel in the pastoral era**

In March 1912, with the Government having resumed 50,000 acres for subdivision into smaller properties, Mt Peel Station sold 25,000 sheep at an auction held at the station sheepyards. The *Timaru Herald* described the sheep as ‘good quality’ and reported that ‘[they] were eagerly sought after, bidding was keen, and the whole offering was disposed of at prices that were highly satisfactory to the vendors’. Mt Peel kept 20,000 sheep to be run on the country that the Acland family had retained.

At the time of sale the station ran 45,000 sheep and, judging by the sale report and prices for the sheep sold, they were good stock in good condition. A history of the sheep loading on the station shows that this level of stocking

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28 *Timaru Herald*, 1 March 1912, p.3.
had been carried on Mt Peel for many years. The station’s flock passed 35,000 sheep in 1870 and in the following forty-two years, up to the time of subdivision, the flock averaged 40,757 sheep. Over that time the size, wool production and lambing performance of the sheep increased.

However, the history of Mt Peel is not one of relentless improvement and progress. The station suffered from similar contingent events and circumstances that were experienced throughout the rangelands, although it was spared the worst excesses of rabbits and drought. Mt Peel sustained devastating sheep losses from snow events, damage from storms and floods, economic depression that resulted from the long-term decline in fine-wool prices, animal health problems, loss of land, encroachment of weeds and pests, and the personal financial crisis of owner John Barton Acland which nearly led to the forced sale of the property. Despite these vicissitudes the station maintained consistently high sheep numbers and the productivity of the stock improved, indicating that the stock loading of the station increased over time.

An even longer view of the station’s record shows that the production off the property has continued to increase. I have estimated that in sheep alone Mt Peel carried 31,361 stock units in 1910/11, a stocking rate of 1.33 stock unit per hectare over the whole station. In 2007 the station consists of 8,800 hectares (21,700 acres) and carries 30,000 stock units in sheep, cattle and deer.29 The stocking rate is 3.4 stock units to the hectare.

The history of Mt Peel does not fit the orthodox thesis of decline. Moreover, in the pastoral era up to 1912, from Marlborough to Southland and from the plains to the hills and mountains there were other stations that did not fit the model of an over-burned, overgrazed, depleted landscape with declining productivity. This thesis has tried to account for this difference in outcomes of the impact of pastoralism. The natural resources of a property, the motivation of the owner, the ability of management, changing economic

circumstances and contingencies all played a part in shaping these different outcomes.

Differences in resource endowments were fundamental in shaping the course and outcome of the pastoral impact on rangeland properties. Mt Peel had natural advantages that furnished opportunities for increasing the productivity of the station. It was a well-balanced run with extensive areas of well-watered, relatively low altitude sunny country in a medium to high rainfall area. There were ample flats and terraces and thousands of acres of easy hill country. The dark country on the Orari side of the Mt Peel Range and the higher tops provided good summering for stock, particularly in dry seasons.

However, there were also natural disadvantages that provided constraints on the productivity and development of the station. The station was subject to severe climatic events. Occasional heavy snow falls killed thousands of sheep. Difficult access between the Orari and front country exacerbated the problem, as it was impossible to get snow-bound sheep out of the Orari after heavy snow. Sheep did not do well in wet years and foot rot remained a serious health problem that reduced the productivity of the sheep and cost time and effort to treat. Occasional floods eroded land and damaged fences, bridges, roads and forced the owners to erect a new woolshed after the old one was nearly swept away.

Mt Peel had another advantage in addition to its natural resources; its owner. John Barton Arundel Acland was by nature a progressive farmer. His eldest brother, Sir Thomas Dyke Acland, was a leading agricultural improver in Devon and Somerset. Farming matters were a regular topic in their letters and the two men kept in close contact throughout their lives. Acland set out to establish an estate that his descendants could enjoy. He was no sojourner here to make a quick profit and return to England.

Acland’s mentalite influenced the management of the station. Although he did not play a hands-on part in the daily activities of running the
property he was in regular contact with his managers and, until old age and ill-health caught up with him in late in the 1890s, he took an active role in the direction of the station. Over time his staff and contractors cultivated hundreds of acres of flats and terraces and sowed green feed and then permanent pasture. Easy hill blocks were oversown with clovers and cocksfoot. Artificial fertiliser usage boosted turnip and young grass crops from 1890. Fencing subdivided paddocks and hill blocks to improve stock management and ease sheep handling. Selective breeding improved sheep productivity. The land management story on Mt Peel is of intensification and increasing inputs. This was a classic example of sustainable pastoral farming, not exploitative pastoralism. All the while, the native rangeland remained an integral part of the farming operation of the station.

The intensification of land use combined with changes in prices for agricultural products encouraged Mt Peel to change its sheep breeding policy. Sheep farming in the rangelands began with Merino sheep imported from the Australian colonies and Acland was an enthusiast for the breed. However, fine wool prices slowly declined from the mid-1870s, which made runs that relied almost totally on the income from wool barely viable economically. A shift to cross breeding produced a half bred type sheep that grew stronger combing wool that was in demand for the worsted trade. The half bred also produced a faster maturing and better fleshe d carcasse for the frozen meat trade. This type did much better on the improved country on Mt Peel and proved to be more profitable than the Merino, so that the last of the original breed were sold off in the 1912 sale.

An advantage that Mt Peel enjoyed over runs in other parts of the rangelands is that the station was not overwhelmed by rabbits in the period up to 1912. The station faced increased rabbiting costs in the first decade of the twentieth century, but rabbits did not have any noticeable impact on sheep numbers and sheep productivity. Even the cost of control measures were minimal compared to runs like Waitangi and Earnscleugh which were devastated by the rabbit plague.
The evidence from this study indicates that the rabbit was a key agent in the depletion of the rangelands in the period up to 1912. Runs in the semi-arid regions were simply overwhelmed by the pest. Despite Acland’s motivation and ability it is seems highly unlikely that he would have been any more successful in preventing or combating the rabbit irruption than anyone else had he taken up a run in Vincent County, or the Upper Waitaki, or the Mackenzie Country.

**Concluding remarks**

At the outset all rangeland properties began with the simple practices of burning and stocking of the land. Thereafter, the extent and pace of development on the stations of the region depended on a variety of factors and circumstances. The resource endowments of the different runs probably proved to be the most significant influence on how far down the road to improvement landowners travelled. On the plains, downlands and easier hill country pastoralists soon became pastoral farmers. In semi-arid and mountainous areas aridity, the short growing season, and steep terrain provided constraints on land improvement and many runholders remained pastoralists. By the 1890s a differentiation between the largely freehold low country and the largely leasehold high country had been established. In fact the term ‘high country’ for the semi-arid and mountain lands began to appear in common usage about this time.30 However, in the hills of the Amuri District, along the foothills adjoining the Canterbury Plains, and in the hill districts of Otago and Southland the distinction between the two systems remained blurred.

This thesis has emphasised the considerable variations in landscape and climate across the rangelands. The timing of the transformation of the rangeland and the processes involved were not uniform and the outcomes of

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30 MB 44. Acland Papers, Box 12, 11 July 1888, Letter from Acland to Mr Alexander. Acland described Mt Peel as a high country run, which is the first instance that I have seen the term used, Macmillan Brown Library, University of Canterbury, Christchurch, New Zealand; *Otago Witness*, 14 November 1895, p.6, ‘Drover’ described some Merino sheep shown at the Christchurch Show as being very suitable for the high country as they were of a very robust type.
that transformation were not uniform. There were marked differences across the region. The orthodox argument that the methods of the pastoralists led to a degraded landscape does not explain those differences. The evidence from Mt Peel and other runs outside the semi-arid areas is that up to the time of their subdivision productivity remained high and even continued to increase.

An improvement ethos underpinned the pastoral era and the actions of the pastoral improvers were characterised by enterprise, enthusiasm and energy. Improving pastoralists applied scientific and technological ideas from around the world to their farming systems. In the pastoral era most experimentation took place on farms and stations and was undertaken by practical men: they bred improved livestock; they discovered that super phosphate boosted the productivity of turnip crops; they experimented with different pasture plants in an effort to develop improved permanent pastures. Improving pastoralists developed the frozen meat trade and lobbied in Britain to improve its marketing.

Pastoralism reached its ecological limits in the semi-arid and hard mountain country. Contemporary technological and scientific knowledge could not solve the problems that restricted production in these areas, and economic and biological constraints turned pastoralists in the high country from improvement to survival. Aridity and rabbits provided constraints on pastoral farming in inland Marlborough, the Mackenzie Country, the Upper Waitaki, and parts of Central Otago; they still do. Critics of pastoralism focus on these regions and choose to ignore the successes of pastoral farming elsewhere in the rangelands: the Rutherfords in the Amuri; Hall, Cameron and Grigg on the Canterbury Plains; Deans in the foothills; Tripp in the mountains; Murray and Roberts in Otago; and Holmes in Northern Southland.

The pastoral impact on the rangelands of the South Island between 1841 and 1912 was complex. It had a profound impact not only on the

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31 New Zealand Country Journal Vol.18, No.4 (July 1894), 281.
rangeland environment, but also on the shaping of New Zealand. Apart from the decade between the early 1860s and early 1870s, when gold was the most valuable commodity exported from the country, returns from products grown on the South Island rangelands - fine Merino wool, grain, and later halfbred and cross bred wool, and sheep meat - provided the stimulus for the growth of the New Zealand economy in the colonial period.
John Barton Arundel Acland at his desk c1893

32 MB 44, CP 4897, Acland Family Photographs, J B A Acland at his desk, c1893, Macmillan Brown Library, University of Canterbury
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APPENDIX ONE

Appendix One consists of twenty-one charts showing sheep numbers with five-year moving averages for the following stations:

CHART: 10.1. Flaxbourne 1879 to 1904
CHART: 10.2. Molesworth 1879 to 1910
CHART: 10.3. Mt Parnassus 1879 to 1904
CHART: 10.4. Leslie Hills 1879 to 1912
CHART: 10.5. Glens of Tekoa 1879 to 1910
CHART: 10.6. The Terrace 1879 to 1906
CHART: 10.7. Springfield 1879 to 1907
CHART: 10.8. Mt Somers 1879 to 1912
CHART: 10.9. Mesopotamia 1880 to 1910
CHART: 10.10. Orari Gorge 1879 to 1909
CHART: 10.11. The Mistake 1879 to 1912
CHART: 12.12. Grampian Hills 1879 to 1911
CHART: 10.13. Pareora 1879 to 1899
CHART: 10.14. Waitangi 1879 to 1912
CHART: 10.15. Morven Hills 1879 to 1909
CHART: 10.16. Earnscleugh 1879 to 1912
CHART: 10.17. Galloway 1879 to 1912
CHART: 10.18. Gladbrook 1879 to 1912
CHART: 10.19. Moa Flat 1879 to 1905
CHART: 10.20. Castle Rock 1879 to 1902
CHART: 10.21. Five Rivers 1879 to 1895

The timeframe for all stations begin in 1879 or 1880. The end points vary; they either finish at 1912 or when the station was subdivided.
CHART: 10.1. FLAXBOURNE. Actual sheep numbers and 5-year moving average.
CHART: The Terrace. Actual sheep numbers and 5-year moving average.
CHART: 10.11. THE MISTAKE: Actual sheep numbers and 5-year moving average.
CHART 10.16. MORVEN HILLS. Actual sheep numbers and 5-year moving average
CHART: 10.17. GALLOWAY. Actual sheep numbers and 5-year moving average.
CHART: 10.18. GLADBROOK. Actual sheep numbers and 5-year moving average.
Sheep

CHART 16.19. MOA FLAT. Actual sheep numbers and 5-year moving average.
CHART: 10.21. FIVE RIVERS. Actual sheep numbers and 5-year moving average.
APPENDIX TWO

TABLE: 10.1. Sheep returns from some selected stations from the Amuri, Canterbury, and South Canterbury, 1879 to 1912

Appendix Two lists the Sheep Returns of thirty stations from the Amuri, Canterbury and South Canterbury. These properties were selected to represent the stations in the different geographical areas of these regions. Many, but not all, of these stations are referred to in the text.

Amuri high country: Glynn Wye
                      Glens of Tekoa

Amuri hill country: Leslie Hills
                   Culverden
                   St Leonards
                   Kaiwara
                   Mt Parnassus

North Canterbury hills: Heathstock
                        Glenmark
                        Cheviot Hills
                        Stonyhurst

Central Canterbury high country: Mt White
                               Double Hill
                               Snowdon
                               Clent hills

Canterbury foothills: Homebush
                      Mt Somers

Central Canterbury plains: The Terrace
                        Springfield

South Canterbury high country: Mesopotamia
                              Mt Peel
                              Clayton

South Canterbury hill and downlands: Orari Gorge
                                  Bluecliffs
                                  Pareora-Holme Station

Mackenzie Country-Waitaki Valley: The Mistake
                                     Rhoborough Downs
                                     Grampian Hills
                                     Haldon
                                     Waitangi
### APPENDIX TWO

**TABLE: 10.1. Sheep returns from some selected stations from the Amuri, Canterbury, and South Canterbury, 1879 to 1912**

<table>
<thead>
<tr>
<th>Station</th>
<th>Owner</th>
<th>1879</th>
<th>1880</th>
<th>1881</th>
<th>1882</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Leslie Hills</td>
<td>G Rutherford</td>
<td>17,536</td>
<td>17,505</td>
<td>17,002</td>
<td>17,750</td>
</tr>
<tr>
<td>2 Culverden</td>
<td>J C Wilson</td>
<td>18,760</td>
<td>19,200</td>
<td>20,508</td>
<td>20,000</td>
</tr>
<tr>
<td>3 Glynn Wye</td>
<td>W A Low</td>
<td>20,567</td>
<td>20,560</td>
<td>16,547</td>
<td>17,500</td>
</tr>
<tr>
<td>4 Glensof Tekoa</td>
<td>G W McRae</td>
<td>16,000</td>
<td>15,000</td>
<td>14,850</td>
<td>15,000</td>
</tr>
<tr>
<td>5 St Leonards</td>
<td>Wilkin &amp; Davison</td>
<td>28,896</td>
<td>25,500</td>
<td>30,800</td>
<td>26,091</td>
</tr>
<tr>
<td>6 Kawaiwra</td>
<td>J Macfarlane</td>
<td>17,100</td>
<td>18,700</td>
<td>18,132</td>
<td>17,700</td>
</tr>
<tr>
<td>7 Heathstock</td>
<td>Mullock &amp; Lance</td>
<td>62,737</td>
<td>62,650</td>
<td>60,500</td>
<td>57,255</td>
</tr>
<tr>
<td>8 Mt Parnassus</td>
<td>J G Anstey</td>
<td>30,369</td>
<td>30,581</td>
<td>31,107</td>
<td>32,390</td>
</tr>
<tr>
<td>9 Cheviot Hills</td>
<td>W Robinson</td>
<td>67,780</td>
<td>60,500</td>
<td>73,000</td>
<td>80,000</td>
</tr>
<tr>
<td>10 Stonyhurst</td>
<td>Clifford &amp; Weld</td>
<td>18,800</td>
<td>17,000</td>
<td>17,180</td>
<td>18,000</td>
</tr>
<tr>
<td>11 Glenmark</td>
<td>G H Moore</td>
<td>90,000</td>
<td>90,000</td>
<td>88,700</td>
<td>87,500</td>
</tr>
<tr>
<td>12 Mt White</td>
<td>J M Cochran</td>
<td>17,000</td>
<td>18,000</td>
<td>17,180</td>
<td>23,542</td>
</tr>
<tr>
<td>13 Home Bush</td>
<td>J Deans</td>
<td>15,000</td>
<td>15,763</td>
<td>15,872</td>
<td>13,500</td>
</tr>
<tr>
<td>14 The Terrace</td>
<td>J Hall</td>
<td>28,781</td>
<td>28,495</td>
<td>30,067</td>
<td>30,500</td>
</tr>
<tr>
<td>15 Double Hill</td>
<td>W Gerard</td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
</tr>
<tr>
<td>16 Snowdon</td>
<td>W Gerard</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>17 Springfield</td>
<td>Gould &amp; Cameron</td>
<td>19,600</td>
<td>22,350</td>
<td>18,703</td>
<td>15,000</td>
</tr>
<tr>
<td>18 Mt Somers</td>
<td>A E Peache</td>
<td>8,932</td>
<td>8,000</td>
<td>8,000</td>
<td>8,000</td>
</tr>
<tr>
<td>19 Clent Hills</td>
<td>A E Peache</td>
<td>16,850</td>
<td>16,000</td>
<td>16,000</td>
<td>16,000</td>
</tr>
<tr>
<td>20 Mt Peel</td>
<td>J B A Acland</td>
<td>44,814</td>
<td>43,655</td>
<td>46,606</td>
<td>47,457</td>
</tr>
<tr>
<td>21 Orari Gorge</td>
<td>C G Tripp</td>
<td>40,253</td>
<td>39,690</td>
<td>41,094</td>
<td>46,086</td>
</tr>
<tr>
<td>22 Blue Cliffs</td>
<td>R Rhodes</td>
<td>21,300</td>
<td>20,447</td>
<td>24,411</td>
<td>29,961</td>
</tr>
<tr>
<td>23 Pareora</td>
<td>E Elworthy</td>
<td>40,527</td>
<td>47,684</td>
<td>45,707</td>
<td>46,660</td>
</tr>
<tr>
<td>24 Grampians</td>
<td>T Fisher</td>
<td>19,700</td>
<td>18,700</td>
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Sheep returns from some selected stations from the Amuri, Canterbury, and South Canterbury

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* Ex denotes Executors.
* denotes the year when a new leaseholder takes over.
Sheep returns from some selected stations from the Amuri, Canterbury, and South Canterbury

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Sheep returns from some selected stations from the Amuri, Canterbury, and South Canterbury

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1 Sheep numbers are no longer included after a station was subdivided.
Sheep returns from some selected stations from the Amuri, Canterbury, and South Canterbury

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Sheep returns from some selected stations from the Amuri, Canterbury, and South Canterbury

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APPENDIX THREE

TABLE: 10.2. Sheep returns from some selected stations from Otago, North Otago, Central Otago, and Southland, 1879 to 1912

Appendix three lists the Sheep Returns of twenty-two stations from North Otago, Central Otago and Southland. These properties were selected to represent the stations in the different geographical areas of the Otago-Southland region. Many, but not all, of these stations are found in the text.

Upper Waitaki: Longslip
Omarama

Central Otago: Hawkdun
Ida Valley
Galloway
Moutere
Earnscleugh

Maniototo: Puketoi

Strath Taieri-Horse Range: Shag Valley
Gladbrook

Upper Clutha: Morven Hills
Wanaka Station

Lake Wakatipu: North Station

West Otago: Moa Flat
Greenvale
Waipahi

Southland: Knapdale
Heddon Bush

Northern Southland: Five Rivers
Castle Rock

Western Southland: Mt Linton
Blackmount
### APPENDIX THREE

**TABLE: 10.2. Sheep returns from some selected stations from Otago, North Otago, Central Otago, and Southland, 1879 to 1912**

<table>
<thead>
<tr>
<th>Station</th>
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<td>11,000</td>
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<td>44,720</td>
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<td>32,402</td>
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<td>30,637</td>
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<td>McLaren &amp; Turnbull</td>
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<td>16,000</td>
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<td>J Fraser</td>
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<td>22,000</td>
<td>19,500</td>
</tr>
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<td>Puketoi</td>
<td>W Shennan</td>
<td>32,000</td>
<td>30,800</td>
<td>31,250</td>
<td>32,000</td>
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<td>50,542</td>
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<td>J Logan</td>
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<td>Spence Bros</td>
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<td>15,000</td>
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<td>18,500</td>
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Sheep returns from some selected stations from Otago, North Otago, Central Otago, and Southland²

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<th>1886</th>
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<td>Young &amp; Dalgety</td>
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<td>47,726</td>
<td>48,700</td>
<td>49,700</td>
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<td>20,921</td>
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<td>35,805</td>
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<td>38,230</td>
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<td>68,000</td>
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<td>McLaren &amp; Turnbull</td>
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<td>J Fraser</td>
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<td>23,000</td>
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<td>W Shennan</td>
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<td>32,000</td>
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<td>31,000</td>
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² Ex denotes Executors
* denotes new leaseholder
Sheep returns from some selected stations from Otago, North Otago, Central Otago, and Southland

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Sheep numbers are not included after a run was subdivided or given up.
Sheep returns from some selected stations from Otago, North Otago, Central Otago, and Southland

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Sheep returns from some selected stations from Otago, North Otago, Central Otago, and Southland

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