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Title of Thesis: Environmental Anxiety in New Zealand, 1850-1920: settlers, climate, conservation, health, environment.

Author of Thesis: James John Beattie

A thesis submitted for the degree of
Doctor of Philosophy
at the University of Otago, Dunedin,
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Abstract

Using a series of interlocking case-studies, this thesis investigates environmental anxieties in New Zealand’s settler society in the period 1830-1920. A central premise of this study is that the rapid environmental transformation of New Zealand stimulated widespread anxieties and reforms within settler society. These anxieties focussed as much on the changes already begun as on apprehensions of the results of these changes. Applying the concept of environmental anxiety to settler New Zealand expands understandings about colonial culture and its environmental history. It moves debate beyond simple narratives of colonial environmental destruction. Instead, this thesis highlights the ambiguities and complexities of colonial views of the natural world. This thesis points to the insecurities behind seeming Victorian confidence, even arrogance, in the ability of science and technology to bring constant material improvement. Europeans recognised that modern living brought material advantages but that the rapid environmental changes that underpinned these improvements also brought and threatened to bring unwanted outcomes.

A diverse range of settlers worried about the effects of environmental changes. Individuals, institutions, committees, councils, doctors, scientists, artists, governments, engineers and politicians expressed environmental anxieties of one kind or another. Some farmers, politicians and scientists held that deforestation decreased rainfall but increased temperatures. Other scientists and politicians feared that it brought devastating floods and soil erosion. Some Māori, travellers, politicians and scientists held that it destabilised sand that would inundate fertile fields. Councillors, engineers and doctors constantly debated ways of improving the healthiness of towns and cities, areas seen as particularly dangerous places in which to live. Doctors’ and settlers’ anxieties focused on the effects of New Zealand’s climate on health and racial development. The impact of environmental change on the healthiness of certain areas, as well as the role played by humans in climate change, also provoked lively discussion.

The effects of these anxieties are evident in some of the land policies, artworks, legislation, parliamentary and scientific debates, and writings of this period. Settlers believed curbing pollution, laying out parks, planting trees and restricting the construction of unhealthy properties improved living conditions in cities. Some scientists and politicians thought setting aside forest ‘climate reserves’ in highland areas, tree-planting legislation and sustainable forestry practices prevented flooding and climate change. Individuals and authorities also
established sanatoria and spas in particularly healthy spots, such as at the seaside and in high, dry places.

In investigating these topics, this thesis expands the discipline of environmental history, bringing to light the importance of studying urban environments, aesthetics, climate change, desertification and health. It expands the largely 'national' narratives of New Zealand's environmental histories by acknowledging that local environments, events and attitudes as well as global environments, events and attitudes shaped anxieties and policies. Global ideas, often operating at a local level, played a role in reinforcing and providing solutions to New Zealand's environmental anxieties. This thesis also acknowledges the on-going significance of Christianity in under-girding ideas about improvement and environmental protection. Most significantly, perhaps, this study underlines both that many settlers displayed an emotional attachment to the New Zealand environment and that most colonists wanted to ensure the long-term productivity of its lands.
Acknowledgements

Studying for this doctoral degree has cemented old friendships and created many new ones. I am grateful to the people who shared and discussed their ideas.

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Otago Settlers’ Museum, Dunedin; Presbyterian Archives of Aotearoa/New Zealand and in particular Yvonne Wilkie; Wein Universität Bibliothek. Miss Savage also kindly gave me permission to reproduce the illuminated address prepared by Alfred Sharpe that had been presented to a member of her family early last century.

I should like to acknowledge the financial support of the Foundation for Research Science and Technology who provided me with a Bright Futures Top Achievers’ Doctoral Scholarship and earlier, when this study began as a Masters, to the University of Otago which funded my masters’ study. I also thank the University of Otago and Melbourne University for their financial assistance to attend conferences.

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Preface

The concept of environmental anxiety both builds on the work of Richard Grove and emerges powerfully from the primary sources themselves. In his influential book *Green Imperialism: Colonial expansion, tropical island Edens and the origins of environmentalism, 1600-1860*, Grove looked at colonial anxieties on tropical islands and in India. Grove demonstrated how ‘[anxieties about environmental change, climatic change and extinctions and even the fear of famine ... helped to motivate early environmentalism’]. My thesis focuses on an area outside of Grove’s study, picking up on many of similar anxieties in New Zealand. It also looks beyond Grove’s period, by charting the denouement of these fears from 1830 to 1920.

This thesis follows a cultural approach to the history of European environmental understandings in the nineteenth and early twentieth century. In response to the primary sources themselves, it became apparent that settlers expressed a powerful set of fears about the potentially damaging consequences of their modification of the New Zealand environment. Adopting the concept of environmental anxiety, uncovers the complex ways in which Victorians saw the dynamic interconnections between themselves and their environment. It demonstrates that all settlers recognised that humans were separate, yet inseparable from the environment in which they lived. Europeans believed that changes in environment affected themselves, their settlements and society. They recognised that unwise environmental actions might threaten anything from livelihoods to their very own health. With these fears in mind, settlers coming to New Zealand wanted to achieve material gains, such as economic independence and land ownership, without paying the high environmental cost that had been paid in Europe and elsewhere.

Many colonists in New Zealand knew that industrialisation in their homeland of Britain had detrimentally affected environments, health and societies. Some also knew first hand or had read about the debilitating impact deforestation had upon climates, soil fertility in European colonies and elsewhere. Taken together, these anxieties created a state of uneasiness caused by apprehension of possible misfortune, danger, etc. Colonists feared what might happen to the environment and population of New Zealand if they followed similarly unwise environmental practises they knew about in Europe and elsewhere. They sought to avoid repeating the mistakes they saw occurring elsewhere by debating problems, enacting legislation, and changing behaviour. It is important to note that settler environmental anxieties usually were fed not by fears about the present state of the environment but by anxieties about what could happen to New Zealand’s environment and their own society if certain environmental actions, such as deforestation or pollution, were intensified. Adding to such general anxiety was that New Zealand’s European settlers knew relatively little about their new environment. Colonists did not


know how the New Zealand environment would behave, or how it might affect their bodies in the future. Therefore, to prevent the realisation of their worst fears, they put in place preventative measures gleaned from their experience of existing environments, such as those of Europe, its colonies and elsewhere.

Using the idea of environmental anxiety parallels recent developments in American environmental history. Environmental historian Richard White has highlighted two new directions in North American environmental history. White has identified the most significant of these as the 'cultural turn'. According to White, the cultural turn follows 'an attention to discourse, story, and narrative that is missing in much earlier environmental history.' Fundamental to this development has been the recognition 'that at any given time, rather than a single American view of nature, there are competing and complex discourses about nature at work'. Second, White has identified a growing emphasis on hybrid landscapes. White notes that recent environmental historians have reinvestigated familiar (such as the wilderness movement) and newer topics (such as tourism) to uncover the complex ways that people saw the environment and their role in it.

This thesis mirrors White's approach, stressing a cultural and intellectual history approach. It emphasises story and narrative. It attempts to understand settlers on their own terms through a textually-based study of different settler stories. It takes a fresh look at long-established topics in New Zealand's environmental and mainstream history while also branching out into new areas of inquiry. More specifically, this thesis attempts to unpack the diversity of elite and popular settler ideas about environment, humanity, health and conservation. This sheds new light on the complexity and deeply ambiguous history of settler environmental anxieties, demonstrating the ways these shaped policy, education, attitudes, artwork, legislation and parliamentary and scientific debates.

This thesis, then, charts the origins of the diverse environmental anxieties that settlers expressed in New Zealand. It looks at, and attempts to explain, the way these anxieties changed over time and the methods colonists adopted to alleviate or prevent them. Anxieties themselves were often diverse and complex, so interwoven and interlinked that to adopt a simple chronology would lose sight of the anxieties themselves and merely replicate their complexity without attempting to understand them. A thematic approach, whereby each chapter looks at a separate anxiety or aspect of its history, maintains both a narrative thread and at the same time shows the rise and fall of particular anxieties. It also allows the reader to see the connections between different anxieties that settlers themselves made. For that reason, the same people often appear in different chapters expressing anxieties that they thought often had a similar cause, such as the common belief in the nineteenth century that deforestation lowered rainfall, increased temperature.

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extremes, brought about more frequent flooding and led to soil erosion. Settlers often expressed anxieties and made connections that today are regarded as discrete subjects. A thematic approach allows the reader to see these connections by exploring them chapter-by-chapter. It also offers the advantage of showing how these different anxieties changed over time and in relation to each other.

Chapter one focuses on deep-seated settler fears about the effects of New Zealand’s climate and landscape upon European bodies. Chapter two looks more closely at anxieties about the relationship between disease, certain locales and health. Chapter three investigates the aesthetic anxieties of one settler through his writing, poetry and paintings. Chapter four examines significant settler environmental anxieties about the effects of deforestation on diminishing rainfall and increasing temperatures. Chapter five charts anxieties about climate change in a small community in North Otago. Chapter six reveals fears about the effects of vegetation removal on shifting sands that threatened to inundate fertile fields. Chapter seven uncovers colonial anxieties about the effect of deforestation on flooding and soil erosion. Chapter eight interrogates the origins and directions that these anxieties took.

Each chapter, by exploring the development and responses to environmental anxieties, furthers understandings about six important areas: science, religion, scale, networks, environmental history writing and the natural world. The first relates to the development of science from the mid-nineteenth century to the early twentieth. This thesis adds to historical considerations of the way science changed, was practiced and understood in settler society. It shows that in the middle decades of the nineteenth century polymaths such as William Lauder Lindsay, mental health reformer, geologist, botanist, lichenologist, education reformer and climatologist, were relatively commonplace in New Zealand. Towards the end of that century and into the next, greater specialisation and professionalisation within the scientific community took place, along with increasing government control over science. Debates about professionalisation are charted in a variety of different ways in this thesis, from scientific discussion surrounding the effects of deforestation on the environment to debates on the role environment played in affecting health. Chapter five, on rainmaking experiments in North Otago, specifically investigates the contested meaning of science between meteorologists and the general public of Oamaru. This also interrogates another important theme of this thesis: the role of religion in shaping settler environmental anxiety.

The rainmaking chapter clearly demonstrates that many current assumptions about the incompatibility of scientific and religious thought did not apply in the nineteenth and early twentieth centuries. Elsewhere, this thesis shows how important Biblical ideas were to framing environmental anxieties. Not only did conservationists draw from Biblical examples to illustrate their environmental anxieties. They also followed a common environmental narrative strongly modelled on Christian thinking. Conservationists often saw the coming of Europeans as
disrupting a natural ‘Garden of Eden’ and, through unwise environmental actions, precipitating, or threatening to cause an environmental ‘Fall’ that could only be ‘ Redeemed’ through certain environmental actions such as tree planting and forest conservation.

Religion also shaped aesthetic views of the environment. And, in the case of Alfred Sharpe, artist and environmental critic, poet and park designer, this generated significant aesthetic environmental anxieties, which he expressed through painting, in poetry and prose. Sharpe believed deforestation and pollution were not only creating an ugly and unsafe environment in which to live but also that settlers were failing to meet Biblical injunctions of treating the earth wisely.

The chapter on Sharpe also points to another important theme of this thesis: scale. Focussing on individuals and their biographies is crucial not only for demonstrating the complexities and contradictions within each person. Biography also allows one to investigate the different influences shaping environmental anxieties, whether they be the experience of India and Mauritius for John Cracroft Wilson or the German education of Ernst Dieffenbach. Biography highlights the role of significant individuals, such as politician Julius Vogel, in pushing forward environmental anxieties and solutions in parliament. More importantly, perhaps, is that biography shows that the same people often expressed myriad anxieties, thereby demonstrating the interconnections between different ideas. Indeed, biography shows up the fine grained detail while also highlighting the bigger picture. Collective biography, such as of Oamaru rainmaking experiments, reveals the complexity and contested nature of environmental anxieties and of ideas about science and religion. Local experience and ideas also remained important in the national context. Specific landscapes, such as swamp- or forestland, often produced specific anxieties that settlers expressed in local newspapers and which were met with in local council or provincial legislation.

Giving due weight to local and international scale highlights that it is important to look beyond the nation-state to understand the global nineteenth century. Overseas examples often influenced settler environmental anxieties and solutions in New Zealand. These anxieties and solutions arose in myriad ways. Expert visitors stopped at New Zealand. Private and official correspondence connected New Zealand policy makers and scientists with overseas experts, allowing for the exchange of information and views. Exchanges took place in English as well as in French and German, took place within the British Empire, continental Europe and North America. Policies did not simply flow from the metro-pole of Europe to New Zealand, but were also generated between colonies. These anxieties filtered into the popular arena through colonial newspapers, art works, popular talks and summaries by ‘popularisers’ and synthesisers.

Settlers’ anxieties, of course, were responses to the environments they encountered, whether mountains, swamps, forests or whatever. To these, they brought their own preconceptions and
cultural views. Experience taught colonists to fear swamplands, and in New Zealand many did just that. They identified swamps near settlement as potential sources of disease, and actively sought to drain them. Similarly, tree-planting made little sense to settlers in heavily-forested areas such as in the North Island and the South Island west coast. Environments, like ideas, do not remain static. Flooding and increased deforestation around Wellington led many writers to connect the latter with the former, and to express considerable anxieties about timber cutting.

Taken together, the concept of environmental anxiety challenges much current thinking about New Zealand’s environmental and settler history in the nineteenth and early twentieth centuries. Environmental anxiety unmasksthe complexity and contradictions inherent in settler culture, moving discussion away from simplistic (and often unhelpful) distinctions made today between religion and science, the native and exotic, popular and elite science, natural and unnatural environments. The double bind of such dualism intellectually straitjackets environmental historians. This is apparent in the strange obsession New Zealand environmental historians have with native and exotic and with charting emerging nationalism, which although certainly an important factor in shaping settler attitudes was far from the only one. Equally, using the concept of environmental anxiety moves historical debate beyond simplistic and unhelpful characterisations of European settlers as unrepentantly rapacious resource eaters. It leaves behind accounts of environmental apocalypse, in which the narrative lurches from one human-caused disaster to another. The concept of environmental anxiety acknowledges the ambiguous inheritance of our forebears, certainly, but portrays them as far more human, far more complex creatures than has hitherto been recognised. The concept of environmental anxiety unearths the confidence but also the fears that drove settlers to do what they did.
# Table of Contents

Abstract  
Acknowledgements  
Preface  
Table of Contents  
List of Tables  
List of Illustrations  
Abbreviations  
**Introduction:**  
Environmental Anxiety  
**Chapter 1:**  
Geographies of Settlement Environment, Health, and Race in New Zealand, 1830-1914  
**Chapter 2:**  
Bad smells, bad places: miasma and disease in nineteenth century New Zealand and engineering solutions to health  
**Chapter 3:**  
Sustaining the City and Preserving Nature: the environmental aesthetic of Alfred Sharpe  
**Chapter 4:**  
‘they [settlers] received a fertile country, but, by a criminal want of foresight, transmitted to posterity a desert.’ (Charles O’Neill, 1873)  
**Chapter 5:**  
Rethinking science, religion and nature in environmental history: drought in early twentieth century New Zealand  
**Chapter 6:**  
‘[H]elpless witnesses of the destruction’: sand encroachment in New Zealand  
**Chapter 7:**  
Sweeping away fertile fields: fears of flooding and soil erosion  
**Chapter 8:**  
Transferring Ideas: conservation origins, influences and exchanges  
**Conclusion:**  
Environmental Anxiety in New Zealand  

**Bibliography**  

Appendix 1  
Appendix 2  
Appendix 3
List of Tables

Table 2.1 Comparative death rate per thousand for New Zealand’s Provinces. *New Zealand Government Gazette, (Province of Nelson)*, 15, 26 (9 July, 1867), p.102.

Table 4.1 Chamberlain’s Findings on New Zealand Rainfall Decline. NZPD, 1 August, vol.45, 1883, p.212.

Table 7.1 Proposed Climatic Reserves as per Index-Map, ‘Report of the Royal Commission on Forestry’, AJHR, 1913, p.xlvii.
List of Illustrations

Photographs

Photograph 1.1 A contemporary of Sharpe’s, the Rev. John Kinder (born between 1834-8, died 1903) photographed as well as painted in the area around Auckland. This composition is entitled ‘Coromandel Gold Field, c. 1866’ in Ron Brownson, ‘John Kinder’s Photographs’, in Brownson, ed., John Kinder’s New Zealand, Auckland, 2004, plate 73, p.115.

Photograph 3.1 The artist at work: Alfred Sharpe. Origins unknown.

Photograph 3.2 A dismal scene of dead, skeletal trees and a polluted sky testifies to the environmental cost of producing sulphide. Creator: Ralph Snowball, ‘Sulphide Works at Cockle Creek’, 28/03/1903, NPL001010010154.

Photograph 3.3 Pohutakawa remain a feature of Newcastle’s parks and verges, as this recent photograph shows. Author’s photograph.

Photograph 3.4 Pohutakawa around the upper part of Hill Reserve, now called King Edward Park. Author’s photograph.

Photograph 3.5 A crowd of onlookers enjoys a concert given in Hill Reserve, Newcastle, in the early 1900s. Sharpe won a competition in 1891 to redesign this park. ‘King Edward Park Showing Band Rotunda’, NPL00600/00600064.

Photograph 3.6 Another view of Hill Reserve. Note the comparatively bare appearance of the park, a reflection of its use as a sports field. A cricket game is going on in the middle distance of the picture. ‘King Edward Park’, NPL/05600/05600282.

Photograph 3.7 Islington Park, Newcastle, in 1906, designed by Alfred Sharpe in the 1900s. As Sharpe would have wanted, children and the infirm are making use of this green space for recreation and recuperation. ‘Islington Park’, NPL00103/00103642.

Photograph 3.8 Hamilton Park, designed by Sharpe for the family Hamilton family. Note the very formal style of the gardens and the winding paths so beloved by Sharpe. This photo was probably taken before World War I. ‘Hamilton Park’, NPL14400/14400080.

Photograph 4.1 Tree planting following deforestation. The importance of schoolchildren to Arbor Day is underlined in this photograph, as is the social importance of this activity to smaller communities. ‘Arbor Day at Rata School, 1 August 1894’, B/w original, Edward George Child, 1/1-011003; G, ATL.

Photograph 5.1 View inland from Raki’s Table, Schaffer’s farm, July 2002. Conditions in 2002 would have been very similar to those of 1907, with the area also under winter drought conditions. Author's photograph.

Photograph 5.2 Explosives canister left from 1907 Rainmaking Experiments, at Shaffer’s farm, Ngapara. Author’s photograph.

Paintings and Sketches

Figure 1.1 Converting forest to farm in the province of Taranaki. Later settlers would criticise much of the wholesale destruction of forests for the effects it had on changing climatic conditions and increasing soil erosion. Thomas Good, ‘Bush Clearing near Oeo’, 1893. 136 x 224 mm. ink and wash on sheet. ATL, A-329-005.

Figure 1.2 The title of this pen and ink drawing illustrates one powerful European aesthetic of viewing forests that has its origins in romanticism. This attractive image of New Zealand’s northern forests is most probably by Joseph Sellery (1824-1875), official artist to the Austrian expedition that visited New Zealand in 1858. ‘Urwald in der Umgebung von Drury [Primeval Forest in the area of Drury]’ Karl Scherzer, Reise der oesterreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wallerstorff-Urbair [Journey of the Austrian Frigate Novara around the world in the Years 1857, 1858, 1859, under the command of Commodore B. von Wülflersdorff-Urbair], Volume 3, Vienna, 1861-2, p.146.

Figure 3.1 Juxtaposing new against old, Sharpe painted this evocation of environmental and human change through the portrayal of a Māori figure clad in traditional dress. The figure and his setting, amid New Zealand’s forest, contrasts with the newly acclimatised plants in the foreground. These new plants are literally pushing New Zealand plants and people into the distance, a measure of the worry Sharpe expressed at such change. Alfred Sharpe, ‘Burial Place of Hone Heke, Bay of Islands, 1885’, B.041287, 1977-0027-1, TP.

Figure 3.2 Sharpe’s concern with attention to detail and, as he put it, ensuring that he painted ‘nature here as she is’ is evident in this painting of a log jam on Cadman’s Creek, Coromandel. On the back of this painting, Sharpe noted that the image presented ‘a faithful delineation’ of the scene. Alfred Sharpe, ‘Entrance to Cadman’s Creek, Coromandel’, 1880, watercolour, 443 x 667 mm, in Roger Blackley, The Art of Alfred Sharpe, Auckland, 1992, plate 13, p.45.

Figure 3.3 Sharpe often travelled with timber millers into previously un-felled forests and it is probably by this means that he gained access to this area of Coromandel. As with many of Sharpe’s paintings, he presents a landscape about to undergo vast change. Although the two figures of the sawmillers are dwarfed by the sheer size of the kauri, it is clear that many of these trees painted will no longer be standing. Alfred Sharpe, ‘Among the kauri, Castle Rock, Coromandel’, 1884, watercolour, 532 x 883 mm, in Blackley, Art of Alfred Sharpe, plate 26, p.74.

Figure 3.4 Two Māori survey the effects of deforestation on Waiheke Island. Alfred Sharpe, ‘A Golden Eve, Waiheke Island’, 1885, watercolour, 456 x 689 mm, in Blackley, Art of Alfred Sharpe, plate 27, p.75.

Figure 3.5 Sharpe presents an image of utter environmental despoliation caused by the Sulphide Corporation smelting works, Cockle Creek. In the background is evidence both of the plant’s insatiable demand for timber and the effects of its pollution on trees. ‘Near view of smelting works, with several men at work, 1902’, from larger illuminated address, 1902, black and white photograph of a watercolour. Original measurements 10.4 cm by 17.7 cm. ‘Lent for copying by Miss G. Savage, November 1977’: Permission obtained from Miss Savage by author, ML, PXB174, folio 4.

Figure 3.6 Another view of the works and its effects on the surrounding area. Alfred Sharpe, ‘Sulphide Corporation Smelting Works, Cockle Creek’, 1902, watercolour, 104 x 177 mm, in Blackley, Art of Alfred Sharpe, plate 43, p.106.

Figure 3.7 Sharpe presents a calm and benign Waitemata Harbour, Auckland. In the foreground is Auckland Domain, of whose management Sharpe expended much energy criticising. Alfred
Figure 3.8 As a youth, Sharpe spent a great deal of his time in Birkenhead Park. Designed by Sir Joseph Paxton, who inspired Frederick Law Olmsted (designer of New York’s Central Park), Birkenhead Park was the first public gardens provided in England by a public authority. Sharpe’s later designs, particularly the winding paths and non-regular clumps of trees and lakes, owed much to the inspiration of this park. Roger Blackley.

Figure 7.1 An example of the forests of northern New Zealand encountered by Hochstetter and his fellow crew. ‘Waldgruppe auf Neuseeland’ ['Forest group in New Zealand']. Scherzer, _Reise der oesterreichischen Fregatte Novara um die Erde...,_ Volume 3, p.138.

Maps


Map 5.1 Locations of Rainmaking Experiments, 1907. Bill Mooney, Geography Department, University of Otago.

Graphs

Graph 4.1 Final Return on Tree-planting and Encouragement Act, 1883. Calculated from ‘Return to an Order of the House of Representatives’ No. 32, 13 August, 1883, LE 1 (Legislative Department), 1/1883/136 (156), Box 207, NA. [NB. number in parentheses refers to temporary shelving number.]
List of Abbreviations

Abbreviations used for Libraries

CF: City Forests, 300 King Edward Street, South Dunedin.
DCCA: Dunedin City Council Archives.
HL: Hocken Library, Dunedin.
ML: Mitchell Library, Sydney, Australia.
NA: National Archives, Wellington.
NRPL: Newcastle Region Public Library, Newcastle, Australia.
NOM: North Otago Museum, Oamaru.
PAANZ: Presbyterian Archives of Aotearoa/New Zealand, Dunedin.

Abbreviations used for Newspapers

AWN: Auckland Weekly News.
LT: Lyttleton Times.
NMH: Newcastle Morning Herald and Miners’ Advocate.
NOT: North Otago Times.
OFL: Observer and Free Lancet.
OM: Oamaru Mail.
ODT: Otago Daily Times.
OW: Otago Witness.
TA: The Australasian.
TP: The Press.

Abbreviations used for Journals, Proceedings and Parliamentary Debates

AJHR: Appendices and Journals to the House of Representatives.
DNZB: Dictionary of New Zealand Biography.
NNZS: North New Zealand Settler.
NZF: New Zealand Farmer.
NZJS: New Zealand Journal of Science.
NZJH: New Zealand Journal of History.
NZPD: New Zealand Parliamentary Debates.
TPNZI: Transactions and Proceedings of the New Zealand Institute.
Introduction: Environmental Anxiety in New Zealand

Using a series of interlocking case-studies, this thesis investigates environmental anxieties in New Zealand’s settler society in the period 1830-1920. The central premise is that settler environmental anxieties generated significant environmental reforms. The effects of these anxieties can be seen in some of the land policies, artworks, legislation, parliamentary and scientific debates, and writings of this period. Royal enquiries, parliamentary and council debates and scientific publications reflected official responses, while those appearing in the popular press and farming journals, as talks or in artworks evinced popular reactions. Anxieties and solutions came from many different quarters: institutions and individuals, states and communities. They particularly reflect the interplay of global concerns at the local level. Texturing these different responses into environmental history means zooming in and out on a variety of scales. Chapters three and five take a micro-history approach. Chapter three looks at the aesthetic and health anxieties of a colonial settler, artist and environmentalist Alfred Sharpe. Sharpe’s anxieties were shaped by his childhood in Birkenhead, England, and later by his move to northern New Zealand in 1859 and in 1887 to Newcastle, New South Wales. Chapter five also zooms in, this time on the community’s and government’s response to a very specific event, drought in North Otago in 1906-7. Although the other chapters explore settlers’ specific environmental anxieties, they also zoom in on local examples and zoom out to look at the wider impacts and origins of these fears. Chapters one and two explore settlers’ anxieties about the way environment shaped their health and that of Māori. These anxieties betoken popular belief in the intimacy between humans and environments. Settlers acknowledged that changes in the natural world also had repercussions in the human world. Chapters four, six and seven chart settler fears related to deforestation. Specifically, they look at concerns about climate change (chapter four), sand drift (chapter six) and soil erosion and flooding (chapter seven). The final chapter
(eight) zooms out to investigate the origins and influences shaping New Zealand environmental anxieties related to deforestation.

**Victorian anxieties**

Behind seeming Victorian confidence, even arrogance, in the ability of science and technology to bring about constant material improvement lay often complex and contradictory environmental anxieties. The rapid environmental transformation enacted by settlers fed a new sense of concern. Although in retrospect Māori settlement and other non-human events had wrought great environmental change in these islands, the scale and pace at which Europeans converted the New Zealand environment was unprecedented. European settlers quickly converted land to agricultural use. They felled forests to make way for farms, filling these spaces with Eurasian plants and animals. In making farms, most settlers thought they were improving, not destroying, nature, particularly when they brought into cultivation uncultivated areas (Figure I.1).

The realisation that humanity could alter the natural environment was, of course, nothing new. It is simply that, in the eighteenth and nineteenth centuries, the ability of

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Figure 1.1 Converting forest to farm in the province of Taranaki. Later settlers would criticise many of the wholesale destruction of forests for the effects they had on changing climatic conditions and increasing soil erosion.

Thomas Good, 'Bush Clearing near Oeo', 1893, ink and wash on sheet, 136 x 224 mm. ATL, A-329-005.
humans, especially Europeans, to change environments increased exponentially. Examples abound of this increased capacity. In the nineteenth century, steam provided a powerful new force to drive forward the industrial might of Great Britain, sucking in workers from the surrounding countryside while supplying the growing demand for manufactured goods. The railway, that great conveyor of social, economic and environmental change, ‘manipulated the landscape on a grand scale’, bringing work to many but wealth to a select few. Although a case can be made that Britain exported some of her environmental problems to the colonies, progress in the British Isles often came at a high price. Blighted landscapes of slag and spoils, cuttings and holes, scarred the very face of Britain, polluting its skies and waters. Britain’s industrial revolution even coined the term ‘slum’. Overcrowding and tenements, disease and death seemed to typify struggling humanity in its new urban environment. Sanitation systems were lacking or were too rudimentary to cope with rapid urban migration. Rural and urban protests sprang up against mechanisation and the poor working conditions endured in factories. Even those English industrialists, who benefited most from the new order, manifested their disgruntlement with capitalism by adopting most of the trappings of the gentry and retreating to the countryside.

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8 There is a vast literature on this topic, on which almost any general text on this period will also focus. See, for instance, Oliver MacDonagh, *Early Victorian Government 1830-1870*, London, 1977; Anthony S. Wohl, *Endangered Lives: Public Health in Victorian Britain*, London, 1983.


Environmental concerns were part of a broader set of British, and western, fears about the change and direction that modernity was taking. As cultural historian Peter Gay notes of European culture during the Victorian period,

All change is traumatic, even change for the better. The very gratification of wishes generates dislocations; as Freud once pointed out, humans resist giving up a pleasure they have once enjoyed and dislike waiting for the dividends that later, greater pleasures might bring. Hence all nineteenth-century progress was pursued by anxiety at times repressed and only reluctantly recognized – some of it, of course, like worries over the social cost of urbanization, perfectly justified.11

So, the very success of progress and modernity generated anxiety. At the individual level, anxiety was expressed in a variety of ways. Self-doubt, nervous disorders, stress, status and money anxieties all betokened an increasingly more worried bourgeois.12 And what applied to the individual also applied to the state. Social Darwinism created brash confidence in European imperialism, but so too deep-seated fears. It seemed that Britons were the Chosen People, yet history taught that civilisations, like people, grew up, reached maturity and then died. Just when would the sun be setting on the British Empire?13 Colonialism created anxieties not only about the effect of colonial environments on European morals and constitutions. It also generated worries about the effects of European colonisation on indigenous peoples and environments, who often suffered when coming into contact with European diseases and technology.14

13 A vast literature exists on Victorian passions and prejudices, fears and foibles. For an excellent survey of the way material improvement and industrialisation, as well as developments in geology, history and Darwinian theory contributed to fears about progress, see James Joll, Europe since 1870: An International History, fourth edition, London, 1990, especially pp.78-112, 143-168.
14 See, for instance, Crosby, Ecological Imperialism; Donald Denoon and Philippa Mein-Smith, with Marivic Wyndham, A History of Australia, New Zealand and the Pacific, Oxford and Malden (Massachusetts), 2000, pp.72-94.
As Ranajit Guha explains, when it comes to looking at British imperialism, most historians have largely ignored these anxieties. Instead, they have focussed on the triumphal march of colonialism, paying attention to what Guha describes as

...all the triumphalist and progressivist moments of imperialism – its wars of conquest, annexation, and pacification in the subcontinent [of India]; its interventions in our environment and our economy by industrialization, monetization, and communication; its project of social engineering by administrative measures and its mission of civilizing by education. Its politics of expansion and improvement, its ethics of courage, discipline, and sacrifice, its aesthetics of orientalism have all been assimilated to this mode by a whole range of rhetorical, analytical, and narratological devices, so that enthusiasm has come to be regarded as the very mentality of imperialism itself.

‘Can we afford to leave anxiety out of the story of empire?’, asks Guha. His answer is that we cannot and should not.15 This thesis attempts to answer Guha’s plea by re-writing the history of settler views about New Zealand, its people and plants and their role in environmental transformations.

Expressing environmental anxieties

Environmental anxieties were shaped both by disquiet that increased comfort had come at a high environmental price and bewilderment at the pace and extent of this change.16 Bewilderment and fear appeared in many guises. Apiarists anguished that, in collecting honey, they killed the bees.17 In England (1824) and France (1850), societies emerged which upheld animals’ rights.18 Some particularly sensitive souls even fretted that trees suffered pain when cut-down.19 One major late eighteenth and early nineteenth century cultural response to this came with romanticism. Romantic sensibility took a

variety of forms. It was expressed in various, sometimes even conflicting, ways in painting, poetry, interior design, architecture, politics and science. Most romantics, though, vehemently opposed industrialisation and its products, often harking back to a 'golden' pre-industrial age of solid community ties and rural society.\textsuperscript{20}

Taken together, such sentiment and concern at the power of humanity to destroy nature provided considerable counterweight to the dominant ethos of progress. Most of New Zealand's settlers believed in human and economic progress but thought this could be achieved, not through industry, but through farming. Settlers expressed their fears of mechanisation and industrialisation with Arcadian images of New Zealand. They celebrated farming and rural people by denigrating the urbanite and city living.\textsuperscript{21} Even New Zealand's urban workers upheld the maxims of skilled, handicraft labour rather than an industrial proletariat.\textsuperscript{22}

Chapter one shows that settlers articulated a spectrum of environmental perspectives. Utmost confidence in the healthiness of New Zealand's environment for Europeans sat alongside clinging fears that constant exposure to the colony's climate and country would damage constitutions and even alter racial characteristics. Many Europeans believed in the suitability of New Zealand's climate to their race, but not for Māori, who, they pointed out, had moved from a tropical climate into a temperate one. Medical works often divided New Zealand into climatic zones, each offering curative properties for specific diseases and ailments. These ideas reflected the strength of belief in the connection between environment and health, precepts followed by medical

\textsuperscript{20} For perhaps the most useful picture of this vast cultural, scientific, religious and political movement, see the following: Boris Ford, ed., The Cambridge Cultural History of Britain: The Romantic Age in Britain, Cambridge, 1992; Schama, Landscape and Memory; Malcolm Andrews, Landscape and Western Art, Oxford, 1999, especially pp.129-149; Gay, The Naked Heart; Alain Corbin, The lure of the sea: the discovery of the seaside in the Western world, 1750-1840, translated by Jocelyn Phelps, Cambridge, 1994; Bernard Smith, Imagining the Pacific in the Wake of the Cook Voyages, Carlton, Victoria, 1992; H.G. Schenck, The Mind of the European Romantic: an essay in cultural history, London, 1966; Charlton, New Images of the Natural, pp.199-220.

practitioners when prescribing cures and situating hospitals. In New Zealand, anxieties and solutions about health frequently owed their origin to Europeans' experience of high mortality rates in the tropics. Experience of overseas environments, then, shaped anxieties and readings of New Zealand's landscape and climate.

Chapter two reveals that just as in the tropics and Europe, settlers feared swamps and poorly drained land, standing water and rotting vegetation. They believed these generated unhealthy miasma, unseen gases that poisoned the body. Medical geographies, investigating the connection between environment and health, only reinforced such concerns. Doctors, local councillors and legislators, chivvying for remedial measures, enacted environmental reforms to improve the healthiness of swampy areas. These included swamp drainage, tree planting and sanitary improvements. Such measures acknowledged that unhealthy areas (such as swamps) occurred naturally but also could be created by urbanisation, industrialisation and inadequate sewerage systems. City buildings also could generate miasma through overcrowding as well as poorly-ventilated and badly-sited buildings. Chapter two, then, examines deep seated settler fears that environmental change threatened their own health.

Chapter three explores the connections between aesthetics, health and environment. Artist and environmentalist Alfred Sharpe (1836-1908) sought to improve urban living. In his two Australasian homes of Auckland (New Zealand) and then Newcastle (New South Wales), Sharpe encouraged tree planting, parks and the provision of adequate sanitation systems. Sharpe expressed an aesthetised environmental anxiety at the destruction wrought by deforestation and acclimatisation in New Zealand. He also articulated complex views about nature in poetry, painting and prose. Sharpe not only advanced the preservation of 'untouched' environments but also their improvement by artistic embellishment. The local environment of his youth, Birkenhead and Liverpool, contributed to Sharpe's environmental ideas just as much as his experience of local nature around northern New Zealand and Newcastle. Sharpe drew his appreciation of New Zealand and Australian nature from the local, rather than the national level.

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22 See, Erik Olssen, *Building the New World: work, politics and society in Caversham, 1880s-1920s,*
International ideas also shaped his appreciation of colonial environments. Romanticism appealed to Sharpe as did the ideas of art critic John Ruskin (1819-1900).

Chapter four highlights environmental anxieties of another sort. As deforestation rates climbed throughout the nineteenth century, so too did climatic anxieties. Periods of sustained drought merely enhanced such consternation. Some natural scientists worried that, since they believed that trees attracted rainfall and moderated temperatures, deforestation caused both drought and greater temperature extremes. The forest-climate link generated great debate among settlers yet many could not agree on the exact influence forests played on climate. Fears about climate change originated with deforestation in both tropical colonies and continental Europe. These highly alarming examples drove forward calls for conservation and tree planting in New Zealand. Often they appeared with environmental anxieties about catchment deterioration such as flash flooding, soil erosion and changed river flows (see chapter seven). New Zealand’s different environments, though, required different responses. With much of New Zealand’s North Island still lying in forest, settlers’ and land officials’ primary aim was to convert forest into farmland. This, however, did not stop provincial conservation measures beginning in the 1850s and ‘60s. In the 1870s, the national parliament enacted forestry conservation and afforestation programmes and continued to do so, in a somewhat intermittent fashion, for the rest of the century. By then, more and more articles appeared on the subject in scientific, farming and parliamentary publications. Central to their promotion of forest conservation were presentations of deforestation as an evil threatening New Zealand’s ‘Eden-like qualities’ of a fertile climate and productive agriculture. Using language deliberately designed to alarm, writers described how deforestation had already begun to diminish New Zealand’s abundant rainfall and fertile soils and that, if continued, it threatened to induce even more unwanted changes. They reinforced their worrying predictions by borrowing from terrifying biblical and overseas examples that illustrated the folly of deforestation. Conservationists also promoted their cause by removing forestry from competition with agriculture. They emphasised that

forestry only required land in the agriculturally unsuited highlands. Supporters also pointed out that climatic conservation protected farmers from prolonged and financially devastating droughts. Increasingly in the 1910s, though, emphasis shifted away from climatic concerns onto those of flooding and soil erosion.

Chapter five extends ideas about climatic anxiety by looking at the North Otago drought of 1906-1907. This event challenged settlers' expectations of New Zealand's temperate climate. During the drought, the community organised public prayers and public rainmaking experiments to find relief from the dry conditions. These actions evince both the importance of religious ideas in under-girding environmental perception and the variety of environmental solutions to which people turned. This chapter reveals that increasing scientific understandings of the natural world did not necessarily undermine religious readings of the same phenomena. Rather, they formed complementary ways of interpreting environmental events and assuaging environmental anxieties. Furthermore, this chapter shows that emerging scientific groups, such as meteorologists, could use environmental anxieties to push forward their own professionalisation.

Chapter six demonstrates that images of fertile fields swept aside by sands gave urgency to calls for sand dune stabilisation. Like anxieties about climate and catchment change, conservationists believed sand drift threatened the economic well-being of New Zealand. Like climate change, sand drift challenged European ideas of improvement. It represented the anti-thesis of a cultivated landscape, a desert. Europeans either blamed themselves or Māori for this process. Solutions to this problem came slowly and in a piecemeal fashion. Recovering land began and continued with local measures, even after the national Sand-drift Act of 1903. More densely populated areas often became the first recipients of reclamation work. Despite the best efforts of a rational state to legislate it away, however, the problem of sand drift remained for later generations to tackle.

Anxieties about increasing soil erosion, as chapter seven shows, followed a similar line to those about sand drift and climate change. As with these other issues, conservationists employed highly alarming language to play up the consequences of deforestation for the fertile lowlands. As with climatic concerns, conservationists
focussed on upland deforestation. Forests, they thought, prevented the rapid run-off and flash flooding that swept away valuable topsoil. They also feared that deforestation brought down trees and branches that clogged up waterways and inundated fertile lowlands. Alongside climatic conservation, catchment protection continued for much of the nineteenth century. An indication of its importance is that even when state forestry was not maintained, climatic reserves were. In the early 1900s, continuing experience of soil erosion and flooding in New Zealand, coupled with its prominence in international forestry literature, led to greater weight being placed on catchment concerns than climatic ones.

New Zealand’s environmental anxieties, as chapter eight demonstrates, formed part of wider European fears about deforestation, environment and health that ranged from South Africa to the Sudan, Washington to Wellington. International forest conservation ideas came from South Asia, Scotland, Australia and Europe. These initiated and sustained New Zealand’s environmental anxieties by providing frightening examples of what awaited New Zealand if its forests were not conserved. They also offered legislative and policy models that could prevent such destruction. Transfers of these ideas took many forms, from correspondence and official forestry papers to the influence of visiting personnel and newspaper articles. Ideas also followed many paths, within and outside the British Empire as well as between colonies. Following these paths significantly expands understandings about transfers of knowledge and origins of New Zealand conservation.

Environmental history

In investigating these anxieties, this thesis contributes to the field of environmental history. As Tom Griffiths and William Cronon point out, environmental historians are interested in the stories people tell about nature and the way these change over time. Environmental historians study both the material modification of nature as

23 Tom Griffiths, ‘Secrets of the Forest: Writing Environmental History’, in Don Garden, ed., Created Landscapes: Historians and Their Environment, Carlton, Victoria, 1992, pp.42-51; Griffiths, Forests of
well as the way people represent that nature, such as through words and images.\textsuperscript{24} With my discussions of European medical, aesthetic, religious and scientific ideas about nature, I lean towards the latter approach: investigating the way people see the environment around them. Like all good environmental histories, however, this thesis pays no heed to disciplinary boundaries. It ranges into the territories of other subjects such as medical history, art history, English literature, historical geography and imperial history.\textsuperscript{25}

Environmental history has been practised in France (through the Annales ‘school’) and Britain (by landscape historians and historical geographers) since the 1920s, in the United States, Australia and Germany since the 1970s.\textsuperscript{26} Compared to these countries, environmental history is a relatively new arrival in New Zealand, although a long line of authors interested in environment-human interactions can be traced back to naturalists such as Charles Darwin (1809-1882), W.T.L. Travers (1819-1903), Herbert Guthrie-Smith (1862-1940) and G.M. Thomson (1848-1933).\textsuperscript{27} Until recently, the


\textsuperscript{27} Charles Darwin, \textit{The Voyage of the Beagle}, New York, reprint, 1958, pp.360-372; on Travers, see chapters four, six and seven; G.M. Thomson, \textit{A New Zealand Naturalist’s Calendar and Notes by the Wayside}, Dunedin, 1909; Thomson, \textit{The Naturalisation of Plants and Animals in New Zealand}, Cambridge, 1922; Herbert Guthrie Smith, \textit{Tutira: The Story of a New Zealand Sheep Station}, Auckland, fifth edition,
academic study of human-environmental relations in New Zealand remained mostly either the purview of historical geographers or the domain of anthropologists. In the last decade, historians and other practitioners have entered this field. The arrival of environmental history in New Zealand was marked by the publication, in 2002, of the inter-disciplinary Environmental Histories of New Zealand, edited by geographer Eric Pawson and historian Tom Brooking. Other collections of New Zealand environmental history have followed.

New approaches to New Zealand’s environmental history

By applying the concept of environmental anxiety to settler New Zealand, this thesis expands understandings about colonial culture and its environmental history. First, this study challenges traditional narratives of ‘environmental apocalypse’ which portray nineteenth century settlers as confident and arrogant agents of environmental transformation. Certainly, as Māori found out, one person or people’s destruction can be another’s construction, but to characterise this as the only European impact on the environment is too simplistic. Second, by highlighting the importance of local and global forces in shaping belief, this thesis expands the largely ‘national’ writing of New Zealand’s environmental history. This study supports environmental historian John McNeill’s observation that, ‘for many sorts of history, including material environmental history [the study of material changes in the environment], the nation-state is the wrong


29 South Melbourne, 2002.


scale on which to operate.’\textsuperscript{32} Investigating the importance of regional and global factors recognizes that people experienced nature at the local level. People recognised that these local environments were in turn shaped by global forces, whether climatic, economic, political or demographic. Experience of local environments and settlers’ cultural expectations about the natural world shaped their environmental views. Third, by investigating ideas about urban environments, health and nature, this study broadens the scope of New Zealand environmental history. Practitioners have given rural environments greatest attention, but have neglected towns and cities. This thesis demonstrates that urban areas also have an important environmental history. Fourth, this thesis focuses on neglected areas of New Zealand’s environmental history. Studying aesthetics, climate change, sand drift and health adds depth and variety to its history. Fifth, this study shows the complexity of environmental beliefs. It acknowledges the ongoing significance of Christianity to settlers’ views of nature as well as its centrality in under-girding ideas about improvement. Sixth, this thesis emphasises the importance of natural events in shaping settler environmental views.

\textbf{Narratives of environmental apocalypse}

The following quote from Alan Grey’s historical geography of New Zealand illustrates the first trope I discuss.

[In nineteenth century New Zealand] The promise of profit provided sufficient moral warrant in an atmosphere where human self-interest determined morality and the natural physical order was not seen as deserving of any necessary respect.\textsuperscript{33}

Imperial environmental historian John MacKenzie has called this the ‘apocalyptic school of imperia: environmental history’\textsuperscript{.34} As cultural historian Simon Schama observes of this type of narrative device, it tells a story ‘of land taken, exploited,

\textsuperscript{33} Alan H. Grey, \textit{Aotearoa and New Zealand: A historical geography}, Christchurch, 1994, p.23.
exhausted; of traditional cultures said to have lived in a relation of sacred reverence with
the soil displaced by the reckless individualist, the capitalist aggressor. Many other
writers of New Zealand’s environmental history have followed this approach. In 1986,
world historian Alfred Crosby used New Zealand as an important case study to show that
deliberate and accidental introductions furthered European imperialism. Crosby showed
how the flora, fauna and pathogens Europeans migrants brought with them to New
Zealand decimated that country’s pre-colonial people and plants and aided its
colonisation. In 1995, ecologist Geoff Park published *Nga Uruora: The Groves of Life:
Ecology and History in a New Zealand Landscape*. In this, Park juxtaposed the more
ecologically sustainable attitude and behaviour of Māori with the ecologically destructive
ideology of Europeans. In 1997, environmental historian Thomas Dunlap wrote about
how, ‘[w]ith increasing speed as the nineteenth century went on...[Europeans in Canada
and Australasia] cut down forests, plowed prairies, and killed the native animals.’ These
transformations certainly took place but it is inaccurate to present them as the only
European response to these environments.

Indeed, one characteristic of many environmental histories of New Zealand is that
they present European ideas and attitudes as a homogenous whole. In a sense, such
studies perpetuate the earlier views of Edward Said. In *Orientalism*, Said argued that
European writers constructed a dualist vision of themselves and others. According to
Said, European writers represented all non-European peoples and cultures as ‘the Orient’,
themselves as ‘the Occidental’. Said argued that Europeans associated ‘the Orient’ with
all that they were not: culturally, religiously and economically backward, malleable and
controllable, unintelligent and devious. Said contended that this vision influenced the
way colonial administrators in the British Empire subjugated, appropriated and

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34 John M. MacKenzie, ‘Empire and the ecological apocalypse: the historiography of the imperial
environment’, in Griffiths and Libby Robin, eds., *Ecology and Empire: Environmental History of Settler
disciplined its subjects. 38 Yet, Said himself was as guilty as the subjects he criticised for presenting an almost unchanging and simplistic duality of historical views. Indeed, in his generalisation both of European culture as homogeneous and expressing an ‘Orientalist’ discourse, Said’s argument appears strikingly similar to the ‘Orientalist’ attitude that he debunks. 39 Similarly simplistic dualism is apparent in much of the work on New Zealand’s environmental history.

Historian Giselle Byrnes, for instance, argues that Pakeha (Europeans) came to control and appropriate New Zealand’s environment by imposing European concepts of painting, mapping and written description. 40 Park states that Europeans controlled and ordered New Zealand’s nature by commodifying its land through map making and quantification. 41 Art historian Francis Pound argues that Europeans appropriated New Zealand nature by imposing European aesthetic frames on the land, such as the picturesque, beautiful and sublime. 42 Post-colonial over-generalisations ignore the complexity and contested nature of European environmental views. Europeans certainly saw great beauty in New Zealand’s landscape. As many authors acknowledge in doing so, settlers often ignored or underestimated the presence of Māori. Yet some settlers could simply appreciate the New Zealand landscape for its beauty (Figure 1.2). 43 As this thesis demonstrates, settler environmental transformation generated a great deal of environmental anxiety and doubt, not just for themselves but also for the impact this had

43 Beattie, ‘Lusting After a Lost Arcadia’.
Figure 1.2 Many of the crew of the Austrian frigate *Novara* saw the bush of northern New Zealand in romantic terms.

on Māori. Highlighting the delineation of boundaries onto land and the pursuit of economic gain as the only settler activities is only a very partial reading of a very complex situation.

**Settler backgrounds and views**

In fact, the very term these writers use to describe settlers ignores the complexity of New Zealand's nineteenth century migrations. Dunlap, for instance, uses the wholly inadequate term 'Anglo' to describe all of the peoples who came to the North America and Australasia. This masks the reality of large-scale non-English and non-European migration. It also implies that these Europeans shared similar environmental views. In New Zealand, as the work of cultural historian Ali Clarke has shown, the ethnic and religious differences British settlers brought to Otago persisted in the new colony into the early twentieth century. Understanding 'the heterogeneity of Britain', Elliott Campbell declares, 'is vital before studying the heterogeneity of its white settler colonies, such as New Zealand.' This rings true both for that multi-national state, the United Kingdom, and for the plea intellectual historian John Pocock made to historians some thirty years ago of the need to recognise the plurality of British history. Recent historians may be meeting this challenge, as witnessed by the explosion of diasporic studies in New Zealand, but environmental historians certainly are not.

My thesis recognises that colonial society constituted a fascinating assortment of people who came from Europe, the British Isles and elsewhere. The views of these people

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49 On diaspora studies, see essays in *New Zealand Journal of History*, 37, 2 (October, 2003).
differed just as much as did their place of origin. I use nouns such as ‘migrant’, ‘colonist’ and ‘settler’ to refer to Europeans, the subject of this study, while proper nouns such as Scottish or German-speaking denote their more specific origins. These acknowledge that differences in European views existed between individuals but also, more generally, between different groups. Chapter eight, for instance, shows that the education of many Scottish-trained doctors shaped their interest in health, nature and conservation. Similarly, chapter three underlines the different ways artists viewed deforestation.

Tracing these differences means recognising that the scale and character of New Zealand’s nature shaped settlers’ environmental beliefs. As Nicholas Thomas recognises, settler identity originated in local experience of the land and people of their adopted home. The most fundamental way colonists experienced nature came at a local level. It was where people’s cultural ideas about nature and the natural world met. A fertile and well-watered environment figured as the norm for most settlers. When they encountered anything different, they set about ‘restoring’ it to what they regarded as its ‘natural’, Eden-like state. Chapters four and five show that, guided by their conviction that forests encouraged rainfall, some settlers thought that forestation would ‘restore’ these lands to their previously fertile state. This assumption originated both in norms about what nature should be and the discovery of old tree stumps which reinforced belief that the environment had once been wetter and more productive because it was forested.

Hierarchies of political organisation ordered space in New Zealand. These levels of administration ranged from the municipal and provincial to the national and international. As civic councils controlled urban areas and local authorities managed rural spaces, so provincial bodies governed larger areas. Above these were the jurisdictions of national and international authorities. Maps and medical geographies, for instance, charted the increasing territorial expansion of European states and municipalities within

Europe as well as, from the nineteenth century, their acquisitions of overseas colonies.\textsuperscript{52} Medical geographies in New Zealand also reflected different political orderings of space. In the 1850s and 1860s, as chapters one and two show, medical geographies often focussed on particular regions, whether towns or provinces. Such focus reflected the greater political power provinces then enjoyed. From 1876, the abolition of provincial government and the concentration of authority within central government found its resonance in medical geographies that investigated the incidence of disease and environment at the national, not just provincial, scale. In reality, however, nature paid no heed to political organisation (see below); power bases coalesced and authorities overlapped. International ideas and identities operated at local scales; local ideas at international levels.

Historian Rollo Arnold expressed the operation of international ideas at a local level in \textit{New Zealand's Burning: The settlers world in the mid 1880s}, a study of Victorian rural society in New Zealand. Arnold found that the 'settler community was essentially a village world, but a village world that was responding to ideas and influences that were global in the scope of their origins.'\textsuperscript{53} This thesis highlights a number of colonists who promoted conservation and who exemplify Arnold's idea of the village in the globe. Sir John Cracroft Wilson, for instance, brought his experience of Indian and Mauritius forestry and forest conservation to bear on discussions of New Zealand conservation (chapter four). Some settlers, such as Alfred Sharpe, identified with multiple local environments (in the United Kingdom and Australasia) as well as the international ideas of romanticism and art aesthetics (chapter three).

If different local experience of nature proved important to environmental perception, settlers believed that government and nature also operated at different scales and levels. These expressed the reality of political organisation and the way settlers


categorised the natural world. In New Zealand, each province’s environmental legislation responded to the natural world and settlers’ ideas about it. Otago and Canterbury introduced tree-planting and forest conservation because these areas had few trees.54 The changed political boundaries after 1876, when provincial government was abolished and power centralised, did not end the importance of experience of the local. Provincial Government or not, Otago and Canterbury still had few trees and it was these provinces who continued to make most use of national tree planting legislation. Although many North Island provinces tried to ensure that some five per cent of the land remained in bush, most thought they had too much forest.55 Forest hindered both the development of agriculture and communication. Many North Island politicians supported national forest conservation, but pointed out that trees delayed the development of farming. Local experiences directed national policies, while national policies impacted on local environments in different ways. By pointing to the importance of local experience of nature, this thesis tries to meet the challenge put down by environmental historian Paul Star, that greater emphasis should be placed on the role of provinces in shaping environmental legislation.56

Exploring beyond national environmental histories

So far, most environmental historians writing about New Zealand conservation history present its development within a national framework. As Eric Pawson and Stephen Dovers note, for island states such as New Zealand and Australia, national-scale enquiry ‘may indeed be useful.’57 Yet, adopting a purely national-scale level of inquiry

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57 Pawson and Dovers, ‘Environmental History and the Challenge of Interdisciplinarity’, p.65.
may blind researchers to extra-national influences or to fascinating overseas parallels. With the welcome exception of the essay of historian Jim McAloon on resource frontiers, the recently published Environmental Histories of New Zealand (2002) is noticeable for its lack of an international perspective beyond that which looks at the acclimatisation of organisms into the country. Similar criticism applies to the majority of ‘environmental apocalypse’ works discussed above.

This thesis plays a counterpoint to such nationalist narratives by looking at how, throughout the nineteenth and twentieth centuries, both local experience of nature and overseas forest conservation ideas initiated and sustained settler environmental anxieties. Fears, solutions and policies on New Zealand forest conservation came from India and East Asia, Scotland, France, Germany and Australia. Information not only flowed ‘horizontally’ – from colony to colony in the British Empire – but also from sources outside the Empire, such as Germany and France (chapter eight). These findings support the work of environmental historian Richard Grove. Grove argues that deforestation in tropical European island colonies led to forest conservation in the British Empire and Europe. Unlike Grove, however, this thesis acknowledges the on-going influence of European forestry on colonial conservation developments. It also recognises that information did not simply flow one way, as Grove maintains, but took multiple and complex paths.

**Exploring new aspects of environmental history**

Focussing on the exchange of environmental ideas expands the scope of existing comparative works about New Zealand’s environmental history, most of which look at the transfer of material nature rather than ideas about nature. These studies fail to recognise that this process often took place as multiple transfers that involved not just

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59 Grove, *Green Imperialism*.

60 On this, note William Beinart, 'Plant Transfers in Historical Perspective; A Review Article', *Environment and History*, 10, 1 (2004), pp.3-29.

61 Crosby, *Ecological Imperialism*.
plants and animals, but also ideas and information.62 Recent environmental history publications perpetuate these lacunae, as noted above with the recently published *Environmental Histories of New Zealand* (2002).63 In the 1960s and 1970s, Pacific geographers such as Oskar Spate looked at the exchange of people, plants and produce within the Pacific Ocean by situating New Zealand in its regional context.64 This study journeys beyond the Pacific by situating New Zealand in its global context. It investigates the exchange of ideas and information about climatic and catchment forestry as well as those about health, environment and aesthetics.

It also explores new aspects of New Zealand's environmental history. The connection between health, environment and aesthetics has attracted surprisingly little attention among environmental historians of New Zealand. *Environmental Histories of New Zealand*, for instance, is silent on aspects of health and environment. One of its chapters, by ecologist Geoff Park, does discuss European swamp drainage. Park, however, does not acknowledge the important role anxieties about health and disease played in swamp drainage.65 Chapter two demonstrates that swamp removal sprang as much from fears of these areas as sources of disease as from desires to use this land. As chapter three reveals, aesthetics and health enjoyed a close relationship. Aesthetically pleasing plants not only delighted colonists. Settlers also thought that they improved the constitutions of city folk by drawing pollutants from the air. These findings significantly expand understandings of the relationship between environment, health and artistic discrimination. Existing studies have either looked at aesthetic appreciation simply as embodying ideas of beauty or, as noted above, as a means of cultural appropriation of the

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New Zealand environment. Studying settlers’ aesthetic views complicates the idea, which historical geographers Paul Shephard and Judith Johnston have presented, that settlers feared forest areas.\(^6\)

It also complicates other assumptions. Writing about the rise of nationalism and nature conservation, environmental historian Thomas Dunlap argues that early settlers’ actions of conquest and destruction gave way to appreciation of native nature towards the end of the nineteenth century. Dunlap’s suggestion of a sea-change around 1890 implies that, because earlier settlers were changing the environment, they could not appreciate the natural world.\(^6\) In fact, environmental change often coexisted with appreciation since it was environmental change that actually heightened anxieties. In 1858, for instance, the settler John Logan complained of squatters in Dunedin’s Town Belt. According to Logan, they had ‘done irreparable damage by cutting down a considerable portion of the Bush on the Belt which served to beautify the place and which hitherto had been carefully preserved by Mr. Chapman and myself respectively.’\(^6\) Appreciation of the beauty of New Zealand’s environment did not always translate into policies like that which Logan proposed, but it does demonstrate that some settlers certainly enjoyed the colony’s environment and that appreciation coexisted with environmental change.\(^6\)

Studying historical ideas also challenges simplistic distinctions people make today and apply to the past. Present-day celebrations of indigenous nature are often accompanied by denigrating non-indigenous biota.\(^7\) As Paul Star has shown, settlers began to value and protect New Zealand nature towards the end of the nineteenth century. This came thanks to the growth of urbanisation and nationalism as well as the influence


\(^{68}\) John Logan to Deput Superintendent, Royal Terrace, Dunedin, 10 August, 1858, Otago Provincial Government, Microfilm 414/8, no. 244, HL.

\(^{69}\) Beattie, ‘Lusting after a Lost Arcadia’.

of an increasingly New Zealand-born European population with greater leisure time.\textsuperscript{71} As Star puts it, near the end of that century, 'the indigenous remnant had begun to capture the hearts of the settlers.'\textsuperscript{72} Many settlers distinguished between indigenous and acclimatised biota, but this separation did not always translate into a higher valuation being placed on one over the other. Chapter three shows that Alfred Sharpe appreciated nature according to its rarity rather than whether or not it had been introduced. Other views about nature were equally complex. Settlers often appreciated both what they regarded as 'unspoil'd nature and what they saw as improved nature. Both could be aesthetically pleasing. As chapters two and three show, most settlers thought that city spaces often could be improved through the addition of trees, flowers, parks and pathways.

Aside from demonstrating the complexity of settler views about nature and the centrality of aesthetics to these, this thesis also highlights another neglected area of environmental history; urban environments. As Eric Pawson notes, environmental historians of New Zealand have been almost totally preoccupied with rural environments and have largely ignored urban areas.\textsuperscript{73} Those few studies on the development of urban preservation societies in New Zealand understandably have focussed on the emergence of voluntary environmental groups that were formed at the end of the nineteenth century.\textsuperscript{74} This thesis suggests that councillors and concerned urban folk, in fact, started 'greening' the colonial city from the 1840s, a period much earlier than has hitherto been recognised. In a sense, city parks fulfilled a similar role to that of national parks, which developed in New Zealand in the late nineteenth century. From the 1840s, right from New Zealand's first official European settlement, civic authorities set aside city parks as 'natural' areas. They established parks in areas they regarded as artificial, human-constructed urban environments. As the influence of cultivation drew in more of New Zealand and as the

\textsuperscript{71} Star, 'From Acclimatisation', pp.217-228.  
\textsuperscript{72} Star, 'From Acclimatisation', p.246.  
extent of non-cultivated areas decreased, so the need arose for natural areas to be set aside for recreation, relaxation and health. These resulted in scenic reserves and national parks. The connection between town and national parks not only underlines the close associations between urban and non-urban areas but also that urban areas just as much as rural ones made environmental history.

### Expanding forest histories

This thesis also expands the scope of New Zealand's many forest histories. These are of two general types. The first is produced by academics and is typified by the work of historical geographers such as Michael Roche, who has published excellent overviews of the development of private and state forestry in New Zealand. Other studies falling into this category either focus on individuals or themes important to forestry, or, in the case of a number of these, investigate fauna and flora conservation. The second type of forest history is produced either by forestry professionals or scientists. At their best these studies provide informed, well-researched works, usually underpinned by excellent understandings of scientific concepts. At worst, they present an a-historical work of

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triumphal history charting the ‘enlightened’ expansion of the forestry service and often
give little if any critical reflection on forestry developments. Few studies from both
groups mention either climatic or catchment forestry. Peter McKelvey’s Steepland
Forests: A Historical perspective of protection forestry in New Zealand looks at
mountain climatic reserves. His focus, like most studies on catchment conservation and
soil erosion, however, is on the twentieth century. Although Roche, Graeme Wynn (a
historical geographer) and Paul Star look at the overall development of forest
conservation, their neglect of catchment and climatic conservation in the nineteenth
century is surprising given its prominence. Even Roche’s excellent doctoral
dissertation, which discusses some climatic and catchment conservation, neglects these
influences on the 1880s, just when this type of forestry reservation was expanding.
Most forest historians also have overlooked sand drift. Only Peter McKelvey’s Sand
Forests: A historical perspective of the stabilisation and afforestation of coastal sands in

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79 Roche, History of Forestry, pp.3, 16-17; Star, ‘From Acclimatisation to Preservation’, p.175; Star, ‘Mental Landscape’.

80 For instance, Roche asserts that Campbell Walker conservation ‘for flood prevention and climatic amelioration.’ (p.138) Later, he believes that Campbell Walker did not hold to climatic ideas and that, moreover, these were ‘far removed from popular ideas’ (p.152). Similarly, according to him, in the early 1880s ‘forest management was discussed in terms of, reserves for the regulated exploitation of timber, soil and water protection, and tree planting.’ (p.169) Roche, ‘An Historical Geography’.
New Zealand has looked at this in the nineteenth century.\textsuperscript{81} This thesis fills these gaps by demonstrating the significance of fears about climate and catchment change, and sand drift. It shows they played a significant role in shaping forest policy in the nineteenth and early twentieth centuries, along with the generation of revenue and the protection of future timber supplies.

**Christianity, improvement and conservation**

Broadening the scope of environmental history in New Zealand also means acknowledging that ideas shaped environmental actions. This thesis demonstrates that religious belief was very important in shaping settler environmental beliefs and actions. Sadly, environmental historians have either dismissed religion outright or presented it as just another ideological weapon justifying destruction of the New Zealand environment.\textsuperscript{82} By stressing the importance of cultivation, Christian ideas could provide guiding principles on how land should be used. They also provided a template of the kinds of environment settlers wanted to fashion in New Zealand. When these expectations were not met or, worse still, when humans did not improve landscapes, environmental anxieties resulted. It is therefore important to understand these settler expectations.

Reverend Thomas Burns (1796?-1871) was one of the leaders of the fledgling Otago Settlement which brought many Scottish Presbyterian settlers to Dunedin in 1848. For him, bringing land into cultivation brought settlers closer to the life of Christ. Wandering with a ‘prophetic eye’ over the Dunedin of the future, Burns envisaged ‘a rustic, transplanted Scotland, with agriculture on the lowlands, pastoralism on the higher ground, and Presbyterianism as its moral glue’.\textsuperscript{83} According to him,

the noble plains of Otago some generations hence to mark the future herds and flocks that cover the upland pastures far away to the ranges of the snowy mountains – whilst the lower lying valleys are waving with the

\textsuperscript{81} McKelvey, Sand Forests.
yellow corn and the pursuits of rural husbandry the pretty farms, “the busy mile” and the happy smiling cottages by the way side or nestling among the trees in some “bosky deyie” or sylvan dell – and all that a God fearing people – with a bold peasantry their country’s pride and an aristocracy whose highest honour it is that they are the disciples of Christ.\(^{84}\)

This improving impulse has a long history in European thought, an impulse most nineteenth century European migrants brought with them to New Zealand. It also had deeper imperatives than simply the increase of profit. Biblical ideas condoned cultivation as a particularly wholesome Christian endeavour.\(^{85}\) In the Garden of Eden, before the Fall ‘the generosity of nature was joined to water, pleasant fragrances, an unvarying springtime climate[,] an absence of suffering, and peace’ reigned between man and beast.\(^{86}\) After the Fall, however, ‘man forfeited his easy dominance over other species.’ ‘The accursed earth,’ wrote St. Augustine, ‘shall bring forth thorns and thistles for thee. Are you not ordained for sorrow and not for delights?’\(^{87}\) After the Fall came insects, wild beasts, thorns, weeds, sterility, drought and countless deadly creatures to sting, eat, prick, starve, poison and torment humanity.\(^{88}\) Since Eden was both natural and enclosed, it could be recreated by humans. By remaking nature, Europeans thereby reached out to God. This took many forms. Botanical gardens appeared in the Renaissance, pleasure gardens in the eighteenth century.\(^{89}\) By the eighteenth century, it also was held that science, by meeting God’s injunction to subdue the earth and make it plentiful, improved

\(^{84}\) Reverend Thomas Burns to Captain William Cargill, Portobello, 6 February 1847, HL, MS 0076.

\(^{85}\) There is, of course, a deep ambiguity among Christian attitudes towards Christianity and barbarity, forest and cultivation, wilderness and civilisation. Aside from being viewed as a spiritual wasteland, in the eremitic tradition the desert also could be a source of inspiration. On this, note Ajay Skaria’s brilliant discussion of these ideas in western India. Ajay Skaria, *Hybrid Histories: Forests, Frontiers and Wildness in Western India*, New Delhi, 2001.


nature and helped, in a sense, to restore humans to the Garden of Eden.\textsuperscript{90} As Richard Grove observes, the Garden offered ‘the possibility of redemption, a realm in which Paradise might be recreated or realised on earth, thereby implying a structure for a moral world in which interactions between people and nature could be morally defined.’\textsuperscript{91} By the nineteenth century, the religious significance of improving the garden remained, but to this aim had been added the imperative that science and colonial expansion achieved ‘Nature’s Government’.\textsuperscript{92}

Settlers used Biblical imagery to describe New Zealand. Its benign environment also reinforced belief in a beneficent Provider. Diarists, letter-writers, propagandists, commentators and naturalists waxed lyrical about New Zealand’s temperate climate. As one person noted, it seemed so fecund that its soils allowed European plants to blossom and multiply, ‘so healthy that you can undergo wettings, and great exposures, without suffering any injurious consequences’\textsuperscript{93} As historian Miles Fairburn put it, settlers viewed New Zealand’s lowlands as a veritable ‘Land of Milk and Honey’ or as premier Richard Seddon later described it, ‘God’s Own Country’.\textsuperscript{94} More often than not, settlers’ reference point was Eden. Dunedin settler Jane Bannerman (1835-1923) quoted verses from Deuteronomy (8: 7-12) – so beloved of immigration agents and propagandists – to describe her new environment around Otago. She thereby related her adopted home to images of Paradise and Canaan, the Promised Land:

“\textit{The Lord my God bringeth thee into a good land, a land of brooks, of water, of fountains and depths that spring out of valleys and hills – a land of wheat and vines, and fig trees and pomegranates, a land of oil olive and honey – a land wherein thou shalt eat bread without scarceness thou shalt not lack anything in it. Beware that thou forget not the Lord thy God.”}

\textsuperscript{92} Drayton, \textit{Nature’s Government}.
\textsuperscript{93} Frederick A. Carrington, Esq., Evidence before the Commons, 4th June, 1844’, in \textit{Scheme of the Colony of the Free Church at Otago, New Zealand}, Glasgow, 1845, p.18.
\textsuperscript{94} For details of these views see, for instance, Fairburn, \textit{Ideal Society}; Beattie, ‘Lusting After a Lost Arcadia’.
Truly this has been all to us, and now "we seek a better country, even a Heavenly [one]." 

Since cultivation signified Christianity, its absence indicated landscapes lying in a state of sin, heathens awaiting redemption. As William Marshall, an evangelical missionary in New Zealand, explained: 'When ... any place is left desolate by man, it becomes of a paradise, a waste; and of an Eden, no longer a well watered garden, but a wild and weary wilderness', a wilderness that serves as a reminder of man's sin, 'to that grand catastrophe of which all the prophets witness, when earth's Creator ... cursed and quitted it'. Otago's Wastelands regulations encouraged the expansion of cultivation. As Captain Fraser informed his colleagues in the Legislative Council, "'God intended the land for men and they must put men on it." These ideas permeated colonial, and Māori Christian, society. Cultivation made a landscape Christian, particularly a treeless one that did not resemble Eden. According to Captain Fraser, hard work involved in cultivation even made the tiller a more masculine Christian. As this thesis shows, turning garden into wilderness thus flew in the face of Christian values. In the nineteenth century, some interpreted scripture to emphasise the importance of stewardship of nature. These sometimes influenced decisions to conserve forests just as they had underpinned calls for cultivating unproductive areas (see chapters two to seven).
Activities such as tree planting and conservation restored the fertility of lands, thereby meeting biblical aims of using land wisely.\(^{101}\)

Christian belief is particularly evident in the arguments of New Zealand conservationists. They usually likened New Zealand to Eden. According to conservationists, the colony possessed richly-endowed soils and vegetation, and a temperate and fecund climate ideally suited to farming (Eden before the Fall). Next, they urged that deforestation should not be allowed ‘to turn the country into a desert to the detriment of whole generations to come’ (The Fall).\(^{102}\) Redemption appeared in two forms. The first involved forest conservation, so that, as German naturalist and geologist Ferdinand von Hochstetter explained, ‘history might not be able to relate that they [settlers] received a fertile country, but, by a criminal want of foresight, transmitted to posterity a desert.’\(^{103}\) Landowner Josiah Clifton Firth (1826-1897), echoed the second form of redemption. According to him, plantations could stop New Zealand becoming ‘an arid desert’.\(^{104}\) In some cases, too, Christian belief provided solutions to environmental problems. As chapter five demonstrates, settlers in North Otago relied on prayers for rain, along with rainmaking experiments, to end the drought of 1906-1907.

**Sustaining a livelihood and maintaining health**

Keeping land fertile also had important practical considerations. For most New Zealand settlers, land was ‘a necessity for survival and a shield against despair’.\(^{105}\) Improving it brought about material and social progress. As Miles Fairburn and others have shown, owning property guaranteed settlers both a livelihood and capital with which

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\(^{102}\) Charles O’Neill, NZPD, (1 October, 1873), p.1545.


to better their situation. Settlers wanted to sustain that livelihood and their standard of living. Strength of belief in the powers of environment to shape humans and human society meant that the natural world was more than a backdrop to human affairs, more than just a provider of food and products. At the most basic level, its influence began on the human body itself and extended, by proxy, to the rest of society. If the North Island’s environment encouraged languor, what were the implications for the future government of New Zealand? If New Zealand and Australia sought political federation, as in 1901, yet the environment of these two areas differed greatly, was it better to forgo union?

These and many other questions vexed the minds of Europeans throughout the nineteenth and early twentieth centuries as they battled with disease and investigated the properties of the new environment to which they had come.

Environmental determinism has a long history. Greek scholars recognised the importance of environment in shaping development and ideas. It also enjoyed a renaissance in the eighteenth century. In the latter part of that century, thinkers such as the French philosophe, Montesquieu (Charles Louis de Secondat, 1689-1755), even explained the working of laws and human society by reference to environmental factors. European scientific voyages into the Pacific, too, led natural philosophers to look at environment to explain the diversity of peoples and ideas they encountered there. As

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109 On this, see Glacken, *Traces on the Rhodian Shore*.

historian of imperialism and health Mark Harrison has shown, by the first third of the nineteenth century the idea of race as an unchangeable biological essence became more accepted.\textsuperscript{111} Changing ideas about race provided many Europeans with explanations for the seeming decline of the Māori population. They thought the temperate climate of New Zealand did not suit a race that had developed in a tropical environment. Some Europeans also speculated on the influence of New Zealand’s climate and landmass on the development of Europeans (see chapter one).

**Environmental influences**

The type of environment settlers encountered, moderated by their cultural understandings, also shaped environmental anxieties. Drought boosted the nineteenth century idea that deforestation caused climate change (chapter four) and thereby encouraged conservation.\textsuperscript{112} For others, it led to rainmaking experiments (chapter five). Unbeknownst to them, the climate settlers experienced was controlled by what scientists now call the El Niño Southern Oscillation (ENSO). This phenomenon affects climatic conditions in many areas of the world, including New Zealand.\textsuperscript{113} ENSO, a process measured by the Southern Oscillation Index (SOI), refers to ‘the normalised pressure difference between Tahiti and Darwin’. Research indicates that during El Niño periods (when the Tahiti-Darwin index reverses), southwesterly flows predominate over New Zealand from September to November. A link also seems to exist between the SOI and river flows.\textsuperscript{114} Under El Niño conditions, the westerly wind belt migrates northwards, thus decreasing rainfall to the north and east of New Zealand.\textsuperscript{115}

\textsuperscript{111} Mark Harrison, *Climates and Constitutions: Health, Race, Environment and British Imperialism in India, 1600-1850*, New Delhi, 1999.
El Niño, of course, is only one contributor to climatic variability. The great complexity of climatic circulations means that apparently related events, such as the simultaneous occurrence of El Niño and crop failure in Europe, need not be immediately connected. Volcanic eruptions, too, can disrupt climatic patterns. In New Zealand, similarly, ENSO is not the only driving force behind the climate. Major weather systems, such as anti-cyclones and depressions, affect New Zealand. These account for the predominant westerly winds that buffer its coasts and bring higher rainfall to the west coast than the east. Nevertheless, ENSO does have a significant affect on New Zealand’s and global climate and history. Two geographers, Peter Holland and Blair Fitzharris, have investigated the effect of ENSO changes on historic mid-Canterbury. Using a station diary and local newspapers, they identified periods of La Niña and El Niño between 1866 and 1871. In 1868, an El Niño event (when SOI is negative), took place, in which this year was drier and windier than average, with a prevalence of northwesterly winds. El Niño patterns switched in 1869 to La Niña patterns, meaning wetter, cloudier conditions, with a prevalence of northeasterlies.

'The most direct and spectacular impacts of' El Niño occurred world-wide in 1877-1878. Dry, cold summers and wet autumns in western Europe led to ‘massive agricultural failure’. Severe drought struck southern Africa and Southeast Asia and affected some 30 million people in South Asia. In South Asia, Australia and South Africa, these El Niño-induced droughts encouraged the publication of a number of tracts encouraging afforestation and forest conservation since people feared that deforestation was bringing climate change. These sources, as well as New Zealand’s own experience

of drought, seem to have heightened fears of human-induced climate change in the colony (chapter four).

**Sources of environmental anxieties**

Investigating these environmental anxieties means relying on many different sources; official and unofficial, published and unpublished. Official publications, including provincial and government gazettes, municipal and parliamentary papers and reports, furnish important evidence about policy directions and debates on environmental anxiety. *Appendices to the Journal of the House of Representatives (AJHR)*, for instance, provide valuable material on parliamentary commissions into forestry, health and conservation. Since they sometimes conducted interviews of regional land officials and settlers on the merits of matters such as forest conservation, tree planting and health, these reveal a cross-section of contemporary opinion on environmental issues. *New Zealand Parliamentary Debates (NZPD)* also testify to the variety of opinions about environmental reform. A significant lobby for conservation came from natural scientists and learned men. They often articulated their environmental anxieties in papers given at regional philosophical societies affiliated to the New Zealand Institute (NZI), founded in 1868. Its annual publication, the *Transactions and Proceedings of the New Zealand Institute (TPNZI)*, also reprinted much of this material. It also testifies to the importance of influential natural scientists such as James Hector and W.T.L. Travers. Both pushed for state forest conservation. Members of the NZI, particularly those from Wellington, maintained a constant lobby for urban improvements. They lobbied for better sanitation and more public parks, more comprehensive forest conservation and greater tree planting. Natural scientists also presented their ideas to the public in lectures, pamphlets and books. Transcripts of talks also sometimes appeared in newspapers and farming journals.

It was not just natural scientists and politicians who popularised environmental reforms such as tree planting and forest conservation. A comprehensive review of the colony’s major farming journals, including the Canterbury-based *New Zealand Country Journal (NZJC)* (first published in the 1880s) and the national *New Zealand Farmer (NZF)*, reveals that some farmers also worried about the effects of deforestation on
climatic and catchment. As New Zealand's first Conservator of Forests noted in the 1870s: 'The subject of the influence of forests on rainfall, climate, and water supply of a country, has of late years attracted much attention, and been freely discussed not only in scientific but general circles.'

My findings support this assessment of the 1870s. They also complicate the research of environmental historians and historical geographers who contend, as Graeme Wynn does, that

Spared by their capital from the immediacy of the general struggle to achieve a sufficiency in the new land, they [wealthy politicians] were able to appreciate the long-term and ecological consequences of an unbridled assault on the New Zealand environment.

Undoubtedly some of New Zealand's educated and wealthy advocated conservation but when one looks only at parliamentary and scientific publications as Wynn does, it is hardly surprising that he finds only élite represented. Michael Roche's research into those who undertook tree planting under the Tree Planting Encouragement Act supports Wynn's analysis. Roche found that most who made use of this act were either farmers or urban capitalists. Owners of large areas of land would be over represented in figures published on tree planting. They planted more trees because they owned more land. Owners of large estates therefore gained more land in recompense than those owning smaller plots.

As the work of historian and linguist Nola Leov is starting to paint a far broader picture of conservation support among non-élite than either Wynn or Roche. Her work on conservation in the Rai Valley, Nelson, is revealing that the great majority of lower-class settlers in the valley, despite struggling to make a living, supported conserving bush land. They objected not to conservation but to the choice of site earmarked for preservation. Since the proposed site offered suitable land for farming, they suggested an

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120 Inches Campbell Walker, 'The Climatic and financial Aspect of Forest Conservancy as applicable to New Zealand', TPNZI, 9, (1877), pp.xxvii-xxviii.
121 Wynn, 'Pioneers, Politicians', p.186.
122 Roche, Forest Policy in New Zealand, p.52.
123 Nola Leov, draft chapter on a history of the Rai Valley area, unpublished MS.
alternative situation in a more isolated valley. Locals correctly discerned that the lobby group (comprised mostly of professionals and wealthy landowners) for the Rai Valley conservation area wanted it set aside for hunting purposes exclusive to themselves. My work supports Leov's findings by suggesting that significant support for conservation existed amongst both wealthy and smaller landholders (see chapters four to seven). It thereby complicates Wynn's assertion by showing that wealth did not necessarily determine an individual's support of conservation.

Newspaper analysis of the responses of the North Otago community to the drought of 1906-1907 also highlights widespread environmental concern at the popular level. Chapter five shows that correspondents closely followed the course of the rainmaking experiments and prayers, and enthusiastically wrote into the local papers their suggestions and opinions. Chapter three demonstrates that many newspaper articles written by Alfred Sharpe in Auckland and Newcastle, Australia, expressed concern about urban pollution and environmental change. These examples illustrate what national policies meant for local areas and, in turn, that local events influenced national policy.

Archival material also provides valuable sources for environmental history. Comments scribbled onto environmental reports or personal collections of forestry papers can explain why environmental responses took a long time to happen. They also can point to the influences shaping an individual's environmental ideas that might otherwise be hidden in published material. These sources are often equally valuable for revealing the tensions and disagreements that lie behind seemingly straightforward environmental decisions. A study consisting of either environmental legislation or action does not necessarily reflect the jostling of competing ideas and policy that took place before such decisions crystallised into practice. This offers an important reminder that bureaucracies or governments, councils or committees are not monolithic entities, but organisations sometimes riven by competing ideologies and approaches.

124 Alfred Sharpes's writings have been collected by Roger Blackley and deposited in the E.H. McCormick Research Library (RC 2000/7), Auckland Art Gallery. I am indebted to Roger's generous gesture in depositing this material for future researchers and for his help and encouragement of my interest in Sharpe.
Archives reflect the dominant aim of the group collecting such material. Colonial archives, upon which this study rests in part, are both ‘products of state machines’ and so too ‘technologies that bolstered the production of those states themselves.’ In other words, ‘colonial archives ordered … the criteria of evidence, proof, testimony, and witnessing to construct its moral narrations’, while official organisations of material ordered the colonial state itself. One problem associated with all existing historical studies, not least works of environmental history, is that most historians continue to reconstruct archival material as embodiments of the archive they study. Reconstruction might be of the city, region, or, as is so often the case, the nation. By uncritically accepting the way it is organised, ‘the archive comes to stand as a proxy for the unit of analysis.’ Using the archive against the grain of a colonial state narrative, as chapter eight does, can reveal the extra-national connections between regions, people and places. Exchanges of information and ideas, people and personnel can help historians gauge the impact of certain ideas and practices on different regions by moving them outside the narrow boundaries of the nation-state.

Images as sources

One type of historical source that New Zealand’s environmental historians have yet to make full use of is pictorial material. Used carefully, photographs can provide evidence of environmental change. Their subject matter also can hint at the interest of the photographer, just as artworks can. Art historian Marian Minson investigated what the promotional paintings of surveyor and draughtsman Charles Heaphy (1820-1881) reveal

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126 Tony Ballantyne, ‘Rereading the Archive and Opening up the Nation-State: Colonial Knowledge in South Asia (and Beyond)’, in Antoinette Burton, ed., *After the Imperial Turn: Thinking with and through the Nation*, London and Durham, 2003, pp. 102-121. Quote from p.113.

about their creator and the group that commissioned them. Similarly, art and environmental historian Tim Bonyhady has undertaken a broad survey of the role of Australian artists in the nineteenth century.

The use of contemporary works of art depicting landscape change, including photography and painting, provide valuable sources to environmental historians, but require careful use. Even if they do not employ them, environmental historians should be familiar with the different art historical methods of analysing images. They also must be familiar with the artistic styles and debates used by the subjects they study. Competency will allow them not only to interpret but also to better understand artists on their own terms. Furthermore, environmental historians must take care not to read into images their own or present-day understandings and interpretations.

The portrayal of deforestation is a case in point. As often as not, the presence of burnt or disfigured trees in the landscape reflected aesthetic notions of landscape composition, such as the coulisse (in which trees frame space in an artwork). They were not necessarily protests against deforestation. In fact, images depicting deforestation might actually be celebrating the march of progress and the progression from bush to pasture. The work of colonial artist John Kinder (born between 1834-1838, died 1903) attracts many different interpretations. Art historian Ron Brownson notes of Kinder’s photograph, Coromandel Gold Fields (1866) (Photograph 1.1), that it ‘reveals Kinder at his most critical.’ Brownson sees it as ‘one of the earliest and most expressive

129 Tim Bonyhady, The Colonial Earth, Carlton South, Victoria, 2002. See also, Schama, Landscape and Memory. For the use of paintings by environmental historians in New Zealand, see Beattie, ‘Lusting after a Lost Arcadia’, pp.100-113.
Photograph I.1 A contemporary of Alfred Sharpe (chapter three), the Rev. John Kinder (born between 1834-8, died 1903) photographed as well as painted in the area around Auckland. This composition is entitled ‘Coromandel Gold Field, c. 1866’.

New Zealand views of a landscape undergoing the process of devastation. Yet, did Kinder view his art as documenting devastation? Another art historian, Michael Dunn, sees one of Kinder’s watercolours of a deforested landscape as a celebration of, rather than a protest against, progress. To avoid such problems of interpretation, ideally written evidence about the creation and intent of such images would be available to the environmental historian. Alfred Sharpe’s voluminous writings on art and nature provide interpretations of his pictorial and poetic works.

**Gender and environment**

If some of the challenges facing historians are to navigate beyond the treacherous but potentially rewarding shores of colonial archives and to incorporate pictorial works into studies, then another is plumbing the archive for material about women. Within environmental history writing outside New Zealand, the challenge has been taken up. In 1996, Carolyn Merchant’s book, *Earthcare: Women and the Environment* appeared. Merchant followed an ‘eco-feminist’ approach. She argued that, because women’s oppression mirrored that of the environment, women had a special biological relationship with the land. Consequently, argued Merchant, women were and remain better conservationists than men. Other writers, such as Bina Agarwal and Amita Baviskar, challenged Merchant’s tendency to reify women as one homogenous grouping. Growing out of the Marxist focus of subaltern studies, Agarwal and Baviskar highlighted that, in India, it is often poor, rural women who suffer most from environmental degradation.

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133 Dunn refers to Kinder’s painting, *In the Backblocks* (1879), which depicts ‘bush clearance near Inglewood, Taranaki’, as a record of ‘man’s progressive clearance of gently-rolling slopes for pasture, the building of houses, and the felling of the dead burnt trees.’ Michael Dunn, *Frozen Flame and Slain Tree: The Dead Tree Theme in New Zealand Art of the Thirties and Forties*, *Art New Zealand*, 13, (1979), p.11.


because they rely on the environment for providing basic foods and fuels. In New Zealand, although some isolated studies exist on women, practitioners have largely ignored gender as a category in environmental history. That is not to say that women did not express environmental anxiety. Robin Hodge's study on the early twentieth century conservationist Pérrine Moncrieff (1893-1979) reveals the importance of her contribution to fauna conservation in New Zealand. Similarly, Julian Kuzma has identified some early twentieth century women novelists who used fiction to criticise environmental change. These include Jane Mander (1877-1949), with The Story of a New Zealand River (1920), and Edith Searle Grossmann (1863-1931), wife of the leading colonial conservationist J.P. Grossmann, with The Heart of the Bush (1910). The few studies on women's environmental views in nineteenth century New Zealand, such as those by Neil Clayton, Michelle Knauf, Katherine Raine and myself, look at the role of women as gardeners and, as Knauf puts it, as representatives of the 'progress of European civilisation into the wilds'. A few works look at the role of women artists operating in the New Zealand landscape. The problem is that, apart from diaries and personal papers, archival material is largely silent on women's ideas about environment. Partly this reflects the type of sources used in this thesis. Partly it reflects the more limited roles open to women in New Zealand society during the period under study. Until the twentieth century, no women presented papers before the New Zealand Institutes, sat in parliament, or worked as lands administrators. Similarly, outside the area of amateur natural history, women did not serve either as colonial scientists or as land administrators. Even the

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136 Agarwal, 'Environmental Action'.
artwork produced that was strongly influenced by environment, such as the use of natural motifs in decorative arts and still life painting, was not regarded as high art and so few examples remain.\footnote{143 This thesis' use of newspapers provides the environmental views of some women amongst the residents of North Otago.}

Maori environmental views

Nor does this thesis focus on the variety of Maori environmental views, the nature of which often considerably differed from settler ideas. For most Maori, land and people remain inseparable, a relationship expressed in the term tangata whenua ('people of the land'). According to Maori belief, Papatuanuku, the mother earth, produced the ancestors of the Maori, a conviction reflected in the practice of burying the placenta in the land.\footnote{142 Maori ('life force') inhabited everything, including birds, people, rivers and rocks. Establishing access and rights to resources and land was a complex process. 'Land ownership in Maori society', as historian Angela Ballara notes, 'required that ancestral claims go hand in hand with inherited mana over the land, plus occupation or other use.' Maori ('life force') inhabited everything, including birds, people, rivers and rocks. Establishing access and rights to resources and land was a complex process. 'Land ownership in Maori society', as historian Angela Ballara notes, 'required that ancestral claims go hand in hand with inherited mana over the land, plus occupation or other use.' Whakapapa (genealogies) helped people define access and relationship to resources, but, as Ballara points out, were insufficient by themselves to define rights. Continual occupation (ahikaroa) as well as conquest (take raupatua), gift (take tuku) and discovery (take taunaha), in addition to other categories, also defined this complex and contested relationship.\footnote{144 This discussion does not mean to imply that Maori environmental ideas were static.} When Maori first arrived in Te Ika a Maui (New Zealand's North Island) and Te Wai Pounamu (New Zealand's South Island), they encountered very different

\begin{footnotesize}
\footnote{140 See, for instance, Julie King, \textit{Flowers into Landscape: Margaret Stoddart, 1865-1934}, Christchurch, 1997.}
\footnote{141 See, King, \textit{Flowers into Landscape}, pp.19-65.}
\end{footnotesize}
environments to the Polynesian one from which they came. Many of the tropical staples that had survived the long sea journey to New Zealand would not grow in this colder land. They therefore had to adapt their agricultural techniques and resource base. Learning the hard way, this often meant total or partial loss of certain species and the utilisation of new ones such as the Ti tree.\textsuperscript{145} After first contact with non-Māori, Māori agriculturists embraced European farming techniques and technology, Eurasian crops and animals. They used these on their own terms just as they did other aspects of European technology and ideas.\textsuperscript{146} The local environment proved as important for Māori as for later settlers, particularly in pre-contact times before the potato enabled a more reliable food base to be maintained in the southern South Island. At Banks Peninsula that important staple, the kumara (Ipomoea batatas), reached the southernmost extent of its growth, while the territory of southern Māori straddled a vast and diverse resource base.\textsuperscript{147} This lower population base meant southern Māori followed a pattern of seasonal resource use, in contrast to the more densely populated, cultivation-based economy of North Island Māori.\textsuperscript{148}

Although my thesis focuses on settler, rather than Māori, environmental anxieties, parliamentary discussions and Māori newspapers reveal not only that some Māori presented environmental anxieties but also that views on resources sometimes differed considerably between Māori and European. Māori regarded swamps as rich sources of food, whereas most settlers feared these areas as harbingers of disease and as areas lying idle. Promoters of scientific forestry wanted to harvest trees in a sustainable manner. They shared a great deal more with Māori views of environmental use than did later preservationist attitudes. Preservationists advocated leaving nature alone and supported

\textsuperscript{144} Ballara, \textit{iwi}, pp.195-205; Asher and Naulls, \textit{Maori Land}, pp.5-7.
the development of national parks – areas of nature in which resource use was prohibited. Yet, as Tom Brooking and others have shown, the expansion of forest conservation areas, as with areas for settlement, often came at the expense of Māori access to land and resources.\textsuperscript{149} Hence, in 1874, one correspondent to the Māori-language newspaper \textit{Te Wananga} feared that Māori forestland would be lost to pay for the protection of forests.\textsuperscript{150} Ironically, this land pressure would force Māori into efforts, such as swamp drainage, designed to maximise the productivity of surviving lands. This reveals that the outcomes of environmental anxieties – in this case, manifested in state forest conservation – had uneven impacts, particularly upon Māori, many of whom were losing access to lands and resources. As the following chapter demonstrates, too, many Europeans and Māori believed that the nature of New Zealand’s climate had an important influence on their health and development.

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\textsuperscript{150} \textit{Te Wananga}, 2, 5 (12 March, 1875), p.47. See, also, the address of Renata Kawepo and sixteen others against the damage done to streams on Māori land through water dams and logging, ‘Petition Relative to the Timber Floating Bill’, \textit{Journals and Appendix to the Journals of the Legislative Council of New Zealand (JAJLCNZ)}, No. 8, 1873.
\end{flushright}
Chapter 1: Geographies of settlement: Environment, Health, and Race in New Zealand, 1830-1914

Most people in the nineteenth century fervently believed in the power of environments to shape human societies and to affect health. Environments could be responsible for the development of racial and national character, they thought, could retard and extend human development and be healthy as well as unhealthy. As the nineteenth century wore on, European beliefs hardened into the idea that certain 'races' suited certain environments and that to take these races out of their environments invited disaster. When peoples accustomed to temperate climates, such as the British, encountered tropical climates it seemed that they simply wilted: disease debilitated them, heat sapped their reproductive and mental powers, and their energies waned. Medical opinion asserted that high temperatures and high humidity strained the body, and that copious moisture bred unhealthy miasma, noxious gases that emanated from marshes and rotting vegetation and which in turn poisoned the body. Temperate climates, free from great temperature ranges, conversely, suited the 'English constitution' since these climates resembled those of northern Europe. If certain climates contributed to health so too did certain landscapes. According to medical and popular opinion, swamps, all poorly drained land in general, as well as stagnant and standing waters, were places that should be avoided, since from these sites emanated the dreaded miasma. Conversely, they believed, clear, running water enhanced health and longevity. Opinion divided on the merits of living near forests and trees. Some held that forests, full of rotting vegetation, bred miasma. Others warned that forest clearance released miasma and that these locations were dangerous places to occupy until the land had been totally cleared, drained and turned into pasture. The contrary school of thought stressed the value of forests and trees as air purifiers, which literally drew from the air the unhealthy miasma. This group advocated their conservation and planting, especially in urban areas, since they believed that the air there was particularly poor.
As many historians have recognised, outpourings of immigrant guides and popular tracts emphasised New Zealand's eminent suitability to the 'English constitution': it possessed a temperate climate, much resembling England's, only better as it experienced neither extremely hot nor debilitating, cold temperatures. Moreover, to many settlers, flourishing 'European' plants and animals testified to the beneficence of its climate and indicated that European people would acclimatise just as successfully as 'European' plants. Arguing that propaganda alone underlay New Zealand's healthy image, as almost all historians have, is only partially accurate. Mainstream medical theory, in the areas of medical geography and public health, lent authority to the study of environments, both natural and built, to explain patterns of morbidity and mortality. Statistics and climatic studies confirmed to many doctors the salubrity of New Zealand's climate, even its therapeutic value, particularly if combined with the taking of waters. By the end of the nineteenth century and in the first half of the twentieth, western medical opinion upheld dry climates for the cure of tuberculosis patients (sanatoria), and sunshine, coupled with outdoors activity and a good diet, to revivify and restore sickly children to health (children's health camps). This chapter reveals a spectrum of settler environmental perspectives that ranged from utmost confidence in the healthiness of New Zealand's environment for Europeans to clinging fears that constant exposure to New Zealand's climate and country would damage constitutions and change racial characteristics. Medical geography helped settlers divine healthy areas from unhealthy, good sites from bad. Most of all, Europeans in New Zealand recognised the dynamic interconnectivity between environments and bodies, that changes in environment brought about changes in health. Humans shaped, and in turn were shaped, by environment. These ideas were underpinned by the fact that, despite advances in medical knowledge, humans could do little to counter the diseases they encountered on a daily basis. Emphasis remained on care rather than cure until the 1940s. Only after this period, with the development of antibiotics, 'chemical substances produced by microorganisms [sic]
which destroy or prevent the growth of bacteria or other microorganisms, did medical science gain the means of successfully treating many diseases.2

Health and environment

As Clarence Glacken's magisterial work on western environmental ideas reveals, the influence of environment on human health, development and culture enjoys a long history.3 Greek doctors believed that ailments originated in an 'imbalance in the four humours of the body'. They sought to explain these ailments, first, with recourse to explanations relating to behaviour (such as sleep, food and drink) and, second, by investigating the influence of environment on disease.4 Named after the Greek doctor Hippocrates of Cos (c. 460-c. 377 B.C.), the Greek Hippocratic corpus of medical writings that dated from this period brought together many theories about the causes of disease. As one of the titles in this collection illustrates, this corpus in part looked at the influence of *Airs, Waters, Places* on health.5 Probably compiled to help Greek physicians anticipate what diseases they could expect to find in unfamiliar environments, the collection discussed the influence of winds, seasons and heat (airs), water supply (waters) and location (places) on health.6 Other works in this corpus, such as *Epidemics I* and *Epidemics II*, looked to the effect of seasonal changes and climate upon patterns of epidemics.7 As Caroline Hannaway notes, central to Greek discussions of health and environment was the concept of miasma, polluted air that caused disease. The nature of

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miasma might be difficult to detect, but its sources were well known: decomposing animal and vegetable matter, stagnant water, swamps, and ill-drained sites.⁸

These environmental and humoral theories of disease continued to influence European medical and popular opinion for the next two millennia. They enjoyed a particular renaissance with the development of medical geography. This study emerged from research into air and air pressure conducted with the development of meteorology in the seventeenth century.⁹ Medical writers such as the doctor Thomas Sydenham (1624-1689), who researched London epidemics, investigated the relationship between locale and patterns of disease. By the eighteenth century, the study of medical geography had become more widespread. In some cases, such as in France from the 1770s, these studies included attempts to form national medical topographies. Researchers such as the German Leonhard Ludwig Finke also led studies into the occurrence of disease in different environments throughout the world. As Hannaway contends, his studies greatly expanded the area medical geographers investigated.¹⁰

Medical geographers investigated 'all elements in the environment that might impinge on disease', including sunshine, barometric pressure, soil types, thunderstorms, temperature, altitude, water quality and so on.¹¹ Map-making and statistics became the favoured means of displaying these qualities as well as the coincidence of disease, topography and climate. The techniques and scope of medical geographies reflected the increasing territorial expansion of European states and municipalities within Europe as well as, from the nineteenth century, their acquisition of overseas colonies.¹² Medical geography thus both grew out of and refined Hippocratic writings. Like the Hippocratic

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writers, medical geographers identified miasma, ‘a quality of particular environments’, as the prime cause of a variety of diseases including malaria, typhoid, dysentery and diphtheria. Most doctors agreed that poisoned, or impure, air caused fevers and associated these with certain physical factors, in particular low-lying ground, swamps, fogs and bad smells. As a popular science journal from New Zealand put it in 1883: ‘The observations of all periods show us, that wherever matter is rotting, the district is unhealthy, and can be predicted to be so. The decay and putrefaction of plants and animals, especially in marshy places, increases the mortality in the neighbouring country.’

Fears of cities and marshlands

Writers identified cities and marshlands as unsafe environments. Urbanisation and industrialisation became catchwords of Britain’s might but also of her shortcomings. In Britain’s burgeoning cities, mortality rates peaked and epidemics rioted as industrial expansion sucked in rural workers and concentrated together poverty and population. In the disease-ridden, dank and dirty streets of towns and cities, sanitarians believed they had discovered a cause for disease: environment. Since they believed foul atmosphere caused infection, they focussed their energy and attention on removing the causes of polluted air: overcrowding, poor and rudimentary sanitation, inadequate fresh water and drainage, unhealthy paving and house design. Edwin Chadwick (1800-1890, later Lord Shaftesbury) led the sanitarians’ attack on ill-health. His Report on the Sanitary Condition of the Labouring Classes (1842) drew attention to sanitary deficiencies and underlined the link between poverty and ill-health. Vigorous campaigning by Chadwick and others created centralised bodies. They promoted both government health legislation and engineering works (such as proper house and street drainage, water supply and

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14 ‘Our Science Page: Decay of Plants and Animals (from the “Chemistry of Common Things”), NZCI, 7, 6 (1 November, 1883), p. 491.
cleansing) as solutions to ill-health. These solutions also underwrote sanitary reform in New Zealand (see below).

Many earlier medical historians drew a sharp line between the belief of sanitarians, that miasma caused disease, and the belief of contagionists, that unhealthy exhalations generated in the body spread disease. In fact, most doctors accepted a range of different theories of disease. They modified their medical opinion to meet the different characters of disease. Some diseases such as smallpox remained constant in character independent of the environment in which they occurred. This contrasted with both intermittent diseases which often occurred seasonally and those located in a particular place such as malaria, which is found in marshy, moist and humid areas. A major step towards the development of a universal classificatory system came with the re-designation of diseases undertaken by William Farr (1807-1883). Charged with the task of drawing up a national classification of diseases, he brought together epidemic, contagious and endemic diseases under one banner, ‘zymotic’. Zymotic referred to the process of fermentation and recognised that morbid matter could accumulate from external sources, enter the body and then spread among people. Farr thus recognised the importance both of environment and humans as possible sources of pollution. Zymotic classifications accepted germ theory quite easily, since this system recognised that unclean areas could be sources of disease. The germ theory of disease only started to usurp miasmic explanations of disease in the 1890s.

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The problem of hot climates

Disease and environment seemed closely linked to many Europeans encountering hot or tropical climates. Heat, medical opinion held, proved inimical to health as it disrupted the internal constitution of people. Fear about heat enjoys a long history dating to Hippocratic ideas which stressed the imbalance it created in the humours. Extremes of temperature had a bad effect on bodies, producing lethargy and sickness. Heat, combined with water, also endangered health through the accumulation of rotting vegetable and animal matter. Indeed, as the British would discover with horror in India, canal building often created unhealthy and disease-ridden landscapes.21

As the nineteenth century wore on, tropical climates came to be seen as particularly dangerous places for Europeans to inhabit. David Arnold dates the development of this fear to the eighteenth century and before.22 Mark Harrison holds that only from the 1830s did many Europeans come to regard the Indian climate, and tropical climates in general, as being totally inimical to European constitutions. Harrison argues that previously, while recognising that disease and death were a problem in the tropics, Europeans thought that they could successfully acclimatise to India’s climate by adopting changes in lifestyle. Optimism in European acclimatisation reflected more fluid notions of human difference that existed in the eighteenth century, notes Harrison. According to these ideas, differences of character were factors not of biology but of ‘lifestyle, diet and, above all, by climate.’ Although, like many before them, these thinkers believed that environment determined morals and character, and that over time this accounted for human difference, they did not hold that these differences were fixed. Hence, Europeans could successfully acclimatise to new tropical environments.23 Pessimism about

22 David Arnold, ‘Introduction: Tropical Medicine before Manson’, Warm Climates and Western Medicine, pp.1-19.
acclimatisation and colonisation developed from the 1830s. According to Harrison, these attitudes arose because of the increasing evidence of European mortality in India as well as the protracted and bloody campaign of the First Burma War (1824-1826). As he notes, the high morbidity and mortality rates suffered by the British and Indian in Burma, suggested that certain races could only thrive in certain climates. Racial differences, rather than fluid, now came to be seen as static, biologically-based traits. Such assumptions meant, since races were fixed, that Europeans could never successfully adapt to new climates.24

A decade after the First Burma War, ideas about places and races, heat and cold, health and climate in New Zealand came to the fore in lively discussions about the prospects for British settlement and Māori health. Settlers and medical geographers identified healthy and unhealthy areas that were suitably habitable and restorative, searched out patterns of disease, debated the effects of human environmental change in enhancing or decreasing mortality and morbidity, and enacted health legislation where they saw fit. These discussions unravel an ambiguous history of environmental assessment, in which confident assertions of the ability of New Zealand’s climate to cure disease sat alongside fears that unhealthy areas also could exist in New Zealand, and even be created by human environmental change.

A perfect migrant destination?

As many New Zealand historians have recognised, propagandists from the 1830s pushed New Zealand onto British and Europeans as the perfect migrant destination.25 Settlement company tracts loudly trumpeted New Zealand’s vast swathes of ample, flat and fertile lands just waiting, as the Otago Journal put it, ‘for the reception of man’.26

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24 Harrison, Climates and Constitutions.
Images of climate featured strongly in these works. In contrast with drier and hotter lands (such as Australia and India), they presented New Zealand as a temperate and well-watered land admirably suited for British agriculture and British temperaments. Luxuriant vegetation indicated a moist and fecund climate, for instance, but also the existence of rich soils and a healthy atmosphere. This connection between vegetation and health appears in John Ward’s 1839 migrant handbook:

The climate [of New Zealand] is unquestionably very congenial to the European constitution. ... A never-failing moisture is dispersed over the country by the clouds which collect on the mountain-tops, without the occurrence of rainy seasons, beyond storms of a few days’ duration. This refreshing moisture, combined with the influence of the sea-breezes, renders the climate very favourable to the health, and development, of the human frame. And vegetation is, from the same cause, highly luxuriant, and the verdure almost perpetual.

Lush vegetation and a sturdy frame went together. This judgement was repeated in many other discussions of New Zealand’s climate. In 1840, William Swainson (1809-1884) noted that New Zealand’s terrain, allied with ‘the nature of its vegetable productions, and the success with which our [European] more tender and delicate fruits and vegetables have been cultivated, [indicate] that its climate fully deserves the character it enjoys for equability, mildness, and salubrity.’ Swainson was a New Zealand promoter, naturalist, conchologist and its first Attorney General. According to The Otago Journal (1848), Otago had some 140 species of fern, so could be judged to possess a fecund and healthy climate that enjoyed ‘equitable’ year-round mildness, ‘refreshing dews and rains, and...temperate heat [which], fill the months with a living verdure.’ Since ‘all sorts of European produce flourish, and all sorts of live stock thrive to an amazing degree’,


29 William Swainson, Observations on the Climate of New Zealand; Principally with reference to its Sanative [sic] Character, London, 1840, p.34.
implied William Fox in 1858. European people would likewise. As the nineteenth century wore on, arguments about the suitability of New Zealand’s climate to European people would be drawn less from evidence of the fecundity of New Zealand plants and more from the successful acclimatisation of European plants and animals. To many settlers, New Zealand plants appeared to be dying out, in Darwinian terms out-competed by superior strains. This process appeared to mirror the apparent decline of the Māori race (see below).

The salubrious nature of New Zealand’s climate, allied to its constancy of temperature, gave propagandists and medical geographers a strong hand in comparison to other migrant destinations. These they could either dismiss as being far too cold (Canada), far too hot (Australia and other tropical areas) or both (the United States), and hence unsuitable for the ‘English constitution’. Rival propagandists countered such charges by building up the reputation of their own land and climate. They drew attention to their rivals’ deficiencies. In New Zealand’s case, this often meant stressing its earthquakes and strong winds. Some of New Zealand’s writers, however, believed strong winds provided benefits by ridding the air of unhealthy air. Former New Zealand Company naturalist, Ernst Dieffenbach (1811-1855) explained that southerly winds’ have a very beneficial effect upon the climate: no sooner is mist or fog formed then they dispel it, and thus purify the atmosphere, and prevent the collection of obnoxious exhalations’. William Swainson chose not to dwell upon New Zealand’s windiness but instead compared New Zealand’s climate to Australia’s. He favoured the former. According to him, ‘if the opinion be well founded, that a climate is suitable to delicate constitutions in proportion as it temperature is equable and limited in its range, and free from frequent and sudden vicissitudes, there can be little doubt that the advantage is decidedly in favour

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31 William Fox, The Six Colonies of New Zealand, Dunedin (HL facsimile), 1971, p.16.
33 William Swainson, for instance, admitting that ‘Paradise can be visited, and that, too, rather roughly, by the winds and rains of heaven’, noted that normally a wet and windy day is followed ‘by one of those calm, bright, and lovely mornings, whose beauty no language can fittingly describe’. Swainson, Auckland, the Capital of New Zealand, and the Country Adjacent: Including some account of the gold discovery in New Zealand, London, 1853 (reprint 1970), pp.44-45.
34 Ernst Dieffenbach, Travels in New Zealand..., volume 1, 1843, London, p.175.
of New Zealand.\textsuperscript{35} Although ‘thanks to the dryness of the atmosphere’, noted Swainson, the high temperature of New South Wales ‘is much less oppressive than would be experienced in India’ it still did not suit the English constitution. Nor did South Australia’s climate, ‘delightful and salubrious’ though it might be for eight months of the year, but not ‘agreeable to English constitutions’ during the extreme heat of summer.\textsuperscript{36} Countless other writers focused on the salubrity and suitability of New Zealand’s climate to the ‘English constitution’. As George F. Angas (1822-1886), naturalist and artist, put it:

The climate of New Zealand seems to be well adapted to the English constitution, and is undoubtedly one of the most healthy to be found in any part of the globe. It possesses the best qualities of both the English and the Australian climates, without the disadvantages of winter. It has the mild winters, the clear sky, and pure atmosphere of the latter, free from its hot winds and long-continued droughts; whilst it has the temperate summers of the former, without its dreary winters and severe frosts. In the spring and early summer there is much wind; and in the winter very heavy rains, with rough tempestuous weather, occur at times for several days together, especially about Cook’s Straits and to the southward.\textsuperscript{37}

Comparisons of healthiness and climates did not merely serve the promotional interests of one colony over another. They could actively influence the fortunes and even effect the fall of the British Empire. If tropical climates proved impossible to live in for Europeans, then finding suitable climates elsewhere gained urgency, particularly given that other European nations also were seeking out empires. Climates thus not only could shape constitutions and individual colonies but also the fate of the entire colonial project.

Cunning and ingenious use of climatic statistics reinforced New Zealand’s equability of temperature and clime, placing the colony in a very favourable light in comparison to some of Europe’s best climates. Explorer and ethnographer Edward Shortland (1812?-1893) ingeniously calculated the temperature of the Fouveaux Straits area. Given that 7° latitude separated Auckland from Akaroa, and accounted for a 2.49

\textsuperscript{35} Swainson, \textit{Observations}, p.67.


Centigrade temperature difference, Shortland reasoned that the 3° of latitude between Akaroa and Fouveaux could not account for more than a 3 or 4 Centigrade difference.\(^{38}\) Using this calculation he made a strong case for the colonisation of the Fouveaux Straits area on the ground of its mild climate.

Observation seemed to bear out these confident predictions of the country’s healthiness. According to the Otago Journal, New Zealand had neither local nor epidemic diseases. Young and old alike thrived and enjoyed unprecedented and uninterrupted ‘good health’.\(^{39}\) Early naturalist and artist Augustus Earle (1793-1838), Swainson observed, ‘noticed the healthy appearance of the missionaries and their families’ and remarked that “the chubby children who peeped at us from all corners, and the very hearty appearance of their parents, plainly evidenced that theirs was an excellent and thriving trade.” \(^{40}\) John Dunmore Lang ‘was particularly struck with the glow of health exhibited on the cheeks of the children of Europeans at the Bay of Islands, compared with the pale faces of children of the same age at Sydney, in much the same latitude. It was quite remarkable.\(^{41}\) Frederick Carrington (1808?-1901) found that ‘the climate is so healthy that you can undergo wettings, and great exposures, without suffering any injurious consequences’.\(^{42}\) Swainson felt that New Zealand’s climate prevented chest and other diseases from developing among Europeans.\(^{43}\)

Tables of comparative climatic statistics showing monthly temperature ranges, rainfall, and mortality statistics both reinforced the healthiness of New Zealand’s climate for Europeans and demonstrated the connectivity of environment and disease.\(^{44}\) Medical geographers such as military surgeons Arthur S. Thomson (c.1817-1860) and K.R. Prendergast lent medical authority to the healthiness of New Zealand’s climate to

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\(^{39}\) *Otago Journal*, 1, (1848), p.6.

\(^{40}\) Swainson, *Observations*, p.56.


\(^{42}\) *Scheme of the Colony of the Free Church at Otago, New Zealand*, Glasgow, 1845, pp.18-19.

Europeans, while also discussing the influence of other environmental factors as well as the prospects for Māori health.

**Imperial health: Edinburgh, India and New Zealand**

Thomson's ideas on climate, race and health had been shaped by his studies at Edinburgh University and by his research in India. At Edinburgh, Thomson wrote his doctoral thesis on the world-wide influence of climate on morbidity and health. He continued to pursue this enthusiasm in India by investigating the effect of tropical climates on the health of British troops there. By comparing death rates among soldiers in Britain, Bengal, Madras, the West Indies and Mauritius, Thomson hoped to find out whether long residence in the tropics developed soldiers' immunity to tropical diseases. He concluded that it did not, and that the tropics proved inimical to the health of Europeans. Not only did sickness result, but so too moral degeneration in the children of those born to Europeans in the tropics. The ideas Thomson developed in Edinburgh and India led him to reject the capacity of races from one climate to acclimatise to a dissimilar one. According to Thomson, when a race from a temperate climate moved to a tropical one, as in the case of Europeans coming to India, or moved in the opposite direction, as in the case of Māori coming to New Zealand (see below), these races degenerated and died out. However, since the climate of New Zealand resembled that of Britain's, and in many respects was its superior, Thomson concluded that Britons could move freely and without worry to New Zealand, particularly the North Island, since this was the location of the troops he studied.

'I am quite convinced the low mortality among the troops does not arise from accident,' Thomson wrote confidently in his 1850 paper on health and climate that appeared in the *British Parliamentary Papers* of 1851. In fact, he continued, their low mortality 'is a true indication that the European population living in the North Island of New Zealand enjoy a remarkable exemption from disease of the lungs, a result of which

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44 For this see, for instance, Swainson's use of Dr. A.S. Thomson's climatic and vital statistics for Auckland. Swainson, *Auckland*, pp.44-63.
can be attributed to no other cause but the climate." Thomson based these conclusions on comparisons of death and disease rates among British soldiers stationed in New Zealand’s North Island with those abroad. This analysis led him to conclude that New Zealand’s climate possessed therapeutic qualities. According to him, it ‘checked the occurrence of ague in several men who had contracted the disease in England’. Moreover, the recuperation of the soldier pensioners who had been invalided out of military service in the East and West Indies testified to its regenerative qualities. As Thomson explained: ‘To the Indian who has suffered from no disease, but whose mind and body are exhausted and enervated by the high temperature and restless nights, which residence in the tropics produces, New Zealand will be found a peculiarly agreeable residence. I speak of this from my own personal experience, and that of one or two others who have suffered from the exhaustion of an Indian life.’ Thomson also relied upon the testimony of his friend, the Royal Naval doctor, H. W. Mahon, placed ‘in charge of one division of these enrolled pensioners for several years’. Mahon stated somewhat inconclusively that: their mortality ‘‘from natural causes is not more than might be expected.’’

Thomson reiterated these findings in papers of 1854 and 1858, and in his 1859 general history, The Story of New Zealand: Past and Present – Savage and Civilized. ‘I came out to this country as Medical Superintendent of one division of the New Zealand Pensioners,’ he commented in 1854, ‘and have ever since watched the influence which the climate has had on their health and strength with much interest’. Statistics furnished to Thomson by Major Kenny, wrote Thomson, testified that over a period of four years from 1850, the annual death rate from disease among the 31st division of the New Zealand Pensioners averaged 17 out of 1000. This death rate, he noted, compared with 32

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49 Thomson, ‘Climate of New Zealand’, p.55.

per 1000 of pensioners in Great Britain also aged between 40 and 50.\textsuperscript{51} As Thomson explained of New Zealand’s pensioners:

All of them are old soldiers, and have seen service in widely different parts of the globe. In every village there are men who have spent years in Canada, Ceylon, the East and West Indies, Aden, Arabia, Sinde, China, Newfoundland, St. Helena, Mauritius, Corfu, Malta, Gibralter, Cabul, Africa, and Australia. All the men have been invalided from the army on account of disease or length of service. Ten were found unfit for the more active duties of a soldier’s life, but were selected in England as [being] fit for seven years’ garrison duty in New Zealand. There are many healthy men among them, who were rendered unfit for the army by liver complaints, contracted in the burning plains of Hindostan [sic], by the fevers of Jamaica, by the snows of Canada, and among the mountains around Cabul – in short, there are many among them who have been invalided for every disease which tropical, frigid, and temperate climates can produce.\textsuperscript{52}

His 1854 research again revealed that soldiers suffered from few lung problems, ‘fevers and other diseases’. As he explained, New Zealand’s pure atmosphere ‘is an invigorating [rather than a ‘depressing’] agent’.\textsuperscript{53} Such healthiness derived from New Zealand’s lack of temperature extremes, he expounded, and thus allowed for ‘the most constant and continued exposure in the open air without injury’. This contrasted to both tropical and southern European climates, where ‘exposure to either produces disease.’ Tropical climates, he elaborated, ‘obliged men to shelter themselves from the burning rays of the sun, and the heavy dews of the night’ while the ‘the fine southern climates of Europe’ produced intense cold in winter and oppressive heat in summer.\textsuperscript{54}

Thomson’s prognosis on New Zealand’s healthiness did not solely rely on climatic explanations. It also encompassed sanitary concerns. Typhus and common fevers developed among Auckland’s civil population, Thomson carefully pointed out, not because of a poor climate, but because of Aucklanders ‘living in low, badly drained, and

\textsuperscript{51} Thomson, 1854, pp.50-51.
\textsuperscript{52} Thomson, 1854, p.50.
\textsuperscript{53} Thomson, 1854, p.52.
\textsuperscript{54} Thomson, 1854, p.52.
badly ventilated houses'. Moreover: 'The comparative exemption of the troops from typhus and common continued fevers, is another proof added to the many which already exist, that these maladies result chiefly from the improper crowding together of human beings' and not from a poor climate.\textsuperscript{55} Thomson, similarly, held up social factors, rather than climate, to explain the decline of Māori (see below).

His confidence in the salubrity of New Zealand's climate to a great extent rested on his own experience of, and research into, the effects of India's tropical climate on Europeans and Indians. His belief in the debilitating consequences of India's climate can be seen clearly in his discussion of the therapeutic effects of New Zealand's climate on bodies (including his own) whose vitality had been sapped by tropical heat. 'The Climate of a country can be tested in various ways, but the amount of sickness and death which occurs among the human race living in it is now looked on as the most valuable of all tests, for a country is of little importance for colonization, even if food grows fast, so long as the climate causes those who cultivate it to decay.'\textsuperscript{56} Most probably, Thomson had India in mind when he spoke of crops which thrived in countries whose people did not. What is certain is that Thomson acknowledged that the study of climates and constitutions was crucial to the project of colonisation and dictated the terms by which a country might be ruled. As he explained, 'without the negro', as 'European settlers in the Southern States of America know right well[,] ... their lands would remain uncultivated.'\textsuperscript{57} He, and many other nineteenth century New Zealand doctors, interrogated the links between climate, health, race and settlement. They did so as part of a wider European interest in such matters both at home and abroad, both in Europe and the colony.\textsuperscript{58} Furthermore, Thomson's work acknowledged the development of scientific

\textsuperscript{55} Thomson, 1854, pp.48-49.
\textsuperscript{56} Thomson, 1854, p.48.
\textsuperscript{57} Thomson, 1854, p.50.
ideas conducted away from the so-called scientific metropolis of Europe. Ideas about acclimatisation originated in study at Edinburgh University. Experience of Indian and New Zealand environments convinced him of the impossibility of acclimatising from one climate to another. As subsequent chapters show, scientific ideas and personnel criss-crossed between New Zealand and its fellow colonies, as well as between New Zealand and the rest of the world (note chapter eight in particular). These men often situated New Zealand within the geography of empire, seeing local events as being connected with other sites within the British Empire.

The connection between New Zealand and imperial health is demonstrated in a despatch dated 13 August 1858 from the Provincial Government of Taranaki to the Secretary of State for War. The despatch was ‘respecting the establishment of a Sanatorium in New Zealand for the benefit of Invalids from the Indian Army’. Upon consideration, the Secretary of State for India in Council rejected the proposal on the grounds ‘that there are other localities better suited, geographically and otherwise, for a Sanatorium than the Colony under your Government.’

Sadly, archival research of records of the Governor’s files and Colonial Office in the National Archives, Wellington, only brought to light details of the proposal’s forwarding to the Secretary for India in Council. Nothing surfaced of the elusive despatch. A decade later, T. Macfarlane mooted a similar proposal, ‘praying that Her Majesty will be pleased to make New Zealand the Sanatarium [sic] of the invalidated troops of the British Army.’ Although both proposals were rejected, these demonstrate imperial connections in general and the association between India and New Zealand in particular (see chapter eight).

60 For discussion of the forwarding of the proposal see Henry John Tancred to His Honour, The Superintendent, Napier, Colonial Secretaries’ Office, 29 March 1859, Auckland, HB, 3 1, 1859/Letter No. 5, General Government Letters, NA, Wellington. For the Governor’s messages of this period see ‘Governor’s messages ~ outwards 16/5/-21/8/1858’ [note: incorrectly dated], Internal Affairs 4, No.296, NA, Wellington.
The benefits of New Zealand's climate

What did other medical geographers make of these suggestions and Thomson's confidence? Many shared his view of the suitability and healthiness of New Zealand's climate to Europeans, but also recognised that naturally unhealthy places like swamps also existed alongside problems of overcrowding in cities and towns (chapter two). A colleague of Thomson's, K.R. Prendergast, surgeon of the 6th Regiment, held that almost 'seven years' residence here' afforded him 'ample opportunity of judging of the climate'. '[E]ach years' observation', he continued, 'tends to prove more and more the great salubrity of the southern portion of the North Island of New Zealand.' Both admissions and deaths into the 6th Regiment Hospital, noted Prendergast, 'have been about a third less than in the United Kingdom.'

Prendergast ascribed the troops' increased healthiness to New Zealand's winds. According to him, these 'act as purifying agents in cleansing and removing “malaria,” the fertile source of all disease.' Its pure air also aided health, he explained, as did its 'short range of temperature' to which 'we may attribute our exemption from fevers on the one hand, and chest diseases on the other.' Prendergast and Thomson bolstered their views in 1858 when they presented even more detailed statistical tables of sickness and mortality among New Zealand's troops.

According to the colonial surgeon, P. Wilson, who served in New Plymouth, New Zealand's healthy climate could even improve naturally unhealthy places. Writing in 1849, Wilson followed the usual pattern of medical geographies: details of the nature of New Plymouth's prevailing winds followed discussion of the prevalence of thunderstorms and earthquakes, and then finally elements of the area's soil (good, but lacking in lime). What amazed Wilson, however, was not that the soils lacked lime but that, despite the prevalence of swamps and marshes found 'here and there throughout the district' and in Wanganui itself, 'the occurrence of indigenous intermittents and remittents is so rare, that during a now nine years' residence in this place and that, I have

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64 See 'Reports on the Health of the Troops Stationed in New Zealand', enclosures 1-3, Supplementary New Zealand Government Gazette (Province of Wellington), 5, 38 (27 December, 1858), pp.i-xxiii.
never met with one case of fever, which, from concurrent circumstances, I could impute to the poison of what is strictly understood by the term marsh miasma or effluvium.' Wilson deemed that New Zealand’s frequent showers and moderate temperatures prevented ‘the drying process to proceed far enough for the peculiar fermentation and exhalation’ usually characteristic of unhealthy miasma and swamps. Wilson ascribed this to the building of poorly ventilated and serviced dwellings rather than natural causes (chapter two).

**The effects of Australasian airs and environments**

In 1868, Charles Dilke (1843-1911), the son of wealthy parents well connected to the Royal Family, published a lively account of his travels around the world. Dilke, who visited New Zealand in 1866, paid particular attention to the influence of climate on the Anglo-Saxon race when it moved into non-temperate climates. In New South Wales, for example, Dilke observed the Corn Stalk. This was ‘someone born in Australia, especially New South Wales. They were corn-stalks’, he explained, ‘because they grew tall and slender, like maize or Indian corn’ and also could be distinguished by the fact that they, like ‘[t]he inhabitants of all hot dry countries speak from the head, and not the chest’. Indeed, Dilke found Australian boys to be active and healthy, but ‘wanting in power and weight’. Australian girls were ‘slight and thin; delicate without being sickly.’ As for New Zealand, Dilke sharply distinguished between its North and South Islands. Dilke compared the climate of the North Island to that of ‘Java and the other islands of the Indian archipelago’. In these areas, explained Dilke, there abounded ‘examples of the supineness of dwellers in the tropics upon the economic position of their countries.’ Although possessing great natural wealth and abundant, cheap labour, Dilke observed that ‘natives have not the energy requisite for the direction of factories and workshops’. European foremen, he explained, were paid enormous salaries but lose ‘their spirit in the

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66 Charles Dilke, *Travellers' Tales of Early Australia & New Zealand: Greater Britain, Charles Dilke visits her new lands, 1866 & 1867*, edited by Geoffrey Blainey, North Ryde (Australia), 1985, p.151. See also footnote on same page for explanation.
damp unchanging climate of the islands [and] soon become more indolent than the natives.’ This hardly flattering portrayal of the North Island was borne out during Dilke’s stay. Steamers never ran on time, he commented, while ‘the officers of the Colonial or Imperial Government only commence to write their letters only [sic] when the hour for the sailing of the ship has come.’ The warmth and moisture of the North Island thus was sapping the strength and efficiency of Antipodean Anglo-Saxons. What about the South Island? Should residence there, too, occasion apprehension for Europeans? No, came Dilke’s answer, for the climate of the South Island allowed Anglo Saxons ‘gains in vigour’.69 Admittedly, Dilke did moderate his more pessimistic overtones on the North Island, by attesting that: ‘Grown men who have emigrated as lads and lived ten or fifteen years in New Zealand, eating much meat, spending their days in the open air, constantly in the saddle, are burly, bearded, strapping fellows, physically the perfection of the English race, but wanting in refinement and grace of mind, and this apparently by constitution’.70 Nevertheless, Dilke’s portrayal of the North Island represented one of the first expressions of apprehension about the suitability of the Anglo-Saxon to New Zealand’s North Island.

Again, like Thomson before him, Dilke looked at the issue of health, climate and racial development in the wider context of British and European imperialism. Dilke’s investigations led him to speculate on the likely changes that climate would bring to those far-flung Britons around the world.

Looming in the distance, we still, however, see the American problem of whether an Englishman can live out of England. Can he thrive except where mist and damp preserve the juices of his frame? He comes from the fogs of the Baltic shores, and from the Flemish lowlands; gains in vigour in the south island of New Zealand. In Australia and America – hot and dry – the type has already changed. Will it eventually disappear?71

67 Dilke, Travellers’ Tales, p.87.
68 Dilke, Travellers’ Tales, p.80.
69 Dilke, Travellers’ Tales, p.166.
70 Dilke, Travellers’ Tales, p.87.
71 Dilke, Travellers’ Tales, p.166.
For Dilke, climate unlocked an understanding of Britain's present and future empire. Knowing climates allowed authors to chart the likely character and course of British colonisation. Dilke, clearly, had reservations about the success of Anglo-Saxon enterprises outside the Flemish fogs or English mists of their homelands. He believed that climate would alter the character of the Anglo-Saxon race, sometimes even to their detriment.72 Dilke also enjoys the indubitable honour of being one of the first critics of the benefits that New Zealand's climate brought to Europeans.

Certainly early critics, such as Frederick Tuckett in 1844, drew attention to migrant guides' less than honest descriptions of the available flat land and opportunities in New Zealand.73 However, few until Dilke had questioned the colony's climatic suitability for Anglo-Saxon acclimatisation. In 1876 strident, jarring and discordant notes broke the happy harmony of ideas about the restorative qualities of New Zealand. Shockingly, Dr. A.K. Newman (1849-1924) predicted the degeneration of Europeans in New Zealand. Newman argued that New Zealand's climate, allied with other environmental factors, was causing 'the immigrants' vital capacities [to] diminish, their physical energies [to] deteriorate'. Only 'a constant stream of immigrants', he stated boldly, prevents the European race from 'very decidedly' deteriorating in New Zealand.74 One example of this process, Newman illustrated, was that European women 'after rearing a small family' 'fade, become old and haggard'.75 Newman's arguments created a great stir because, unlike Dilke who at least had recognised the suitability of the South Island's climate to migrants, Newman blanketed both islands and the project of colonisation in a cloud of doubt. Newman's doubts about the climate of New Zealand, however, did not last long. Faced with trenchant criticism of his barometric figures,

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72 I use the terms Britons, Anglo-Saxons and English interchangeably.
73 'It almost enrages me to read that lying journal [The New Zealand Journal]', fulminated Tuckett in 1844. Indeed, because of this he was at first unwilling to accept the post of Chief Surveyor at Otago. Tuckett to Francis Tuckett, J/J (presumably January, June, or July) 16-26 1844, Letters to his brother, 1842-1846, MS-Papers-0246-1, Alexander Turnbull Library, Wellington. "Hopeful", "Taken In." Being, A Sketch of New Zealand Life, London, 1887.
75 Newman, 'Speculations', p.44.
Newman changed his tune. In 1882, he argued that New Zealand was one of the healthiest countries in the world.\(^7^6\)

**Healthy places, healthy airs**

Popular and scientific works continued to extol New Zealand's healthiness throughout the rest of the nineteenth century and into the next. As the century wore on, growing information about New Zealand's climate and the healthiness of its population led many authors to discern greater climatic differences between New Zealand's regions and hence attach therapeutic value to different climates. Sometimes, as with the medical geographies of Bonwick and Moore, authors mapped out these climatic and therapeutic differences spatially. They did this to direct sufferers to suitably salubrious sites. Mapping visually reinforced the health connection between places and peoples, climates and constitutions. It led doctors to prescribe healthy climates along with healthy places, such as spas, coastal sites, forests and even mountaintops. New Zealand's fame also was spreading overseas; German and French texts attested to New Zealand's healthiness. Popular works, too, attested to New Zealand's salubrious climate.

Typical of the latter, and of the growing interest in the history of New Zealand's early settlers, is Alfred Cox's *Recollections: Australia, England, Ireland, Scotland, New Zealand*, published in 1884. With the exception of Wellington's windiness, Cox presented a glowing picture of the healthiness of the North Island's climate.\(^7^7\) He also recognised the regional rivalry that was developing between provinces over which possessed the best climate.\(^7^8\) Likewise, novelist Anthony Trollope extolled the healthiness of New Zealand's climate.\(^7^9\) Interest in New Zealand's climate did not end with the English-speaking world. In the same year of publication as Cox's book, an article on New Zealand appeared in a French geography journal. Charles Grémiaux

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\(^7^7\) 'Speaking generally of the climate of the North Island,' he wrote, 'it may with truth be said that it is a thoroughly healthy and most enjoyable climate to live in.' Alfred Cox, biography, *Recollections: Australia, England, Ireland, Scotland, New Zealand*, Christchurch, 1884, pp.195-196.

\(^7^8\) 'I never yet knew a man who was not at hear a Provincialist in the matter of climate. Every man not belonging to Wellington maintained stoutly that the climate of the province [he represented]...was far and away the best in New Zealand'. Cox, *Recollections*, p.169.

presented New Zealand in the most auspicious and healthy terms. Its ‘favourable situation’, he argued, ‘is overall due to its climate, which is a constant temperature; neither excessively hot in summer, nor excessively cold in winter. Rarely does the temperature descend below that experienced in the month of April [in Europe]’. A more scientific discussion of New Zealand’s climate appeared in 1871 in the *Periodical of the Austrian Society for Meteorology* [*Zeitschrift der österreichischen Gesellschaft für Meteorologie*]. It was written by Dr. J. Hann, who apparently had lived in Auckland for thirteen years. Replete with detailed comparative statistical tables of monthly and daily temperature between Auckland and overseas, Hann furnished recordings of daily temperature changes between cities. He also included information about rainfall and wind strength, rates of insolation and radiation. According to Hann, ‘[t]he salubrity of New Zealand’s climate is widely known’. He believed it rated higher than those of the health resorts of southern Europe and Madeira. The qualities of New Zealand’s climate thus appeared throughout the European world, in German-language scientific publications, in popular travel (Trollope) and personal (Cox) accounts and in French geographical magazines. All of these sources attest to the global flows of information and ideas. As chapter eight shows, flows of print and personnel, ideas and information connected New Zealand with scientific ideas occurring throughout the world and in turn kept these places informed of developments in the colony.

It is doubtful that Cox’s book enjoyed a readership outside New Zealand. Cox identified the climate of Taupo as the healthiest in the country. Many authors before and after Cox also highlighted the healthiness of the central plateau region. According to him, a good climate combined with spas to produce a superbly healthy area. New Zealand’s first Colonial Surgeon, John Johnson (1794-unknown) believed the thermal waters near Rotomahana “possess valuable medicinal qualities both for internal use, and external application, as the natives cure many diseases by simple immersion in them”.

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82 Dr. J. Hann, ‘Klima von Neu-Seeland’.
Johnson advised the Government to appoint a scientific enquiry on the thermal pools.\textsuperscript{84} Ernst Dieffenbach went further than Johnson, linking together healthy air and healthy waters. 'Invalids', he wrote in 1844, 'rapidly recover in this climate [of the thermal areas], and there is no doubt that the presence of numerous thermal waters in the island, and the attractive scenery, will make New Zealand the resort of those who have been debilitated in India, and one in search of health.'\textsuperscript{85} Dieffenbach looked at the wider imperial appeal of New Zealand as Thomson and Dilke later did. He described its qualities as a health resort for those suffering from a lengthy residence in India.

**Spas, seaside and mountains**

A number of other papers appeared in the *Transactions*, parliament and the popular press promoting spa development throughout New Zealand’s thermal areas. In the 1880s, for instance, C.P. Winkelmann investigated the curative properties of healthy places such as those around the thermal pools of Great Barrier Island, off Auckland’s east coast.\textsuperscript{86} Similarly, in 1884, James Stewart advocated 'the Establishment of a Grand Hotel and Sanatorium in the Rotorua District'. Drawing attention to the area’s thermal pools and healthy climate, he advocated 'the formation of extensive orchards, gardens, and pleasure grounds.'\textsuperscript{87} Experience of European health resorts also guided readings of New Zealand’s healthy spots. In 1894, H. Hill presented a paper on the qualities of Nuhaka Hot Springs. He predicted this area 'should prove a valuable mineral water, as it resembles [the European spa areas of] Wiesbaden...Harrogate and Cheltenham, but is more highly charged with salt than they are.'\textsuperscript{88} In 1897, James Adams prophesised that the springs lying about six miles from Waipiro, in the Hikurangi Mountains, would become ‘a great health resort’ thanks to the qualities of the waters and the fact ‘that the locality is protected from the strong sea-breeze by a range of hills’.\textsuperscript{89} Many others echoed

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\textsuperscript{84} Johnson quoted from L.K. Gluckman, *Tangiwi - a medical history of New Zealand prior to 1860*, Auckland, 1976, p.66.

\textsuperscript{85} Dieffenbach, *Travels in New Zealand*, volume 1, p.183.

\textsuperscript{86} C.P. Winkelmann, ‘Notes on the Hot Springs Nos. 1 and 2, Great Barrier Island, with Sketches showing the Temperature of the Waters’, *TPNZI*, 18, (1886), pp.388-392.


these sentiments. In the 1880s, the Government began to develop spas on a small scale at Hanmer, Te Aroha and Rotorua. Their development gathered pace with the creation, in 1901, of the Department of Tourist and Health Resorts, reaching a high-point with the building of the Rotorua Bathhouse in 1911. Both Māori and European valued such areas. Most European commentators also relied on Māori both to take them to the thermal areas and to identify the special curative properties of each area. In eighteenth and nineteenth century Europe, taking the waters became a popular pastime and places such as Wiesbaden and Bath entered popular literature and folklore.

Europeans also identified other areas that offered special climatic benefits. As Pamela Woods has brilliantly shown in her study of constructions of colonial dirt in Dunedin, many of the city’s residents flocked to the seaside at St Kilda and Brighton (south of Dunedin). They did this to regain their vim and vigour by allowing winds to blow away evil miasma. Aside from purifying winds, ozone also was found at the seaside. Most people believed this to be an important cleansing agent (chapter two). European health seekers believed this formed when ‘heavy’ sea air, ‘charged with saltwater vapour [sic]’, passed over cresting waves. Since they knew that ozone formed close to the surface, health seekers maximised their exposure to it by staying as close to the surface of the water as possible. Other places and things could produce ozone too, including certain vegetation (see chapter two) and high places. In 1880, Arthur Clayden (1829-1899), propagandist and lecturer on New Zealand settlement, and occasional contributor to the British magazine, The Field, neared the end of his weeklong tour of New Zealand’s Southern Alps. He and his fellow passengers had revelled in the breathtaking scenery of southern Westland. They had taken much delight. Clayden in particular, in marrying the scenery to aesthetic conventions. The ‘wild weird scene’ and

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90 The best source on the history of spa development in New Zealand unfortunately remains Ian Rockel’s rather patchy, Taking the Waters: Early Spas in New Zealand, Wellington, 1986.  
91 Winkelmann, for instance, noted that Māori preferred the second hot pool on Great Barrier Island as they regard it ‘to be specially useful in skin diseases.’ Winkelmann, ‘Notes on the Hot Springs’, p.391.  
94 Lencek and Bosker, The Beach, pp.113-138. Quote from p.132.  
the sublime and lonely grandeur’ of a river moved Clayden to ‘admiration and awe’, as it ‘tumbles down the rocky molines ... splashing and dashing into the gloomy and fantastic grottoes hollowed out along its walls.’ Aesthetic senses satisfied, Clayden and some of his companions decided on a healthy dessert by climbing one of the Alps’ lesser peaks. Reaching the top after an ascent of several hours, they carefully paused to toast to ‘Her Majesty’s health’, survey the scenery below and, most importantly, drink ‘in the invigorating draughts of health-giving ozone that the mountain provided.’ Having refilled their lungs with ozone, on the descent: ‘Every sense seemed alive to its magic influence, and every one of the party wore holiday faces of the brightest and most cheerful character’. Searching out sublime scenery had become the vogue thanks to the work of philosophers such as Edmund Burke who promoted this particular aesthetic. Vertiginous horror delighted and appalled the senses, as well as bringing the person who experienced it closer to God.

It is doubtful whether James Bonwick, author of *Climate and Health in Australasia...*, would have expressed the hopes for his medical geography with quite such ebullience as Clayden. As Bonwick put it rather less theatrically, his book aimed ‘to indicate to health seekers localities fit for their resort. Medical men, by a knowledge of the climate, can direct patients to a suitable residence or warn them against a particular region as prejudicial in their individual cases.’ Weaving together the quotes of previous authors to produce a rather eccentric patchwork, Bonwick discussed the climate of each of New Zealand’s provinces. Importance attaches not to its eccentric nature, but rather to Bonwick’s recognition of the importance of regional climatic variation and acknowledgement that certain regional climates possessed less than desirable average weather. Bonwick, for instance, characterised Westland as: ‘Storm and flood, rain and cold, dripping forests, cheerless flax marches’. He recognised that Canterbury ‘is

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98 James Bonwick, *Climate and Health in Australasia, to which is added a chapter on the land laws of the Colony, New Zealand*, London, Street Brothers, 1886, p.v.
occasionally subjected to fierce and prolonged droughts, heavy and devastating floods. Therefore, Bonwick’s acknowledgement that deluge and dearth, not constancy and clemency, characterised aspects of New Zealand’s regional climates forms part of wider recognition of the problem of climatic variability in parts of the colony (see chapters four and five).100

Climatic variability, thankfully, offered a blessing rather than a boon. As Bonwick explained

New Zealand, with its great variety of climates and its singular general salubrity, can provide within its area a home for every sort of patient. Instead, however, of pronouncing an opinion upon its suitability anywhere, a careful discrimination of locality is to be held of primary importance. The colony is not a Parr’s Life Pill for all complaints in all its districts.101

Bonwick acknowledged that, since only the young and healthy had migrated to New Zealand, its mortality statistics offered an unreliable guide to its healthiness. Nevertheless, he judged that New Zealand offered very real health benefits. Admittedly its ‘damp settlements are depressing, and are provocative of rheumatism and dyspepsia’, not to mention throat and lung infections, but thankfully, he pointed out, drainage and ‘the extra liveliness of the breezes counteracts much of this evil’ of headaches, maladies and bronchitis associated with a ‘heavy atmosphere’.102

What areas should the prospective consumptive or typhus carrier expect to settle in? That, answered Bonwick, depended on the complaint. Sea areas are ‘better for rheumatic, liver, bowel, and neuralgic complaints’, he explained, ‘but for some other diseases, the interior, where dry, has the preference.’ Similarly, sufferers of rheumatics or eruptive diseases should look to the hot springs as well as to the sulphur and mud pools of the North Island’s Central Plateau. And for tuberculosis sufferers, Bonwick noted that although New Zealand would not cure them, at least their condition did not worsen.103 Equally, advised Bonwick, female migrants should settle on the west side of the North

99 Bonwick, Climate and Health, pp.20, 25.
100 For instance, Bonwick gave contradictory evidence of the advantage of winds, quoting from pro and anti sources on this matter. Bonwick, Climate and Health, pp.50-51.
101 Bonwick, Climate and Health, p.47.
102 Bonwick, Climate and Health, p.48.
Island. Women ‘have twice as good a prospect of living on the west side of North Island as on the east of either island.’ As a whole, although Bonwick promoted New Zealand’s climate and particularly that of the North Island, he avoided much the unfailingly glowing recommendations of its properties so characteristic of earlier medical geographies.

**Mapping health**

In 1890, Dr. J.M. Moore published *New Zealand for the Emigrant, Invalid and Tourist*, a work aimed at a wide readership. It relied on medical prognosis and cartography to delimit aspects of the colony’s climate. This work, ‘fruits of the author’s nine year’s professional work in the colony’, as its author explained proudly, ‘set forth with care and original research ... the various Climatic Zones into which New Zealand viewed as a Health-Resort is divisible, which are here classified for the first time; and a fully detailed account of the characters and therapeutic achievements, up to date, of the principal Thermal Springs of the North Island.’ Possibly in case illness would not grant the invalid enough time to leaf through the whole book, Moore’s preface thoughtfully advised the reader on the parts of the book that would suit him or her. He then launched into the detail of his climatic zoning. Just what could the potentially plague-carrying passenger expect of New Zealand’s climate?

‘[P]ure and bracing or mild air’, for one thing, observed Moore. In addition one could expect to find ‘interesting natives, beautiful scenery, good water for drinking, mineral baths, their accustomed food, convenient excursions, and pleasant society ... among people of their own language.’ Indeed, Moore predicted, ‘the invalid of the future’ will soon tire ‘of the noise and dust of the Riviera, of the demoralizing gaming-tables, and of the parasites who hang on to the visitors at all foreign resorts’. Instead, he or she

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102 Bonwick, *Climate and Health*, pp.48-53.
103 Bonwick, *Climate and Health*, p. 53.
104 Bonwick, *Climate and Health*, p. 53.
106 For the record, ‘The emigrant (vii) will find chapters i., iv., vii., ix., and xi. suited to his requirements; the invalid will be specially interested in chapters ii., iv., and v.; while the tourist may study the whole book profitably, except the last chapter, which is written for the medical men alone.’ Moore, *New Zealand for the Emigrant*, p. viii.
‘will fly on the wings of steam to the realm of the Southern Cross’. Moore’s four climatic classifications, ‘for the first time attempted’, was ‘based upon their adaptiveness [sic], suitability, or unsuitability for invalids coming under this head [‘for the prevention, or cure of some pulmonary disease’], as well as for those whose nerve-centres require a change of scenery and climate.’ As the reproduced map overleaf (Map 1.1) shows, these areas include the following:

1st. A zone of latitude extending from the North Cape, S. lat. 24°20’, southwards to Napier, and across the North Island to Hawera, S. lat. 39°30’ – Zone No. 1.

2nd. A zone stretching from this line southwards to the Hurunui River and Hokitika, both in the Middle Island – Zone No. 2.

3rd. A zone reaching from the Hurunui River to the southern coast line of the Middle Island, and including the South or Stewart’s Island – Zone No. 3.

4th. An alpine plateau, comprising a large portion of the middle of the North Island, extending upwards from an elevation of 1000 feet above sea level - this we may designate Zone No. 4. This zone is cut out of No. 1, being a distinctly different climate as regards its effects upon visitors, and must be regarded as an atmospheric rather than a terrestrial zone, a highland zone as compared with the lowlands. This zone includes of the whole “Taupō Volcanic Zone” of map No. 3.

As most other medical geographies had, Moore measured healthiness through recourse to detailed comparative climatic statistics of mean temperature and rainfall, as well as mean temperature variation. Moore, for instance, identified Zone 1 as having ‘the most delicious [climate] in New Zealand’. It was ‘a wholesome warm climate, equable in its range of temperature,’ but moderated by sea breezes and by ‘the exhalations from the forests’. It was tropical-like but not malarial. This climate enabled men either ‘to work hard at manual labour all summer’ or to pass their time ‘raising [sic]’ oranges. According to him, ‘[t]he abundance and excellent quality of both [sic] meat, milk, butter, and eggs,

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107 Moore, New Zealand for the Emigrant, p.15.
Map 1.1 'New Zealand Showing Climatic Zones': Dr. Moore's division of New Zealand into four climatic zone.

vastly improve the pale unhealthy children born and reared in the large cities of England where they can neither have this nourishing diet, nor breathe the pure oxygen of the New Zealand air.\textsuperscript{110} Appendix 1 summarises Moore's climatic characterisations, adapted from his discussion in the text.

Moore's mapping of disease provides a fascinating window into ideas about the relationship between specific atmospheres and specific diseases. It is also characteristic of the cartographic imperative in medical geography. So far, it is the only New Zealand example of such a cartographic style I have discovered.\textsuperscript{111} Most New Zealand medical geographers either used written descriptions or tabulated vital statistics and mortality rates to demonstrate the connections between environment and disease. From Moore's zoning, rheumatic readers can learn, for instance, that although Auckland's high humidity did not suit their condition, it did suit those afflicted with throat diseases or rickets. Environmental influences were not solely confined to climate. Soil also affected health. Auckland's 'clay subsoil', explained Moore, 'retains the moisture when the ground does not slope sharply, so that some inhabitants contract rheumatism, bronchitis, or sore throats, and towards the end of summer typhoid fever.' Cure could be easily sought 'by sending the family to reside on the slopes of Mount Eden, Mount Hobson, Mount Albert, or Mount Victoria on the Devonport side'.\textsuperscript{112} Moore, moreover, recognised the influence of seasons on healthiness. He recommended that a 'consumptive invalid should arrive \textit{not earlier} in the year than October 15\textsuperscript{th} or 20\textsuperscript{th}, \textit{nor later} in the year than March 31\textsuperscript{st}'.\textsuperscript{113} Many medical geographers and doctors recognised the seasonal arrival of afflictions such as typhus or malaria as well as intermittent fevers in general (see chapter two). Few, however, acknowledged the effect of seasonal differences on tuberculosis. Although Moore recognised the seasonal occurrence of certain ailments and the importance of regional climates, he certainly did not acknowledge the existence of drought. 'Periods of drought are unknown in New Zealand', he confidently asserted. He pointed out that, in

\textsuperscript{110} Moore, \textit{New Zealand for the Emigrant}, pp.20-22.
\textsuperscript{112} Moore, \textit{New Zealand for the Emigrant}, p.23.
\textsuperscript{113} Moore, \textit{New Zealand for the Emigrant}, p.25.
contrast to Australia’s drought-stricken state capitals, New Zealand’s towns are ‘abundantly supplied with good drinking water’.114

Had New Zealand’s European population changed? Although ‘[it] may be but a whimsical notion’, Moore considered ‘that the characteristics of the New Zealander of British, not Māori blood, have been altered to some degree by his environment.’ ‘I have noticed,’ he continued,

while studying the psychological features of New Zealand-born youths, that some of the Māori tendencies have been imparted to them. A certain stoicism and unimpressiveness [sic] are noticeable about native-born New Zealanders. For instance, in visiting London they never seem astonished at anything; nor can they “enthuse” over Westminster Abbey, St. Paul’s, the Tower, Windsor Castle, or any of the “show places.” I cannot explain this, except on the above theory, although well acquainted with all shades and grades of colonial character.115

Little enthusiasm for some of London’s sights, allied with a ‘certain stoicism’, hardly appear to be conclusive evidence of the extent of environmental changes imparted to European New Zealanders. Although anecdotal, Moore’s recognition that ‘some of the Māori tendencies have been imparted to’ the European is perhaps significant given that many commentators believed Māori and Anglo-Saxons to be separate races and that the former were destined to die out. Moore’s comment suggests a much closer relationship in which environment brought both groups closer together. Similarly, Moore believed that diet also influenced behaviour. ‘There may be nothing in the theory’, he began cautiously, and went on incorrectly, ‘that an excessive meat diet conduces to hardness and even cruelty of disposition; but it is a fact that the flesh-eating and cannibalistic Māori of the recent past was conspicuously callous and cruel, quite unlike his tāro-eating cousins, the Samoans and Hawaiians [sic].’ Moore held up the ‘striking coincidence’ between high levels of meat consumption and ‘the existence of a large and increasing class of evil-doers, termed “larrikins” or street-roughs, who are usually well fed – on meat chiefly.’ (For the record, Moore believed that the larrikins should be sent ‘to sea in a

114 Moore, New Zealand for the Emigrant, p.17.
115 Moore, New Zealand for the Emigrant, pp.203-204.
training ship to teach them discipline or to drill them in a cadet corps.) Moore's discussion of diet is a reminder that most medical geographers, while looking to environment as an important causative explanation in disease, did not restrict themselves solely to this explanation but also looked to such factors as diet and overcrowding (see below).

Many other authors emphasised the healthiness of New Zealand for Europeans. In 1896 and 1898, the mathematician C.E. Adams presented detailed mortality statistics of different periods in New Zealand's history. He also compared New Zealand's death rate with those overseas, comparisons that led him to conclude 'that New Zealand is the healthiest place in the world.' In 1907, D.C. Bates, Government Meteorologist, maintained that ‘European families, under these skies, have generally developed into finer and stronger men and women than their parents.' 'From youth to [old] age men can in such a climate keep in vigorous health and enjoy life to the fullest extent.' Although popular and medical investigations into climate and health continued, Moore's work of 1890 seems to be the last of this specialist genre of medical geography in New Zealand. Doctors still ascribed many cures and causes to environment, and other writers still drew attention to New Zealand’s healthy climate, but most did not tie together the fate of health and climate as closely as Moore and the others before him had.

The decline of medical geography?: sanatoria and sunshine

According to some present medical historians, at the end of the nineteenth century medical geography was declining in western medicine because of medical specialisation, growing acceptance of germ theories and the increasing acceptance of the ideas of

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116 According to him, 'the adult Anglo-Saxon in New Zealand consumes an average amount of 200 to 250 lbs. of meat in the course of a year, while the American is content with 120 lbs. and Briton with 110 lbs.' Moore based his evidence of larrikinism on '[t]he police-court records of New Zealand'. Moore, *New Zealand for the Emigrant*, p. 204.


hygienists. 119 As Michael Osborne puts it, medical geography encompassed ‘a descriptive activity more akin to natural history than to clinical or therapeutic medicine’. Given increasing specialisation in western medicine, the broad-based Humboldtian approach to the holism of disease and environment is perhaps made more understandable. 120 Certainly in New Zealand around this time, historians have identified the beginnings of medical professionalisation and scientific specialisation. Germ theories of disease further discouraged wholly environmental explanations for disease. 121

Yet decline is one thing, development another. In the late nineteenth and early twentieth centuries, the ideas and imperatives of medical geography continued in new forms and in different guises. Germ theory might have dismissed the notion of miasma as a source of sickness, but the sanitarians’ focus on good sanitation and overcrowding as causes of ill health still rang true (chapter two). Medical specialisation into epidemiology and tropical medicine, similarly, continued the connection between geography and health evident in medical geographies. 122 Environmental therapeutics continued with the development of the tuberculosis sanatorium. This institution of care and cure developed in the late Victorian period but had its antecedent much earlier in the resort culture of continental Europe. 123 Alongside the older notion of climatic therapeutics, sanatorium treatment embraced good regimen, diet, exercise and, increasingly from the 1920s, education and sometimes even surgery. Experts prescribed a dry, sunny and bracing

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119 In France, aside from the development of germ theory, medical power shifted away from the military schools, who supported medical geography, to university medical schools and hygienists. Osborne, ‘Geographical Imperative in Nineteenth-Century French Medicine’, pp.49-50. According to Nash, professionalisation helped ‘to sever knowledge about the environment from knowledge about human health, locating them in different disciplines and institutions, making it even more difficult to draw connections between environmental change and changes in human health.’ Nash, p.44.

120 Humboldt recognised an intimate connection between different environments and health and advocated investigating these various factors when conducting research on health. Osborne, ‘Geographical Imperative in Nineteenth-Century French Medicine’, p.50.


climate as best to prevent tuberculosis.\textsuperscript{124} Mainly developed in Germany and Austria in the 1860s, sanatoria spread over alpine continental Europe and eventually came to England in the late nineteenth century.\textsuperscript{125} The rise of the sanatoria in the late nineteenth century owed much to Koch’s scientific discovery, announced to the world in 1882, that tuberculosis ‘was a communicable disease caused by bacilli’. This discovery highlighted the necessity of isolating tuberculosis sufferers. Acceptance of Koch’s ideas took about a decade and eroded the belief that consumption was either hereditary or environmentally caused and hence not contagious.\textsuperscript{126}

In New Zealand, medical geographers had long recognised the particularly advantageous qualities of New Zealand’s climate to tuberculosis sufferers. Thomson, for instance, highlighted the low incidence of lung disease among soldiers stationed in New Zealand. Moore recommended Napier’s climate to consumptives (see above). Since medical opinion often prescribed a long sea voyage and healthy climate as cures for tuberculosis, many of New Zealand’s early doctors, in fact, had been tuberculosis sufferers who migrated for their health.\textsuperscript{127} By the turn of the century, there were growing calls both for the state to establish sanatoria and to prevent migrants suffering from tuberculosis bringing this into New Zealand.\textsuperscript{128} As Linda Bryder has shown in her detailed study of deaths from consumption in Auckland 1880-1914, recent immigrants to that city did seem to feature strongly in tuberculosis death rates.\textsuperscript{129} Responses to calls for sanatoria and quarantine came just before the dawning of the new century. Although an

\textsuperscript{124} On this programme note specifically Smith, Retreat of Tuberculosis, pp.97-135; Bryder, Below the Magic Mountain, pp.46-69.

\textsuperscript{125} A sanatorium actually opened in England in 1840, but the idea did not spread until European ideas became influential later in the century. Smith, Retreat of Tuberculosis, pp.97-103. For a fascinating later view of the sanatorium experience in Austria see Thomas Bernhard, Wittgenstein’s Nephew: Eine Freundschaft [Wittgenstein’s Nephew: a Friendship], Frankfurt am Main, 1982.

\textsuperscript{126} Smith, Retreat of Tuberculosis, pp.24-55. Quote from p.47.

\textsuperscript{127} Gluckman, Tangiwai, pp.57-61.


\textsuperscript{129} According to Bryder, ‘[a] notable feature of the 3,500 or so deaths from tuberculosis in Auckland in the period 1880-1914 was indeed the number of recent immigrants.’ Bryder, ‘“A Health Resort for Consumptives”’, p.464.
Immigration Restriction Act was passed in 1903 to stop sufferers entering New Zealand, because of the generally sympathetic response of doctors to sufferers of phthisis, it still took a number of years for the regulations to be properly enforced.\textsuperscript{130}

If immigration restrictions aimed to prevent the influx of consumptive patients into the colony, a similar kind of isolation aimed at stopping the spread of tuberculosis within New Zealand. It also subjected the patient to the benefits of New Zealand's climate. The colony's first sanatorium opened in 1899, at Flagstaff, near Dunedin. More soon followed.\textsuperscript{131} Climate featured strongly in the 'cure' and, like their counterparts overseas, designers in the colony ensured that sanatorium buildings had windows, vents and French Doors that opened to let in as much fresh air and sunshine as possible. Of course, in winter these designs would allow in snow as well as sunshine, coldness as well as heat, a fact many former patients would remember.\textsuperscript{132} In choosing the sanatorium site, health officials sought out dry climates with low humidity and high temperature extremes often in isolated, high altitudes sites. Waipiata (established in 1924), on the Maniototo Plain, typified the ideal. Located at 1600 feet, it averaged less than 20 inches per year of rainfall and less than 70 per cent humidity.\textsuperscript{133} With the exception of a few coastal sites (such as Pleasant Valley, North Otago), most sanatoria followed overseas precedent and opened in high, dry, isolated, inland positions.\textsuperscript{134} Although sanatoria combined good diet with graduated exercise, health education with occasional surgery and, finally from the late 1940s, vaccination with BCG (Bacillus Calmette-Guerin), climate determined the location of sanatoria and played an important part in therapy until the 1940s and 1950s.\textsuperscript{135}

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\textsuperscript{132} On architecture see Bryder, *Below the Magic Mountain*, pp.49-53; Middleton, 'Establishment of Tuberculosis', pp.27-28, 46-47.
\textsuperscript{133} Middleton, 'Establishment of Tuberculosis', p.30.
\textsuperscript{134} See Middleton, 'Establishment of Tuberculosis'; Bryder, 'If preventable, why not prevented'. The same remained true overseas see, for instance, Bryder, *Below the Magic Mountain*, pp.46-49.
\textsuperscript{135} On changing therapies in New Zealand see Middleton, 'Establishment of Tuberculosis'; On changing therapies in Britain see Bryder, *Below the Magic Mountain*, pp.130-198; on BCG's introduction into New Zealand see Maclean, *Challenge for Health*, pp.375-377.
Within the sanatoria movement, then, the principles of medical geography continued and were combined with other forms of therapy.

In the 1900s, fears over the declining health of children led to the establishment of children’s health camps. According to experts, health camps would reinvigorate sickly and undernourished children by exposing them to better food and beneficial sunshine and regular exercise. Anxieties about declining birth rates and even physical deterioration also contributed to the emergence of children’s and adults’ organisations that promoted camping and outdoor life (such as the scouts) as well as physical culture. These aimed to improve New Zealanders’ healthiness through environmental therapeutics. The Sunlight League of New Zealand, founded in 1931, not only exalted the rehabilitative properties of outdoor exercise and climate, but also lobbied for the creation of cleaner skies. These groups pressed for the therapeutic benefits of climate, allied with exercise and diet, as part of the eugenics movement designed to improve racial health.

Medical geography may have declined by the early 1900s but many of its principles, such as recognition of the confluence of disease and environment, continued in new forms. They often were combined both with eugenic theories that also looked to the influence of hereditary factors on health and to tuberculosis treatment in which climate formed part of a programme of therapeutics. Discussion of eugenics illustrates the continuing racial debate over health that began in nineteenth century New Zealand with debates on the colony’s climatic suitability to the ‘English constitution’ and the ability of races to acclimatise to new areas. Generally, with the exception of Newman and Dilke, doctors and others held that New Zealand’s climate admirably suited Anglo-Saxon


migration. New Zealand’s climatic similarity with, and even improvement over, Britain’s meant that arguments between polygenists and monogenists, between those who dismissed acclimatisation and those who promoted it, mattered little. Polygenists, such as Thomson, who maintained that the movement of races from one climate to another produced degeneration, could accept European migration to New Zealand, since, climatically speaking, Europeans were coming to a very similar climate.  

Māori Health: the connection between plants and people

When authors applied these ideas to Māori, a people who had moved from a tropical to a temperate climate, this same argument worked in the opposite direction, particularly when observation and statistics pointed to high mortality rates among Māori.  

Although some early writers upheld both the healthiness of Māori and the large size of the New Zealand vegetation as testaments to the healthiness of the colony’s climate, increasingly attention focussed on their rapid decline. By the late nineteenth century, some people even contemplated their extinction. A. S. Thomson, for instance, carefully pointed out that high Māori mortality indicated the inability of races to move from a tropical to a temperate climate, not the unhealthy nature of New Zealand’s climate for Europeans. He also pointed to bad food, overcrowding and poor hygiene as factors explaining their decline.

Similarly, William Swainson explained that although it seems ‘consumption is prevalent among New Zealanders, it does not by any means follow, that the circumstances [sic] is to be attributed to the nature of the climate.’ Following a somewhat specious argument, Swainson noted that: ‘In a country which enjoys a total exemption from the disease, we should rightly conclude in favour of the climate: but the

140 On these ideas see Livingstone, ‘Human Acclimatization’, pp.359-394.
142 According to Swainson, ‘we should be led to form a favourable opinion of the climate of New Zealand from the mental and physical character of its native population. By almost all writers, they are described as tall, active, and well made, with active and inquiring minds. There is considerable difference however in personal appearance among the various tribes; the free 28 population too, being in all respects superior to the Cookees or slaves’. Swainson, Observations, p.29; Augustus Earle, A Narrative of Nine Months’ Residence in New Zealand in 1827, Christchurch, Wellington, Dunedin, Melbourne and London, (1832) 1909, p.110.
144 Thomson (16 June, 1854, p.52.
converse does not hold; we cannot conclude that the climate is necessarily unfavourable because the disease is found to prevail.’ Swainson believed the disease is of recent origin’. According to him, it occurred because of Māori having ‘unrestrained contact with civilization’ and living in the open air. These factors, he summarised, are ‘calculated to produce and spread the disease to a degree far beyond the preventive or remedial effects of climate.’

Many detected in declining Māori, New Zealand avifauna and flora populations evidence of the superiority of European people, plants and animals (see also chapter three). According to Dilke: ‘Natural selection is being conducted by nature in New Zealand on a grander scale than any we have contemplated, for the object of it here is man.’ ‘The English fly, grass, and man, they and their progenitors before them,’ he explained, ‘have had to fight for life against their fellows’. It was ‘a struggle’, he pointed out, ‘which at once crushes and starves out of life every weakly plant, man, or insect, and fortifies the race by continual buffetings’. This process, Dilke elaborated, occurred even though the climate ‘is singularly good’. As he noted, ‘the English fauna and flora are peculiarly well fitted to succeed at our antipodes, because the climates of Great Britain and New Zealand are almost the same, and our men, flies, and plants – the ‘pick’ of the whole world – have not even to encounter the difficulties of acclimatization in their struggle against the weaker growths indigenous to the soil’. Many authors, Māori and European alike, made this comparison and used the explanatory tools of social Darwinism to explain the demise of Māori.

One of the earliest leading figures to study the parallel decline of Māori and New Zealand plants and animals was W.T.L. Travers, a politician, naturalist and lawyer. Strongly influenced by Darwin, Travers published three lectures ‘On the Changes Effected in the Natural Features of a New Country by the Introduction of Civilized Races’. Travers’ sobering investigations focussed on the ability of European people and

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145 Swainson, Observations, pp.59-64.
146 Charles Dilke, Travellers’ Tales of Early Australia & New Zealand: Greater Britain, Charles Dilke visits her new lands, 1866 & 1867, edited by Geoffrey Blainey, North Ryde (Australia), 1985, pp.76-77.
plants, to him superior and civilised entities, to effect devastating environmental and human changes among uncivilised people and plants. As subsequent chapters show (four, six and seven), Travers approved of the transformation of wastes and wilds into gardens and 'marts' but deeply feared some of the adverse environmental effects that Europeans were having.

He, and the others who upheld this idea, dovetailed the idea of progress with Darwin's idea of evolution. They regarded human progress as 'a law of nature' and the extinction of 'those who had failed to elevate themselves ... in the universal struggle for survival' as inevitable. 'Some people are disposed to judge a climate by its effects on an aboriginal people', explained Bonwick but: 'It is of no use looking to the physical state of the Maories [sic] for an answer to an enquiry upon the healthiness of New Zealand. Tasmania, one of the most salubrious of lands, has not an aborigine left.' As Trollope put it of Māori: 'There is scope for poetry in their past history. There is scope for philanthropy as to their present condition. But in regard to their future, there is hardly a place for hope'. Others expressed it differently, but the message often remained the same.

Not everyone, however, accepted this grim prognosis. Just as fellow parliamentarians challenged James Buller's assertion of the imminent extinction of Māori, so too did many of Newman's scientific contemporaries. In 1907, for instance, D.C. Bates, Government Meteorologist (see chapter five), held that: 'The Native Maori is one of the finest races in the world'. Nor did high mortality rates translate into a


\[150\] Bonwick, Climate and Health in Australasia, pp.49-50.

\[151\] Trollope, With Trollope, p.134.

\[152\] Hon. Mr Hart, for instance, thought 'that the general notion of rapid decrease among the Maoris was prematative. It had yet to be proved that there was an actual diminution. So far, the statistics pointed to an opposite conclusion.' Capt. Fraser also expressed doubts about Buller's prognosis. Dr. Buller, 'The Decrease of the Maori', NZJS, 2, 2 (March, 1884), pp.55-59. See also Stenhouse, 'A Disappearing Race', pp.132-137.

\[153\] Bates, Climate of New Zealand, p.8.
defeatist attitude whereby government healthcare bypassed Māori. Different definitions of extinction existed too. For some writers, Māori extinction meant assimilation with European and not necessarily their sudden disappearance (see chapter three). For those who held that Māori would die out, it was a deep cause for sadness but not necessarily proof of the moral superiority of one race over another. As Dilke put it: ‘There is nothing which the average Englishmen can do which the average Maori cannot be taught to do as cheaply and as well. Maori own ships, farm sheep, soldier, ride rough, trade, and fix machinery (mechanics), and yet they still die out.’ Sadness at the passing of the Māori often translated into artistic and written depictions coloured by romanticism (see chapter three). It also fostered ethnographic collection of native material. By the 1890s and early 1900s ethnographers were criticising the accuracy of the dying race argument.

**Conclusion**

By no means were ideas about race and environment either simple or straightforward. Contrary to most contemporary analysis that contact with Europeans was causing the Māori population to decline Alfred Newman, for instance, held up a variety of social and environmental factors, including habitations built on low-lying, damp ground, to contend that Māori were dying out before the arrival of Europeans. These and the many other examples discussed above demonstrate the importance Europeans ascribed to climate and environment in determining not only patterns of disease but also prospects for settlement, racial development and extinction, and even their own political future. With the exception of a few writers such as Newman (briefly) and Dilke (partly), commentators regarded New Zealand’s climate as ideally suited to the Anglo-Saxon race. They expressed great confidence about the future prospects of the race. New Zealand’s climatic similarity with, and even superiority over, the climate of northern Europe effectively annulled the fears of polygenists, who believed acclimatising people from one

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155 Dilke, *Travellers*, p.76.
climate to another was an impossible and fruitless task. After all, writers only had to look at New Zealand’s European and Māori mortality rate to find evidence of the country’s healthiness and conversely, of its decided danger to Māori. As Thomson argued, the decline of Māori, also partly influenced by poor sanitation and overcrowding, owed a great deal to the inability of races from a tropical climate to acclimatise to a temperate one. The astonishingly rapid and extensive spread of European plants and animals throughout New Zealand furnished further evidence of the ease of acclimatisation of things European to the colony. It also led many to draw the parallel between the seeming decline of Māori and decline of New Zealand plants and avifauna. However regrettable, however horrible, for many by the 1870s New Zealand’s Māori seemed to be fitting the template of social Darwinism, slowly dying testament to the ideals of natural selection and the replacement of an inferior race by a superior one. The afterglow of dying race theory illuminated academic inquiry into native populations, as anthropologists and collectors, painters and photographers recorded aspects of their life in a race against time before their subjects disappeared.

Health and racial ideas bound New Zealand firmly to the rest of the world, and particularly, to the British Empire. While rival migrant destinations overplayed their own climate and opportunities at the expense of their rivals’, imperial and medical angst about the ravages of tropical climates on British constitutions placed much greater interest and urgency upon discovering climates more suitable for the European constitution. New Zealand’s temperate climate ideally fitted this category. Unlike India’s sickly, sticky heat, it permitted permanent European settlement. Imperial medical geographers also sought soothing climates that could restore damaged bodies. In New Zealand, they identified one such therapeutic climate that could aid imperial designs. Health and climate, race and place, then, were intimately linked in the minds of many. Yet, as the next chapter shows, beside such confident assertions of New Zealand’s healthiness lay lurking fears of unhealthy environments and deadly diseases.

13 Stenhouse, ‘“A disappearing race before we came here”’, p.125.
Chapter 2: Bad smells, bad places: miasma and disease in nineteenth century New Zealand and engineering solutions to health

Some environments were healthy, others not. Medical geography and popular opinion held up swamps and cities as particularly deadly places in which to live. The olfactory sense helped settlers nose out dangerous sites. Both the noisome stench from rotting matter and the poisonous air of overcrowded dwellings endangered health. Colonists believed that atmospheric pollution emanated from natural and human sources. These included rotting vegetable or animal matter, as well as stagnant, standing water and even the breath of sick persons. Humans could make naturally unhealthy sites such as swamps even more dangerous through pollution. They could create deadly sites from healthy ones by building ill-ventilated houses that rotted and which confined inhabitants to unhealthy stale air. Sight as well as smell guided settlers to healthy areas. Vegetation could be an ambiguous marker of health. While certain plants, such as pines and eucalypti, denoted a good site, others, such as the swamp plant raupo, marked a bad one. More certainty affixed to the fear of urban places. Cities congregated together markets and miasma, people and pestilence, earning much criticism from sanitarians for their overcrowding, poor sanitation, accumulated rubbish and polluted drinking water. What methods could be taken to improve these unhealthy areas? For cities, sanitarians prescribed improvements in public health. These included the provision of clear, running water, good sewerage systems. Swamp drainage, the planting of healthy trees and creation of parks also improved health.

This chapter looks at fears of swamps and cities and attempts taken to improve these areas. By focussing on certain diseases, such as yellow fever, malaria and typhus, associated with marshy and settled sites, Europeans recognised that New Zealand, although climatically very healthy, possessed some naturally unhealthy spots. On the one hand, they felt confident that draining and tree planting could improve these sites. On the other, they feared they also could alter environments for the worst. Settlers realised that
their bodies were intimately attuned to environment and that to change the environment changed their own bodies. This realisation demonstrates the ambiguity of European environmental ideas and questions the received historical wisdom of a people wilfully perpetrating an orgy of environmental destruction. As this chapter shows, many Europeans were aware of their own terrifying powers to shape and be shaped by environment.

The dangers of swamps and cities: malaria, yellow fever, typhus and typhoid

Miasma loomed large and dangerous in the nineteenth century world as the unseen enemy of humans and the origin of a variety of diseases. Malaria was one such unseen affliction. Until the late 1890s, medical experts thought it was caused by environment. A variety of theories explained its origins. Sanitarians and others held that a malarious poison emanated from decaying matter in the soil and arose after soil disturbance by pursuits such as agriculture or urban development. Others held that it either originated in fungal spores or only attacked temperature-weakened bodies. Doctors had difficulty finding the cause of malaria, particularly when researchers could not culture malarial organisms or, other than identifying a single parasite, were unable to meet Koch’s exacting postulates for identifying the causes of disease. Racial immunity, similarly, appeared to preclude native populations from its clutches while predisposing Europeans to the disease. In 1897, the vector theory of disease enrolled malaria as a germ disease by identifying the importance of the host, the *Anopheles* mosquito, in transferring the disease.¹ New Zealand does not have this mosquito, but most New Zealand doctors who, after 1900, accepted the vector theory of disease, did not know this.²

Europeans were no strangers to malaria. They met it throughout lowland Europe, including parts of Italy, France and England, as well as in the tropics.³ Malaria varied in

intensity by season and place. Physicians usually diagnosed malaria as continuous, remittent or else intermittent. They recognised that certain months brought on outbreaks of fevers. Hippocratic doctors, for instance, long had recognised that the warmer, wetter weather of spring brought on relapses of benign tertian malaria from the previous season. Later, doctors associated continuous fevers with cities, intermittent fevers with the countryside. Although New Zealand doctors recognised the influence of season and situation on outbreaks of disease, not all believed that it existed in New Zealand. Given that New Zealand possessed large areas of swamps, Doctor A.K. Newman marvelled at the country’s absence of malaria. Others disagreed.

In 1879, a correspondent for the New Zealand Country Journal identified malaria as the ‘black spot on beautiful Napier’. According to the writer, its ‘tepid swamps which lie at the back of this portion of the town, [are] poisoning the otherwise pure air with fever-laden malaria, ruinous to health, retarding settlement, and bringing hundreds to an early grave.’ ‘Until this swamp is filled in,’ continued the correspondent in an ominous tone, ‘we fear that Napier must content herself with being an unimportant and unattractive town.’ By the time this piece was written, people used malaria to describe the specific disease, not as before as a synonym for miasma. Clearly, for the journalist, Napier’s noxious swamps not only poisoned its people but so too its potential for development. It was a danger simply screaming out for drainage.

Hokitika’s Surgeon Superintendent also identified another disease associated with tropical places. In 1869, he drew attention to the prevalence of certain endemic diseases such as fevers, dysentery and neuralgic rheumatism. He also recognised the local and regional existence of yellow fever on the West Coast. Yellow fever was found along the tropical littoral of the Atlantic Ocean and in inland tropical forests. It literally plagued


Warboys, ‘Germs, Malaria and the Invention of Mansoni Tropical Medicine’, p.186.
Europe in the eighteenth and early nineteenth centuries. Although the ‘precise source of this influence was often left unspecified’, doctors believed that ‘the movement of a morbid influence (miasma)’ transmitted the fever through the atmosphere.

As Hokitika’s Surgeon Superintendent explained, notwithstanding that ‘most people – even by members of the profession’ suppose it ‘to be peculiar to tropical climates’, he believed the disease to be yellow fever. According to him, ‘it presented the characteristic symptoms of the worst form of yellow fever, as it occurs in the tropics, viz., jaundice, haemorrhages from the mouth, nose, and ears, black vomit, and death about the sixth day in convulsions.’ As symptom supported the case for yellow fever, so did aetiology. ‘The causes of the disease’, the surgeon explained, ‘excessive moisture, swampy grounds, absence of cultivation and drainage, and a bush resembling the jungles of the tropics – exist in greater abundance here than in any other part of New Zealand.’ Further evidence of the malarial nature of this disease, the surgeon believed, came with its prevalence among newcomers to the district. He believed this suggested that most of the population already had ‘become acclimatised’. The Superintendent ended by noting that yellow fever ‘was prevalent in Great Britain and the Continent of Europe about forty years ago; but since drainage, and the reclamation of swamps, and the construction of proper roads, this disease has entirely disappeared.’ Hokitika’s environment, jungle-like, moist and uncultivated and still not drained, endangered lives by providing the ideal conditions for the outbreak of malaria. The existence of symptoms of yellow fever merely confirmed this environmental link. Although the surgeon highlighted the danger of uncultivated and forested areas, he implied that, as in Europe, the disease could be eradicated through drainage and cultivation. Again, the conclusion was that environment (swamps, moisture and bush) shaped human health and itself could be shaped by human action (draining and cultivation).

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10 ‘Report of the Hokitika Hospital, by the Surgeon Superintendent for the twelve months ending 30th April, 1869’, *County of Westland Gazette*, 13, (7 June 1869), p.77.
Other diseases commonly associated with swamps, as well as cities, were typhus and typhoid fever. Typhus ‘occurred irregularly in great epidemics’, sweeping aside great swathes of the urban population. In contrast, typhoid often broke out sporadically but with some regularity mostly in late summer and autumn. The variable prevalence and occurrence of typhus, most physicians held, broke out because of ‘the prevailing epidemic constitution of the atmosphere’. Most physicians also believed, as Hokitika’s Surgeon Superintendent did, that it was ‘a fever generated and propagated by poverty, filth, and over-crowding.’ The Surgeon Superintendent maintained that ‘we have no typhus or infectious fever in New Zealand’. Many doctors in New Zealand disagreed with him.

Writing initially in 1850, P. Wilson, Colonial Surgeon, drew attention to a typhoid epidemic that had broken out in New Plymouth in 1847. He blamed both poor housing and their poor location for the outbreak. Typhoid fever, Wilson pointed out, only affected the occupants of those dwellings that lacked ventilation or which had clay floors. ‘If that injurious plan of erecting tenements be not abrogated,’ Wilson warned, ‘sporadic cases of the fever in question must continue to be of annual occurrence’ and may even lead in a dense population to ‘a wide-spread epidemic, with its mischievous attendant, panic, would be the inevitable occasional consequence.’ Experience of living in the local environment changed his diagnosis. When, in 1860 Wilson returned to this subject, he believed that he had mistakenly identified typhoid fever for typhus fever. Since 1847, with the exception of 1850, he explained, typhus had broken out every winter. Thankfully, Wilson noted, these were ‘generally, of so mild, though lingering a stamp, that, of the several individuals attacked, from the above noted period to the present date, four cases only are recorded in our bills of mortality’. The cause, charged Wilson, ‘is

13 Wilson, ‘Fevers’, p.400.
17 P. Wilson, Colonial Surgeon and Health Officer, 18 June 1860, New Plymouth, Government Gazette, Province of Taranaki, New Zealand, 8, 7 (20 June, 1860), p.19.
not only local, but in a manner is of domestic production – to wit – a *malaria* proceeding. I believe, from the moist rotting, or dry decaying of the timbers of dwellings … and not improbably strengthened in the degree of its poisoning influence by the oozing of indoor soil emanations also.'18 Environment and building conspired to cause death. As Wilson explained, he had ‘never yet seen a case of the disease, whether in the town, or its adjacencies, where an *uninterrupted* current of air passes betwixt the ground and the timbers and flooring’ hence its sporadic, and not epidemic, occurrence throughout the district. Wilson held up the example of Richard Foreman’s cottage to exemplify his point. Foreman, and his family of eleven, explained Wilson, had moved into a relatively newly constructed cottage. Built of sawn timber and located in a sheltered, un-drained site ‘on the right bank of the Mangotuku stream’, it possessed a fatal design fault. Its basement, related Wilson, ‘is carefully closed up by turf and earth against the admission of fresh-air’, factors that, allied with the damp, still environment, caused ‘honeycomb rottenness’ to devour the building and typhus to ravage its occupants.19

As Wilson elucidated, ‘*malaria* – in plain English, fever-exciting, or health-poisoning effluvia emitted from decaying timber, as also other innocuously-seeming terrestrial exhalations, is a doctrine, not like that of contagion, readily comprehensible by the meanest mental capacity’. ‘Although my Report on the subject has been before the public, in printed form, for upwards of the last ten years’, he continued, exasperated, ‘and, that, on all our fever occasions, I have verbally drawn attention to the preventive means stated, yet I am not aware that I have succeeded, even once, in persuading any one of the really concerned, to attend practically to the suggestion.’ Wilson ended with a plea to the Superintendent for legislative action to forbid such dangerous settlements and buildings.20 Wilson’s discussion of typhus is fascinating for the window it opens into the techniques, thought processes and frustrations of a colonial surgeon. The nature and location of the outbreaks demonstrate the importance of geography and environment in guiding doctors and surgeons towards expectations of certain diseases. Wilson also testifies to the significance of experience in reading health. Furthermore, his frustrations

18 Wilson, 18 June 1860, p.20.
19 Wilson, 18 June 1860, p.20.
show that settlers sometimes ignored popular and medical advice about living next to standing water.

Other doctors and writers connected swamps with miasma and disease. McBean Stewart, Medical Officer of Health in Milton, Otago, pointed to human and natural causes to explain Tokomariro’s high death rate of 60 per cent (sic). Stewart attributed it to the building of houses from green timber, the undrained sites on which such houses were built and, intriguingly, ‘to the climatic changes’ that had occurred in the area. Because of these factors, he noted, ‘there is always a damp vapour arising, highly prejudicial to the health of the inmates, and especially the children.’ Stewart, sadly, did not elaborate on his explanation of climatic change. As Hokitika’s Surgeon Superintendent did, it is possible that Stewart was referring to the idea that cultivation and deforestation, by disturbing soil, released noxious miasma into the air. Stewart, like many others, recognised the connection between environment and disease as well as the role of human and natural factors in manufacturing these environments.

**Responding to miasma: settlements, commissions and drainage**

No measures seem to have followed from Stewart’s suggestions, nor, certainly, Wilson’s, as his frustrations indicated. Fears of swamps, nevertheless, did force people to move and did impel some town and city councils to improve the healthiness of their settlements. In 1835, for instance, members of the Church Missionary Society’s station at Puriri, because of ‘the unhealthy place’, decided to move the station to Hauraki, ‘higher up and washed by the sea.’ As James Preece explained to Rev. W. Jowett in a letter dated 4 October, 1835:

> The Puriri has every sign of an unhealthy place. The land is very low and entirely surrounded by swamp, which extends for miles, and comes close to the settlement. The vapour which arises there from during the whole of

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20 Wilson, 18 June 1860, p.20.
the summer has been the cause of our being affected, both with fever and
ague, which nearly proved fatal to Mr Wilson, his two children and Mr
Brown's little boy. 23

Apparently the mission had decided on Puriri because the largest number of Māori lived
here, but only later did they realise that this was a temporary place of food gathering and
they had made a mistake. 24

Rather incredibly, other settlements, such as Christchurch, had been built upon a
swamp or, as with Nelson, near to one. On 7 May 1867, the Superintendent of Nelson
formed a commission ‘to investigate the subject of the Drainage and Sewage in this
city, and to report to him what measures should be adopted to secure the public health
with a view to those measures being embodied in a bill’. On the Commission sat three
laymen, a doctor (Cusack) and the Provincial Engineer (Blackett), the last two proof of
the faith placed in the ability of engineering solutions to solve the problem of public
health. 25 The commission interviewed drainage workers, four doctors and the Inspector of
Nuisances. It also conducted research into New Zealand’s Blue Books (statistical data of
the colony) ‘and various medical works in the library of the Chairman of this
Commission, Dr. Cusack. ’ 26

Its interviews reveal contemporary views about the cause of illness. Repeatedly
interviewees connected bad smell with ill health, a common means of identifying
unhealthy sites. 27 Typical of these is the response of Mr Webb. Reported by the
Commission, Webb stated that ‘the sewer from the Trafalgar [street] occasions a bad
smell: several people have been sick.’ 28 By contrast others, including the two local
drain-cleaners, denied that any smell emanated from this outfall pipe. This latter
judgement was supported by members of the Commission who had nosed around the site

25 The full Commission was ‘Dr. Cusack, the Provincial Engineer Mr. Blackett, and Messers. Hunter
Brown, R. Burn and D. Rough’.
27 On this, see Corbin’s brilliant Le Miasme et la Jonquille. On the importance of smell in late eighteenth
and reported no foul smell. The area adjacent to the pipe might not yet be dangerous to health but, as Dr Williams pointed out, "if the town became densely populated and the sewage be allowed to find its way as it does now, the health of the inhabitants must be injuriously affected by it". Moreover, he noted, it would only be a matter of time before, owing to "the porous nature of the soil" and the contamination of the atmosphere, that "the present system of collecting sewage in cesspools" will pollute the drinking water and cause a "terrible epidemic." Mr Sherratt supplemented the doctor's public health concerns by explaining how the spring tides are 'a worse nuisance than the sewer'. These "bring up dead animals, &c., &c., to the edge of the mud flat behind Bridge-street, where they remain and rot'. He pointed out that 'the inhabitants throw out refuse' and so exacerbate the problem. Its poor healthiness was indicated, Sherrat noted, by the soil, which 'when disturbed has a bad smell.'

Aside from printing the interviews, the Commission presented comparative mortality rates of New Zealand's provinces (table 2.1, overleaf). Given New Zealand's 'extraordinary salubrious climate', the absence, or almost entire absence of extreme poverty, or great crowding, or of haunts of crime and profligacy ... and looking to its rank in health statistics as compared to the other provinces of New Zealand, and even to that of old countries, the health of Nelson is not so good as it should be.' Although 'there is nothing in the present state of the health of Nelson to justify immediate alarm', it continued, 'by proper precautions it should be brought up to be more nearly on a par with the country districts, and certainly to equal the very healthiest districts of London, which are stated to be as low as 12 per 1000.'

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Table 2.1 Comparative death rate per thousand for New Zealand’s Provinces (p.102)

<table>
<thead>
<tr>
<th>Province</th>
<th>Death rate per thousand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marlborough</td>
<td>9.14</td>
</tr>
<tr>
<td>Hawke’s Bay</td>
<td>9.14</td>
</tr>
<tr>
<td>Southland</td>
<td>9.22</td>
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<tr>
<td>Canterbury</td>
<td>10.98</td>
</tr>
<tr>
<td>Otago</td>
<td>11.22</td>
</tr>
<tr>
<td>Nelson</td>
<td>14.44</td>
</tr>
<tr>
<td>Wellington</td>
<td>16.33</td>
</tr>
<tr>
<td>Auckland</td>
<td>18.97</td>
</tr>
<tr>
<td>Taranaki</td>
<td>21.66</td>
</tr>
</tbody>
</table>


A combination of factors explained this high death rate: human pollution, overflowing and soaking cesspools, dusty streets and swampy land. The causes, noted the Commission, ‘in general terms ... include all the so called “preventative diseases,” being such as by decaying vegetable and animal matters, and the gases they give off polluting air and water.’ The Commission recommended engineering solutions to environmental problems. Citizens required pure water, better drains and improved earth closets. They needed tighter building regulations that guaranteed good ventilation in housing. All swampy areas either should be drained or filled up, continued the Commission, ‘if not capable, then such places, and all swampy spots of ground, such as the near Halifax-street, near the out-fall of the sewer, should be so raised by deposit of earth or gravel as to prevent the stagnation of water on them, and the rise of noxious emanations, the product of decaying vegetable matter.’ Similarly,

...on all low-lying unoccupied town sections within the proclaimed limits, all long growth of shrubs, flax, raupo, bushes, tussock, or other ran vegetation, should be kept down – periodically cut down, and burnt or removed – so as to lay the mud open to sun and air, and prevent it from being a source of damp exhalation, and from being eligible for an impromtu depot for filth of any sort. Such draining, covering, filling-up, or cleaning from vegetable growth to be at the expense of, or recoverable from, the landowner or his agent.

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33 *15, 26 (9 July, 1867), pp.103-104.*
34 *15, 26 (9 July, 1867), pp.104-107.*
Environmental causes of disease could be solved by environmental engineering. Already, in 1863, Nelson had enacted penalties for pollution: for those ‘who shall commit or cause any act whereby the water in any reservoir, tank, cistern, aqueduct, drain, or pipe constructed under the authority of this Act shall be fouled or corrupted, shall for every such offence forfeit and pay any sum not exceeding Fifty pounds.’ Clearly, however, this legislation had been ineffective in stopping pollution.

**Drainage in the Hawke’s Bay, Otago and Canterbury**

Elsewhere in the country, sanitary engineering offered hope to settlements besieged by disease. Archival material from Hawke’s Bay’s Engineers’ Office offers a rare insight into the process and procedure of health improvements in a significant colonial town. Engineers were commissioned to investigate a large swamp lying between Hastings and Carlyle streets thought to be the cause of much disease. According to their survey, the swamp covered ‘about 19 Acres’, varying in depth ‘from a few Inches to 4 ft’. Filling in ‘to the level of deep water in the Inner Harbour’, advised engineer Charles Leckey, appeared to be the best and most cost-effective solution to remove this hazard, but would still require some 78,600 Cubic feet of soil (2,224 cubic metres) and £4909 of finance. An earlier survey of 1870 provided a detailed overview of the extent of swamp drainage (appendix two). With the problem defined, legislative solutions were sought.

On 14 July 1873, the Provincial Council of Hawke’s Bay passed ‘The Napier Swamp’. As its preamble noted, ‘by reason of the said parcels of land being flooded by stagnant water a nuisance dangerous to the health of the community hath been created and ... should be abated.’ Abatement regulations gave owners 4 months in which to ‘keep such land free from stagnant water’. If not, they faced a penalty of up to £100 to

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36 Engineers’ Office, ‘Reclamation of Swamps at Napier’, Napier, 1 January 1872, Departmental Reports: Provincial Engineers, Swamp, HB 1/12/Session XIX, NA.
37 ‘Schedule of Sections forming the Napier Town Swamp’, Charles Leckey, Engineers’ Office, 1 May 1870 appended to ‘Memorandum as to Napier Swamp Nuisance Act’, HB 4/1873/Letter No.195, NA.
'be recovered in a summary way.\textsuperscript{39} Success seems to have attended the legislation, no doubt helped by railway expansion removing 1 acre of land from the area to be reclaimed.\textsuperscript{40}

Similar problems faced other cities. In Dunedin, as Pamela Woods has shown, many organisations and campaigns concentrated on draining the city's miasmic morasses and improving its sewerage systems, drainage and water supplies.\textsuperscript{41} In the 1870s, Wellington inaugurated better water supplies in response to press condemnation of its soaring rates of typhoid. In Christchurch, the city's Drainage Board endeavoured to prevent further river pollution and construct a sewer to improve the Avon's water quality. Elsewhere, the pattern, and the message, was the same: that many of New Zealand's cities suffered from alarmingly high death rates, that the causes were environmental factors allied with pollution, poor drainage and inadequate water and sewerage supplies.\textsuperscript{42} This increasing concern over public health also can be gauged by the proliferation of publications on public health that appeared in the Transactions from the late 1860s onwards. Articles discussed town sanitation, including surface and house drainage as well as water supply, sewage disposal and house ventilation.\textsuperscript{43}

\textsuperscript{39} See 'Napier Swamp Nuisance Act 1873', pp.1-2.
\textsuperscript{40} Reclamation of Swamps Between Hastings-St. & Carlyle-St.', Hawke's Bay Council Proceedings Session 20, 1873, p.85.
Different and changing views of swamps

Ironically, European suspicion of swamps contrasted totally with Māori experience of these areas. To Europeans, swamps harboured death and disease, but to Māori they teemed with life and resources. Māori valued swamps for the resources and food they provided, particularly for foods such as eel or duck. As Geoff Park notes, European transformation of the New Zealand environment took its heaviest toll on the lowlands. Yet, many Māori also adapted European models of public health and town planning. At Parihaka (South Taranaki), the spiritual centre of Te Whiti o Rongomai (?-1907) and his followers, the village was laid out ‘in an orderly plan around two maraes ... Strong picket fences enclosed intensely cultivated clearings.’ In 1881, Dr. A.K. Newman (1849-1924) visited Parihaka, at the height of tensions between Te Whiti’s followers and the government. Wandering ‘down the main throughfares’, Newman found the place ‘singularly clean’. He speculated that it ‘must be regularly swept and all dirt removed almost daily’, and commented that ‘drainage is excellent’, the drinking water clear and clean. By 1902, Parihaka had electric lighting and a new water supply put in. The capital city, Wellington, did not yet have electricity installed!

Concerns about New Zealand’s urban areas: drainage and pollution laws

Europeans were concerned about the healthiness of urban areas, particularly larger ones. Investigations into patterns of disease in cities alarmed many. Reports revealed that New Zealand’s cities were far from the healthy places many thought. One

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44 Not all Europeans, of course, feared swamps. ‘The swamp bounds my run on two sides for miles. They are useful as affording food for infinite numbers of pigs and being the hide[?] of wild pigs, upon which we partly depend for food at the station.’ James Edward FitzGerald to Lucius Henry FitzGerald [JEF’s bro], The Springs Station [Canterbury], 21 March 1853 in ‘Correspondence of James Edward FitzGerald, Prime Minister of New Zealand, 1854’, Miss Eur D1171/27, Oriental and India Office, BL.


46 Park, Nga Uruora.


49 Scott, Ask that Mountain, pp.189-190.
good indicator of the healthiness of cities came by comparing urban death rates with those of the countryside. Traditionally, death rates in the countryside were much lower than cities. As W.D. Campbell observed in 1876, ‘the high proportion of the deaths in New Zealand, due to zymotic diseases ... show plainly that there is a fearful loss of life that might be prevented by proper sanitary measures.’ In the 68 largest English towns, he explained, the annual death-rate per thousand in 1873 was 3.6. In New Zealand’s seven largest towns in 1875, the annual death-rate averaged 8.63. Corresponding percentages for the countryside put the figure at 2.9 for England and 3.17 for New Zealand. Even more ‘startling’, continued Campbell, was that the death rate in New Zealand’s seven largest towns (25.91 per 1000) was much greater than England’s rural death rate (18.4 per 1000). This comparison challenged favourable impressions, and much propaganda, that held New Zealand to be far healthier than Britain, urban and rural.

In 1902, eugenicist R.H. Makgill (1870-1946) came to a similarly alarming conclusion about New Zealand’s unhealthiness. He reported that its ‘death rate was ... not so much behind the English rural death-rate, and with only one-twentieth of the density.’ Makgill proscribed overcrowding and prescribed imitating nature. ‘Nature has framed certain sanitary laws’, he noted, ‘more reaching than any by laws [of which] the most exemplary local body ever conceived’. These sanitary laws included elimination of the unfit, the removal of sanitary waste onto fields, knowledge about the microbe and the sanitary powers of sunlight and fresh air. For Makgill, discovery of the microbe did not diminish the role of environment in causing and explaining patterns of disease. His views highlight that, although by upholding miasmic theory many sanitarians had identified the wrong mechanism for disease, they had recognised the correct correlate. Research into New Zealand’s cities thus not only reinforced the connection between environments and disease but also revealed alarmingly and unacceptably high mortality and morbidity.

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52 Makgill, ‘Nature’s Efforts at Sanitation’. Quote from p.139.
53 In 1888, for instance, H.P. Higginson still upheld miasma as the cause of Wellington’s high death rate. According to him, Wellington’s ‘sewage-mud festered’ foreshore ‘is that it generates foul gases, which force their way upwards through the drains to the higher levels of the city.’ Higginson, ‘Sanitary Sewerage’, TPNZI, 22, (1889), pp.369-378. Quote from p.369-370.
Drainage was a popular measure to remove the sites of miasma. Many local drainage acts aimed to achieve this. They also tried to prevent their occurrence by prohibiting water pollution. In 1864, for instance, clause 55 of the Auckland Waterworks Act banned any bathing, washing and pollution of the city waterworks, at a penalty of £5 plus 20 shillings per day so long as the offence continued. Not every drainage act, of course, had an anti-pollution clause attached and not all, as Nelson’s shows, successfully dealt with the problem. Yet, it is still peculiar that Geoff Park, who claims to provide an overview of swamp drainage, makes no mention whatsoever of drainage for health. Certainly drainage for improvement was an important consideration but Park’s mania for delineating a European desire to apply straight lines and the principles of profit to lowland New Zealand are preconceived ideas that sadly blind him to another extremely important motive to drainage: health.

Aside from health fears, the nature of New Zealand’s geography may account in part for European desires to remove swamps. First, New Zealand’s hilly nature means that flat land was in relatively short supply. Drainage made available areas of flat land for cultivation and stocking, and could provide valuable sites for roads. Second, New Zealand’s temperate climate and ideas about the role of swamps in affecting rainfall may have caused people to look poorly upon swamps. As chapter four shows, some people believed that water bodies affected climate and that swamps increased rainfall. Given New Zealand’s temperate coastal climate, settlers may have thought that they had sufficient rainfall. In Victoria, Australia, where rainfall is less and more variable, Meredith Dobbie is finding that settlers there articulated a wide spectrum of views about swamps. Although many settlers feared swamps for their danger to health, colonists also recognised the importance of these places as supplying water, particularly in times of

55 Wellington, for instance, possessed a comprehensive, nine clause act mitigating against a variety of pollution. ‘Streets Sewerage and Drainage Act’, Acts and Proceedings of the Provincial Council of Wellington, Session 6, 4 (1858), p.345.
56 Park, ‘ “Swamps which doubtless might Easily be drained”’, pp.151-165; Park, Nga Uruora.
drought. Local environments, then, appear to have affected the way settlers saw swamps.

**Improving health through tree planting**

Engineering solutions to health, such as drainage and sanitation, building design and waterworks, took place in most towns and cities alongside another form of sanitation – tree planting. In the seventeenth and eighteenth centuries most thinkers held that trees, by impeding the free passage of air through their lower branches, kept the air stagnant and therefore endangered public health. Forest clearance, they similarly thought, undercut health, since it disturbed the soil, releasing long-dormant miasma. Attitudes began to change in the late eighteenth century. By the nineteenth, the therapeutic and prophylactic value of trees ‘was firmly implanted in both lay and medical opinion.’ Far from generating miasma, people now thought that trees not only filtered miasma from the air but also produced ozone and had a general sanitary affect on air. In particularly, they praised the pine tree for its sanitary qualities. Victoria’s Ferdinand von Mueller (1825-1896), ‘Baron Blue Gum’ to the public, did much to popularise another tree. He promoted the eucalyptus as a quick-growing, useful tree that also acted as an anti-malarial agent. Word of its anti-febrifugal (anti-fever) properties spread like an epidemic through Europe and the Americas and reached a peak in the 1870s. According to the Baron, eucalypti would combat malaria in southern Europe; it would make uninhabitable areas in California habitable; it could be rubbed on the body, taken internally or sniffed. In Mueller’s hands, there seemed no end to its usefulness.

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57 Meredith Dobbie, ‘If this is now, what was then? Past perceptions of Wetlands in Victoria’, paper presented at *Is it Environmental History? Postgraduate Conference*, University of Melbourne, 11-12 October, 2004.
Although his promotion of eucalyptus in New Zealand did not include discussion of its health properties, others did promote the Australian tree for this purpose.61

Doctors also discovered amazing medical uses to which other trees could be put. Pine trees seemed to possess particularly powerful curative properties for tuberculosis sufferers. In California, as a forerunner of the sanatorium, a special kind of cure developed that was based on patients living in dry, clear climates located near evergreens. In wilderness therapy, the theory recognised that trees acted on the individual by purifying the nearby air through the release of ozone. Many believed ozone was a powerful disinfectant that helped clear the lungs (see chapter one).62

**Planning parks, planting trees and producing ozone**

Ideas about the sanitary effects of trees also merged with two other intellectual currents of the time: strong anti-urbanism and romanticism. New Zealand's founding, as many historians relate, centred on a strong anti-urban bias. Settlers defined New Zealand as everything Britain was not. It was rural not urban, farm-based not industrial, spacious not overpopulated, healthy not diseased. Poets ingeniously ignored New Zealand's rapid urbanisation and urbanites. They instead waxed lyrical about its rapturous bush and colourful rural folk.63 Promoters ignored its booming settlements, settling on its rural lands instead. Yet, as the introduction shows, this was often an image at odds with reality. By 1900, New Zealand was one of the most urbanised countries in the world. By then,

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61 On Melbourne Botanical Garden's link with Otago, see File No. 9967 in 'Superintendent General, Inwards Correspondence, 1861-1877: Otago Provincial Government', Series 7, Roll 43, Micro 414/67; File No. 3969 in 'Superintendent General, Inwards Correspondence, 1861-1877: Otago Provincial Government', Series 7, Film 022, Micro 414/46, HL.


too, many settlers had realised that the old world serpents of urbanised industrial society – pollution, disease, overcrowding, and filth – had followed them to paradise.

Even before organised European migration to the colony began in the late 1830s, the New Zealand Company had provided for public parks and green spaces in its town plans. With the arrival of yet more settlers, most newly established towns in New Zealand soon had land reserved either for a public park or domain. Some of the larger centres such as Dunedin and Wellington even gained botanical gardens. These gardens served a variety of purposes, from research and plant acclimatisation, to pleasure, leisure and health. With the explosion of urban growth in Europe, as well as providing areas for leisure and pleasure, city parks and open spaces fought disease and purified the air, furnishing important weapons in the arsenal of public health. Often their development took place together with sanitation, town planning and other public works, as in Paris of the 1860s during its extensive redevelopment under Baron Haussmann. An additional spur to appreciating the sanitary properties of public spaces and vegetation came from the romantic movement. Its followers, worshipping at the altar of nature, drew attention to the spiritually and physically regenerative properties of nature (see next chapter). All of these ideas arrived in nineteenth century New Zealand and were responsible for many of the urban spaces that its population enjoys today.

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64 For a list of these towns, see Grahame Anderson, ‘Wakefield Towns’, in Edward Gibbon Wakefield and the Colonial Dream: A Reconsideration, Wellington, 1997, pp.143-158.
Parks improved health by providing areas in which to exercise. They also provided spaces with clean air and areas on which to grow plants that purified stale, city air. Village greens in New Zealand, wrote F.E. Wright in 1873, ‘would have a beneficial influence on the character and stamina of the future inhabitants of the colony’. According to him, they ‘should be left in a state of nature, except that the village club might level a place for their games.’ ‘[T]he free use of muscles,’ explained Wright, ‘and the joyous abandon of youthful games are conducive to the development of a perfect body and a virtuous mind.’ In the 1880s, T.H. Potts (1824-1888), similarly, linked recreation grounds and fresh air with healthiness. He suggested setting aside ‘open spaces of land, conveniently situated, open for all, for sanitary and recreative [sic] purposes’.

If some tapped into New Zealand’s egalitarian culture, by desiring the democratic delimitation of recreation areas, others went further and tied health and freedom to settlers’ ideals. ‘Folks sought these shores to better themselves,’ explained a journalist of the *New Zealand Country Journal*. They wanted ‘to leave behind’ ‘what they could of the evils or ills of the old country’. ‘[T]o better themselves did not mean merely the acquisition of wealth; [but also] the happiness of freedom and health for themselves and their children’, ‘[A]n adequate open space or lung for the well-being of future inhabitants should be dedicated for public use’, declared the writer. It formed an important part ‘of rational and social progress’. These authors believed that environmental reform should improve the human condition. They shared the aims of New Zealand’s social reformers who saw the colony as in the vanguard of social progress. The members of this movement stood confidently by rational and social progress as worthy enterprises that would improve everything from working conditions and women’s health to agriculture and the armed forces.

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70 F.E. Wright, ‘On the Desirability of Dedicating to the People of New Zealand Small Areas of Ground, assimilating to the Village Greens of England’, TPNZI, 6, (1873), p.416. This article also appeared in full in the Lyttelton Times, after 2 April, 1873.
73 8, 4 (July, 1884), p.278.
74 On these ideals, note Erik Olssen, Building the New World: work, politics and society in Caversham, 1880s-1920s, Auckland, 1995.
How exactly, though, did plants aid this process? 'Ozone', explained one writer in 1883, is the great natural disinfectant or purifier of the atmosphere. Wherever it encounters decaying organic matter gases it tends to combine with and quietly burn up the bad-smelling gases which are evolved therefrom. So powerful is its action that a piece of tainted meat immersed in an atmosphere of ozone has all the disagreeable effluvia at once removed from it.

Country air, continued the author, contained much ozone. Cities and towns did not, owing to the putrefying animal matter of these areas removing ozone from the air. Many plants, related the writer of an earlier article of 1877, 'throw off ozone largely on exposure to the sun's rays'. '[S]o powerful is this atmospheric purifier', it continued, 'that it is the belief of chemists that whole districts can be redeemed from the deadly malaria which infests them by simply covering them with aromatic vegetation.' Particularly attractive flowers and plants included those 'possessing green leaves and aromatic odours.' Several other authors advocated planting in towns and connected human with plant life (see also chapter three).

In 1880, J.B. Armstrong's 'Planting in Towns' listed three benefits conferred by planting: shelter, 'improved appearance' and health. 'The life of human beings', observed Armstrong, 'is connected intimately, then, with the vegetable productions of the globe, not only as regards the materials for their food, but also in reference to the air which they breathe.' What trees should be planted? Armstrong recommended carbon-absorbing plants, 'such as the Blue Gum, which is the most active absorber of carbon known, the various varieties of Poplar, the Maples, Planes, Elms, &c.' The list expanded to include the Tasmanian Wattle, Stingy-bark gum and 'the Willow-leaved gum and the Peppermint

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75 'Our Science Page: Decay of Plants and Animals (from the "Chemistry of Common Things")', NZCJ, 7, 6 (1 November 1883), p. 494.
76 NZCJ, 1, 2 (2 April 1877), p.82
gum'. It also included native beeches and Ribbonwoods, the American and Oriental plane, Maples and poplars.\(^7^9\) If trees purified the air they also, as Southland forester D. McArthur (1806/08–1888) pointed out in 1882, facilitated the drainage of swampy areas.\(^8^0\)

No New Zealand writer advocated forest conservation for health reasons, probably because most held that sufficient ozone existed in the countryside anyway. Some, however, did recommend visiting the bush for health.\(^8^1\) ‘[H]ealth ... as well as amusement, is gained by a journey in the bush’, as William Swainson explained: ‘Almost constant mental excitement, gentle in degree, and agreeable in its kind; exposure to the open air, active exercise, and plain and scanty diet, all tend to health.’ A traveller returning from a stint in the bush, Swainson noted, ‘returns from his journey a stronger and a better man.’\(^8^2\) Later in the century, when fears of poor fitness and health surfaced, reformers looked to parks and nature as recreational areas to improve the racial health of the nation.\(^8^3\)

### Regulating and purifying water supplies

If the bush elevated individual spirits, it also could improve the health of a populace by purifying and regulating its water supply. Tree planting was widely recognised as a means of regulating water supply and preventing damaging floods (chapter seven). David Tannock (1873–1952), Dunedin’s Superintendent of Reserves, promoted these aims through the planting of trees throughout the watersheds of the city’s reservoirs. In 1908, for instance, the city’s annual report noted that Tannock anticipated tree-planting to occur ‘at the rate of 40 to 50 acres per annum.’\(^8^4\) Tannock believed trees fulfilled a number of important roles. They increased rainfall and regulated temperature

\(^7^9\) Armstrong, ‘Planting’, pp.50-53.
\(^8^1\) One author did connect the spread of ‘the poisonous breath of the marsh lands’ of northern Italy with deforestation. NZCJ, 7, 5 (September, 1883), p.347.
\(^8^4\) R.W. Richards, *Report, 1907-1908*, Dunedin, 1908, p.27.
extremes, provided shelter and reduced evaporation (for further details on such ideas, see chapters four and seven). Of particular relevance to the water supply, explained Tannock, was that they ‘render the flow of rivers more continuous’. They ‘help to regulate the water supply, produce a more sustained feeding of springs’ and reduce the risk of flooding and land slips.\textsuperscript{85} In 1924, Tannock observed with satisfaction that:

The beneficial effects of clothing the catchment areas with trees was very evident in two distinct and opposite directions during the past season. In the early months of the year, when we had the severe floods, the creeks which flowed from tree-clad slopes did little or no damage, whereas those which came from slopes which had been denuded of their original covering did very considerable damage.

Moreover, the trees also purified water flowing into the catchment.\textsuperscript{86}

Perhaps the decision to protect and re-afforest the city’s water supply owed something to the talk given by the naturalist G.M. Thomson, in 1901, to the Otago Institute. Thomson had walked the whole catchment area of the rivers flowing into Otago Harbour, commenting on the natural history of each on the way.\textsuperscript{87} Thomson advocated the alienation of ‘the whole area of the watershed’ of Ross Creek, source of the town water supply, for the purposes of preventing soil erosion, flooding and pollution getting into Dunedin’s drinking water.\textsuperscript{88} Earlier, other councils had reserved catchment areas of their water supplies. In 1865, for instance, the \textit{New Zealand Government Gazette (Province of Nelson)} recorded that a ‘reserve for the purposes of the Nelson Waterworks’ had been created.\textsuperscript{89} These examples illustrate the importance of forests in the health of cities, a theme explored further in the next chapter.

\textsuperscript{86} Tannock, \textit{Report 1923-24}, Dunedin, 1924, n.p., DCCA.
\textsuperscript{87} G.M. Thomson, ‘Tongues in Trees, books in the running brooks, Sermons in stone, and good in everything’, handwritten lecture read before the Otago Institute on 12 November 1901, HL, Ms-0218.
\textsuperscript{88} Thomson, ‘Tongues in Trees’, p.18. See also, Thomson, \textit{A New Zealand Naturalist’s Calendar and Notes by the Wayside}, Dunedin, 1909, pp.94-95.
\textsuperscript{89} \textit{New Zealand Government Gazette (Province of Nelson)}, 13, 27 (16 September, 1865), pp.132-133.
Conclusion

This chapter shows that if dry climates and high places, spas and the seaside enhanced health, others actually endangered it. Swamps and cities harboured unhealthy miasma, putrefying vegetable and animal matter that poisoned the atmosphere and led to death and disease. Unhealthy zones could be worsened and even created by human activity. Badly ventilated housing could magnify and even make miasma by blocking the free passage of air. Poor drainage, sewerage and cleanliness could cause the same and render healthy rivers and streams conduits of filth and foulness. Thankfully, solutions were at hand to improve these dangerous areas and allay environmental anxieties. Swamp drainage could improve marshy areas, while the tenets of public sanitation could fix the unhealthy cities. Unhealthy towns resembled human bodies, since both responded well to good treatment, the input of clean water and the removal of bad. Under the public health programme, individual house design acted as a barometer of the town’s health. Houses should be well-built and evince well-ventilated construction. They should be well drained, be served by sewerage and clean water and ideally be set in gardens since plants exhaled air-purifying ozone. Public spaces improved health not only because they provided exercise places for urban dwellers but also because the plants growing there sanitised the surrounding city. Most New Zealand towns, therefore, had parks and domains along with programmes of tree planting for the enhancement of beauty and health. The decline of miasmic theories of disease towards the late nineteenth century did not diminish the determination of members of the sanitary movement. Although they had misdiagnosed the cause (miasma), they had successfully identified the solution (public health). The decline of the miasma idea, however, did change ideas about malaria. By the late nineteenth century, medical science showed this to be transmitted by the *Anopheles* mosquito and not to be a consequence of either swamps or rotting vegetation. Fears of disease and death lurking in swamps and cities betoken far from glowing assessments of New Zealand’s healthiness. They evince widespread concern that Europeans were making some unhealthy areas worse and even creating new ones. These fears sat side-by-side confident assessments in the overall climatic suitability of New Zealand for Europeans. Although a number of commentators questioned the healthy image of New Zealand, most accepted that humans could improve its healthiness and draw it into line
with most of the countryside. To settlers, a healthy and temperate climate was the archetype. Swamps and damp places stood out as abnormal areas which required improvement. A certain acceptance of the ill health of towns existed. Strong anti-urban sentiment suggests that people recognised the dangers inherent in urban living. Although medical geography declined towards the late nineteenth century, its influence and people's faith power of environment continued strongly into the next century. The development of tuberculosis sanatoria as well as the eugenics and fresh air movements testify to the on-going importance of environment in affecting health. Indeed, all commentators strongly believed in the connection between environment and humans. They assumed that changes in one resulted in changes in the other. As the next chapter shows, Alfred Sharpe supported tree planting, nature conservation and public garden designs to improve the healthiness of cities.
Chapter 3: Sustaining the City and Preserving Nature: the environmental aesthetic of Alfred Sharpe

Alfred Sharpe (1836-1908), artist and environmentalist, poet and park designer, displayed strong and enduring concern about the state of the environment. For Sharpe, conserving and planting trees, planning parks and preventing pollution not only provided an aesthetically pleasing and healthy environment for humans. It also bestowed on later generations the benefits enjoyed by those of his day. As other romantics, Sharpe celebrated his own direct experience of nature and conveyed the feelings that sprang from such encounters in poetry and painting. As other romantics, too, Sharpe’s worship of nature sprang from his belief that God had created the natural world and that knowing and experiencing environments led one closer to Him. Instead destroying nature meant desecrating God. For Sharpe, the New Zealand bush he knew as a young man in the late 1850s seemed to be facing just as great and irrevocable change through acclimatization as Māori lifestyle was in the face of European culture. Sharpe believed the environment around Newcastle, New South Wales, his home in the last two decades of his life, also faced similar changes. Yet, Sharpe was no fatalist, willing to passively accept the inevitable loss of these natural treasures. In New Zealand and later Australia, he wrote passionately about the need for settlers to preserve their natural heritage. He penned attacks against polluters, poor managers of parks and others whom he believed destroyed nature. Sharpe wanted existing areas of natural beauty, such as kauri forests and volcanic domes preserved, and the embellishment and creation of new ones. By focussing on urban environments, this chapter investigates a neglected area of Australasian environmental history. It demonstrates that urban areas have an important environmental history too. Sharpe submitted designs for landscape gardens in Auckland and Newcastle, New South Wales (where he moved to in 1887). In Newcastle, he successfully designed or re-designed most of the city’s parks. His urban designs, in particular, illustrate that Sharpe applied European aesthetic conventions onto New Zealand and Australian nature. Sometimes, with the latter, Sharpe struggled to fit it neatly into his own ideas about
beauty. By investigating the importance of local and global factors in Sharpe’s environmental views and identity, this chapter also draws the study of environmental history away from purely ‘national’ narratives. It recognises that experience of different local environments, combined with settlers’ cultural expectations about the natural world, shaped colonists’ views about nature. Sharpe was only concerned about preserving the nature of areas he knew, specifically the environments around Auckland and later Newcastle. The other local world of his youth – Birkenhead and Liverpool – also had a lasting influence, through his experience its artistic community and park. Although Sharpe was not directly concerned about either global or even national forest issues, national and international ideas still influenced his outlook. He sometimes appealed to national sentiment in order to save local environments. The romantic ideas of art critic John Ruskin (1819-1900) also shaped Sharpe’s ideas. Ruskin’s voluminous writings promoted landscape and heritage preservation, naturalism in painting. At least until the 1870s, Ruskin viewed study of the natural world as a means of establishing a closer relationship with God. He also campaigned against environmental pollution and the destruction of things of beauty. Sharpe applied many of Ruskin’s precepts to New Zealand. This chapter also underlines the complexity of Sharpe’s ideas about nature. He appreciated both introduced and ‘indigenous’ nature, and both what he termed ‘unspoilt’ and improved nature (such as that found in city parks). Sharpe particularly valued unique and long-lived plants. He also delighted in foliage that highlighted the contrasts between shadow and light and vegetation that produced attractive flowers (such as the pohutakawa). Exploring Sharpe’s views of the natural world complicates traditional portrayals of nineteenth century settlers as confident and arrogant agents of environmental transformation. So too does it challenge researchers to look further back to find environmental concerns expressed in urban areas.

**Sharpe’s early life**

Sharpe’s experience of the local environment in which he grew up, shaped many of his later views about nature. His childhood experiences probably led him to appreciate the need for parks and green spaces. As well, it introduced him to the ideas of John
Ruskin and the importance of conserving nature, and the need to adopt a naturalistic style when painting nature.

The Birkenhead of Alfred Sharpe’s youth could not have been more of a contrast to the sprawling city across the Mersey. In the early to mid-nineteenth century, Liverpool already had the trappings of a big city; sombre civic buildings, bustling markets, lively theatres and a crowded port. It also had many of its problems. Out of tenements tumbled out poor, filthy, underfed Britons. As Sharpe would do later, many chose to leave their homeland for better opportunities in the colonies and Americas.\(^1\) Probably to escape much of this poverty and disease, many of Liverpool’s wealthier set had decided to live in Birkenhead, a far greener and healthier place than smoky, overcrowded, stressful Liverpool. Sharpe’s father, William, a successful merchant, was one of the products of this age of capitalism and of the growth of the middle classes. Sharpe senior collected art. The family enjoyed what appears to have been a privileged existence. They lived in Clifton House, a sizeable residence in Birkenhead and one of several elegant mansions in the area. Family fortunes seem to have changed during the 1850s. Somewhere in this decade Mrs. Sharpe became widowed, and the family moved into a smaller, though no less desirable, residence above Clifton Park.\(^2\)

As art historian Roger Blackley notes, during this formative period of Sharpe’s life, the young man attended the Birkenhead School of Art, and developed a keen interest in the Pre-Raphaelites.\(^3\) The famous Pre-Raphaelite Brotherhood (recognised at its foundation simply by the enigmatic initials, ‘PRB’), was formed in 1848 by a group of young artists all of whom took an interest in early Italian art. Although their aims and writings would differ, the art of the Pre-Raphaelites can be characterised by realism or naturalism, noticeable particularly in their rendering of minute detail and their use of ‘bright colour with a minimum of shadow.’\(^4\) Success brought them regular exhibition space in Liverpool’s galleries. Their 1851 exhibition in Liverpool attracted considerable critical success. These tours gave Sharpe excellent access and a solid grounding in the

\(^3\) Blackley, *Art of Alfred Sharpe*, pp. 16, 18.
Pre-Raphaelite oeuvre.\(^5\) As Blackley notes, Sharpe's artistic style – his concern with naturalism – owed much to this Pre-Raphaelite tradition.\(^6\) Other influences on Sharpe included those of the art critic and promoter of the PRB, John Ruskin, and Birkenhead Park, the first park of its kind laid out by a public authority (see below).\(^7\)

**Migration, painting and writing**

In 1859, for reasons unknown, Sharpe immigrated to New Zealand. He settled at Mangapai, near Whangarei (northern New Zealand), where he took up farming and digging of another sort (part-time undertaking). Soon he had added an 'e' to his surname, in order to distinguish himself from the commonly-spelled Sharps.\(^8\) In 1866, after a few years in Mangapai, Sharpe moved to Auckland. Here, in the former colonial capital, he married Jane Jeffares and initially set himself up as a draughtsman. A short while later, he was describing himself as a professional artist, a clear indication of where his aspirations lay.\(^9\) Struggling to earn a living and beset by a series of financial hardships, Sharpe's life in Auckland and later Newcastle reflected the difficulties facing professional artists in a smaller colonial societies were the demand for art was not great. Sharpe, nevertheless, persisted with his vocation and produced a number of outstanding landscapes in watercolour (Photograph 3.1). His fame as a watercolourist also was accompanied by a quite prodigious outpouring of writing.\(^10\)

In the 1870s, Sharpe began to submit letters, poetry and drawings to northern New Zealand newspapers, many written under a variety of pseudonyms. Using these anonymous titles, Sharpe poured forth his rants and raves onto many topics and types: lawyers, lovers and landsharks, judges, deforesters and acclimatisers, vandals, suffragettes and so on.\(^11\) One of his favourite *nom-de-plumes* was Asmodeus, a lame devil in Jewish demonology. He used many others, too, such as Anti-Vermin, Pro Bono publico, Arboriculus. Probably, as Blackley notes, Asmodeus so appealed to Sharpe

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\(^{5}\) Staley, *Pre-Raphaelite, 'The Liverpool School*', ch. 11, pp.138-149.


\(^{7}\) Blackley, *Art of Alfred Sharpe*, pp.16-17.

\(^{8}\) Throughout this thesis, I spell his name with the 'e'.


\(^{10}\) On his time in Auckland, see Blackley, *Art of Alfred Sharpe*, pp.25-93.

\(^{11}\) Blackley, *Art of Alfred Sharpe*, pp.53-56.
Photograph 3.1 Alfred Sharpe sketching.

Origin Unknown.
because in later life it seems the artist lost his hearing. Roger Blackley has convincingly demonstrated that, despite his use of aliases, Sharpe’s distinctive style, topics and timing makes it relatively easy to identify him as the author. Sharpe’s letters were sometimes vitriolic, usually eccentric, but invariably punctuated with a keen eye for detail and a sharp wit. His strident and condemnatory tone continued to appear in the Auckland papers virtually until his departure from the Auckland region in 1887. He also returned to a number of pet topics during his time in the Antipodes. These included criticism of acclimatisation, park mismanagement, tree planting, conservation, and pollution. Today, his writing forms an invaluable archive for those interested in all forms of art historical and historical research of this period aside from their value as a record of a colonist’s environmental attitudes.

Sharpe’s environmental attitudes did not significantly change when, forced by difficult financial circumstances and locked into a deeply unhappy marriage, he moved to Newcastle, New South Wales, in 1887. Newcastle, like the northern English town after which it was named, drew its prosperity as an industrial centre and a bustling port from where it exported coal. Sharpe was deeply affected by this industrial landscape and consistently supported the improvement of Newcastle’s urban environment and that of its surrounding area. Sharpe’s successful younger brother already lived in Newcastle, so perhaps out of respect to him Sharpe reverted to his family name by removing the ‘e’ that he had added when he came to New Zealand. Sharpe continued to passionately pursue his environmental interests, his painting and writing. He even designed or re-designed many of Newcastle’s city parks. Yet, financial worries still dogged him. In 1908, he died in relative obscurity and poverty.

Romanticism

Only within the last thirty years have Sharpe’s landscape paintings again enjoyed popularity. Thanks to Roger Blackley’s 1993 exhibition of Sharpe’s paintings and writings, only within the last decade have his works been considered of significance to art

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historians. So far, however, the importance of Sharpe’s environmental views has not yet been fully recognised. To understand his environmental views means paying close attention to Sharpe’s own writings as well as to formative influences on him. Romanticism and religion were central to Sharpe’s attitudes. Like many romantics, Sharpe worshipped at the shrine of nature, extolling experience of the natural world as a means of knowing God. ‘Trees’, he declared, ‘are the most beautiful and useful of God’s creations’. The originality of this message was not that experience of nature generated piety – this idea has a very long history in Christian thought – but that the observer could connect with the divine through his or her own experience and sensitivity with nature. As Max Oelschlaeger notes, romantics ‘believed that God’s presence was revealed through an aesthetic awareness of nature’s beauty.’ Many of Sharpe’s poems delighted in the beauty and inspiration artists and poets could find in the natural world. In ‘The Forest Temples of New Zealand’ (1888), he wrote that:

Temple reared by human hands
May be grand and may be fair;
But who worships Nature’s God
Never worships truly there.

He to forest temple goes,
From all human things apart,
And he gives God service there.
Not from lip, but from the heart.


16 M NH, 31 October 1893, p.3.
19 NMH, 6 September 1888, p.2., c.l. This was earlier printed in the NZH, 6 September 1888, p.2. For Sharpe’s religious views see the poem ‘Earth is Fair’, NMH, 20 February 1888, p.2, c.l.
According to Sharpe, forests were the true places of worship since they had been created by God. For Sharpe, those parts of the natural world ‘Where man’s foot hath seldom trod’ were holiest. Such concern for what Sharpe regarded as untouched nature reflected the value romantics placed on the natural world, who retreated from what they saw as the artificiality and corruption of urban living. In ‘Earth is Fair’ of 1888, Sharpe recognised that ‘man, His creation, hath dimmed’ the ‘bright tone’ of the natural world created by God. Yet, Sharpe still insisted that ‘this bright earth’ existed both for the enjoyment and uplift of humanity and as a ‘shadowy type, of what heaven will be’. Sharpe acknowledged that humanity could sometimes destroy the natural world and desecrate its purity. This view is particularly evident in his criticism of acclimatisation and deforestation (see below). Yet Sharpe accepted that humanity, by planting trees or planning public gardens in cities could create healthy and moral places, could improve upon nature. According to him, too, God had created the natural world for the enjoyment of humanity. His belief that the natural world was a ‘shadowy type, of what heaven will be’, placed great religious and moral emphasis on the need for humans to steward this inheritance. Sharpe’s argument dovetails with those of many contemporary New Zealand conservationists, who argued that humans should wisely use the natural world and ensure its continuing for later generations.

The influence of Ruskin: holding in trust the ‘great entail’

Sharpe’s romanticism owed much to the writing of John Ruskin. Ruskin was an influential art critic and social commentator who vehemently criticised the alienating and destructive effects of industrialisation. Ruskin was also a romantic through and through. For the first half of his life, Ruskin regarded nature as ‘a direct revelation of God’s glory’. He delighted in all natural phenomena, especially clouds and mountains. As David Carroll notes, too, Ruskin was particularly troubled by pollution and the

despoliation of nature. He saw this as breaking God's covenant which had granted humanity dominion over the natural world in return for them stewarding its resources. Ruskin emphasised this broken bond, by contrasting what he regarded as 'pure' nature with its defiled state. He often contrasted Arcadian scenery with its destruction. Once, he described a clear, swift-flowing river that had been desecrated by pollution. In contrasting scenes in this way Ruskin relied strongly upon nostalgia, which induced a longing for a lost time or place. Sharpe followed these precepts closely in his own artistic work. Yet, unlike Ruskin, who only criticised the destruction of nature, Sharpe offered solutions and a more positive assessment of human nature. Sharpe recognised that humans could improve nature and even create more beautiful areas than before.

Sharpe, like Ruskin, was deeply concerned about the 'transmission of cultural property'. As Ruskin had written in *The Seven Lamps of Architecture* (1849)

> God has lent us the earth for our life, it is a great entail. It belongs as much to those who come after us, and where names are already written in the book of creation, as to us; and we have no right by anything that we do or neglect, to involve them in unnecessary penalties, or deprive them of benefits which it was in our power to bequeath.

Sharpe's religious beliefs similarly motivated his desire to preserve aspects of the natural environment for future generations, believing that the present generation merely held it in trust for the following. This interpretation is borne out as, in discussing the need to preserve Mount Eden (one of Auckland's extinct volcanoes), Sharpe speculated on 'what what John Ruskin would say could he walk out and see the ravages of the Auckland Goths?' As Sharpe emotionally wrote later in May that year, 'I want Mount Hobson to be a joy forever. I want my children and their children to have the same sentiments evoked which have been evoked in me in contemplating its quiet beauty.'

> 'God help the nation which has no reverence for the sublime and beautiful, its better

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26 Gill Chitty, "'A great entail': the historic environment", in *Ruskin and the Environment*, p.104.

27 Quoted in Chitty, "'A great entail'", p.105.

28 'Spare the Mount', NZH, 28 March 1877, p.3, c.3.
nature has gone our of it.\textsuperscript{29} For Sharpe, then, the preservation of natural areas meant that people should steward the heritage granted them by God, a duty they owed to their children and succeeding generations. Sharpe appreciated wild nature, but so too human improvement of its beauty. Sharpe's vision, while essentially romantic, focused on the betterment and improvement of the human condition. Just as climatic conservationists argued that the reservation, and planting, of forests would safeguard the nation's climate and its agriculture, so Sharpe argued that the preservation of natural areas had a beneficial effect upon humans, particularly upon those living in urban areas.

**Ruskin and Sharpe on nostalgia**

Nostalgia and concern about environmental destruction are evident in Sharpe's view of the role of the artist. As one of the earliest writers on watercolour technique in New Zealand, Sharpe echoed Ruskin's recommendations. Ruskin keenly supported the endeavours of the PRB and, in the five volumes of his *Modern Painters*, advocated a strongly naturalistic style of painting. This is not to say, as George Landow cautions, that Ruskin, notorious for his inconsistencies and dogmatic statements, was arguing that great art could only 'take the form of realistic transcriptions of visual fact'. In *Modern Painters*, began as a defence of the artistic work of J.M.W. Turner (1775-1851), a romantic painter concerned with portraying the dynamism of different tones of light. Ruskin highlighted the affinity between this great master and the PRB because he believed that all good art had to begin with nature. Since the painters of the PRB were only just starting out on their artistic education and because they had begun with nature, Ruskin therefore approved of their output.\textsuperscript{30} Ruskin believed in the "'necessity, as well as the dignity, of an earnest, faithful, loving study of nature as she is' " and recognised that artists 'must break free from both the conventions on everyday seeing and those of

\textsuperscript{29} 'Circumspice'. 'The Hills Around Auckland', NZH, 19 May 1877, p.5, c.2-3.

artistic representation. Ruskin, then, urged artists to study nature. He himself belonged to natural history societies and collected fossils, a popular Victorian pastime.

In ‘Hints for Landscape Students in Water Colour’, Sharpe advocated a new approach for artists in New Zealand. This work first appeared as a series of articles in the New Zealand Herald and later was republished in 1890 in the Newcastle Morning Herald and Miners’ Advocate. In words strongly reminiscent of Ruskin’s quoted above, Sharpe wrote in ‘Hints…’ that

New Zealand is special and unique and, therefore, it is altogether inexcusable [for artists] to take liberties with it on pretence of improvement. Leave that to artists at home, who, painting hackneyed scenery, depend greatly on novelty for effect, and strive to reproduce Nature here as she is, ere her originality disappears before the combined effects of advancing civilisation and imported vermin and vegetation.

As Ruskin had urged European artists to, so Sharpe pressed New Zealand artists to adapt European painting traditions to the colonial environment. In words strongly reminiscent of Ruskin’s, Sharpe believed they should aim to reproduce ‘nature here as she is’. As Nicholas Thomas notes, colonial artists such as Sharpe, in seeking ‘to create national emblems’ and define colonial culture as native, ‘frequently turned to what was locally distinctive, either in the natural environment or in indigenous culture’. The importance of local environments in shaping both his identity and criticism of environmental destruction is as evident in Sharpe’s paintings as it is in his writings.

A transitory vision: nostalgia in art

Acutely aware of the environmental changes underway in New Zealand, Sharpe believed that the originality of the New Zealand bush was being corrupted by the

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33 ‘Hints for Landscape Students in Watercolour’ is reproduced in full in Blackley, Art of Alfred Sharpe, pp.131-141. Unless referred to otherwise, when I quote from ‘Hints’ I use the transcription found in the above pages. Quote from ‘Hints’, p.141.
importation of 'vermin and vegetation.' With this process to the forefront of his thinking, Sharpe believed it was the duty of artists to record for the sake of posterity this rapidly changing New Zealand environment. Writing in 1884, for instance, Sharpe held that the 'main object' of the newly-formed New Zealand Art Students' Association should be to preserve for posterity the features of the New Zealand bush, now rapidly disappearing before the cattle of the settler, the axe of the bushman, and the spread of imported vermin. It also aims at preserving for posterity the features of the old picturesque Maori life, that are so rapidly passing away for evermore, so that future generations can see them vividly reproduced on canvas or paper...\(^\text{35}\)

Nostalgia, a sense of the loss of purity of the New Zealand bush, and concern with literal depictions of nature as it appeared to him are evident in two artistic works on which I focus: Burial Place of Hone Heke, Bay of Islands (1888) (Figure 3.1) and Entrance to Cadman's Creek, Coromandel (1880) (Figure 3.2). In the first watercolour, a ghostly Māori figure clad in traditional pueru (cape), possibly even Hone Heke himself, passes over the historical site of Heke's grave. In the foreground is a cleared area which, as Sharpe later described, 'had been exterminated by cattle'.\(^\text{36}\) Foxgloves and possibly European grasses grow in the foreground.\(^\text{37}\) It is likely that Sharpe deliberately painted these European plants both to show the environmental transition underway within the New Zealand environment and to emphasise that the nature he painted, quite literally, was being altered before his very eyes. In this, Sharpe's intent differed significantly from that of other contemporary colonial artists.

The New Zealand Company (NZC), for instance, deliberately commissioned works of art as propaganda to attract migrants. Charles Heaphy's topographical landscapes flattened out Wellington's hills, presenting benign images of the future capital.\(^\text{38}\) Provinces and the national government also used art to attract migrants. Edward

\(^{15}\) NZH, 26 April 1884, p.6.
\(^{36}\) 'Water Colours at the Exhibition', NZH, 21 April 1883, p.6.
\(^{37}\) Blackley, Art of Alfred Sharpe, p.68.
\(^{38}\) Marian Minson, 'Promotional Shots: the New Zealand Company's Paintings, Drawings and Prints of Wellington in the 1840s and Their Use in Selling a Colony', in Edward Gibbon Wakefield and the Colonial Dream: A Reconsideration, Wellington, 1997, pp.159-166
Figure 3.1 Juxtaposing new against old, Sharpe painted this evocation of environmental and human change through the portrayal of a Māori figure clad in traditional dress. The figure and his setting, amid New Zealand’s forest, contrasts with the newly acclimatised plants in the foreground. These new plants are literally pushing New Zealand plants and people into the distance, a measure of the worry Sharpe expressed at such change.

Alfred Sharpe, ‘Burial Place of Hone Heke, Bay of Islands, 1885’, watercolour, 617 x 455 mm, TP, B.041287, 1977-0027-1.
Figure 3.2 Sharpe’s concern with attention to detail and, as he put it, ensuring that he painted ‘nature here as she is’, is evident in this painting of a log jam on Cadman’s Creek, Coromandel. On the back of this painting, Sharpe noted that the image presented ‘a faithful delineation’ of the scene.

Alfred Sharpe, ‘Entrance to Cadman’s Creek, Coromandel’, 1880, watercolour, 443 x 667 mm, in Blackley, *Art of Alfred Sharpe*, plate 13, p.45.
Immyns Abbot's ((17?-1849) views, for instance, promoted Otago.39 Nicholas Chevalier's (1828-1902) did the same for Canterbury.40 Even artists such as George O’Brien (1812?-1888), whose aim was not propaganda, painted idealised and celebratory views cataloguing Dunedin’s progress.41

Indeed, there were many ways of looking at nature. Although not necessarily promoting nature preservation, artists often advanced nationalistic sentiments.42 In the United States, for instance, many landscape artists, including Thomas Cole (1801-1848), celebrated the transformation of ‘virgin’ landscapes with monumental works portraying wild nature while also rejoicing in its domestication. Cole advanced his paintings of nature as free of the hackneyed conventions of European art. His attitude symbolised both America’s different nature and American independence from Britain.43 Nor did exploring nature necessarily entail adopting a naturalistic artistic style, as Cole and Sharpe had. In Australia, artists of the Heidelberg School, founded near Melbourne in the 1880s, sought to use a European convention – Impressionism – to encourage interest in Australia’s nature.44 Earlier, the work of J.M.W. Turner had been concerned with evoking movement and the emotional experience of nature.45 As noted in the introduction, too, there were many ways of viewing deforestation. Some painters and photographers felled trees to create more aesthetically pleasing results. Others portrayed deforested landscapes not as protests at what had taken place but as celebrations of the triumph of progress and the domestication of wild areas.

In Sharpe’s Burial Place of Hone Heke..., the turned-away face of the figure has double significance. Looking away from the viewer, it almost merges with the forest.

45 On the fascinating ways artists explored landscape, nature and environment, note Andrews, Landscape and Western Art, pp.176-199.
This pose suggests an affinity between the native forest and the native person (see below). Sharpe’s figure also turns away literally and metaphorically both from European plants and European viewers. Sharpe exhibited *Burial Place of Hone Heke*... alongside two other works in the April 1883 exhibition of the Society of Arts. Potential buyers and appreciators who viewed his paintings would most probably have been European.\(^\text{46}\) I interpret this painting as symbolising the way European plants and people were pushing out Māori. As Sharpe did, the figure he depicted sought solace in the New Zealand bush.

Sharpe employed other compositional techniques to achieve this same effect of portraying the transitory state of nature. In *Among the kauri, Castle Rock, Coromandel* (Figure 3.3), for instance, Sharpe painted what appears to be an as-yet unsullied nature. A clump of kauri trees, their trunks spare, straight and white, vertically dominates the left foreground. In the right foreground, two lean kauri stretch upwards. A rocky promontory rises in the middle distance and balances out these two clumps of framing trees in the foreground. Conspicuous by their red and blue tops, the two small figures (both saw millers) placed in the foreground are dwarfed by the sheer size of the kauri. The message here is clear: within a short time those stately kauri will be cut down. Even for the contemporary viewer, this image, like that of the later, *Burial Place of Hone Heke*..., is an ephemeral one. Even at the time of its exhibition, the nature portrayed in the painting only existed in the studio. Outside it, these trees no longer lived, this scene no longer existed.

Sharpe portrayed the after-effects of deforestation in other images. *A golden eve, Waiheke Island* (1885) (Figure 3.4), has two Māori figures placed in the middle distance. Dressed in capes as in *Burial Place of Hone Heke*..., they survey a deforested scene. One figure outstretches his hand, as if to lament the destruction that has taken place. Perhaps, though, Sharpe’s most devastating critique of environmental destruction comes from an illuminated address he prepared for the departing manager of the Sulphide Corporation smelting works at Cockle Creek, Newcastle (Figures 3.5 and 3.6). These images accurately portray an utterly desolated and destroyed landscape, which compares closely with photographs taken shortly after Sharpe painted the images (Photograph 3.2). Dead,

\(^{46}\) On the exhibition of *Burial Place of Hone Heke*, see Blackley, *Art of Alfred Sharpe*, pp.62-63.
Figure 3.3 Sharpe often travelled with timber millers into previously un-felled forests and it is probably by this means that he gained access to this area of Coromandel. As with many of Sharpe’s paintings, he presents a landscape about to undergo vast change. Although the two figures of the sawmillers are dwarfed by the sheer size of the kauri, it is clear that many of these trees painted will no longer be standing.

Alfred Sharpe, 'Among the kauri, Castle Rock, Coromandel', 1884, watercolour, 532 x 883 mm, in Blackley, Art of Alfred Sharpe, plate 26, p.74.
Figure 3.4 Two Māori survey the effects of deforestation on Waiheke Island.

Figure 3.5 Another view of the works and its effects on the surrounding area.

Figure 3.6 Sharpe presents an image of utter environmental despoliation caused by the Sulphide Corporation smelting works, Cockle Creek. In the background is evidence both of the plant’s insatiable demand for timber and the effects of its pollution on trees.

Alfred Sharpe, ‘Near view of smelting works, with several men at work, 1902’ from larger illuminated address, 1902, black and white photograph of a watercolour. Original measurements 10.4 cm by 17.7 cm. ‘Lent for copying by Miss G. Savage, November 1977’: Permission obtained from Miss Savage by author, ML, PXB174, folio 4.
Photograph 3.2 A dismal scene of dead, skeletal trees and a polluted sky testifies to the environmental cost of producing sulphide.

Creator: Ralph Snowball, ‘Sulphide Works at Cockle Creek’, 28/03/1903, NPL001010010154.
skeletal trees lie about the landscape, poisoned by the toxic fumes pouring out of the factory. A contemporary’s letter expresses this fact as well as the contempt that many of the factory owners had for the frightening environmental consequences of the aluminium production. H.L. Gibbs, a supporter of the project, wrote to merchant banker F.A. Keating, that ‘I only hope the atmospheric horrors you so graphically described (red rain etc.) portend the successful working of the’ plant.47

Native nature and people

Sharpe’s concern about and the connection he made between the fate of Māori and the native environment is evident in many of his paintings. Such connections occasioned regular comment from ordinary settlers as well as painters and scientists, Europeans and Māori. They also justified the intellectual pursuit of ethnography and collecting (see previous two chapters).48 Many also linked the passing away of New Zealand plants with that of the Māori.49 Unlike many commentators, though, it appears Sharpe did not believe that both Māori and New Zealand plants faced outright extinction.50 As noted in chapter one, for much of the nineteenth century, belief in Māori and faunal extinction was complex. Extinction could mean the intermarriage of Māori and non-Māori just as much as it could refer to the loss of ‘traditional’ aspects of this culture. Sharpe probably did not believe in the imminent death of either Māori or New Zealand plants. Instead, he simply believed that both were rapidly changing, hence his call for artists to strive to faithfully record scenes before these changes took place. Indeed, Sharpe actually promoted the planting of New Zealand species. In portraying

47 H.L. Gibbs to Keating, 5 February 1896 quoted in Turner, Manufacturing in Newcastle, p.88. For details of the plant, see pp.69-92.
48 The popularity of environmental determinism among western thinkers in the eighteenth century meant that most Europeans viewed the physiological characteristics of people as reflections of the environment in which they lived. On the connection between the portrayal of Pacific People and natural history, see Bernard Smith, European Vision and the South Pacific, New Haven and London. 2nd ed., 1985; Smith, Imagining the Pacific in the Wake of the Cook Voyages, Carlton (Victoria), 1992.
49 As Leonard Bell shows, for instance, the idea that artist should record for posterity the extinction of traditional Māori culture was suggested as early as the 1850s but was pursued by artists only from the 1890s. Leonard Bell, Colonial Constructs: European Images of Māori, 1840-1914, Auckland, 1992, pp.147-194.
50 There is one exception to this view. As Sharpe noted in 1891, ‘I never go into the forest without seeming to hear from every bosky covert of virgin greenery the sad, sad words, ‘Morituri te salutant’ – ‘Those about
Māori people in this manner, though, Sharpe typified other painters of the time. As Thomas notes, many artists presented ‘a dehistoricized indigenous population in sombre terms’ to reflect the transitory nature of their tenure on land, and even to symbolise that they would soon be gone.\(^5\) Like other European artists painting in both Australia and New Zealand, too, Sharpe, although recognising the presence of Māori in New Zealand, avoided both painting and indeed mentioning Aboriginal people.\(^5\) It is likely Sharpe did not describe or paint Aboriginal people because there were simply none in the Newcastle area. Studying another New Zealand settler, Mary Stewart has found that William McCaw, resident in South Otago, hardly mentioned Māori because he did not come into contact with any.\(^5\)

### A ‘truthful and exact representation’ of nature

Another important way of expressing nostalgia came through Sharpe’s belief that artists in New Zealand should faithfully render a scene as it appeared. For *Burial Place of Hone Heke* (Figure 3.1) and the other painting exhibited alongside it, Sharpe explained that he ‘was determined to give a vividly truthful and exact representation’ of the scene. ‘I spent infinite pains over the sketches, regardless of time, and made copious notes also,’ he continued, ‘and I flatter myself that they were as close reproductions of the scenes as is possible on paper’. Critics who, he continued, took issue with the colouring and detail of *Burial Place of Hone Heke* ‘prevent faithful reproductions of the special or historical scenes peculiar to this country’.\(^5\) As art historian Roger Blackley notes, concern for rendering nature in a naturalistic manner is one of the main characteristics of Sharpe’s artistic style.\(^5\) It is particularly evident in *Entrance to Cadman’s Creek, Coromandel* (1880) (Figure 3.2). Sharpe labelled the painting as

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\(^1\) Water Colours at the Exhibition’, p.6. On artistic criticism of Sharpe’s style in *Burial Place* and other works, see Blackley, *Art of Alfred Sharpe*, pp.57-64.

\(^2\) Thomas, *Possessions*, p.65 and Bell, *Colonial Constructions*.

\(^3\) Thomas, *Possessions*.


\(^5\) Thomas, *Possessions*, p.65. On artistic criticism of Sharpe’s style in *Burial Place* and other works, see Blackley, *Art of Alfred Sharpe*, pp.57-64.

\(^6\) On this note, Blackley, *Art of Alfred Sharpe*, pp.89-93.
A faithful delineation of the scene, down to the smallest objects – it gives a life like idea of the general appearance of the entrances to the mountain gorges of the Coromandel peninsula; & shews [sic] the way in which the stranded logs lie in the creeks, waiting for the next flood to carry them further down towards the booms.

Sharpe drew attention to the bush that had been burnt off, highlighted where new life was springing up and described the effects of flooding on the landscape; all in addition to labelling each New Zealand plant in the scene. To achieve this accuracy, as noted above, Sharpe followed the maxim of John Ruskin, who urged artists to study nature and who himself belonged to natural history societies. Sharpe, similarly, drew attention to the importance of scientific studies of nature in aiding artists. Sharpe belonged to the Field Naturalists' Club, which undertook botanical excursions in the Auckland area. In his 'Hints for Landscape Students in Watercolour', he also extolled the necessity of artists knowing geology, to better understand and thus better paint nature.

**Acclimatisation**

One of the main drivers of environmental change was acclimatisation. Sharpe's attitudes towards this process were complex. He criticised acclimatisation because it was changing the New Zealand environment and because it had failed to bring about the promised improvements in settlers' lives. Yet, he also valued certain introduced species, such as oaks, colourful, flowering plants and birds for hunting. And, Sharpe introduced trees native to New Zealand into Newcastle.

In 1876, Sharpe mocked the Acclimatisation Society of Auckland by drawing attention to the ineffectiveness of its endeavours. Sharpe pointed out that, in 1875, the Acclimatisation Society had received over £1000 from game licences. The advantages of which reaped, he listed sarcastically, '40 partridges (nearly all cocks), 4 plover, 18 hedge-sparrows, a quantity of seeds', along with young fish (nearly all of whom died). In conclusion, Sharpe noted that: 'It is questionable if Sir Julius Vogel could have expended

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56 Sharpe's manuscript label quoted in Blackley, *Art of Alfred Sharpe*, p.44.
the revenue of the Society in a more lavish manner.\(^59\) (Sharpe was referring to the
criticism that Vogel’s development schemes attracted over the extensive state borrowing
required to fund them.) Later that month, Sharpe delighted that someone else had referred
to sparrows as ‘“miscreant birds.”’ ‘[T]he word “miscreant”,’ he noted mischievously,
‘is more applicable to that society that would persist in forcing these “little cusses” down
the throats of the people in spite of their almost unanimous protests? Yes, verily! Them’s
my sentiments.’\(^60\)

Sharpe also enjoyed hunting birds. In Mangapai, for instance, he recorded that he
and his colleague shot ‘a pretty green parrot’; later he described how they used to catch
sharks in Mangapai River.\(^61\) In 1893, he recommended the introduction of stuffed male
and female birds into Newcastle’s museum, noting, that ‘I myself have shot no less than
20 varieties of birds in a single day within 10 miles of our post-office’.\(^62\) Yet, Sharpe, in
criticising the ‘grandmotherly character’ of Australia’s ‘Birds Protection Act’,
distinguished between indiscriminate protection of edible birds and those which required
conservation. Native animals, he noted, should be conserved since they are ‘unique’.\(^63\)
Clearly, Sharpe enjoyed hunting, so did not want this past time taken away from him by
legislators. Similarly, Sharpe’s attitude towards hunting remained constant in both the
Auckland region and Newcastle.

The Auckland Acclimatisation Society kept aviaries and maintained gardens in
the Auckland Domain. Perhaps inevitably, its activities drew Sharpe’s vitriol (Figure
3.7). Sharpe pointed out that a private society should not be using a public domain as a
source of revenue. Not only was this unjust, he complained, but it also discriminated
against the poor.\(^64\) For Sharpe, gardens should be democratic spaces, open to all members
of society, not just the wealthy. Sharpe agreed with another letter writer who had
complained about the waste of time and money after visiting them.\(^65\) According to

\(^{59}\) Blackley, *Art of Alfred Sharpe*, pp.43, 85.
\(^{59}\) NZH, 13 March 1876, p.3.
\(^{60}\) NZH, 24 April 1876, p.3, c.5.
\(^{61}\) NNZS, 2, 1 (January, 1883), p.7; NNZS, 2, 3 (March, 1883), p.71.
\(^{63}\) Alfred Sharp, ‘The Birds Protection Act’, NMH, 17 May 1893, p.8. Elsewhere, he criticised the
\(^{64}\) NZH, 23 February 1876, p.3.
\(^{65}\) NZH, 1 August 1876, p.6.
Figure 3.7 Sharpe presents a calm and benign image Waitemata Harbour, Auckland. In the foreground is Auckland Domain, of whose management Sharpe expended much energy criticising.

Alfred Sharpe, 'Devonport and the Waitemata Harbour from the Domain', 1877, watercolour, 415 x 620mm.
ATL, C-126-001.
Sharpe, ‘sixpence expended in visiting such a miserable exhibition of flora and fauna is
sixpence indeed wasted, and in fact I think the directors should pay visitors for loss of
time … no one sane would make a second visit’. 66

Sharpe’s vehement criticism of some introduced plants and animals was quite
unusual for his time. In the 1870s, acclimatisation was still widely accepted as a
necessary and useful endeavour. It furthered European agriculture and provided food,
ornament and recreation. Indeed, to underline that Sharpe’s views were uncommon, at
the same time he was crusading against acclimatisation, one writer to the New Zealand
Herald complained of the scarcity of rabbits in his area. 67

As noted earlier with his belief that artists had a duty to record an ephemeral New
Zealand nature, Sharpe’s critique stressed the destruction that these misplaced plants and
animals had caused. Yet, Sharpe’s ideas were complex. They do not corroborate either
with the present-day glorification of the native flora and fauna or the corresponding
vilification of all things non-New Zealand. 68 Indeed, Sharpe advocated the improvement
of nature through artifice at the same time as he stressed the need to preserve ‘wild’
areas. First and foremost, Sharpe judged a plant according to its beauty and rarity.

**Saving urban areas**

According to Sharpe, art could embellish artifice by bringing nature to the city.
Just as he eulogised the local rural areas in and around Auckland, so he did the built
environment, particularly of his beloved Auckland. ‘Beautiful art thou, Auckland,’ he
wrote in 1879:

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Thy city of the sea.
Thy terraced slopes rise swelling from the wavelets
That murmer unto thee. 69

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66 NZH, 5 August 1876, p.3.
67 NZH, 19 February 1876, p.5, c.6.
68 On this peculiar phenomenon, see Ross Galbreath, ‘Displacement, Conservation and Customary Use of
Native Plants and Animals in New Zealand’, NZJH, 36, 1 (April 2002), pp.36-50. For a similiar, though
more subtle approach, note Geoff Park, ‘Our Terra Nullius’, Landfall, 204, (Spring, 2002), pp.53-67.
69 Alfred Sharpe, ‘Auckland’, NZH, 9 August 1879, p.3.
He believed that certain urban spaces should be reserved and improved through the adoption of artistic garden designs. As noted above, Sharpe particularly appreciated contrasts of light and darkness produced by the form of a plant, in addition to its colour and, most crucially, its rarity and age. For Sharpe, the older and rarer the plant, the better it was. Beauty, it seems, led him to champion the planting of many Eurasian and American species, to exhort the protection of unique European trees and to decry the destruction of anything beautiful. Like Ruskin, Sharpe abhorred ugliness.\footnote{On Ruskin’s abhorrence to ugliness, note Clark, Ruskin Today, p.135.}

Through the addition of pathways and vegetation, he believed, natural areas could be improved. These concerns are most apparent in campaigns to save Mount Eden and Mount Hobson from development. Mount Hobson’s campaign is discussed above. In 1877, writing as ‘One Interested’ Sharpe drew attention to ‘the wholesale destruction of that beautiful mountain [Mt Eden], which is one of the most delightful spots near Auckland’. Mt Eden, noted Sharpe, ‘could be made far more beautiful by making serpentine walks, interspersed with trees and shrubs, and a favourite place of resort to all holiday makers.’ Sharpe played up its closeness to the city and its ‘salubrious air’.\footnote{One Interested, ‘Mount Eden’, NZH, 19 March, 1877, p.3, c.6.} Just over a week later, Sharpe again pleaded for its conservation. ‘[W]ere such a hill’, he wrote, ‘in the environs of any city in Europe, it would be husbanded with the greatest affection and care’. He also appealed to local rivalries. Christchurch’s residents, he chided, would certainly appreciate this area, and so too should Auckland’s. Sharpe speculated that its location would be ideal for ‘a convalescent hospital, an asylum for dipsomaniacs, or a new home for the destitute children’. Part of it, he continued, could be set aside as an educational farm.\footnote{‘Spare the Mount’, NZH, 28 March 1877, p.3, c.3.} ‘The day will yet come’, he wrote prophetically, ‘when the future inhabitants of this city will bless us for its preservation.’\footnote{‘Spare the Mount’, NZH, 28 March 1877, p.3, c.3.}

Elsewhere in Europe, America and Australia, societies were emerging with the aim of creating parks and preserving aspects of the natural environment. As noted above, Ruskin’s romanticism inspired a number of conservation movements in Britain.\footnote{74 In continental Europe, romantic movements sprang up with similar goals. In many areas of}
Germany, for instance, they emerged out of a fierce desire to celebrate the goodness and purity of German culture and its homeland through the preservation of historical sites and areas of nature. In Australia in 1884, the Kalizoic Society was founded with the aim of preserving what was beautiful and healthy in the city of Melbourne. As in Germany and the United States, a division often developed between the protection of nature and the betterment of urban environments. Yet Sharpe embraced both aims, suggestive of his belief that beauty could both be derived directly from nature and contrived by humans. In this sense, Sharpe followed the views of many earlier park designers in Australia, such as William Guilfoyle (1840-1912) who had attempted to improve the health and beauty of Melbourne and Sydney from the 1870s. Guilfoyle, like Sharpe, created hybrid environments by using native and introduced species in European-style gardens. For instance, in Melbourne Botanic Garden, Guilfoyle fashioned ‘a stunning ensemble’ of sub-tropical plants within a more traditional aesthetic.

Sharpe’s promotion of urban conservation and improvement complicate present understandings about early urban conservation in New Zealand. Paul Star and Lynne Lochhead have studied urban preservation societies in New Zealand. Emerging after 1888, they regard these groups as the first urban conservers of historical sites and indigenous forest. According to them, ‘for a few, concern went beyond the purely

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74 See, also James Winter, Secure from Rash Assault: Sustaining the Victorian Environment, Berkeley and Los Angeles, 1999, pp.189-208.
76 Bonyhady, Colonial Earth, pp.219-247.
77 Ott et al., ‘Über die Anfänge’, p.48.
78 See, Paul Fox’s brilliant Clearings: Six Colonial Gardeners and their Landscapes, Carlton (Victoria), 2004.
utilitarian. However, Sharpe’s endorsement of protection for both introduced and indigenous plants in the 1870s predates the formation of these groups. His views of the importance of both indigenous and introduced nature also complicate the views of those historians who see conservation as springing wholly from interest in indigenous nature. The example of Sharpe and the urban reforms discussed in chapter two present a more nuanced picture of the views of nineteenth century settlers.

Observing of the nineteenth century, Star holds

that some early settlers regarded the scenery, the flora and the fauna with interest. But perhaps most often, and more simply, people had no emotional investment in it one way or the other. The bush and the wetlands were in the way and had to go, and that was that. 

As noted in the introduction, Star points to the growth of urbanisation and nationalism, an increasingly New Zealand-born European population and greater leisure time as factors which, particularly from the 1890s, led settlers to value and protect New Zealand nature. As he puts it, near the end of that century, ‘the indigenous remnant had begun to capture the hearts of the settlers.’ Star correctly identifies the growth of nationalism as an important factor in the development of conservation of New Zealand flora and fauna. Yet, he juxtaposes earlier indifference with later appreciation, thus implying that appreciation could not coexist with destruction. He also implies a radical disjuncture between indigenous and introduced nature that really does not appear to have meant so much to settlers.

Thomas Dunlap also has written about the rise of nationalism and nature conservation in New Zealand in relation to that which occurred in Australia, Canada and the United States. He argues that, towards the end of the nineteenth century, early settlers’ actions of conquest and destruction were giving way to appreciation of native nature. Dunlap’s suggestion of a sea-change around 1890 implies that, because earlier

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82 Star, 'From Acclimatisation', pp.217-228.
83 Star, 'From Acclimatisation', p.246.
settlers were changing the environment, they did not appreciate the natural world. In fact, settlers’ environmental actions in transforming the land fed anxieties about species and landscape loss. Hence, environmental change often coexisted with appreciation, even from the early years of colonisation. Right from the first days of exploration in the eighteenth century, Europeans admired the beauty of the New Zealand environment, often by applying European aesthetic conventions to this nature.85

Local and national ideas of nature

Sharpe’s vigorous campaigns for the protection of special nature in New Zealand and Australia encompassed only the areas that he knew. His campaigns were essentially local in vision, although sometimes national in appeal. In 1886, for instance, Sharpe wrote imploringly to the Observer and the Free Lance of the need to preserve kauri trees. Many kauri trees are being lost, noted Sharpe, thanks to the:

short-sighted greed of landed proprietors on the Waitakerei [sic], who have exterminated almost every accessible kauri tree of any value as a show tree ... within a short quarter mile from the station there were seven or eight magnificent kauri trees. These trees have, one by one, departed this life to be boards in the timber yards, which isn’t far better. A group of two or three still remained at his last visit; and entering into conversation with the bushmen there, one of them stated that he thought the owner would keep those two trees. The foreman, however, said that they would be both in Auckland next week ... Would it not be wise to reserve at least one of the best clumps there, so that the next generation may see what kauris were like? Then, there is the magnificent Puhipuhi kauri forest. Could not Government be induced to reserve a few hundred acres of the best of it, so that future generations may arise and call us blessed? The American Government have reserved very many square miles of country, under the name of the ‘Yellowstone Park’, solely for its natural wonders, both mineral and vegetable; and surely our Government might reserve a single beggarly square mile of about the only existent uncontaminated

kauri forest we have. The kauri will be utterly extinct in twenty years more, unless some are reserved for posterity.  

Sharpe echoed his occasional nationalist appeal in Australia. In 1890, Sharpe re-published his ‘Hints for Landscape Artists in Water Colour’ in the *Newcastle Morning Herald*..., giving it an Australian bent by substituting references to New Zealand with those of Australia or Australasia. In 1901, too, he labelled his watercolour, *The last dying remnant of the grand ti tree forests, between Adamstown and the Glebe*, as an area ‘which should have been preserved and reserved as a fine park when the Government appropriated our 3,000 acre reserve.’

His concerns reveal the importance of local and international factors in shaping his ideas about nature and influencing nationalism. As Rollo Arnold notes of the 1880s and 1890s, settler identity was complex. Provincial attachments, along with a ‘continuing affection for the distant homeland, remained stronger than the various other competing frames of reference, which included federation, nationalism, even provincialism and Pacific federation.’ Identity need not be exclusive. As Arnold illustrates, settler identity was often multiple. Nor did it even have to be limited to this world. In the case of some colonists, their frame of reference was not earth but Heaven.

Like many Australasian settlers, experience of local environments shaped Sharpe’s understanding of his world. Deforestation around Auckland and later Newcastle spurred his concern with local nature. As explored below, Sharpe also drew his frames of reference from the local worlds of his youth as well as the international ideas of romanticism and specifically those of Ruskin. Sharpe’s ideas thus tie into and extend the views of Rollo Arnold of 1880s New Zealand. Arnold found that the ‘settler community was essentially a village world, but a village world that was responding to

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86 OFL, 2 January 1886, p.11.
90 As Mary Stewart shows, William McCaw, a nineteenth century Scottish settler to New Zealand, identified himself first and foremost as living in a Christian world. Stewart, ‘Notes from New Zealand’.
91 Thomas, *Possessions*; Stewart, ‘Notes from New Zealand’.
ideas and influences that were global in the scope of their origins. Yet Sharpe relied not on one local world, but many. These were those of his youth, and the areas around Auckland and Newcastle. From these local environments Sharpe extrapolated his national arguments. It is interesting to speculate on what he would have made of, say, Central Otago’s virtually treeless interior or Canterbury’s vast flatness, both environmentally different areas from the Auckland and Newcastle areas. Would he have accepted these areas as aspects of national nature or did his vision merely extend to forested landscapes? Just like the many settlers who viewed forests and temperate climates as the norm, so Sharpe viewed the forested landscapes around Auckland and Newcastle as acceptable and typical aspects of nature.

Sharpe’s conceptualisation of space also offers a different political, though not geographical, conception of his environment than those expressed by earlier settlers. Sharpe regarded urban nature as under the control of urban authorities. Sharpe believed the area outside of this jurisdiction was controlled by government and hence representative of the national domain. Yet, quintessentially, Sharpe’s vision remained local and from this local vision he drew his nationalism. This is indicated as much by what he said as what he did not. He passed no comment on the overall state of New Zealand’s forest supplies, as many contemporaries did (see following two chapters). Nor did he engage with other contemporary environmental issues in New Zealand, such as fears of a timber famine. He did not, for instance, promote the development of parks outside Auckland or Newcastle.

**Urban tree planting**

The importance of local environments is clearly seen in Sharpe’s concern about Auckland and Newcastle. Sharpe fervently believed that tree planting improved urban environments. Viewing trees as ‘the most beautiful and useful of God’s creations’, Sharpe believed their introduction into Newcastle had improved that ‘bare and uninteresting town’. In Auckland in the 1870s and 1880s, Sharpe had penned strong

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93 ‘Tree Planting in Hunter-Street West’, NMH, 31 October 1893, p.3.
criticism of the methods of tree planting adopted by the council. In 1876, for instance, he noted its poor choice of oaks as street trees and drew attention to the incorrect methods of planting adopted by the council. The reply from the nurseryman criticised, C.T. Wren, was terse and dismissive. Wren suggested 'that "Arboricultus" might appropriately shorten his nom-de-plume by dropping the "cultus" portion of the' name, thus leaving behind what he was, a wooden-head. Undaunted, Sharpe continued to criticise the methods of tree planting adopted by the council.

He reserved particular opprobrium for the managers of Auckland Domain, the subject of one of Sharpe's watercolours (Figure 3.7). In 1880, for instance, Sharpe (writing as 'Asmodeus') assailed against 'the monstrous vandalisms now being perpetrated in the Domain, under the name of arboriculture'. In a subsequent letter, Sharpe listed a litany of arboreal misdeeds. These included the cropping of 'hundreds of fine young oak trees into imitation cauliflowers, and generally ... [turning] the loveliest part of the Domain ... into the similitude of the abomination of desolation, spoken of by Daniel the Prophet'. 'It is time', thundered Sharpe, 'for Mr. Mitford, [the Director of the gardens] and others like him, to understand that the days are gone by when Aucklanders will placidly submit to the playing of such vagaries with their heritages [sic], especially by one who openly professes, with cool insouciance, his utter ignorance of the commonest principles of arboriculture or landscape gardening. Sharpe's final comment took advantage of the hapless Director's earlier admission that, although he had no experience as a forester or landscape gardener, he had nevertheless taken the correct steps based on 'advice from those who had some experience with those matters.'

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94 On the original tree planting on Wellesley street East and Symonds street, note NZH, 8 August 1876, p.3, c.1. Sharpe felt evergreens were best suited for boulevards, citing Paris as one famous example of this. According to him, saplings in Auckland required a fence of at least six feet in height to protect them 'from bipeds as well as from quadrupeds'. NZH, 9 May 1876, p.3. Sharpe recommended that each tree should be planted into a hole 3 feet square and deep, and filled with good soil, so as to protect its growth. Arboricultus, 'Arboriculture in Auckland', NZH, 12 August 1876, Supplement, p.1, c.5-6. Note also Arboricultus, 'Tree Planting in Auckland', NZH, 24 August 1876, Supplement, p.2, c.1-2.
95 'Tree-Planting in Auckland', NZH, 15 August 1876, p.4. Note also Wren's reply to Sharpe's continuing criticism. NZH, 25 August 1876, Supplement, p.1, c.6.
96 NZH, 5 October 1880, p.6.
97 NZH, 12 October 1880, p.6.
98 NZH, 12 October 1880, p.6.
In 1876, Sharpe attacked 'the substitution of karaka trees for the fine old oaks so wantonly destroyed in Government House grounds' on aesthetic grounds. 'The oak', he wrote, 'is always picturesque, - whether in winter, with its gnarled and twisted branches; in spring, with its lovely green frondage; in summer, with its massive leafage and shade, and in autumn, with its rich colouring of russet and yellow. To compare that with the never varying, stiff, awkward looking, dark green karaka is an absurdity', he concluded. Oak trees, moreover, harboured strong memories. They 'are endeared to us by old associations as reminiscences of old England', he noted. What is more, he continued, they have 'taken 25 years to grow, and are unique in the colony and irreplaceable in our generation, while karakas ... can be seen by groves any day, in many parts of the country.'

Sharpe measured the value of trees by their appearance and rarity and by the fact that they stood as living symbols of past memories. As Simon Schama and others have shown, for centuries in European culture trees have served as important repositories of memory and meaning.

In 1884, possessed by 'Asmodeus', Sharpe drew attention to the 'arboricultural controversy' over trees along Hobson street, Auckland. As he put it, 'The arboricides [sic] claim that the trees are a nuisance and obstruct business, while the oppositionists [sic] say they are things of beauty, and joys for ever.' Sharpe's reference to '[T]hings of beauty, and joys for ever' comes from John Keats (1795-1821) unfinished poem, 'Hyperion'. Sharpe also mentioned that 'the fine old poplars' at St. Paul's are rumoured...
to be facing destruction and consequently implored 'them to spare those two trees, which are the finest and the oldest in the province.' Nearly six months later, Albin Martin (1812/1813?–1888), a fellow artist and, ironically, one of Sharpe's most trenchant critics, highlighted what had become of those trees. Martin protested against the destruction of 'those popular poplar trees near St. Paul's Church', which were some of the finest of their kind I have ever seen. We have no elms in this province of any importance, but these poplars were almost, if not quite, as beautiful as elms. Mr. Ruskin, if I recollect rightly, says that the poplar is the most picturesque and graceful of all trees.

Martin then recorded their historical importance and significance to Christian and English history, ending his speech with a denunciation of the 'ignorance and bad taste' of whoever had taken the decision to cut down the trees. Naturally, of course, Martin's words pricked Sharpe into action. Five days later an anonymous comment appeared on this topic, judging from its style and content, written by Sharpe. Sharpe supported Martin, calling their removal 'an act of unmitigated vandalism', but, by questioning Martin's discussion of Ruskin, could not resist taking a dig at his long-time rival.

**Promoting tree planting in Newcastle**

In Australia in the 1890s, Sharpe continued his criticism of council deforestation, and discovered a new tree foe, the larrikin. In 1893, for instance, he railed against 'a horde of larrikins' who had destroyed the trees along Pacific Street. While in Newcastle, Sharpe also enthusiastically promoted the introduction of New Zealand trees, particularly the pohutakawa, karaka and the puriri. Such acclimatisation possibly

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103 'Trees in Streets', NZH, 29 August 1884, p.3, c.7.
104 Martin took odds with Sharpe's emphasis on artistic naturalism and criticised him publicly for this. On this rather public and prolonged spat, see Blackley, *Art of Alfred Sharpe*, pp.59-63.
107 NZH, 28 February 1885, p.6.
108 On his travails against the destruction of trees by the council, see, for instance, Alfred Sharp, 'Arbor Day and Arboriculture', NMH, 7 September 1891, p.5, c.7.
109 Alfred Sharp, "Arboricultural Thugs", NMH, 9 March 1893, p.9, c.7. Note also "Woodman, Spare that Tree", NMH, 19 February 1892, c.6, p.3. Sharpe earlier had encountered the larrikin in New Zealand.
reflected of his homesickness for the colony's forests. In 1891, for example, he commented that: 'For years I have been advocating the planting of the giant myrtle of New Zealand in all exposed places; and the Ironwood of New Zealand in all sheltered places.'

Evidence suggests that the first pohutakawa were planted at some point between the time of Sharpe's arrival in Newcastle and the first few years he spent there (1887-1889). In addition to their beauty, Sharpe promoted pohutakawa because of their ability to survive in exposed places on the coast. Many still survive in Newcastle today (Photographs 3.3 and 3.4), along the old Hill Reserve that Sharpe redesigned and throughout parts of the city. These form a suitable memory of Sharpe's influence in Newcastle.

**Coming to terms with the Australian environment**

By moving from Auckland to Newcastle, Sharpe also came into contact with a different kind of environment. Although attitudes varied, many early colonists found both Australian bush and animals unusual and ugly. Trees that lost their bark, not their leaves perplexed colonists, as did the topsy-turvy nature of the seasons. Artists often faced similar difficulties. As William Swainson confessed to his son in 1851:

> Except on the far horizons, when a slender narrow streak indicates the Blue Mountains, the whole country is either dead flat, or just raised into low unbroken ranges of low hills, covered with brushwood or half-

**Note**

For instance, his amusing poem: Asmodeus, 'Hark, Hark the Larrik(in), with variations', NMH, 15 April 1882, p.6, c.6. See also Censor, 'Those Vandals Again!', NZH, 19 February 1885, p.3, c.7.

110 Alfred Sharp, 'Tree Planting', NMH, 12 August 1891, p.8, c.5.

111 An article of 1889, for instance, mentions that 'Between the oval and the Horseshoe Bend a plantation of trees has been commenced, and among other are some specimens of the New Zealand pohutakawa, a tree which grows to a height of 100ft., and flourishes in this district. To protect the young trees a belt of hardy shrubs has been planted around the plantations, and the plants are growing well.' 'Improvements on the Reserve', NMH, 21 October 1889, n.p. in 'King Edward Park: Photographs and Paper Clippings', in Newcastle Region Public Library LHD 712.5/KIN.


Photograph 3.3 Pohutakawa around the upper part of Hill Reserve, now called King Edward Park.

Author's own photograph.
Photograph 3. Pohutakawa remain a feature of Newcastle's parks and verges, as this recent photograph taken in the grounds of the cathedral show.

Author's photograph.
withered, sickly looking stunted trees, almost defying the artist to make anything tolerable of such subjects.\textsuperscript{114}

Like other artists in Australia such as John Glover (1767-1849), Eugene von Guérard (1811-1901) and Louis Buvelot (1814-1888), Sharpe relied upon more traditional landscape compositions such as the picturesque to look at this nature. The picturesque accorded significance to the composition of a picture, particularly to the use of framing trees, distinct plains and pastoral settings.\textsuperscript{115}

That Sharpe was able to fit the Australian landscape into such aesthetic ideals is reflected in the re-published ‘Hints for Landscape Artists in Water Colour’. As noted earlier, Sharpe gave this series an Australian bent, often by substituting references to New Zealand with those of Australia or Australasia.\textsuperscript{116} The most significant difference between the two versions arose in the last section of the Australian edition, which Sharpe totally re-wrote. Instead of discussing the importance of naturalism and geology, the means of painting trees and some admired painters, as he had in the first edition, in the Australian version Sharpe discussed in detail the Australian bush. He perhaps appealed to some settlers’ dismissal of the Australian bush by rhapsodizing over its qualities. ‘Comparatively few among you’, wrote Sharpe, ‘have seen the real glory and grandeur of the Australian bush.’ Sharpe particularly appreciated the ‘secluded mountain gorges’, in which grew a variety of different species.\textsuperscript{117} Yet, his aesthetic only went so far. Like most artists, Sharpe painted on the coastal littoral. Only in the twentieth century, initially with the work Hans Heysen (1877-1968) and Albert Namatjira (1902-1959), did artists explore Australia’s Red Centre.\textsuperscript{118} Not all of Australia’s coastal littoral, however, appealed to Sharpe. Since he appreciated variety in scenery and plants, Sharpe disliked the ‘open gum


\textsuperscript{115} Mulligan and Hill, Ecological Pioneers, pp.43-44. Unlike Mulligan and Hall, I argue that colonial artists did not simply use the picturesque as a means of presenting the kind of landscape into which they wanted the environment transformed. On the picturesque, see also Gina Crandell, Nature Pictorialized: “The View” in Landscape History. Baltimore and London, 1993, pp.109-160.


\textsuperscript{117} ‘Hints: General Notes’, NMH, 8 April 1890, p.6.

\textsuperscript{118} On this, see, for instance, Mulligan and Hill, Ecological Pioneers, pp.53-71.
forests around us [in Newcastle], which are unutterably wearisome in their unchanging monotony'. This attitude possibly led him, in 1895, to recommend using 'the illimitable quantities of timber at our doors' for Newcastle's street paving or overseas exports. Sharpe advocated the use and destruction of gum timber, because these trees could not be aestheticised into his European artistic conventions quite as easily as New Zealand nature and because these appeared to be in unlimited supply.

**Designing parks: Auckland**

Sharpe's most tangible impact on Newcastle came through his park designs. In New Zealand, although there is no evidence to suggest that he won any competitions to design Auckland's parks (a common practice at that time), it is clear that he regarded himself as something of an expert on this topic. Given this interest, it is likely Sharpe would have submitted some park designs in Auckland. Although none of his designs have surfaced, Sharpe did provide detailed written descriptions of the parks he would have designed in Auckland. These detailed garden designs exemplify Sharpe's aesthetic, the role he thought such areas played in the city and the formative influences that shaped his designs.

For Sharpe, gardens improved unnatural areas such as cities. They provided places in which to exercise, places to enjoy nature and places of good health (see chapters one and two). Sharpe's designs stressed a mixture of wild and designed nature. In 1880, for instance, Sharpe urged the Domain Board to leave 'a little bit of wild and natural woodland here and there, so as to form a contrast with the docked, cauliflowered, and artificial trees of the more open parts.' According to him, they should 'spare a little natural woodland in the secluded portions of the grounds for the artist and the lover of nature to feast their eyes on and to sketch'. In requesting the preservation of 'wild', uncultivated areas of nature, Sharpe followed European artistic conventions of the picturesque, a style originating in the late eighteenth century and which celebrated wild

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119 Alfred Sharp, 'Hints: General Notes'. NMH, 8 April 1890, p.6.
120 Alfred Sharp, 'Newcastle Resources'. NMH, 21 March 1895, p.3.
121 NZH, 2 November 1880, p.6.
and romantic scenery. Sharpe also followed the lead of some English landscape protection groups, who sought to have special areas of wild forest and common ground preserved in cities, believing that these areas had a regenerative effect on individuals worn down by the artificiality of city life.

Alongside appreciation of what he saw as unadorned 'pure nature', Sharpe delighted in the pleasure garden, that "scene of embellished neatness" as landscape designer Sir Humphrey Repton (1752-1818) described such places. "The walks are to a pleasure ground", wrote Sharpe of Albert Park in 1880, ‘what the foundation is to a house.’ ‘All planting’, he recommended, ‘must be done in unison with these .... [and] must, in a great measure, depend upon the ulterior objects the designer may have in view.’ Meeting this objective meant that ‘walks should wind’, vary in length and width. Provision should be made for plenty of seating. Along these walks, he enthused, conifers and ‘many of our New Zealand trees, which from their size, beauty, and variety of form, and rich verdure ... are unrivalled’ should be planted. For shade, he noted, deciduous trees are best: ‘they afford protection from the sun in summer, and in winter their bare stump and branches stand out in bold relief against the verdant foliage of their trees and shrubs. And during the different changes of season, with what pleasure we view the various tints of foliage.’

Sharpe sailed away on a flight of garden fancy, describing the alterations he would make to Albert Park if given the chance. A colourful Italian flower garden, its beds altering each year, he delighted, would give a ‘different effect each time the change is made’. It would be where ‘the lover of flowers can enjoy himself, and also where the invalid can breathe a little fresh air, mingled with the perfume of the surrounding flowers.’ Through these grounds, the male head of the family could take his constitutional, he rhapsodised, ‘and obtain a peep of our magnificent harbour and surroundings, from amongst the trees.’ Sharpe’s design closely followed artistic

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123 Winter, Secure from Rash Assault, pp.189-208.
125 NZH, 1 June 1880, p.6.
126 NZH, 21 May, 1880, p.6.
principles. He wanted walks and plantings to provide views of Waitemata. He also described the health and exercise benefits of the park. The effect of the different hue and textures of foliage delighted him as did, perhaps unsurprisingly given Sharpe’s famous watercolours, the play of light. Sharpe held that, through careful crafting, pleasure gardens would allow for the full flowering of art and nature. It was a fundamental aesthetic vision that eschewed, as Sharpe put it, ‘the villainously regular and mathematically equidistant planting now going on the Barrack Hill under the auspices of the muddleheads’? These aesthetic guidelines reveal that Sharpe fitted New Zealand and other species into the conventions of the European landscape designs. In this sense, Sharpe created a hybrid space of New Zealand and introduced plants.

Sharpe’s pleasure garden closely followed the principles of landscape designer Sir Humphrey Repton, mentioned above. Although Repton worked in the late eighteenth and early nineteenth centuries, his influence continued well into the nineteenth. After his death, many other designers adopted his ideas. Following Repton, Sharpe upheld the importance of prospect. Following Repton, Sharpe upheld that art should prevail over nature. Repton’s influence is unsurprising, because it was one of his followers, Sir Joseph Paxton (1803-1865) who designed Sharpe’s beloved Birkenhead Park (Figure 3.8), which Sharpe visited and appreciated as a youth. Created by Paxton out of 125 acres of low-lying swampy land, Birkenhead Park inspired Frederick Law Olmsted (1822-1903), the designer of New York’s Central Park. According to Olmsted, Birkenhead Park was made up of ‘shady glens, open meadows dotted with trees, rock gardens, cricket and archery grounds, ornamental buildings’, all inter-crossed ‘by winding paths over acres and acres, with a constant varying surface … growing every variety of shrubs and flowers’. Sharpe’s designs incorporated most of these features – variegated scenery, ornamental buildings, winding paths and so on. The vogue for the pleasure garden, and

127 NZH, 2 August 1879, p.5
Figure 3.8 As a youth, Sharpe spent a great deal of his time in Birkenhead Park. Designed by Sir Joseph Paxton, who inspired Frederick Law Olmsted (designer of New York’s Central Park), Birkenhead Park was the first public gardens provided in England by a public authority. Sharpe’s later designs, particularly the winding paths and non-regular clumps of trees and lakes, owed much to the inspiration of this park.

Thanks to Roger Blackley for providing me with this image.
for parks with serpentine paths, areas of ‘wild’ and tamed nature, and irregularly placed clumps of bush, also enjoyed considerable popularity in Australia at this time.\textsuperscript{130}

**Designing parks: Newcastle**

Sharpe’s brought these landscape aesthetics to Newcastle, New South Wales. Entering local design competitions, Sharpe enjoyed considerable success there. He designed or re-designed all the major parks in the Newcastle area. Sadly, these original designs have been lost, but it is still possible to reconstruct them from contemporary descriptions and photographs.

In 1890, Newcastle City Council tendered out designs for improving the 38-acre Hill Reserve (also known then as Upper Reserve, but now called King Edward Park). In late August, 1890, the *Newcastle Morning Herald* proudly announced that Alfred Sharpe, the designer of many other parks around the district, had submitted the prize-winning design for the re-fit of Hill Reserve.\textsuperscript{131} By the 1890s, Hill Reserve was a popular recreation spot for many of Newcastle’s residents, its popularity no doubt helped by the fact that it commanded fine views out onto the Pacific Ocean.\textsuperscript{132} A description of Sharpe’s successful design appeared in the *Newcastle Morning Herald*.

According to the paper, Sharpe’s plan ‘is very simple, and consists in continuing the path from the fountain up to the hill to a centre gate and a top gate on Terrace-street.’ Sharpe’s design gave particular emphasis to recreational walking and demonstrates his belief in the therapeutic value of nature and exercise. As the journalist explained, one path swept ‘round the top of the middle hill between the two valleys’. A branch from this path then snaked ‘down into the upper valley by easy gradients’, crossing the ‘head of the stream by a rustic bridge’. It finished by sweeping ‘round the other side of the valley’ and joining ‘the main path at the cliffs.’ A third formed ‘a promenade overlooking the entire park’ and afforded the walker ‘fine ocean views’. Sharpe’s plan gave prominence to tree planting. The newspaper noted that: ‘Every part of the reserve that will give the slightest

\textsuperscript{130} Fox, *Clearings*, pp.100-143.
\textsuperscript{131} ‘The Hill Reserve’, NMH, 27 August 1890, n.p. in ‘King Edward Park: Photographs and Paper Clippings’, in Newcastle Region Public Library LHD 712.5/KIN.
shelter is utilised for tree planting'. Three dams, each 10 feet high, formed three ponds, which would ‘be stocked with fish, and planted with choice waterlilies’, and around which ‘are thickly planted with hanging woods, which will adorn their barrenness, and which will hereafter be opened up by other paths winding in and out among the trees’. Sharpe’s design incorporated aspects of the formal garden. At the top of the reserve, he envisaged ‘that the upper lawn will be levelled and turfed’. It also incorporated ‘wild’ nature. Near the gully, Sharpe sought to recreate a romantic dell of wilderness, with densely planted trees overhanging the path just past the water feature. Sharpe, too, displayed his love of the pohutakawa, with many of the 800 trees provided for in the reserve, coming from this species. These, as well as Sharpe’s provision for winding paths, demonstrate his debt to Repton, and illustrate that he held the same landscape aesthetic that he held in New Zealand.

Contemporary photographs of Hill Reserve from the period do not do justice to Sharpe’s designs since this park has since been altered. Nevertheless, it is still possible to see the winding paths and formal layout of the upper section of the reserve that adhere to Sharpe’s design (Photographs 3.5 and 3.6). In the photographs, the ground appears bare because the trees have not yet had enough chance to grow. Today, despite extensions and changes to the reserve, Sharpe’s basic design of the upper portion of the reserve remains, as do many pohutakawa (Photographs 3.3 and 3.4). Sharpe also designed other parks in the Newcastle area (Photographs 3.7 and 3.8).

Local and national nature: urban parks as a forerunner for national parks?

National parks certainly arose from pride in national nature, a sense heightened by the rapid loss of areas of native bush and fauna. Yet, they also derived from the longer tradition of park reservation. Settlers set aside areas of urban nature for a variety of

134 These included the addition of 49 acres to the reserve in 1894; the addition of a band rotunda, sometime between 1891 and 1897; in the 1920s, the draining of the gully and changes to the flower gardens at their top; in the 1930s, a re-design of the roads to incorporate the motor car; in 1978, the beginning of significant landscaping of its north-western section and widespread tree planting. See Bagley and Trigger, *Future of an Historic Park*, pp.9-15.
135 See, for instance, Star, ‘From Acclimatisation to Preservation’; Star, ‘Native Forest and the Rise of Preservation in New Zealand (1903-1913)’. 
Photograph 3.5 A crowd of onlookers enjoys a concert given in Hill Reserve, Newcastle, in the early 1900s. Sharpe won a competition in 1891 to redesign this park.

‘King Edward Park Showing Band Rotunda’, NPL00600/00600064.
Photograph 3.6 Another view of Hill Reserve. Note the comparatively bare appearance of the park, a reflection of its use as a sports field. In the middle distance of the picture, game of cricket is being played.

'King Edward Park', NPL/05600/05600282.
Photograph 3.7 Islington Park, Newcastle, in 1906, designed by Alfred Sharpe in the 1900s. As Sharpe would have wanted, children and the infirm are making use of this green space for recreation and recuperation.

'Islington Park', NPL00103/00103642.
Photograph 3.8 Hamilton Park, designed by Sharpe for the family. Note the very formal style of the gardens and the winding paths so beloved by Sharpe. This photo was probably taken before World War I.

"Hamilton Park", NPL14400/14400080.
reasons. Health and recreation figured just as prominently as did acclimatisation and utility. As Sharpe and chapter two demonstrate, settlers also recognised the need to reserve green spaces in urban environments because cities were artificial environments and because its inhabitants did not have direct access to the natural world. Similarly, as more areas of New Zealand came under human control, thanks to agriculture, deforestation and spreading settlement, so many recognised the need to protect ‘natural areas’ within this largely human-controlled environment. With increasing cultivation and other human landscape changes, ‘wild’ spaces, such as the ones Sharpe championed to protect, were becoming fewer and fewer in number.

Ironically, as Sharpe explained, in order to gain access to Australasian ‘landscapes that had never before been painted’, he ‘accompanied timber workers’ to these remote areas of bush.  As art and environmental historian Tim Bonyhady has shown, this was common practise among many artists, including Eugene von Guérand, who painted in both New Zealand and Australia. There is no evidence, however, that as many other artists did, Sharpe cut down trees to improve the prospect for painting.  

Promoting a clean environment

In Auckland and Newcastle, Sharpe campaigned against air and water pollution, and promoted the provision of clean water and a clean environment. These ideas subjects strongly reflected the influence of Ruskin, who railed against pollution and the destruction of nature. In 1872, commenting on council plans for smoke abatement in Auckland, Sharpe argued that: ‘As the object of all good government is to secure the greatest good for the greatest number, it is our bounden duty to do our utmost to secure pure air and pure water for the whole community.’  Sharpe thought that authorities had a duty to provide a clean environment, just as other conservationists argued that it was the duty of government to control environmentally destructive practices such as deforestation.

136 Blackley, Art of Alfred Sharpe, p.94.
Sharpe also expressed concern about the sanitary condition of water and beaches. In 1876, for instance, he decried decaying animal matter near Auckland’s theatre as injurious to health. The following year, he identified the smells near Britomart Hotel as ‘dangerous’. Sharpe expressed the popular idea of miasma, discussed in the previous two chapters, whereby smell indicated potential sources of infection and in which environment influenced health. An 1876 letter of his to the *New Zealand Herald* railed against pollution of Auckland’s harbour from sewerage, and asked ironically:

Surely the above gentlemen members [of the City Council] can clearly demonstrate that the harbour was made on purpose to receive the filth of Auckland. Cannot they boldly assert, “that like cures like,” and therefore, though the filth in the harbour at the present time is a great nuisance, the city authorities sending ten or more times the amount of filth from water closets, will speedily effect a cure...

Sharpe returned to this topic in 1882 in a vicious parody of the ineffectual efforts of the various sanitary boards to improve the city’s health.

Flaunts Fever’s scarlet banner  
O’er Newton and Parnell.  
The gutter whiffings fan her,  
While “Boards” cry, “All is well.”  
The foul putrescence lieth  
On each side of the street,  
And, in each festering backyard,  
Slops welter in the heat.  
The cess-pits belch forth gases  
On fever-laden air,  
And fever-damp unrolleth  
From sewer-gullies there.  
Death grins, ‘twixt each fence paling,  
Upon each passer-by,  
And the earthless privy boxes  
Cry out, “Prepare to die.”

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140 Frank, ‘City Abominations’, NZH, 15 September 1877, Supplement, p.1, c.5. On miasma, see also Verbum Sab., ‘The Waterworks in the City’, NZH, 21 September 1876, p.3, c.6.  
141 NZH, 14 November 1876, p.3.  
The rest of the poem urged citizens to pay their water rate:

Would ye rather die of fever  
Than pay a water rate?  
Your wives and bairnies ask it,  
Decide ye, ere too late.\footnote{143}

This poem clearly and wittily articulates Sharpe’s concern about water quality and the pollution of nature. Its style, too, is of interest, for it has the rhythmic consistency of a hymn, while its first line is a play on a nineteenth century jingo, ‘Fever’s/Freedom’s scarlet/sacred banner’.\footnote{144} Unlike most poems from the time, this one by Sharpe neither followed his usual romantic conventions nor extolled the virtues of a New Zealand environment bursting with opportunities and unspoilt nature.\footnote{145} Although it seems he wrote no further poems on the subject, Sharpe maintained his battle for Auckland to have a better water supply, even suggesting, in 1883, the establishment of an Auckland-wide water corporation, though apparently without much success.\footnote{146}

In Australia, beginning in the 1890s, Sharpe crusaded against the pollution of Newcastle’s beaches.\footnote{147} In 1902, he penned a number of letters drawing attention to this disgrace. When attempts to stop pollution began early that year, he initially nodded appreciatively at way in which ‘the power of public opinion ... can rattle the dry bones of parochial obstruction and private animosity’.\footnote{148} Triumph, however, soon turned to

\footnote{143}Quoted in Blackley, ‘Writing Alfred Sharpe’, vol 2, appendix, pp.113-114.
\footnote{144}Thanks to Dr. Kuzma for his analysis of Sharpe’s poetry.
\footnote{148}See, for instance, Alfred Sharp, ‘Sea bathing’, NMH, 3 January 1894, p.7.
A couple of weeks later, Sharpe reported irritably that ‘about ten loads of street filth have been deposited there during the last two days’.149 A few days later, winds blowing more rubbish onto the beach prompted Sharpe to ask breathlessly and with great frustration: ‘Why? and why? and why?’150 ‘Can anything be done to check this howling nastiness? Must the citizens be left to apply to the Supreme Court for an injunction?’, he asked in a subsequent letter.151 After a brief and angry discharge of salvoes against the mayor’s (Mr Cann) description of the beach pollution as ‘harmless’, Sharpe wrote in to the paper again on 19 February. He expressed satisfaction with Cann’s decision to ‘stop the deposit of garbage on our sanatorium [the beach]’ 152

Conclusion
Alfred Sharpe held complex and fascinating attitudes towards the natural world. The key to unlocking these lies, first, in investigating his romanticism, which was strongly influenced by Ruskin. Sharpe’s belief in God guided his view of the natural world. Sharpe believed that, since God had created the world and had given it over to humans to steward, any destruction of it broke the sacred bond between God and humanity. As with many of his contemporaries concerned about future timber supplies, pending climatic change or even the development of industry and commerce, Sharpe also wanted to conserve nature for future generations. Just as he extolled ‘wild’ nature, so too did Sharpe believe that it could be improved. Trees and parks beautified cities and improved the health of city-dwellers, while the beauty of natural areas also could be enhanced through art (walks and garden designs). It was very much a local nature that he aspired to protect. He gained this insight both from his experience of multiple local worlds (those of his youth, and around Auckland and Newcastle) and the ideas of romanticism. Taken together, Sharpe’s views add greatly to understandings about settler

149 Incidentally, in perhaps the greatest irony, Sharpe also refused to reply to the correspondent ‘Bather’, since, as Sharpe explained, he did ‘not wish to enter into unprofitable discussions with people who make wild assertions under cover of a non de plume!’ (Sharpe possibly did not use pen names as much in Australia than in New Zealand because of his greater success in Newcastle.) Alfred Sharp, ‘Baths and Beach’, NMH, 24 January 1902, p.6.
151 Alfred Sharp, ‘The Ocean Beach’, NMH, 31 January 1902, p.3.
152 Alfred Sharp, ‘The Mayor and the Beach’, NMH, 13 February 1902, p.6; ‘Beach Sanitation’, NMH, 19 February 1902, p.3.
views of nature. As Ged Martin and Jonathan Lamb have separately identified, many settlers imagined exciting utopias from ‘smiling farms’ with swathes of green fields to built up towns with teeming populations. Others have written about settlers’ wilful environmental destruction in their drive for prosperity (see introduction). Yet, Sharpe and those others who cautioned against deforestation sought material progress without wanton environmental destruction, beauty without ugliness, health without pollution. Ultimately, the importance Sharpe placed upon forest conservation expresses the strength of romanticism and religion in shaping his environmental beliefs. It also demonstrates the significant role both of local nature and urban environments in contributing towards these views. As the following chapter shows, other settlers expressed environmental anxieties not so much about aesthetic loss but climatic change.


Chapter 4: ‘they [settlers] received a fertile country, but, by a criminal want of foresight, transmitted to posterity a desert.’ (Charles O’Neill, 1873)\(^1\)

Urgency and fear underpinned Charles Gordon O’Neill’s (1827/28-1900) introduction of the Conservation of Forests Bill to New Zealand’s Lower House in 1873. Already, he roared, New Zealand’s climate ‘had been altered considerably by the effect of forest fires’, as had the course of the Hutt River through deforestation. Unless parliament protected forests, he prophesised that worse would come. O’Neill pointed out the injurious consequences of deforestation for a region’s climate: ‘Ali Pacha burnt down the forests ... and then came famine and drought’; the Russians changed the Caucasus’ climate, and ‘the land became barren, drought ensued ...’\(^2\) O’Neill’s fears were not isolated. Fears that deforestation was altering New Zealand’s climate emerged in the 1860s. Natural scientists worried that, since trees attracted rainfall and moderated temperatures, deforestation caused drought and increased temperature extremes. Motivated both by experience of deforestation in tropical colonies and continental Europe and by increasing rates of deforestation in New Zealand, these fears drove forward calls for conservation and tree planting in the colony. Very often they appeared with environmental anxieties that deforestation increased flash flooding, soil erosion and changed river flows. Catchment conservation refers to actions taken in response to these anxieties. In this view, different environments under threat required different responses. Since much of New Zealand’s North Island still lay in forests, land officials recognised the primary needs of settlement, that is, to convert forestland into farmland. Nevertheless, as early legislation shows, provincial acts tried to limit timber cutting to some ninety five per cent of the bush. If most North Island provinces suffered from a dearth of timber, many of those in the South suffered from a deficit. Indeed, some areas such as Central Otago and the Mackenzie Country had little, almost no, standing forests. In the 1860s,

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\(^1\) Charles O’Neill, NZPD, 1 October, 1873, p.1545.
suggestions emerged that tree planting could redeem these dry areas and convert the climate into a temperate one, thereby creating the conditions suitable for agriculture. Forestation offered further advantages to treeless regions by providing building and burning material (supplies that were in particularly short supply in gold rush Central Otago), shade and rainfall, and protection from flooding and drought. In the 1860s, climatic concerns reached the national parliament. After two studies undertaken into deforestation rates in New Zealand and a number of attempts to establish state forestry, the efforts of conservationists finally met with success in 1874. The short-lived New Zealand Forests Act (1874) created a national forestry department but wrote climatic reserves into national policy on a permanent basis. Climatic reserves, argued its proponents, protected lowland agriculture by preventing soil erosion and flooding and by maintaining a regular rainfall. They cleverly placed forest reserves in upland areas away from the needs of settlers of lowland plains. Supporters emphasised that forestry practices complemented, rather than interfered with, the needs of settlement and carefully pointed out that forestry did not interfere with development. They, in fact, stressed that forests were integral to successful agriculture since they protected farming from drought. Thus they advocated a policy of dual development: agriculture on the lowlands, forestry on the highlands. Although the forestry legislation of 1874 was repealed, both its provisions for climatic reserves and climatic concerns stayed on the political agenda into the next decade. By the 1880s, over half a million acres of forestland lay in climatic reserves. By then, more and more articles appeared on the subject in scientific, farming and parliamentary publications. These articles shared not only their promotion of forest conservation, but also their presentation of deforestation as an evil threatening New Zealand's fertile climate and productive agriculture. Writers about New Zealand commonly described the country in eulogistic terms as akin to Eden, a land blessed with an abundance of rainfall and fertile soils. Conservationists followed this image, but inverted it. Employing biblical and other examples to illustrate the follies of deforestation, they charged that deforestation was turning the garden to waste and despoiling New Zealand's natural fecundity. According to these authors, Government

\[2\] NZPD, 1 October, 1873, p.1545.
was duty bound to protect against such a frightening outcome by conserving forests. Parliament responded to these fears, but inconsistently. The 1885 New Zealand Forestry Act followed the fate of its predecessor of 1874, being repealed a few years after its passing, and while the Liberal Government of the 1890s made new forest reserves, it also opened up large areas of forests for settlement. By the 1900s, catchment theories were replacing climatic theories. The influence of overseas scientists on those in New Zealand played a part in discrediting the forest-rainfall link. So did increasing evidence of the alarming effects of deforestation on soil erosion and flooding in New Zealand. As a yardstick of this movement, the 1913 Royal Commission on Forestry charged with charting New Zealand's future forest history, made no mention of climatic arguments as a basis for forest conservation. It instead focussed on forests protecting catchment areas. Climatic ideas, though, died out gradually in non-scientific circles. This chapter both investigates catchment fears and charts responses to them in a chronological discussion of the period 1850-1920. It focuses on parliamentary, scientific and popular debates, as well as looking at legislation and the interplay of local, national and international forestry ideas and policies.

**Forest influence debated**

Although supporters of forest conservation shared a common language of fear and loss, they could not agree on the influence forests played on climate. Some held that forests had an appreciable influence on rainfall, that a direct relationship existed between deforestation and precipitation, and that tree-cover affected temperature. As the engineer and surveyor Frederick Septimus Peppercorne explained,

> Trees not only attract the rain bearing clouds, and prevent the rain from being rapidly evaporated, but they check radiation from the surface of the earth, and thus obviate sudden changes of temperature, while the atmosphere is able to retain less moisture, and therefore rain becomes more frequent in densely timbered countries. But when we cut down our forests, we produce new conditions of radiation, as the moisture in the ground evaporates very rapidly, so that bare and unsheltered country soon
become barren, because the amount of evaporation will exceed the ordinary annual rainfall.³

Peppercorne elucidated the mechanism behind this by referring to the work of M. Fautral. Fautral was a French forester who, for four years, had kept ‘observations on forestial meteorology’. His research led Peppercorne to conclude that forestland attracted more rainfall than bare ground, and that those trees with the greatest foliage attracted the most. Air around forests was also more saturated than that over open land, continued Peppercorne, while trees’ leaves also trapped evaporated moisture from the ground.⁴

Other authors, like Archdeacon Walsh, Page: 152 disagreed with the idea of more forest meaning more rain, although Walsh did believe there was a link between deforestation and temperature increases. Walsh held that it is ‘to mistake cause for effect’ and believe that ‘rain is attracted by standing forest’.⁵ Instead, observed Walsh, deforestation increases the strength and dryness of winds. In summer, the air above deforested land becomes superheated, he explained, and ‘rises in a column to the heavens, and a current is established to draw in a fresh supply from the lower levels.’ This ‘tearing blast’, which becomes even drier, then desiccates orchards and blights grasses, he explained, prematurely ripens crops and encourages fire into the bush remnants.⁶

The origins of climatic arguments

Writers who explored the relationship between climate change and deforestation in New Zealand were not espousing anything new. They were drawing on a rich vein of writing about the influence of forests and climate. Debate on climate change dates back to Classical times. Either side of Christ’s birth, Theophrastus (c.272-c.287 B.C.) and Pliny (23-79 A.D.) were writing about the relationship between forests and climate. By the middle ages, writers like St. Albertus Magnus, the thirteenth century scholastic

³ F.S. Peppercorne, On the Influence of Forests on Climate and Rainfall, Napier, 1880, p.5.
philosopher, discussed this idea. Although earlier authors were interested in this link, as Richard Grove notes, these works represented a compendium of ideas rather than a coherent body of climatic theory since they were often not scientifically investigated. A revival in climatic theory occurred between about the late sixteenth and the early eighteenth century. One major contribution to this came when, in 1699, John Woodward established the basic concepts of transpiration. Later, in 1726, Stephen Hales used Woodward’s work ‘in estimating the amount of moisture contributed by trees to the atmosphere.’ In the 1730s, Hales’ work was translated into French by Count Buffon, opening these ideas to a French audience that included the French arboriculturist and meteorologist Duhamel du Monceau, and Buffon himself.

Richard Grove contends, however, that climatic and catchment conservation – both of which he terms desiccation theory – came to full fruition on tropical islands, since the effects of deforestation there could be readily seen. According to him, deforested islands evoked images of a despoiled Eden, torturing the minds of some European observers into restoring their fertility. On more practical terms, treeless islands threatened the economic earnings of plantation agriculture. Certainly, as Grove shows, a case can be made that climatic and catchment conservation was discussed by authors in tropical areas. It is probable, however, that Grove overestimates the importance played by experience of these ‘tropical island edens’ in stimulating fears about climate change in relation to deforestation. As the examples of New Zealand, Australia, Canada and the United States show, debate about climatic and catchment conservation occurred in these temperate climates. Moreover, at the same time as conservation ideas and measures began in tropical areas (see below), climatic and catchment conservation occurred in European countries, particularly in alpine areas. Nevertheless, as Grove shows, in the 1760s both the French and British Governments supported conservation in some of their colonies. Pierre Poivre, Commissaire-Intendant on Mauritius, established a climatic

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reserve on the island in 1763. He was impelled by fears of drought and social disorder, and influenced by a pot pouri of physiocracy, and Chinese and Indian techniques of horticulture. Physiocracy proved an important but brief influence on French economic theory in the mid-1760s. It also strongly shaped French forestry into the nineteenth century. Physiocrats maintained that agriculture produced not only natural goods, but also bore responsibility for the development of humanity and functioning of society. A strong agricultural base also supported legal networks, the economy and, in short, the functioning of civilised life. As Caroline Ford has written, conservation in the French colonies 'was shaped to a greater extent by ecological considerations and by anxieties concerning the impact that environmental degradation might have on the survival on European civilization'. At the same time, British climatic conservation began in many of its West Indian territories: St Vincent, Grenada, St Lucia and Tobago.

In the eighteenth and nineteenth century, climatic theories received support from a number of influential scientists such as J.R. Forster, J.D. Hooker and Alexander von Humboldt. In India from the late eighteenth century, medical officers trained at Scottish Universities became radical and influential critics of wasteful forest destruction and active promoters of climatic and catchment conservation. Concerned about the effects of environmental degradation on health and society, they argued for state intervention by the East India Company (EIC) to stop deforestation and mitigate the effects of famines. According to Grove, this medical activism later contributed to the emergence of strong regional – and later: national forestry departments. Regional forest conservancy began

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14 Caroline Ford, 'Nature, Culture and Conservation in France and Her Colonies, 1840-1940', *Past and Present*, 183 (May, 2004), p.188. On colonies, see also pp.188-197.
in Madras in 1837-1838 and nationally in 1865.\(^{18}\) Climatic conservation formed an important operation in these departments.\(^{19}\)

**Climatic arguments in Europe**

Forest reservation to prevent climatic deterioration built on a strong tradition of European forestry.\(^{20}\) In nineteenth century Europe, the climate-flooding-forest link interested a number of authors, particularly in France, and appears to have been discussed widely in French forestry and popular circles.\(^{21}\) Antoine César Becquerel, physicist and chemist, for instance, played an important role in reinforcing and stimulating interest in forest-climate linkages in Europe.\(^{22}\) Climatic arguments also appeared in a variety of countries. The curriculum of the imperial forest school at Nancy, France, founded in 1817, focussed on the link between climate, flooding and forests.\(^{23}\) Indeed, by mid-century officials in Germany, France, Austria-Hungary and Switzerland responded to climatic and flooding arguments with forest reservation. Often this occurred in mountainous areas.\(^{24}\) In Germany in 1820, the ardent nationalist Ernst Moritz Arndt

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\(^{19}\) Although not all foresters in India initially held to the forest-climate link, Satpal Sangwan demonstrates that many, including India's first Conservator, became supporters after being shown evidence to support the link. Sangwan, 'Making of a popular debate', pp.196-200.


promoted forest conservation ‘because of its meaning for the climate and the fruitfulness of the soil’. He linked forest health and purity with that of the German race.\(^{25}\)

**American climate debates**

Nor were these environmental anxieties limited to the tropics or Europe. Concerns about climatic deterioration arrived with the first settlers to North America. In 1688, for instance, Rev. John Clayton wondered whether Virginia’s dense forests obstructed the passage of wind, making it more stagnant below, yet more violent above the trees. A few years later, Dr. John Woodward charged that deforestation had made America’s climate better by rendering it drier.\(^{26}\) Debate on the effect of forest clearance continued into the eighteenth and nineteenth century. Did deforestation, in fact, cause climatic warming? Had winters worsened or improved with deforestation? Did deforestation diminish rainfall?\(^{27}\) Some writers of this period believed forest clearance led to a warmer, drier climate. Others held the opposite, that deforestation encouraged cold winds that blew away warmer air.\(^{28}\) Climate-forest ideas generated similar discussions in New Zealand in the nineteenth century, and influenced forest policy just as they did in the United States.

By the mid-nineteenth century, climatic arguments appeared in legislation. A report commissioned by the state of Wisconsin in 1867 favoured the forest-climate link.\(^{29}\) The 1873 Timber Culture Act of the United States aimed ‘“to encourage the growth of timber, not merely for the benefit of the soil, not merely for the value of the timber itself, but for its influence upon the climate”.’ It also enjoyed the support of the President of the United States and the commissioner of agriculture.\(^{30}\) Like New Zealand’s forest legislation, the Act signalled ‘the prevailing sentiment of the country, whereby useless (for agriculture, that is, but not for grazing) land was converted to productive land by the

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\(^{26}\) Thompson, ‘Forests and Climate Change’, p.48.


\(^{29}\) Thompson, ‘Forests and Climate Change’, p.54.

planting of trees'. Other legislation addressing the climate-forest link followed. In 1876, the Agricultural Appropriation Act sanctioned the investigation of the influence of forests on climate. Dr. F. B. Hough's Report Upon Forestry (like Becquerel's work) cautiously accepted the idea of forest influence on temperature and moisture.

Outside legislation, popular rainfall theories had possibly their most spectacular impact on land policy in the 1870s and 1880s as many settlers moved into semi-arid zones. Boosters and journalists, as well as politicians and scientists, held that tree planting and agriculture could redeem semi-arid lands. One of these boosters, the pioneer farmer, editor and later president of the American Forestry Association, J. Sterling Morton, established Arbor Day. Arbor Day was a day set aside each year for the celebration of trees as 'the epitome of refinement and of the "cultured landscape," and as bringers of rain (see chapter seven). Official publications also lent weight to these theories. Scientific American, for instance, proudly proclaimed the accuracy of the rainfall-forest correlation, as did the journals Science and Nature. The Smithsonian Institute and the American Association for the Advancement of Science, likewise, supported the belief that ploughing increased rainfall. Doubters, of course, challenged the ideas that ploughing and tree planting brought rainfall. Still, as rainfall exceeded all expectations criticism failed to stop a flood of migrants pouring into the Great Plains area in the 1870s. Confidence quickly evaporated after a decade, however, as drought returned and remained. Continued drought coincided with low farm product prices during the

31 Williams, Americans and their forests, p.384.
32 Thompson, 'Forests and Climate', pp.55-56.
34 Williams, Americans and their forests, pp.379-381.
35 Williams, Americans and their forests, pp.379-383.
39 Smith, 'Rain Follows the Plough', p.191.
years 1893-1897. Together they served to cripple the region.\textsuperscript{40} By 1895, 200,000 settlers had fled the parched region.\textsuperscript{41}

**Australia**

Climatic arguments in Australia had assumed a similarly prominent role with academics and settlers from the 1860s and '70s. Many of the leading bureaucrats and scientists of each state debated the relationship between trees and rainfall as well as the effects of ploughing on precipitation. In 1873, the Director of Adelaide’s Botanic Gardens, Dr. Richard Schomburgk, for instance, presented a paper to the Philosophical Society and the Chamber of Manufacturers on the ‘Influence of Forests on Climate’.\textsuperscript{42}

The rural press and, in 1878, the recently-appointed New South Wales (NSW) Conservator of Forests, John Ednie Brown, eagerly embraced Schomburgk’s climatic ideas. In the hands of Brown, though, this theory was taken to the extreme. According to Brown, the absence of trees explained the aridity of Australia’s interior and exerted almost complete climatic control. As Australia’s settlers pushed ever northwards into increasingly marginal agricultural land, these publications helped shift the emphasis on settlement away from ploughing to the need for extensive plantations to bring climatic modifications.\textsuperscript{43}

Yet, for many South Australian settlers of the 1870s ploughing, not planting, held the promise of redeeming a dry climate. Experience seemed to prove the idea. Settlers spreading northwards across sub-tropical South Australia found, to their delight, above average rainfall.\textsuperscript{44} Indeed, in late 1875 heavy rains washed away fears of drought and gave settlers confidence to move beyond Goyder’s Line. Established by Surveyor-

\textsuperscript{40} Pisani, ‘Forests and Conservation’, p.353.
\textsuperscript{41} John Opie, ‘100 Years of Climate Risk Assessment on the High Plains: Which Farm Paradigm Does Irrigation Serve?’, *Agricultural History*, 3, 2 (Spring, 1989), pp.244-245.
General Goyder, this boundary demarcated ‘lands suitable for agriculture from those fit only for pastoral use.’ The successful northward penetration received support from many boosters in the rural press, as well as politicians who even included the Minister of Agriculture. In the late 1870s, drought once more returned to South Australia. Settlers’ dreams, like most of their crops, turned to dust. Drought taught them the unreliability of rainfall in these lands, as well as the importance of drought management strategies and the need to grow mixed crops that survive in low rainfall areas, similar practices advocated after the North Otago drought some thirty years later (see chapter five).

A similar pattern of boosterism, climatic theory, settlement and disappointment followed in other Australian territories as settlers pushing into semi-arid areas used the discussed plough-rainfall and tree-planting theories to justify their actions. As drought sapped settlement in semi-arid regions in New South Wales, so it did in South Australia, twice. Even many leading scientific figures voiced their approval of such ideas. Von Mueller in Melbourne encouraged tree-planting to ameliorate the climate and bring rainfall to the Murray Valley.

**New Zealand climatic debates: William Lauder Lindsay**

New Zealand’s promoters of climatic conservation drew on many of these overseas examples to argue for the importance of climatic forestry. They also relied upon their experience of the New Zealand environment. In 1844, the German naturalist employed by the New Zealand Company, Ernst Dieffenbach (1811-1855), while holding that latitude and height influenced climate in New Zealand, noted: ‘The wood-covered hills and the forest-lands, which constitute the greater part of New Zealand, attract this humidity, and render rains more frequent than they would perhaps be if the land were cleared.’ While Dieffenbach criticised deforestation for causing soil erosion (chapter seven), he did not note any change in climate occasioned by deforestation. Dieffenbach

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may not have made this connection because deforestation rates in New Zealand were still relatively low.

Scottish and German educated medical doctors, of whom Dieffenbach and Lindsay (see below) are representative, contributed in important ways to the development of New Zealand’s natural resources as well as to their conservation. As chapter eight shows, doctors educated in Scotland and northern Europe were prominent conservationists partly because they had gained a strong and broad training in practical sciences and in particular in botany. So too did Scotland and particularly Germany possess strong and well-established tradition of forest management. As chapter eight also notes, forest science developed in German-speaking northern Europe out of the cameral sciences (which emphasised the efficient management of government). Scotland enjoyed a flourishing tradition of plantation forestry that originated in the late eighteenth and early nineteenth centuries.

Another early doctor and naturalist to raise the possibility of climatic deterioration in New Zealand was the Scotsman William Lauder Lindsay (1829-1880), who arrived in Otago in 1861. Lindsay produced many articles from his three-and-a-half month stay in Otago, all of which focussed on either the province itself or smaller areas of it. In 1862, the newly-formed Young Men’s Christian Association (YMCA) asked him to present a paper on his research in Otago. This recently-formed organisation, according to a newspaper from the time, aimed ‘to produce vital godliness ... to foster a spirit of union and charity between Christian young men of every denomination, by all means to seek their advancement in useful and elevating knowledge’. Lindsay’s paper was to be the third lecture aimed at advancing and elevating knowledge. Great excitement surrounded the up-coming talk. The Otago Daily Times anticipated ‘the services of so eminent a savant as Dr. Lindsay’ to attract a large crowd at Knox Church. Sadly, bad health prevented Lindsay from speaking, but his paper was soon after made public, being

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50 Otago Colonist (OC), 29 November 1861, p. 5, c.2.
51 The Provincial Superintendent gave the first lecture, followed by J. McGlashland on ‘Connection Between Mental and Mechanical Pursuits’. See respectively OC, 6 December 1861, p. 4, c.4; 10 January 1862, p. 6, c.1-6.
published in full by the *Otago Colonist* and the YMCA, in part by the *Otago Daily Times* and later in full in Scotland.\(^53\)

Entitled ‘The Place and Power of Natural History in Colonization; with special reference to Otago’, it demonstrated how ‘the systematic, economical, and complete development of her [Otago’s] resources can be effectually [sic] accomplished only by the aid of scientific observations and deductions’.\(^54\) Although Lindsay mentioned forest conservation and meteorology in this 1862 paper, it was only in 1868 that he expressed the climate-forest link fully.\(^55\) In his groundbreaking 1868 publication ‘On the Conservation of Forests in New Zealand’, he not only turned his attention to the colony as a whole. He also advocated the introduction of systematic forest conservation and the establishment of a state department of forests.\(^56\) Despite his broader perspective, Lindsay extrapolated his evidence and arguments from the environment of Otago, an region that he knew so well. In 1868, Lindsay wrote that

Evidence already exists of the production of an *artificial climate* in some parts of Otago, or of the modification of the natural climate, by man’s operations, especially as to drainage and timber-felling. These operations tend, in Otago, to render the climate drier and warmer; and such a change has already been experienced in the settled districts around Dunedin, as the result of swamp-draining and forest-clearing.\(^57\)

According to Lindsay, deforestation and swamp draining in Otago had changed the region’s climate. It had decreased rainfall but increased temperatures. Interestingly, Lindsay did not comment if this was a good or bad thing. His lack of comment is surprising, because he certainly did not fear calling attention to what he thought was done

\(^{53}\) OC, 24 January 1862, p. 4 (c.1-2), p. 5 (c.1-6), 6 (c.1-6), 7 (c.1), 8 (c.1). Supplement to the ODT, 31 January 1862, p. 1, c.1-3. *The Place and Power of Natural History in Colonization; with special reference to Otago; being portions of a lecture prepared for, and at the request of the “Young Men’s Christian Association” of Dunedin, Dunedin, 1862*. It appeared in a slightly modified form in 1863 as *The Place and Power of Natural History in Colonisation with special reference to Otago (New Zealand)*, Edinburgh, 1863. I shall refer exclusively to his address in Dunedin.

\(^{54}\) OC, 24 January 1862, p. 4, c.1.

\(^{55}\) In his *Place and Power*, he regretted having to omit a fuller elaboration on forest conservation in Otago in his final paper. *Place and Power*, pp.26, 28-29.


\(^{57}\) *Contributions to New Zealand Botany*, London and Edinburgh, 1868, p. 28.
badly. Lindsay, for instance, criticised the colonial government and colonists for their 'blind indifference to, or ignorance of, the importance of' forest conservation and planting, yet he passed no judgement on climatic warming.  

1868: national climatic fears

In 1868, deforestation generated sufficient concern that Thomas Potts (1824-1888), naturalist, explorer and conservationist introduced these into parliamentary debate. Potts advocated that: 'Government should take steps to ascertain the present condition of the forests of the Colony, with view to their better conservation.' During the ensuing debate, concern focussed on the 'wanton and unnecessary waste' of timber as well as on the need for forest protection for climate and catchments. The two men who upheld climatic arguments in this debate later featured as strong proponents for climatic and catchment conservation. The first of these, scientist and politician W.T.L. Travers, began by noting that: 'It would be useless to trouble the House with any observations as to the effects that the destruction of the forests had upon the climate'. He continued, however, elaborating on his earlier point:

It was well understood that in Canada the cold had been rendered more intense by the destruction of the forests, so that some parts of the country were almost uninhabitable. The question had been much studied in America, and it was found that the time necessary to replace the growth made it important to consider the indiscriminate destruction of the aboriginal forest, and he [most probably GP Marsh] was sure that here also it would in a short time become a matter for serious consideration how this country was to be supplied with timber.

Travers spoke of the forest-climate link with confidence, indicating his unequivocal support for it. Like many other MHRs, he also drew attention to the economic wastage of forestry through its loss by fire. Travers presented the forest-climate link as both well-

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39 NZPD, 7 October, 1868, p.188.
40 quote from Major Heaphy, NZPD, p.189. For the debate see NZPD, pp.188-193.
41 WTL Travers, NZPD, 7 October, 1868, p.191.
42 WTL Travers, NZPD, 7 October, 1868, p.191.
known and well-accepted, topics to which he would later return in parliament and in the New Zealand Institute.

Edward Stafford (1819-1901), former premier and Nelson City's MHR, offered a more pragmatic view of forest conservation than Travers. Because of the 'great disparity of circumstances' existing in the country, Stafford favoured provincial control rather than central governmental conservation. As he pointed out, in some provinces 'instead of the preservation of the original timber being an object at the present time, that timber was in fact a nuisance, preventing beneficial occupation of the country.' Stafford thus highlighted that the local geographical distribution of forests in the colony would dictate how settlers viewed forests. Stafford also distinguished between utilitarian and climatic conservation, a unique discrimination for, as subsequent debates show, climatic conservation offered utilitarian advantages not least of which was the protection offered to agriculture in the prevention of droughts and floods. With regard to climatic conservation, he firmly believed that, 'destruction of timber must be prohibited for any purpose.' Stafford, like Potts, urged 'the great desirability of the country being clothed with a certain amount of arboreal vegetation, merely in a climatic point of view and with reference to the fertility of the soil, for they had evidence all over Europe of the evil effects of the great destruction of the original forest'. Stafford added emphasis and urgency to his argument by warning his fellow MHRs that if parliament did not conserve the country's forests, the fertility of New Zealand would decrease.

The 1868 debate, as a whole, foreshadowed those of later years in the language, examples and arguments used by conservationists and their detractors (see below). Already with this debate, the pattern of climatic and catchment arguments had been set. Conservationists would begin by detailing the effects of deforestation, offer examples from mountain Europe or Persia of fertile areas turned into arid wastes and then warn that a similar fate would befall New Zealand unless its forests were protected. In each case, protagonists measured the effects of deforestation more by their own experience than by scientific study.

63 Edward Stafford, NZPD, 7 October, 1868, p.190.
64 Stafford, NZPD, 7 October, 1868, p.190.
65 Stafford, NZPD, 7 October, 1868, p.190.
1869: gauging climatic concerns

Parliament agreed to commission a report on forestry based on Potts’ lobbying. Its findings appeared in the *AJHR* the following year. Of the six main questions the report levelled at provincial authorities, one (Question 6) specifically asked respondents to: ‘State any damage which has occurred to agricultural districts, or other destruction of property, such as mills, &c., that has been imputed to floods, or droughts being rendered more severe through the destruction of the forests?’ Question 6 elicited 21 responses. Of these, only four recognised the possibility of floods and droughts being rendered more frequent by deforestation (see chapter seven). Only one person posited the forests-climate link. A typical response came from the explorer Thomas Brunner (1821?-1874). He did ‘not think that the very small amount of forest that has been destroyed can have affected either the floods or droughts.’ As Brunner’s response shows, the relative silence on the forests-climate issue does not necessarily indicate the unpopularity of the idea. Brunner reasoned that flooding and drought had not yet occurred because rates of deforestation were not yet sufficiently high to cause these. Also, Question 6 specifically asked whether any *material damage* had occurred as a result of deforestation, not whether the reporters believed in the climatic or hydrological effects of deforestation. As is clear with the opinion of many authors, it was possible to both support the forests-climate link and believe that it had not yet occurred in New Zealand.

Debate on these effects also took place in the press in the 1860s. In this and the next decade many articles on the trees-climate link appeared in papers from the Otago

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66 Stafford, NZPD, 7 October, 1868, p.190.
67 ‘Enclosure 2 in No. 1: Extract from Dr. Hector’s Memorandum, 18 November, 1868’, in AJHR, D-22, 1869, p.3
68 R. Townsend observed that, after fire has swept through forest ‘the rapid growth of Mako-ngaio and other small trees protect the ground and watercourses from the sun, and possibly assist (according to the received notion) in causing the fall of rain.’ Townsend, D-22, AJHR, 1869, p.10.
These included, in 1869, John Gillies’ discussion in the *Otago Daily Times*. Gillies contended that tree planting in dry Central Otago ‘would convert that district into the garden of Otago’ by bringing more rain to the region.\(^7\)

**The 1870s: increasing anxieties**

In 1870, Travers read before the Wellington Philosophical Institute the third part of his work ‘On the Changes effected in the Natural Features of a New Country by the Introduction of Civilized Races’. According to Travers, the settler ‘becomes, as a rule, more and more careless of the native productions, unless they present some prospect of being immediately and directly profitable.’ This exploitative attitude was no more evident than in the forests of New Zealand. These, he complained, are ‘recklessly and improvidently burnt or otherwise destroyed, without regard either to the immediate effects which such destruction may produce upon climate, or to the certain injury which must be inflicted upon posterity.’\(^7\) Travers quoted examples of climatic problems in Asia Minor, North Africa, Alpine Europe, and Greece, caused by deforestation. ‘I may confidently appeal’, he wrote, ‘to any of those who have visited the plains of Babylon and Nineveh, and those parts of Judea, once described ... as flowing with milk and honey, and now converted into a howling desolation’. Continuing with such biblical imagery and ‘setting aside all questions of controversy as to whether the Great Author of Nature ever so deals with man as intentionally and mischievously to interfere with the conditions of life’, he concluded that ‘it is clear that ... man’s action [is] ... a primary cause’.\(^7\) Travers used a common image of such literature, of the garden being turned to waste, of Eden despoiled. Images of Eden despoiled and biblical examples of lands rendered infertile added heavy moral weight to the importance of forest conservation. Like Lindsay before him, it seems that Travers believed that the Bible condoned the use of the natural environment, but not its despoliation. If the God-given role of humans was to improve the earth and cultivate it, it followed that to despoil and degrade it was

\(^7\) See, for instance, ODT, 11 April 1863, p.5; ODT, 6 October 1869, p.2; ODT, 14 September 1869, p.2; OJW, 20 May 1876, p. 5.

\(^7\) ODT, 13 September 1869, p.3.

morally and religiously unacceptable. Conservation thus assumed a far higher moral plain than simply ensuring future supply; stewardship in Travers’ opinion was a necessary part of being a Christian (see chapter eight).

Travers’ concerns mark the beginning of an increase in writings on the forest climate link that occur in the 1870s. Parliamentarians aired these fears throughout the next three decades, enacting legislation to safeguard timber supply and climate and catchments. Privately published papers and talks on the subject also appeared alongside those read before the newly-established New Zealand Institute and published in its journal, the *Transactions and Proceedings of the New Zealand Institute*. By the 1880s, farming journals joined the clamour for climatic conservation, voicing their authors’ distaste and concern about on-going deforestation. Among the scientific community, members of the Wellington Philosophical Society emerge as leading promoters of forest conservation for climate and soil protection. In 1871, James Hector, the leading figure of New Zealand science in latter part of the nineteenth century, read a paper by Dr. A. Wjeikof on the effects of deforestation on flooding and climate in Russia. Wjeikof’s scientific study into deforestation did not support the notion that forest removal increased flooding. Yet, Wjeikof reasoned that the experiments had not been run long enough to provide any set conclusions. Downplaying this possible mitigating factor in his results, Wjeikof proclaimed that ‘the inhabitants may be in the right when complaining of drought, if the land is cleared of forests, as seems to be the case in the basin of the Wolga [sic].’

Support for this paper among Wellington’s NZI members reveals the extent to which many believed in the process of climatic deterioration in New Zealand. Hector, who read the paper, held that New Zealand displayed the climatic effects produced by deforestation without the climatic complications ‘which affect continental climates’. T. Cockburn Hood agreed. He believed that climatic change occurred in Egypt, Canada, and

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75 Dr. A. Wjeikof, ‘The Results of the Destruction of Forests upon the River Wolga at Astrakhan’, TPNZI, IV. (1871), p.375.
Scotland. Two other members highlighted the affects of deforestation on catchment areas.77 J.A. Wilson, however, dismissed these claims. He pointed out that Wjeikof’s paper ‘applied more to trees preventing the melting and blowing away of snow, and the case was, therefore, not quite applicable to that of New Zealand.’78

Debate about Wjeikof’s findings characterised debate about the forests-climate link in general. Very often this link rested not on scientific enquiry but on historical experience or estimates. Wjeikof, for one, chose to ignore the findings of his own research, which actually contradicted his belief in the rainfall-trees relationship. In 1876, Captain Inches Campbell Walker would do likewise when he investigated the influence of deforestation on rainfall. As long as the forest-rainfall theory remained scientifically unproven, critics would invariably attack its unscientific basis. By the 1900s, these unscientific underpinnings would undermine its currency.

**Tree planting and climate**

Yet it remained popular in the meantime. The Trees Planting Encouragement Act of 1871, originated in provincial tree planting legislation in Canterbury and, most probably Otago.79 During discussion of the Canterbury Forest Trees Bill debate centred on the extent of land area that should be granted to settlers in return for tree planting. Most parliamentarians accepted the need for such as measure, particularly in the relatively treeless provinces of Otago and Canterbury.80 During this debate and the one the following year discussing amendments to the tree planting legislation, Charles O’Neill, Walter Mantell, and later Andrew Buchanan, stressed the climatic benefits that would accrue with the legislation.81 This Bill passed into the legislation books as The Forest Trees Planting Encouragement Act, and underwent slight amendments the

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80 NZPD, 15 September 1871, pp.459-462; 8 November 1871, pp.918-919.
81 O’Neill, NZPD, 15 September, p.459; Mantell, NZPD, 8 November 1871, p.919. During discussion the following year over amendments to the Act Dr Andrew Buchanan (Otago) believed that the climate would ‘be altered and improved’ if ‘planting was were encouraged and carried out to any extent on those arid plains and hill tops’ of Otago. NZPD, 14 August 1872, p.466. In 1871 16 members debated the Bill and 6 the following year.
following year. The Act awarded planters of trees by granting them either a free grant of two acres for every acre of land planted in trees or a land order not exceeding £4 that they could redeem later. This legislation enshrined the principles of tree planting for fuel, construction, climate and soil quality. It was legislation that effectively incorporated environmental concerns into the very process of lowland settlement, but still recognised the dominant aim of agriculture. The legislation targeted provinces with treeless tracts and betokens the confidence that many felt not only in the redemptive properties of trees with regard to climate and soil but also the redemptive and transforming power of human action. As human action was wasting fertile lands, so it could also win back this productivity. As human action was diminishing rainfall, so it could also redeem dryness and sterility. Victorian anthropocentrism, for all of its anguish about environmental change, could also play the trump card of environmental reform by dealing out the hand of wise stewardship and protection over God’s dominion.

How successful was this legislation? To which provinces was it applied? By 1877, an incomplete return of those who obtained land orders reveals that 1624 acres of land had been planted in trees. In 1883, the last year of the act, trees had been planted on a grand total of 3798 acres, 1 rood and 4 square poles or perches of land. As Graph 4.1 shows, tree planting activities focussed mainly in the Provinces of Otago and Canterbury. These provinces had relatively few areas of forest, particularly relative to the North Island. The concentration of tree planting returns in these provinces highlights the importance of geography in influencing the acceptance of environmental legislation. Using this return, geographer Michael Roche argues that it was principally farmers and urban-based capitalists who made use of the Act. Most smaller-scale farmers, he notes, did not. It is likely that owners of large areas of land were over represented in figures

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84 ‘Trees Planting and Encouragement Acts (Return of Names of Persons who have taken advantage of the)’, Journals and Appendix to the Journals of the Legislative Council of New Zealand, no. 24, Wellington, 1877.
85 Calculated from ‘Return to an Order of the House of Representatives’ No. 32, 13 August, 1883, LE 1 (Legislative Department), 1/1883/136 (156), Box 207, NA. [NB, number in parentheses refers to temporary shelving number.] See, Appendix 3.
86 See, Roche, Forest Policy in New Zealand, p.52.
published on tree planting simply because they could plant more trees as they owned more land.

According to Roche, the Act 'enjoyed only modest success.' Delays in meeting

Graph 4.1: Final Return on Tree-planting and Encouragement Act, 1883

land grants and land orders hampered the legislation, he points out, as did the fact that by the mid 1870s much of Canterbury's plains had been taken up as freehold. By the 1880s, much of the land requested as compensation for tree planting had been reserved from sale, with only fragmented and isolated blocks remaining.\(^87\) Despite these drawbacks, the legislation illustrates that concern existed for tree planting on treeless lowland areas for economic as much as for climatic and hydrological reasons. The fact that, by 1883, over 70 individuals or companies had used this legislation demonstrates its popularity in the

\(^{87}\) Roche, *Forest Policy*, pp.53-54.
relatively treeless southern provinces. This evinces the continuing importance that experience of local environments played in influencing settler environmental behaviour.

**1873: conservation and a commission**

In 1873, Charles O’Neill introduced a Conservation of Forests Bill. He wanted a Royal Commission appointed to look into the state of the colony’s forests and to recommend measures towards “securing their conservation and permanency.”88 ‘My Conservation of Forests Bill requires careful consideration both by the House and Government’, advised O’Neill, ‘so that history might not be able to relate that they received a fertile country, but, by a criminal want of foresight, transmitted to posterity a desert.’ O’Neill presented a fearful picture of the likely consequences of continued deforestation. Timber famine would ensue. Flooding and soil erosion would increase. Rainfall would decrease. ‘[E]ven in New Zealand the climate, he wrote, had been altered considerably by forest fires.’89 Donald McLean, Minister of Lands, agreed that New Zealand’s climate ‘had very materially altered’, especially in the Auckland area, and promised that the government would look into the matter.90

A parliamentary survey was conducted in 1873 into the climatic and drainage effects of clearing forest and other vegetation. Its findings reveal that most land commissioners did not believe any alteration had yet occurred.91 Reporting for Moeraki, Hawksbury, Taieri and Waikouaiti, Valpy observed that: ‘There is no difference in the climate caused by the clearing away of bush in my district worthy of notice, as the bushes are very limited, and in patches, and far apart.’ Without doubt, however, continued Valpy, ‘the draining of land and burning off of rough herbage has improved the climate

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88 O’Neill, NZPD, 1 October, 1873, p.1546.
89 O’Neill, NZPD, 1 October, 1873, p.1545-1546.
90 McLean, NZPD, 1 October, 1873, p.1545.
91 They were asked to ‘State any known effect to climate or drainage, by clearing of bush, grasses, or other vegetation’. See, for instance, Mr Innes to Mr Thomson, Land Office, Dunedin, 17 February, 1874, p.18; Superintendent of Nelson O. Curtis to Colonial Secretary, Nelson, 11 May, 1874, p.31; James Bonar, Superintendent Office, to Colonial Secretary, Hokitika, 12 May, 1874, p.30; A.P. Seymour to Colonial Secretary, Blenheim, 12 May, 1874, p.31; W. Fitzherbert to Colonial Secretary, Wellington, 20 May, 1874, p.31; F. A. Carrington to Colonial Secretary, New Plymouth, 27 May, 1874, 31-2 in ‘Papers relating to state forests, their conservation, planting, management, &c.’, AJHR, H-5, Vol. 2, 1874, pp.18, 30-32.
Valpy’s comments, that land draining and clearing improved the climate, are consonant with the idea that swamps constituted unhealthy places. Swamps, many believed, released unhealthy miasmic gases into the atmosphere (chapters one and two). Thomas Hughan, Ranger in the Tautuku and Glenoamaru districts, reported ‘the oldest settlers in the Mataura district’ had told him that the ‘climate has become much drier within the last eight years.’

Again, like the commission of 1869, most respondents did not discuss the impacts of deforestation. Lack of discussion, however, does not mean that they discounted the theory. Mr Innes, whose report covered Lake Hawea, the Matukituki River, Lake Wakatipu, and the forests of Te Anau and Manapouri, believed that, since only limited areas of forest had been cleared, this ‘could have no perceptible effect on climate or drainage.’ In other words, like many others, Innes held that timber felling had not yet made an impact on climate or flooding.

1874: New Zealand’s Forests Bill and climate debates

After the failure of O’Neill’s Bill (1873) and the investigation into the country’s forestry resources, in 1874 Premier Julius Vogel (1835-1899) introduced the New Zealand’s Forests Bill. Vogel pressed for the establishment of state forest conservation, along with a forestry bureaucracy to oversee its management and a school for the training of foresters. Supporters argued that deforestation would threaten future timber supplies and destroy New Zealand’s agriculture by decreasing rainfall and accelerating flooding and soil erosion. Unlike O’Neill’s debate, which elicited only three responses, almost half of the house spoke during the forests debate of 1874. Heated discussion followed because of the controversial nature of the Bill. Many supporters of the maintenance of provincial power vehemently opposed it. They did so not because of opposition to the principle of conservation but rather because the Bill would increase the control of central

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93 Mr Hughan to Mr Thomson, Taieri Beach, 6 January, 1874, in ‘Papers relating to state forests, their conservation, planting, management, &c.’, AJHR, H5, vol. 2, 1874, p.22.
94 Mr Innes to Mr Thomson, Land Office, Dunedin, 17 February, 1874, in ‘Papers relating to state forests, their conservation, planting, management, &c.’, AJHR, H5, vol. 2, 1874, p.18.
95 34 out of a total of 78 members spoke.
government at the expense of the provinces. Provinces had been established in 1852, with initially six and later nine (Southland became a province in 1861 but was abolished in 1870). Many provincial politicians, who were responsible for such matters as health, immigration, law enforcement and the disposal of “waste lands,” resented the intrusion of central government into their affairs. Particular opposition centred on Vogel’s initial debt-for-land scheme. Vogel’s plan involved reserving not more than three per cent of the land area of each province for forest growth in return for writing off the 1 per cent sinking fund provinces paid to the government for the construction of railways. According to Vogel’s model, the revenue earned from forestry would be used to discharge the colony’s debt.⁹⁶

Although recent writers on the Forests Bill, including Graeme Wynn, emphasise that state intervention stood as an affront to the laissez-faire policies of the day, the fact that the principles of conservation received significant support from some quarters indicates the popularity of government intervention.⁹⁷ Twenty-two of the thirty-four members who spoke during the Bill actually supported some form of forest conservation.⁹⁸ Even if they did not favour the establishment of a forestry department, at least they agreed in principle on the need for governmental intervention, whether central or provincial, to protect threatened forests. As many pointed out, though, the trouble with New Zealand’s forest resources were that there they were unevenly spread across the country.⁹⁹ The North Island’s surfeit was the South Island’s dearth. This debate also indicates that supporters for forest conservation furthered the notion that some kind of regulation was required to protect the public good. In this case, it meant preventing a likely timber famine and the ruination of a country’s climate and agriculture. Throughout this debate, climatic arguments featured strongly both in arguments for and against forest conservation. Some members accepted climate change and feared its consequences. Some dismissed it altogether. Others accepted climate change but held its influence to be beneficial.

⁹⁸ Calculated from NZPD, 14 July, 1874, pp.79-94; 31 July, pp.350-381; 4 August, pp.399-426.
The Bill’s tabler, Julius Vogel, as well as emphasising the need for forest conservation to safeguard timber supply and waterways, played up fears of the climatic effects wrought by deforestation. Vogel’s recent visit to the South Island, he related, ‘forcibly presented’ to him ‘how much deterioration our climate was liable to sustain’ from deforestation. To support his arguments, as Paul Star notes, Vogel tied together ‘a string of quotes from the writings of others’ on the necessity of forest conservation. These vivid descriptions emphasised the wages that would be paid by a people foolish enough to deforest their lands (see chapter eight for a fuller discussion of these).

Other voices of doom thundered on the same note. Charles O’Neill continued where he had left off the year before:

We know that, by the destruction of forests, climate is most seriously altered. We know quite well that, in other countries, plains which were once filled with forest have had their climate much changed by the destruction of those forests by fires which have had their climates much changed by the destruction of those forests by fires which have desolated miles upon miles of country.

Edward Stafford agreed. According to him, New Zealand required mountain reserves so as to protect its climate and soils. These doom-laden predictions certainly had the desired effect on one parliamentarian. Given the enormity and seriousness of the predictions, Nelson MHR David Mitchell Luckie (1827–1909) worried that these should not have been available earlier and led him to declare boldly ‘I say, perish the provinces, but preserve the country.’

Not everyone gave trees’ carte blanche control over climate, however. Buckland believed that forests only had a local influence on climate. According to him, ‘they extend but a short distance beyond the forests themselves.’ Richardson felt that only

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99 See, for instance, Rolleston, NZPD, 4 August, 1874, pp.404-405.
100 NZPD, 4 July, 1874, p.79.
103 Stafford, NZPD, 31 July, p.365.
104 Luckie, NZPD, 4 August, pp.409-410.
105 Buckland, NZPD, 4 August, pp.403.
time would indicate the ‘effect planting of trees will produce in New Zealand.’

John Sheehan (1844-1885) adopted a contradictory view of the climatic arguments. These arguments, he noted, ‘are too much of an alarmist character.’ France and Germany removed its forests, he asked rhetorically, but are they not still the ‘gardens of Europe’? He felt that ‘scientific men’ often ‘go too far in estimating the effects produced by the destruction of timber. No doubt’, he continued, deforestation affects climate but not always detrimentally. Ultimately, though, he supported conservation, unlike Johnston and Andrews, both of whom launched sustained attacks on the climate theory.

Andrews attacked the historical accuracy of statements attending to the evil effects of deforestation. Andrews pointed out, for instance, that Palestine, upheld by many supporters of conservation as offering a salutary lesson against deforestation, faced water scarcity before deforestation began and actually suffered the opposite problem of drought: over-watering led to salinisation. In Spain, he related, sugar cane grew in the seventh to eighth centuries. It still grows, he continued, and thus disproves the claim that deforestation decreases rainfall. Equally, he pointed out, Canada’s climate ‘may have become more severe, but it by no means follows that it is from disforesting.’ These, and other reasoned examples, indicated to Andrews that ‘the conclusion drawn by scientific men, that disforesting injuriously affects a temperate climate, are not proved so far as to justify us in passing a Bill of this kind on the strength of them.’

Johnston adopted a similar tactic. According to him, those ‘countries the most happy in respect of climate and fertility, were precisely those which had the least percentage of forests, namely Great Britain, Holland, Spain, and Portugal.’ Johnston dismissed the comparisons made with New Zealand, tropical countries and the United States, as ‘entirely irrelevant’. For one thing, he pointed out, the United States enjoys great extremes of summer and winter temperatures, unlike the largely temperate, narrow landmass of New Zealand. Ireland, a comparably temperate and similar sized country to New Zealand, he noted, ‘broadly speaking, has no forests at all’. Great Britain, with six times less forest than New

106 Richardson, NZPD, 31 July, p.374.
108 Andrews, NZPD, 4 August, p.412.
Zealand, still had a productive agricultural base. These criticisms illustrate that neither the forests-climate link nor the comparisons made between New Zealand and other countries were accepted by all parliamentarians. As would become increasingly evident later in this century and into the next, critics often attacked the historical and anecdotal nature of conservationists’ claims. And, it is partly for this reason that climatic arguments became fewer in number by the early twentieth century.

Despite such opposition, however, Vogel’s Bill passed, albeit in a more muted form than its author originally had intended. Designed to assuage regional apprehensions, the new Act invested provincial superintendents, not central government, with the authority to reserve areas for state forests. The three per cent clause also was dropped from the new legislation. Although in a qualified form, the new legislation was no paper tiger. The Act created a new state forests department and, for bite, granted it a £10,000 budget over 5 years. In 1876, New Zealand’s first Conservator of Forests, Captain Inches Campbell Walker, arrived. Upon his arrival in New Zealand, the Indian forester Campbell Walker set out on a tour of the colony’s forests. He was soon writing with enthusiasm and urgency about the importance of subjecting forests to scientific management.

Campbell Walker’s arguments

These arguments appeared in the parliamentary papers of 1877, as well as the Transactions of 1876 and 1877. At their core, Campbell Walker advocated scientific forestry, the idea that forests could be systematically harvested to ensure their best use, by what today would be termed ‘sustainable logging’. Mindful that the main thrust of settlement for development, Campbell Walker was at pains to emphasise the economic

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109 Johnston, NZPD, 4 August, p.408.
110 Roche, History of Forests, p.87.
benefits that scientific state forestry would bring to New Zealand.\textsuperscript{114} Quoting the impassioned writings of various authors on this topic, he also upped the moral ante of foresters, by associating forests, through their regulation of climate and soils, with the preservation of New Zealand fertile and 'smiling fields'.

Although he confessed to feeling 'no sort of certainty one way or the other' if deforestation decreased rainfall, by noting that the theory has not been proven, on the next page he wrote exactly the opposite:

\begin{quote}
nothing, I think, has been more clearly proved, both by scientific argument or theory, and actual observations of practice, than that the wholesale and indiscriminate clearing of forests exercises an injurious effect on both [climate and permanent water supply], whilst the formation of plantations in dry and arid regions ameliorates the climate and renders the water supply more copious and permanent.\textsuperscript{115}
\end{quote}

It seems the Conservator tried to settle the forest-climate question himself. He consulted records of New Zealand's average rainfall over a period of ten years from 1866 to 1875 and tried to correlate these to deforestation rates. His research revealed that rainfall had actually risen slightly despite accelerating rates of deforestation.\textsuperscript{116} Campbell Walker, though, dismissed the reliability of such readings since, according to him, meteorological records had improved significantly in this period.\textsuperscript{117} Campbell Walker's attempt to measure the effects of deforestation on climate perhaps reflected the fact that Indian foresters only began to accept climatic theories in the face of experimental evidence.\textsuperscript{118} As with other climatic conservationists, though, intuition and observation ultimately informed his belief in the powers of forests to attract rain.

Campbell Walker pushed for the establishment of climatic reserves to protect against rainfall decline and increasing floods and soil erosion. Since Campbell Walker

\begin{footnotes}
\textsuperscript{113} On scientific forestry, see Jan Oosthoek, 'Themes in European Woodland History', in John Dargavel, Denise Gaughwin and Brenda Libbis, eds., \textit{Australia's Ever-Changing Forests V: Proceedings of the Fifth National Conference on Australian Forest History}, Canberra, 2002, pp.34-36.
\textsuperscript{114} See his 'The Climatic and financial Aspect of Forest Conservancy as applicable to New Zealand'.
\textsuperscript{117} Campbell Walker, 'Report of the Conservator of State Forests', AJHR, C3, 1877, p.49.
\textsuperscript{118} Sangwan, 'Making of a popular debate', p.198.
\end{footnotes}
believed that no ‘damage has as yet been done to the climate of New Zealand’ through
deforestation, he therefore had to strengthen his climatic arguments by presenting the

Invariably, and in common with other conservationists, he chose examples of
deforestation deliberately designed to alarm readers by sending them into paroxysms of
fear and thereby converting them to the gospel of conservation. Vast reams of scientific
papers and other accounts appeared in his work and offered cautionary tales of the
foolishness of fertile lands turned to wrack and ruin through deforestation (see chapter
eight). The removal of high altitude forests, cautioned Campbell Walker, would mean
bidding ‘farewell to the smiling fields in the valleys [sic] below and abundant pasture on
had happened in Southern France. There summer drought and disastrous floods, the latter
of which in 1875 had killed 3000 people, had combined to wreak havoc in the region.
They caused £3 million worth of damage and depopulated the area.\footnote{Campbell Walker, ‘The Climatic and Financial Aspects’, pp.xxxiv, xxxix.}

If saving existing forests was important to Campbell Walker, then so too was
creating new ones. Tree planting should go ahead, he continued, since he had ‘little doubt
that’ trees had already ameliorated the colony’s climate.\footnote{Campbell Walker, ‘The Climatic and Financial Aspects’, p.xxxviii.} According to him, ‘all along
the East Coast with bare plains and comparatively little timber, we have but a scanty
rainfall, whereas in the densely-wooded West Coast we have a rainfall greatly in excess
of the average.’ The Conservator confused cause with effect by asking rhetorically: ‘why
should not rain have fallen and forests been created on the eastern slopes of the
mountains, on which the clouds, laden with moisture from the Pacific, first impinge’?\footnote{Campbell Walker, ‘The Climatic and Financial Aspects’, p.xxxviii.}

Campbell Walker, then, believed ‘it is our duty, as well as our interest, to
preserve’ New Zealand’s “local advantages which it owes to nature”, by which he meant
its forests and water supply.\footnote{Campbell Walker, ‘The Climatic and Financial Aspects’, p.xxxix.} He bolstered the forest department’s lobby by tying its
function not only to revenue collection and the scientific development of a resource but
also with the health of New Zealand’s agriculture. Campbell Walker emphasised that

forestry promoted and protected agricultural development by leaving the lowlands to farming while utilising the unproductive uplands:

I would gladly see all the low-lying forests betwixt [sic] the sea and mountains in Westland and in the lower portions of the valleys cleared away, only striving to have the timber utilized...and not wasted or destroyed; but I should view with very great anxiety any clearing of the hills which form the dividing range or back-bone of the island, and am convinced that it would be followed, sooner or later, by the most disastrous results, both in the shape of the deterioration of the climate, dangerous floods and landslips, and drying up of the springs and sources of rivers...

Realising that the dominant aim of New Zealand’s economy lay with agricultural development and that any competition between this and forestry would be in favour of the former, Campbell Walker removed state forestry from any direct struggle with agriculture by situating it in the uplands. Deforesting highlands like those of the Southern Alps, the Conservator was at pains to emphasise, offered nothing like the ‘gain’ that ‘is generally supposed’ in terms of opening up these areas to sheep or cattle runs. The soils were poor, he stressed, and once deforested, would most likely be washed away, leaving nothing behind but ‘arid hill-sides’. Campbell Walker thus presented a comprehensive, though in parts contradictory, discussion of climatic conservation. Relying on his own observations, and scientific hearsay, he saw evidence of climatic deterioration in New Zealand. He pointed out that, unless the Government protected some of the colony’s forests, disastrous droughts and floods would follow. As chapter eight shows, Campbell Walker’s views remained influential in conservation debates later that century and into the next.

The state forestry department ends; climatic protection continues

The state forestry department that Campbell Walker was to lead did not last long. Faced with economic depression and the need to cut costs, parliament repealed Vogel’s

Forest Act. The 1877 Land Act incorporated many of the clauses of the defunct Forests Act, the most significant of which allowed the Governor to declare forests reserves and appoint a conservator. Under this legislation, over half a million acres of forest reserves were created for climatic and soil conservation reasons. This increased to some 547,785 acres by 1881. As the Secretary for Crown Lands, James McKerrow, observed in 1881, the reserved forestland was located ‘on hill tops and at the sources of streams’ and prevented ‘the drying up of springs and streams from exposure to sun and wind.' McKerrow made no mention of climatic amelioration brought about by conservation, perhaps indicating that climatic conservation did not enjoy his support.

In 1882, Scottish-born Southland forester, Duncan McArthur (1806/08-1888), read a paper before the Southland Institute on the role of trees in reclaiming swamp land and the climatic benefits of forestry. Other professional surveyors and members of New Zealand's Lands Department also upheld the forest-climate link. Their support suggests that, while the idea may not have had universal support among land officials, it at least proved important to some. Engineer and surveyor Frederick Septimus Peppercorne and A. Lecoy, a French forester employed to undertake surveys of New Zealand’s forests, were two wholehearted advocates of climatic forestry in New Zealand.

Peppercorne was a surveyor and engineer interested in the human modification of climate and waterways. He published not only on the influence of forests on climate, but also irrigation works, transportation networks, geology and the interaction of water bodies and climate in New Zealand and Australia. He arrived in New Zealand at a

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127 See Brown and McKinnon, Captain Inches Campbell Walker, pp.11-16.
128 1877 Land Act', Statutes of New Zealand, Wellington, 1877, pp.177-179.
relatively early date in its colonisation, since in 1852 he published a work on the geology of the Auckland area. It seems Peppercorne left New Zealand for Australia in the early 1880s. In Australia, he urged the conservation of forests and creation of waterways to modify that country’s dry climate. He also investigated global climatic patterns. Before he left New Zealand, in 1879 Peppercorne wrote the ‘Influence of Forests on Climate and Rainfall’, which was published first in the Transactions and later privately in 1880. ‘It appears to be not generally known that, within certain limitations, climates (like soils) may be made good or bad by human agency’, explained Peppercorne, ‘and that one great agent in diffusing a general and uniform moisture, is the growth of forest trees, whose roots, branches, and leaves serve as reservoirs in times of rain, to be given forth again in dry weather.’ Peppercorne expounded in great scientific detail on the exact influence of trees on the surrounding air and groundwater, reading off a list of overseas experts who had written on the topic (see chapter eight for more detail). Peppercorne felt that ‘one of the first duties of an enlightened Government’ concerned ‘[t]he preservation of the forests of a country’. Quoting from the French forestry expert, Professor Macarel, Peppercorne demonstrated that ‘All the wants of life are closely related to their conservation: agriculture, architecture, and most industries, seek therein their ailment and resources’. Peppercorne’s arguments were borrowed from those of the physiocrats. As noted above, physiocracy enjoyed particular influence on French forestry in the nineteenth century. Given Peppercorne’s extensive knowledge of many French forestry works, it seems likely that it was from these that he derived his physiocratic arguments. To the physiocrats’ emphasis on agriculture, then, foresters added an earlier stage. If forests underwrote agricultural expansion, it followed physiocratic reasoning that the

133 Peppercorne, Geological and Topographical Sketches of the Province of New Ulster; comprising a brief account of the geology, and mineral productions of the northern provinces of New Zealand; and remarks on its topographical and hydrographical features. Auckland, 1852.
134 Peppercorne, On Rainfall and Water Conservation in New South Wales, Sydney, 1881, in Mitchell Library, 042 P95. Clearly, Peppercorne was living in the 1880s, at Wentworth Court, Sydney. See letter inside On Rainfall and Water Conservation in New South Wales, in Mitchell Library, 042 P95.
functioning of economic and governmental structures ultimately depended on state conservation. Forestry conservation did not simply deal with issues of timber famine. According to some, its existence influenced the very functioning of state and society.

As Peppercorne demonstrates, some conservationists brought physiocratic arguments to New Zealand in their publications. In the case of A. Lecoy, though, the ideas came direct from France. This retired French forester, employed by the New Zealand Government to look into the colony’s forests, assembled a strong case for state forestry in New Zealand based on physiocratic arguments. The New Zealand Government must, implored Lecoy, for the sake of the climate, increase the extent of state forests. Private individuals, he pointed out, would not leave forests standing for the benefit of society as a whole. State forestry, according to Lecoy, brought financial gain as well as climatic and hydrological stability.139

By the late 1870s a number of other articles about climatic conservation appeared in scientific papers, popular farming journals and in members’ parliamentary bills. Before merging with other farming journals to form the New Zealand Farmer, the North New Zealand Settler (established in 1882) carried many forestry articles. These included articles on the forest-climate link, health and forests, the use of trees in drainage and the need to plant forest trees.140 One article argued that both Auckland and Christchurch had experienced a ‘diminution in the rainfall’. ‘Experience’, it explained, ‘teaches that in all parts of the world the climate of a country is affected by the proportion of forest-covered land which it possesses.’ ‘There is no doubt whatever’, concluded the article, ‘that a liability to inordinate floods of rain, alternating with prolonged droughts, is the result of reckless forest denudation.’141 Of interest, too, is that the article employed economic and extinction reasons for conservation. Unless forest protection was swiftly enacted, the rare

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141 NNZS, 2, 9 (September, 1883), p.260.
and valuable trees 'peculiar to New Zealand' would be 'gone for ever; while if preserved, their timber may one day be worth as much per inch as it is now worth per foot.'

Popular discussion of the forests-climate link began at least in the 1860s, possibly earlier (see above). In the 1880s, Thomas Potts introduced these ideas in his 'Out in the Open' series, which discussed popular aspects of natural history. The New Zealand Country Journal (NZJH), a Canterbury-based farming journal established in 1877, also carried other articles on the importance of forests for maintaining adequate rainfall. In 1882, for instance, R. Aherne read before the Kaiapoi Farmers' Club an article on the importance of tree planting for rainfall. In contrast, William Morgan discounted that forests affected rainfall, but held that they moderated temperature extremes.

These examples reveal that discussion of the influence of forests on climate was not simply confined, as Graeme Wynn contends, to 'an educated and informed minority in the colony.' Debate permeated colonial society, reaching a popular audience, particularly in areas like Canterbury in which the NZCJ was published. The forests-climate idea appealed because of its very simplicity. Treeless areas were drier than forested areas. It was simply the explanation climatic conservationists used that was incorrect. Relief, the prevailing direction of rain-bearing winds and altitude determine a region's climate, not vegetation cover. The west coast of the South Island receives a great deal more rain than the east coast because the Southern Alps cause the moisture-laden westerlies to condense and fall as rain. By the time these westerlies reach the east coast, they have deposited their moisture and, from late summer to autumn, become dry, north westerlies.

142 NNZS, 2, 9 (September, 1883), p.260.
143 My discussion has not focussed primarily on newspaper sources and climatic debates.
145 Aherne, NZCJ, 6, 6 (November, 1882), pp. 405-8. See also T. A. Patrick, 'Encouraging Tree Planting of Farms', NZCJ, 9, 5 (September, 1885), p.410;
147 Wynn, 'Conservation and Society in Late Nineteenth-Century New Zealand', p.133.
Chamberlain's challenge: the climatic lobby in the 1880s

Although forest conservation areas had slightly increased in the 1880s, the conservation lobby in parliament remained vocal in the 1880s. In 1882, Henry Chamberlain, Auckland’s MHR, presented a quite extraordinary discussion of conservation and settlement that relied exclusively on the forests-climate link. Based on Lecoy’s report (see above), Chamberlain noted that in both Germany and France, countries that ‘had for long ages studied the advantages of maintaining and retaining their forests’, the ‘desirable quantity’ of forestland was one quarter of the total area. In Canterbury, Chamberlain instanced that the area was only 2 percent; in Auckland, 7 percent. Deforestation in a region with a ‘moist hot climate’ such as Auckland’s, Chamberlain noted, was particularly dangerous for ‘the climate would become very different, and scarcely anything would be able to be produced there.’ Chamberlain advocated drawing up maps showing highland areas and forest areas and then using this information to inform forest legislation. In his discussion, the MHR ascribed to forests almost exclusive control over climate:

Persons seeing the amount of forest and forest reserve would be able to judge what kind of climate any particular district would be likely to possess, which would influence them in choosing a place to settle in, and people would be also able to see where they could purchase forest land whenever Government might have it for sale.

Interestingly, Chamberlain appears to have advocated the integration of forestland with farming. Although sympathetic and recognising that wasteful deforestation ‘was a deplorable fact’, Richard Oliver, Minister without portfolio, replied that ‘very often there was no option between letting the lands lie idle and sacrificing valuable trees.’ Land settlement triumphed over forest conservation.

The following year Chamberlain, undaunted, introduced another bill aimed at protecting forested areas from ‘the wooded ranges to the plains and lowlands’ specifically

148 NZPD, 7 June 1882, pp.316-317.
149 NZPD, 7 June 1882, p.317.
150 NZPD, 7 June 1882, p.317.
for climatic and catchment reasons. Bolstered by rainfall statistics, Chamberlain demonstrated that deforestation had dried up the colony’s climate.

**Table 4.1 Chamberlain’s Findings on New Zealand Rainfall Decline**

<table>
<thead>
<tr>
<th>Region</th>
<th>Decline in Rainfall over last seventeen years (measured in inches over five year periods)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1867-1872</td>
</tr>
<tr>
<td>Auckland</td>
<td>48</td>
</tr>
<tr>
<td>Southland</td>
<td>46</td>
</tr>
<tr>
<td>Canterbury</td>
<td>27</td>
</tr>
</tbody>
</table>

Based on NZPD, 1 August, vol.45, 1883, p.212.

He also charged that deforestation increased flooding and pointed that conservation would extend the timber trade.\(^{151}\) Eight other MHRs spoke during the debate, of whom five supported Chamberlain’s espousal of the forests-climate link.\(^{152}\) J.W. Barnicoat (Nelson) argued that by enacting forest conservation humans:

> had it to some extent in their power to transmit the soil and the climate, in all their richness and excellence, that they themselves now enjoyed; for forests had an influence on the atmosphere, on the waters that fertilized the earth, and even on the crust of the earth itself.... When the forests were destroyed the streams dried up, the floods became sudden and violent, and the earth became arid and barren.\(^{153}\)

According to Barnicoat, the ability of forests to influence climate and hydrology gave humans the power to transform the earth so as to maintain a region’s fertility. Mathew Holmes (Otago) agreed. Tree planting in dry districts like North Otago and the Waimea Plains, he piped up, could double the amount of existing rainfall and increase the value of the land.\(^{154}\)

As had occurred during earlier debates about conservation, doubters either questioned that climatic deterioration had yet occurred in New Zealand or criticised the

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\(^{151}\) NZPD, 1 August, vol.45, 1883, pp.212-213.

\(^{152}\) These were Barnicoat, G.R. Johnson, Mathew Holmes (Otago), and William Hugh Nurse (Otago) and James Williamson (Auckland).

\(^{153}\) NZPD, 1 August 1883, vol.45, p.214.

\(^{154}\) NZPD, 1 August 1883, vol.45, p.218.
rainfall thesis itself. A great deal of forest still remained in the country, observed Henry Scotland (Taranaki), and where it had been removed no appreciable decline in rainfall had occurred.\textsuperscript{155} The relief of the mountains, not trees, pointed out Richmond, accounted for the surfeit of rain on the South Island’s west coast and its deficit on the east.\textsuperscript{156} Whitaker dismissed the contention that rainfall had declined. He noted the practical difficulties of reserving land in Canterbury since most of it lay in private hands.\textsuperscript{157}

Debate about the climatic and hydrological effects of forests increased in parliament in the 1880s. Chamberlain’s Bill of 1883 principally focussed on the need for forest conservation for the prevention of climatic deterioration and decreasing rainfall. Significantly, more supported than rejected its provisions. This presents a markedly different view from the one Graeme Wynn does of this period in his articles of 1977 and 1979. In his two pioneering articles on New Zealand forest conservation, Wynn has created the impression that conservation suddenly emerged in New Zealand in the late 1860s, peaked with the 1874 Forests Act, only to suddenly decline again once it was revoked in 1876.\textsuperscript{158} Wynn has ignored the forest conservation provisions of the 1877 Land Act, continuing parliamentary concern about deforestation, and that articulated elsewhere in scientific and popular circles.

\textbf{The rise and fall and rise of state forestry}

In June 1885, Vogel, now Colonial Treasurer in the Vogel-Stout Government introduced his second forestry Bill. Parliament passed The New Zealand State Forests Act. This legislation aimed to subject state forests ‘to skilled management and proper control in order thereby to prevent undue waste of timber, and to provide for future industrial purposes, and to provide for the proper climatic conditions by the preservation of forest growth in elevated situations’.\textsuperscript{159} As well as repealing the section of the 1877 Land Act on forests (section V), various sections of the legislation encouraged tree

\textsuperscript{155} NZPD, 1 August 1883, vol.45, p.215.
\textsuperscript{156} J.C. Richmond, 1 August 1883, vol.45, p.218.
\textsuperscript{157} NZPD, 1 August 1883, vol.45, pp.215-216.
\textsuperscript{158} Wynn, ‘Conservation and Society in Late Nineteenth-Century New Zealand”; ‘Pioneers, politicians and the conservation of forests in early New Zealand’, Journal of Historical Geography, 5, 2 (1979), pp.171-188.
\textsuperscript{159} ‘The New Zealand State Forests Act, 1885’, Statutes of New Zealand, Wellington, 1885, p.70.
planting. It also allowed the Governor to appoint a forest conservator and to establish schools of forestry and agriculture. The Act established three types of land use. Class III comprised timber reserves of forest blocks awaiting commercial exploitation. Class II involved forest reserves and plantations that would not be harvested in a sustainable manner. After cutting, these areas would be given over to the Commissioner of Crown Lands for land settlement purposes. The final category was Class I forests, called 'Climatal [sic] or Mountain Reserves, to include all Forests reserved for Shelter, for the Conservation of the Water-supply, or for Climatic Reasons, irrespective of Altitude'. Climate reserves (Class I) lay in highland country, on economically valueless land, and could be harvested or planted in more commercially valuable tree crops. They only could be felled with the approval of a forestry department officer.

With debate primarily focussed on the costs of Vogel's programme (Vogel required a £50,000 pounds loan to start up the forestry), little mention was made either of the climatic or hydrological aspects to the legislation. Only two MHRs, in fact, discussed climatic conservation. It is surprising, on the face of it, that not more time passed discussing the climatic principles of the Bill. After all, this comprised a major part of the Bill. Silence and lack of criticism of these ideas, suggests that parliamentarians accepted the forests-climate link. A closer look at the actual legislation reveals another important difference from earlier climatic legislation. Although most of the reserves were gazetted in highland areas, the Act also provided for the reservation of lowland areas. This suggests that parliament had realised the importance of lowland, as well as highland, protection. Perhaps, too, it realised that rather than planting trees after forest had been removed, it was a lot cheaper and less labour intensive to reserve existing areas of lowland forest.

162 See NZPD, 26 June, 1885, pp.200-211; NZPD, 7 July, 1885, pp.445-453.
163 Two MHRs did discuss climatic conservation. George Beetham, Wairarapa North MHR, denied that forest clearance had caused a drier climate: Beetham thought that the converse, in fact, had occurred despite significant deforestation in the North Island. George Beetham, NZPD, 26 June, 1885, p.206. New
Excising and reserving forests

The 1885 Act followed that of its predecessor. In 1887, despite criticism of this move by TH Kirk, Conservator of State Forests, a new government withdrew Crown funding.\textsuperscript{164} In 1888, signalling a departure in policy from conservation to use, parliament passed the ‘State Forests Act Amendment’ which allowed the Governor to withdraw land from State Forest areas.\textsuperscript{165} During debate on this Bill, some parliamentarians protested against the opening up of forests, warning that this would prove detrimental to both New Zealand’s climate and soils. Yet withdrawing land from State forests, as historical geographer Michael Roche notes, reflected the Liberal Government’s programme of closer land settlement.\textsuperscript{166} Closer land settlement relied on converting Māori tenure to European. Much of former land lay in forest. Opening it up to agriculture significantly reduced the forested land in New Zealand up to the turn of the century. Under the Liberals, ‘the acreage of forest reserves dropped in 1893 and did not exceed its former extent until 1900.’\textsuperscript{167} Although emphasis fell, once more, on development, this does not mean either that calls for forest conservation fell silent or that conservation ground to a halt in this period. A number of motions were tabled that questioned the sagacity of withdrawing large areas of forests.\textsuperscript{168}

Another change in this period also took place. Especially from the 1900s, catchment arguments started to gain greater prominence than climatic arguments. Increasing land deterioration in New Zealand and greater scientific emphasis being placed on catchment concerns precipitated this shift (see chapter seven). New motives and new considerations for conservation also appeared in the 1890s. Nationalism evoked pride in New Zealand’s native plants and animals and sanctioned the reservation of forest

Zealand’s former Governor, Sir George Grey, summarised the Bill as ‘necessary for climatic reasons’ and for future timber supplies. Sir George Grey, NZPD, 7 July, 1885, p.448.
\textsuperscript{164} Brown, Forestry Era, p.12.
\textsuperscript{166} Roche, History of Forestry, p.137. See also Brooking, Brooking, Tom, Lands for the People? The Highland Clearances and the Colonisation of New Zealand: A Biography of John McKenzie by Tom Brooking, Dunedin, 1996, pp.176-178.
\textsuperscript{167} Roche, History of Forestry, pp.137-138.
\textsuperscript{168} See, for instance, NZPD, vol. 74, 21 September 1891, pp.813-821; vol. 88, 8 August 1893, pp.478-481; 9 August 1893, pp.549-552; 11 August 1893, p.585.
areas for aesthetic purposes. The Land Act of 1892 reserved areas of scenic beauty, the same year in which island sanctuaries for native birds were created. In 1894, New Zealand gained its first national park, Tongariro. In 1903, the Scenery Preservation Act promoted scenic preservation and protected areas from settlement.\textsuperscript{169} Ecological ideas, leavened with nationalism, gave conservationists greater scientific credibility thanks to the influence of the ecologist Leonard Cockayne (1855-1934). Cockayne charged that conservationists had the task of protecting symbols of the nation’s national identity. Keeping the scenic wonders of New Zealand also received strong economic support with the growth of tourism as well as from the fact that many of the newly reserved areas lay in areas with little potential for farming.\textsuperscript{170}

\textbf{Arbor Day}

Climatic arguments continued alongside these newer considerations, albeit with less prominence than before. In the 1890s, climatic arguments for forestry appeared only once in the \textit{Transactions}, and received only sporadic mention in parliamentary discussion about forest conservation.\textsuperscript{171} Some influential scientists and land officials, including New Zealand’s Chief Forester and others, still held to these arguments in the first two decades of the new century. Climatic ideas, for instance, were incorporated into Arbor Day, introduced as a national holiday into New Zealand in 1892. Ostensibly modelled on the United States, where it emerged in the provinces of Nebraska in 1872 and gradually spread to all other states except Delaware, Arbor Day promoted tree planting as a patriotic activity and aimed to instil in schoolchildren an ethic of conservation.\textsuperscript{172} According to one of its early proponents, the New Zealand conservationist Alexander

Bathgate (1891), Arbor Day had a ‘refining influence’ on ‘youthful colonists’, by stimulating their interest in nature and cultivating a community spirit. It also served more utilitarian motives by providing timber for fuel and building, increasing rainfall and protecting against soil erosion. Arbor Day in New Zealand, as for the United States, promised to be as redemptive for the planter as it was for the planted: Tree planting would redeem and improve arid ‘wastes’ just as it would redeem and improve a nation’s morals.

As Leigh Eric Schmidt notes, religious overtones accompanied Arbor Day in the United States. Most Protestant churches ‘gave their blessing to such civic ceremonies’, with some Sunday Schools undertaking their own tree planting. One pastor even required proof of tree planting before administering confirmation! In New Zealand, both patriotic and religious overtones are evident during Arbor Day, although without a thorough reading of every newspaper in the country it is difficult to gauge its overall impact on the rest of the colony. I have attempted to gain an impression of Arbor Day in Otago thanks to a reading of reports in the Otago Witness for the years from 1892 to 1913.

This newspaper reveals that particular attention was given to the festivities surrounding Arbor Day. Reports of the numbers and types of trees planted and by whom, also were forthcoming, but sadly few discussed the precise motives for planting. It is therefore difficult to gauge the exact extent to which climatic ideas played in these activities. It is much easier to judge what took place on Arbor Day. At Waikoikoi (Southland) in 1894, for instance, people planted trees only after the district’s children had sung ‘a couple of Arbor Day songs’ and ‘God Save the Queen’. They then marched ‘through the township displaying flags and giving ringing cheers’. The day’s activities


173 Hocken Pamphlets, vol.172, no.3, p.6. It was first published in ODT, 5, 12, 19, September, 1891.

174 A government booklet advised that at the start of Arbor Day ‘a short and appropriate address or addresses should be given by the Mayor and other prominent colonists, pointing out the great advantages resulting from an intelligent planting of trees’. See Department of Agriculture, Arbor Day, 1894, 1894, in Hocken Pamphlets v. 099/no.90, p.6.

ended with a concert and dance.\textsuperscript{176} At Moa Creek (Otago) in 1895, once tree planting had ended, the adults organised sports and then treated themselves to a dance, which ‘kept going with great spirit until 4am [sic]’.\textsuperscript{177} Religious overtones sometimes accompanied the occasion. In 1894, the Presbyterian magazine, \textit{The Christian Outlook}, argued that: ‘Though Arbor Day has no place in the ecclesiastical year, it deserves it. It is a force that makes for Christianity.’ Expanding on this last point, the editorial noted that for children relation with the natural world ‘would do more to develop and culture their finer tastes than the dry curriculum of books and standards.’ Trees, moreover, symbolised God’s work. The Bible, too, reminded the writer, ‘opens with the story of a tree … and it closes with a life renewed, sustained by a similar method.’\textsuperscript{178} Other editions of the magazine also referred to Arbor Day.\textsuperscript{179} In keeping with its civic importance, clergies attended the celebration. In 1896, with the unavailability of Kaitangata’s mayor, the Reverends R. Fairmaid and J. Somerville delivered short addresses.\textsuperscript{180} Church involvement in what stood out as an important civic occasion in many communities in the 1890s should come as no surprise. It is clear from these and other reports that in many areas of Otago in the 1890s, Arbor Day became an important civic occasion for the focus of community festivities, one that was in part at least inspired by fears of climatic deterioration.

Admittedly, of course, not everyone in Otago engaged in such celebrations. Although the \textit{Otago Witness}, for instance, observed that Dunedin’s residents kept the holiday ‘in only a half-hearted sort of way’, the majority of places of business and offices ‘were closed all day’ as tree planting enthusiastically went ahead.\textsuperscript{181} By the late 1890s, as the \textit{Witness} noted, the fervour for tree planting had somewhat lessened, an impression supported by an \textit{Otago Daily Times} report of 1898. The \textit{Witness} blamed its waning on the fixing of one date for Arbor Day throughout the entire colony. It pointed out that this

\textsuperscript{176} \textit{OW}, 9 August 1894, p.23.
\textsuperscript{177} \textit{OW}, 26 September 1895, p.23.
\textsuperscript{178} \textit{Christian Outlook}, 1, 25 (4 August, 1894), p.289.
\textsuperscript{179} The\textit{ New Zealand Presbyterian} of 1892, for instance, reproduced the poem: ‘Grind Your Axe in the Morning’, 7, 1 (1 August, 1892), p.21.
\textsuperscript{180} \textit{Otago Witness}, (26 August 1896), 25. In Queenstown: ‘The children of the local Catholic schools also adorned the ground surrounding their schools and churches by planting a number of ornamental and timber trees.’ \textit{Otago Witness}, (27 August 1896), 25.
\textsuperscript{181} \textit{OW}, 11 August 1892, p.16.
pronouncement did not take into account different rates of growth in the colony.\textsuperscript{182} The \textit{New Zealand Official Yearbook} offered a far less positive assessment of the keeping of Arbor Day in New Zealand. As early as 1893, for instance, it felt that Arbor Day 'attracted little attention in New Zealand'; by 1896 it was observing that 'New Zealand settlers have not yet entered into the spirit of the institution, as it is hoped they would.'\textsuperscript{183}

Clearly, in the early 1890s, when the \textit{Yearbook} passed its first assessment, many areas of Otago had enthusiastically embraced the celebrations. Whether, then, as a province Otago was singular in celebrating Arbor Day is difficult to gauge without undertaking an in-depth study of the rest of the country. It is quite possible that tree planting was undertaken in areas that had relatively few trees such as some parts of Otago and Canterbury. As the \textit{Witness} observed in 1895 about Ratanui (probably the Catlins, Southland), 'no big fuss' attended Arbor Day 'perhaps owing to the fact that the settlers have too many trees already.'\textsuperscript{184} Yet, despite both the \textit{Yearbook} and, from 1897, the \textit{Witness} lamenting the declining enthusiasm for Arbor Day, the event was still celebrated in many North Island schools in 1899.\textsuperscript{185} Its continuing support suggests that while community participation in Arbor Day may have declined, schools continued to recognise the occasion (Photograph 4.1). The \textit{AJHR} report on Arbor Day among Native Schools indicates that Māori schoolchildren planted a mixture of native and introduced trees. The Education Department's memorandum on Arbor Day recommended planting fruit trees for their usefulness and because they offered 'simple practical lessons on planting, grafting, pruning, &c.' It also noted that 'the natural history of the pests injuring fruit-trees, would form a very suitable course for older scholars in Native schools.' It further recommended, planting 'osiers for basketwork', since the Department envisaged introducing 'cane-weaving and basket-work as manual operations into some of the Native

\textsuperscript{182} OW, 21 July 1898, p.5; ODT, 15 December 1898, p.7.
\textsuperscript{183} New Zealand Yearbook, Wellington, 1893, p.174; 1896, pp.377-378.
\textsuperscript{184} OW, 5 September 1895, p.23.
Photograph 4.1 Tree planting following deforestation. The importance of schoolchildren to Arbor Day is underlined in this photograph, as is the social importance of this activity to smaller communities.

‘Arbor Day at Rata School, 1 August 1894’, B/w original, Edward George Child, 1/1-011003; G, ATL.
Thus Arbor Day also served important practical and didactic purposes in Native schools and those around the country.\textsuperscript{187}

As a whole, the activities of native schools and, indeed, the popularity of Arbor Day in Otago in the early 1890s at the same time as the Yearbook’s criticism, perhaps suggests that criticism of non-compliance with Arbor Day was used more as a rhetorical device to encourage more activity than a reflection of the reality of the situation. More research, however, is required to offer more conclusive answers as to the impact, extent and popularity of Arbor Day.

**McNab, Wragge, Meeson and Matthews on forests**

One supporter of Arbor Day, the Southland politician and landowner Robert McNab maintained his own plantations and published articles on the importance of forestry to farmers in New Zealand.\textsuperscript{188} In his 1903 series ‘Forestry in Its Relation to the Farm’, McNab upheld the forests-rainfall link. According to him, forests moderated the extremes of temperature and increased rainfall. Evaporation, he explained, created a moist atmosphere which, in turn, ‘tempers the dry winds, to the benefit of vegetation’. Forests, likewise, reduced the extremes of heat in hot countries. In cold countries, they protected neighbouring vegetation ‘from the effects of late frosts.’\textsuperscript{189} McNab was also attuned to the debate about the effects of forests on rainfall, unsurprising since over almost a decade he had assembled a vast collection of forestry papers from around the world (see chapter eight). In support of this idea, McNab cited the work of a researcher in the United States who had calculated that forests contributed to the climate at least ‘5 or 6 extra inches of rainfall’. He also relied upon reports of the Canterbury Agricultural and

\textsuperscript{188} McNab, for instance, hosted a party of school children at his plantation on Arbor Day. *Ensign*, 20 August 1903, newspaper cutting in McNab, papers relating to afforestation in New Zealand 1895-1908, Hocken Library, MS 0608.
\textsuperscript{189} See R. McNab, ‘Forestry in Its Relation to the Farm’, *NZF*, 23, 10 (October, 1903), pp.695-696; 23, 11 (November, 1903), pp.787-788; 24, 12 (December, 1903), pp.875-876. His ideas were also published independently: McNab, *Forestry in its relation to the farmer: Four articles: the Farmer’s Homestead Plantation, Forestry’s Contribution to Agriculture, Forestry’s Aid to the Farm, Forestry Supplies*, Gore, 1903.
Pastoral Association. These attested to the more equable and milder climate before deforestation on the Canterbury Plains. Yet, interestingly, elsewhere in that same year McNab noted that the forests-rainfall link had not yet been decided. Thanks to his widespread reading on the subject unlike many climatic conservationists, McNab had a well-informed and sophisticated understanding of the supposed mechanisms of climate change exerted by forests.

Another with a similar depth of understanding was the meteorologist Clement Wragge (1852-1922). A colourful figure in many respects, Wragge probably came to New Zealand in 1903 after his dismissal from the weather bureau in Brisbane. This self-styled ‘Boss weather prophet’ supervised many interesting projects, among them rainmaking experiments in Charleville in 1902, and visited New Zealand as a lecturer later in that decade. Wragge maintained that in Southland zones of timber ‘should be left on the’ southern, ‘eastern, northern, and western sides of any holding which it is intended shall be partially cleared’ since these areas offer shelter and increase rainfall. Wragge recommended the planting ‘of broad-leaved trees in cases where the native trees have already been destroyed, because they afford a greater surface for condensation.’ As he explained, the moderation of temperature by forests also contributed to increasing rainfall:

Forests provide a wider area for the condensation of vapour, and prevent too rapid evaporation, and it is well known that changes of temperature go on more slowly in wood than in the air, and thus frequently forests have a lower temperature, which obviously tends to increase the rainfall. The wholesale destruction of forests provides a wider surface for evaporation, and thus the land becomes dry and desiccated and hard; whereas the replanting of native timber would help to keep the moisture that is now largely dissipated.

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193 Southern Cross, 5 March, 1904, n.p. newspaper cutting in McNab Papers.
The woeful effects of deforestation in parts of New South Wales and Queensland, observed Wragge, fully vindicated the necessity of conservation and tree planting since ‘[i]t is a suicidal thing to denude any land of its native timber without at the same time carrying on systematic tree-planting.’

Wragge was not the only meteorologist to uphold the forests-climate link. In 1890, the New Zealand meteorologist John Meeson had discussed the idea. Although he held that elevation and latitude, prevalent winds and mountains, ground slope and soil character and proximity to sea influenced rainfall distribution in New Zealand, he noted that both forests and cultivation had localised effects on climate. ‘[D]ense neighbouring woods’, Meeson observed, ‘will diminish local temperature, and so, to some extent, attract rain.’ Blenheim settlers, he continued, ‘attributed [the slight increase in Blenheim’s rain] – rightly or wrongly – to increased cultivation and arboriculture.’ In 1907, the future Director of New Zealand’s meteorological bureau, the Rev. D.C. Bates, recommended tree planting to increase rainfall in droughty North Otago (see chapter five). Although Meeson tentatively talked about the forests-climate link, Bates and Wragge accepted it, unlike meteorologists in the United States. In the United States many meteorologists and engineers had waged war on both the forests-climate theory and the forests-flooding link promoted by the United States Forestry Service. The USFD deliberately played up the influence of forests on climate and catchment areas as a means of increasing the extent of land within its control.

New Zealand’s Chief Forester, Henry Matthews (1859-1909), also discussed the effects of forests on climate and catchment areas, indicating that climatic ideas enjoyed some institutional support within the Department of Lands and Survey. Matthews headed the forestry branch, established in 1897 on the recommendations of the 1896 Timber Conference held in Wellington. Its aim was afforestation in treeless areas, such as Central Otago and the volcanic basin in the North Island. In a 1901 article printed in the New

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194 Southern Cross, 5 March 1904, n.p. newspaper cutting in McNab Papers.
199 See Historical Records Volume 1, Volume 6, 1908-1913, F1, 45/2715, National Archives, Wellington.
Zealand Farmer and read at the Dunedin Horticultural Conference, for instance, Matthews listed forests’ increasing rainfall as one of the four reasons why more timber planting was required. In 1905, he returned to the subject of climate change in the introduction to his popular book on tree planting, Tree-culture in New Zealand. A reading of the records of the forestry branch reveals no explanation of the motives behind afforestation. This is hardly surprising since these records concerned the minutiae of running a department.

Climatic ideas in popular debate

Climatic ideas certainly gained popular support and reached out to an audience not only made up of politicians or scientists. Matthews, as noted above, presented a paper to the Dunedin Horticultural Conference in 1901. That same year James Burgess, President of the Cape Egmont Horticultural Society, presented a highly alarming depiction of a flourishing area rendered infertile by deforestation. Burgess constructed a cautionary tale. It began with Eden before the Fall and ended with Paradise Lost. In the beginning, before Europeans came to this area, Burgess related that the forest along the west coast of Taranaki between Stoney River and Opunake had stewarded ‘a profusion of lovely palms and ferns’. In spring, these plants ‘were lit up by masses of the beautiful white clematis.’ Meanwhile, in the open land nearby, Captain Cookers (pigs) snorted and snuffled through the undergrowth while ‘droves of cattle as wild and wary as deer’ and ‘large numbers of pigeons, tuis, bell-birds and numerous other species’ tenanted the forests. This profusion of plenitude was broken with the coming of European man, stated Burgess. Noting the success of Māori cultivation, he explained, Europeans ‘jumped to the conclusion that anything they chose would flourish’. So they began planting and ‘clearing off the native growth’ ‘without taking into consideration the effect that would be produced upon the climate’.

201 Matthews, Tree-Culture in New Zealand, Wellington, 1905, pp.1, 4. Matthews’ book, for instance, was quoted by the conservationists Grossmann in 1909 and also in the New Zealand Farmer. See ‘Tree Culture in New Zealand’, NZF, 26, 7 (July, 1905), p.563.
202 See Forestry Papers. F1, 45/271/5, NA, Wellington, p.2
[A]las! this illusion [of plentitude] was soon dispelled. In two years peaches became almost extinct, deciduous trees would only grow where sheltered from the southerly gales, by some eminence, the patches of native scrub left standing began to look unhealthy, whilst melons and other tender plants became very uncertain each year. The climate appeared to get worse every year, until about five years ago it culminated in two severe gales from the south...killing gumtrees, which had attained a height of fully 30 feet!; badly damaging, and even killing many of the macrocarpa, laurel and akeake; even the insignis did not escape injury; and only the maritima, cabbage palm and flax were uninjured. Thousands of fruit trees were utterly destroyed, and thousands more have since dragged out a miserable existence – unlovely and useless.  

Unlovely and useless, Burgess believed humanity had rendered the Garden of Taranaki a howling wilderness! Redemption, implored Burgess, would come with afforestation. For these reasons, noted Burgess, the government must plant more trees than the 900 it had so far sowed.

Redolent of biblical imagery and employing alarming language, Burgess’ concerns embodied the classic arguments put forward by climatic conservationists, who charged that deforestation was turning the garden to waste and despoiling New Zealand’s natural fecundity. In 1908 and 1909, J.P. Grossmann, academic and journalist, wrote a similarly disturbing text designed for a popular audience. His work was published in the Auckland Weekly News, in book form and in New Zealand’s parliamentary papers.

The rainfall-forests link under attack

The tide was turning against climatic arguments, however. In 1910, another conservationist, Canon Philip Walsh dismissed claimed that ‘rain is attracted by standing
forest’, but upheld that it affected temperature, wind and frost patterns.\textsuperscript{207} With deforestation, he explained:

Every gully becomes a funnel up which the wind rushes in a tearing blast, becoming more and more desiccated as it travels; orchards are blighted, grass is parched up, and crops are prematurely ripened; while the remnant of the bush becomes so dried up that it is ready to be swept by the first fire that comes along. Old settlers will tell you that the seasons have changed of late years...\textsuperscript{208}

Deforestation in Taranaki and Hokianga increased frosts in winter, he related, while in summer winds desiccate orchards and vineyards in Hokianga.\textsuperscript{209} Other groups and individuals, such as the Taranaki Scenery Preservation Society, still presented climatic arguments for forest conservation.\textsuperscript{210} By the 1900s, these writers were describing what had happened to New Zealand’s climate in contrast to earlier, when conservationists such as Campbell Walker wrote about what would happen if deforestation continued. By the 1900s, conservationists were drawing examples of the effects of deforestation from New Zealand itself as well as from earlier writers on the topic (see chapters seven and eight).

This evinces a shift occurring in perceptions of New Zealand’s climate. Although images of New Zealand as the Promised Land, blessed with ample rainfall, fertile soils and fecund vegetation, died hard, a series of droughts, including those in 1890-1, 1906-7 and 1910-11 which struck areas of eastern New Zealand, made some people recognise that regional rainfall variation existed in temperate lands.\textsuperscript{211} Sometimes, this caused people to link deforestation with this change. As meteorologist D.C. Bates observed of


the North Otago region after the 1906-1907 drought, although ‘our seasons are usually so temperate, regular, and fruitful’, ‘climatic variations are of the greatest concern to the colony’. Bates, along with some other authors, urged that tree planting and dry farming should be considered in parts of New Zealand where rainfall was irregular (see chapter five). Another symptom of this increasing concern, particularly in areas of low rainfall such as Canterbury and Central Otago, came with the development of irrigation. Thus the realisation was dawning in some quarters that even ‘God’s Own Country’ suffered from drought. Writers, though, quickly pointed out that: ‘When we speak of a drought in this Dominion, we do not mean that we are labouring under the rainless, agonising periods which so frequently afflict Australia; the information we intend to convey is that, for the time being, New Zealand has not been blest [sic] with the copious, energising rainfall which it usually enjoys.’ Most European New Zealanders viewed drought as much of an aberration as unproductive land. Thankfully, they held up forest conservation as a means of maintaining New Zealand’s temperate climate. Tree planting also promised to redeem dry and desolate areas by increasing rainfall.

**The decline of the forests-rainfall argument in scientific circles**

Tree planting and forest conservation also checked soil erosion and flooding. As chapter seven shows, by the turn of the century these protective capabilities of forests received more emphasis than climatic concerns. This occurred partly as a response to growing environmental problems in some areas of New Zealand. Evidence reinforced theory. In New Zealand, devastating floods swept through much of the North Island in 1897 removing much topsoil and farming profits. No sooner had the floods dissipated than drought appeared. By the 1900s, many high country runs faced hard times, wracked

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211 According to an article in the *New Zealand Farmer*, for instance, ‘Mother Earth’ in giving them such a favourable climate had been ‘too indulgent to her children’. ‘The Wast [sic] of Natural Advantage’, NZF, 21, 2 (February, 1901), p.62.


214 NZF, 32, 10 (October, 1911), p.1175.
by overgrazing or else eaten out by rabbits. Land deterioration in these areas suggested to some that the worst prophesies of the earlier conservationists would come true, that New Zealand would be become a howling wilderness ravaged by alternating cycles of dryness and wetness. In response to these fears, a shift towards catchment conservation and away from climatic concerns took place in official circles in the 1900s. This changing ethos was reflected in the 1913 Royal Commission on Forestry, which emphasised the threat deforestation posed to land degradation through its increase of flooding and the removal of topsoil as well as problems exacerbated by the impact of grazing animals on vegetation. Scientific literature reinforced these fears by drawing attention to the importance of catchment conservation (see chapter seven).

Belief in the forests-climate link, though, did not simply die out.215 Even at the 1913 Commission, a number of lands officials espoused the influence of forests on rainfall. When asked if ‘taking the forest off the hills will diminish the rainfall?’, William Norris Masefield, Commissioner of Crown Lands and Chief Surveyor for the District of Hawke’s Bay, replied ‘Tremendously’. He explained that by ‘Taking the south-west wind in the Nelson District, that wind becomes a dry wind after it passes the Hope Saddle.’216 William Jones, a member of the Crown Lands Board of Auckland, also felt the need for climatic conservation to maintain rainfall.217 Others argued along similar lines.218 Nevertheless, this group was in the minority during the debate, a fact reflected by the recommendations of the commission for forest reservation for catchment protection. This commission stands as a watershed by which catchment conservation gained official sanction over concerns that forests affected rainfall and temperature (chapter seven).

215 In 1934, Lord Bledisloe was still emphasising the influence forests on rainfall in his address promoting Arbor Day. Lord Bledisloe, The Glories and Peculiarities of New Zealand Forest Vegetation: Address by his excellency Lord Bledisloe at Wellington College, Wellington, N.Z., on Arbor Day, 1st August, 1934, Dunedin, 1934, p.3.
217 ‘A great deal of injury is done to our climate by cutting down belts of timber that should be preserved,’ he observed, ‘when we have a vast area of good, open country that should first be settled before wooded lands are thrown open.’ Jones, 24 April, Auckland, 1913, no. 61, in ‘Report of the Royal Commission on Forestry’, AJHR, 1913, p.56.
Conclusion

Fears that deforestation was changing New Zealand’s climate date from the 1860s. They reached the national parliament first in 1868, and remained prominent in the political arena for the rest of the century. Natural scientists and farmers also drew attention to the dangers of deforestation. Very often they used climatic and catchment arguments side by side. Conservationists promised that forest reserves would maintain New Zealand’s temperate climate and productive fields. And that, in some cases, planting trees in dry areas like Central Otago could even redeem climates. Continued emphasis on tree planting in scarcely forested areas reflects the on-going importance of local experiences in shaping the success of legislation. Tree planting legislation had no relevance in North Island provinces where forest hindered development. Emphasis on tree planting also resonates with other measures of environmental improvement. As swamp draining and irrigation improved the health and agricultural prospects of an area, so too did tree planting by increasing rainfall and moderating temperatures. Unusually, too, forestation efforts focussed on the lowlands. The 1885 New Zealand State Forests Act also recognised that forest reserves could be made in lowland areas. Most attempts at forest conservation, however, focussed on its development in the uplands. This was a deliberate policy. Foresters emphasised that their practice complemented, rather than interfered with, the needs of settlement. They carefully pointed out that forestry did not interfere with development because it took place in the agriculturally marginal highlands. Conservationists also highlighted that forestland protected agricultural pursuits and if properly managed according to the principles of scientific forestry, brought profit. Scientific opinion backed up parliamentary views on the importance of forests. In the 1870s and 1880s, a number of articles appeared in the Transactions, often supplied by politico-scientists such as W.T.L. Travers. The Philosophical Institute of Wellington, and to a lesser extent Auckland’s, emerge as hotbeds of conservationist concern. Of the thirteen papers on climatic and catchment concerns published in the Transactions, seven came from Wellington and three from Auckland (see also chapters six and seven).

218 Auckland’s Commissioner of Crown Lands, Harry May Skeet, 24 April, Auckland, 1913, no. 61, in ‘Report of the Royal Commission on Forestry’, AJHR, 1913, p.57.; Clement William Govett, Minutes of Evidence, 28 April, Wanganui, 1913, no. 61, AJHR, C12, 1913, p.61
Indeed, a particularly sustained period of writing on the forests-climate link occurred in the 1870s and 1880s, interspersed with a relative lull in the 1890s before again assuming prominence in the 1900s. In the 1870s, forestry and particularly climatic anxieties received quite prominent discussion in parliament. Climatic conservation received significant discussion in these debates and was promoted by New Zealand’s Chief Conservator, Captain Inches Campbell Walker. His views appeared in parliamentary papers, newspapers and the Transactions. From the 1880s, farming journals such as the New Zealand Country Journal and New Zealand Farmer reveal concern in popular circles for the effects of deforestation on climate. In the 1890s, climatic arguments were obscured by the emphasis placed on opening forests for settlement, by new arguments for scenic and island conservation and by the problems created by the Long Depression. By the 1900s, New Zealand was emerging out of depression. Government no longer coveted state forests for settlement while scenic and island conservation had become more commonplace, thus giving space for attention to focus on climatic conservation. Ultimately, tree planting for reasons of climatic conservation fell victim to a concurrence of two events. Growing land deterioration in New Zealand coincided with increasing scientific emphasis on the effects of deforestation on the hydrology of catchment. From their emergence in the 1860s, climatic arguments, though, did not enjoy universal support. Some doubted their very existence. A few held that forests influence temperature but not rainfall. Others supported the theory but thought that it had not occurred in a newly settled country like New Zealand. One of the problems for climatic conservationists, indeed, was challenging the image of New Zealand as a temperate land. Many solved this by relying on terrifying examples selected from around the world of fertile countries laid waste through the folly of deforestation. They pointed out that if conservation did not occur in the colony similarly terrifying events would follow in New Zealand. By the 1900s, experience with living in New Zealand had taught some European New Zealanders that New Zealand’s climate, while overall temperate, did have some drawbacks. Accordingly, many writers about climatic conservation in the 1900s drew their examples no longer from overseas but from New Zealand, a trend that also was mirrored in writing about sand drift and soil erosion. Paying attention to New Zealand examples reflected people’s growing perception of the problem as well as increasing
research undertaken into New Zealand's environment. As the following chapter demonstrates, local experience of nature still proved very important in generating environmental anxieties and in seeking solutions to these.
Chapter 5: Rethinking science, religion and nature in environmental history: drought in early twentieth century New Zealand

The previous chapter revealed widespread colonial environmental anxiety that deforestation was causing deleterious climate change. This one also focuses on drought but shows that this could stimulate a variety of settler responses and not just fears about deforestation. Looking at the reaction of the residents of North Otago, New Zealand, to the drought of 1906-7, reveals the importance of religious perception in environmental anxiety. Investigating the rainmaking experiments and rainmaking prayers which took place in 1907 uncovers a far more complex picture of religious and scientific ideas in New Zealand than many writers have recognised. Natural events, such as floods and fires, earthquakes and storms, comets and eclipses, have elicited a wide range of responses from different societies. Some people viewed them as evidence of divine displeasure brought on by human transgressions, some as omens of bad things to come, and others as extreme natural phenomena. Environmental historians can use these events as occasions to learn about contemporary ideas of nature, science and religion. So far, however, these debates have been ignored by New Zealand’s environmental historians. Nor have New Zealand historians paid them much attention. In his two-volume history of New Zealand, James Belich, for instance, argues that the growth of scientific rationalism between the 1880s and 1920s meant a decline in religious belief. Belich’s views form part of a general writing-out of religious history and the religious views of early twentieth century New Zealanders that is evident within the wider New Zealand historical profession. As this chapter shows, extending natural scientific explanations into new areas does not necessarily


undermine religious readings of the same phenomena. Nor do increasing scientific understandings invariably bring about secularisation in society. Many North Otago Protestants viewed prayer and experiment, religion and science as complementary activities designed to achieve the same ends. These findings complicate both the dominant historiographical picture of "modern society" in which science inevitably undermined faith, and the notion of hermetically-sealed divisions between the secular and the profane, science and religion. Reactions to drought also demonstrate the fascinating process by which emerging scientific groups, such as meteorologists, sought to strengthen their own claims of professional legitimacy by criticising the rainmaking experiments as scientifically unsound. This thereby demonstrates both the complexity of European environmental responses to the New Zealand environment and the variety of environmental explanations presented. Rainmaking prayers in North Otago received a different response to those in other countries. Controversy often attended rainmaking prayers in Australia and England for a variety of reasons. Liberal-minded clerics, scientists and professionals challenged the wealth and influence of other clergy by criticising special prayers and the like. In England, some professionals attempted to undermine the church’s status and authority. They attempted to create a niche for themselves by challenging the dominance of the state church over educational institutions, politics and government. New Zealand professionals, in contrast, did not have to challenge an established church to gain power since none existed in the colony. New Zealand’s greater social opportunities, similarly, reduced the potential for religious grievances in the colony. Drought also led to other reactions. For some, it threw into doubt the accuracy of assessments of the temperate nature of North Otago’s climate and the suitability of European farming practices there. These demonstrate the importance of local environments in changing environmental attitudes.

**Defining drought**

People define drought and natural events in different ways. A farmer may measure it primarily by the lack of crop or pasture growth, a meteorologist by the lack of rainfall or a deeply religious person by reference to God. Indeed, ‘the severity of a drought is controlled not just by the duration of the period without precipitation (meteorological drought), but by

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the effect of weather on plant growth, water supplies, and human activity. There is no doubt that drought struck North Otago in 1906-7: vegetation and stock died, water supplies dried up, and people widely referred to this phenomenon as a drought. The dry spell began in January 1906 and by the end of the year, the rainfall of 1906 averaged 45.2 per cent below the annual mean of the last thirty-nine years (1867-1906). For the first half of 1907, North Otago fared no better. `[The absence of rain], worried a journalist in 1906, `is beginning to tell on the district' since Ngapara's soil was `as dry as dust' while late-sown grain was `not germinating at all'. Another writer equated the area between Ngapara and Oamaru with the Sahara: dry, dusty and unproductive.

Although some rain fell in May 1907, it was insufficient to end the drought since, by now, the ground was extremely dry. A little later, on 15 July 1907, heavy clouds raced across the sky, and it seemed that the drought might soon end. Hopes, however, rapidly evaporated when by evening the skies cleared and once more the stars shone brightly. By mid-1907, the agricultural and domestic situation in the region had deteriorated further. Duntroon residents had to travel some distance to collect drinking water. North Otago pastoralists had to bring in truckloads of turnips as feed for stock from Southland, over 200 kilometres away. Many also faced the choice of either out-pasturing their stock or killing them. Grain farmers had their lowest average annual harvest yield in the past decade and the dairy farmers fared very badly. When the drought ended, and the cost counting began, estimates placed the financial impact of the drought at about £1 million. Butter producers alone lost £50,000, grain harvesters, £200,000. Ironically, while much of Central and North Otago as well as Canterbury were experiencing drought, many areas in Southland and most of

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6 *Otago Witness* [henceforth *OW*], 5 September 1906, p.40.
7 *New Zealand Farmer* [henceforth *NZF*], 28 (March, 1907), p.219.
8 *Oamaru Mail* [henceforth *OM*], 25 May 1907, p.2.
9 OM, 15 July 1907, p.2.
10 OM., 5 July 1907, p.1.
the North Island enjoyed excellent weather. One report described the North Island season as the "most bounteous" in living memory.16

Organising rainmaking experiments

'[N]othing less than a flood will serve us now', urged one Kakanui farmer. He urged farmers to embark upon rainmaking experiments. Detonating explosives in moisture-laden air worked in Oamaru ten years ago and more recently in Queensland, continued the agriculturist.17 Support for the farmer's suggestion gathered pace, and not just in North Otago. Two letters of support, for instance, appeared in the paper of a neighbouring province, Canterbury.18 A North Otago correspondent, T.M. Whither, urged that 'no time should be lost in again repeating these experiments' while other letter-writers pledged support and money.19 Drought clearly generated a great deal of environmental anxiety in North Otago. Not all farmers, though, willingly championed rainmaking. Observing that his neighbour had contributed to the rainmaking fund, one canny Scots farmer declared that: 'If the rain falls in his [the neighbour's] paddock it'll no miss mine.'20

Without explaining the reason, Oamaru's councillors declined the subscriptions that had been collected, so instead people began organising the experiments themselves.21 A Rain-Making Committee was formed on 6 August 1907. Soon, thanks to petitions and other fund-raising activities, a sizeable fund - £187 to be exact - had been collected for the experiments.22 Both farmers and citizens attended the meeting, indicating that concern for the drought was widespread, as indeed did the quick raising of such a large sum.23 Although the local council declined to support the experiments, the New Zealand Government did. It eventually contributed £200 to the experiments, cost-price dynamite, five Defence Force artillerymen, and one meteorologist.24

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17 OM, 15 July 1907, p.3.
19 OM, 23 July 1907, p.4; OM., 24 July 1907, p.3.
20 North Otago Times [henceforth, NOT], 12 August 1907, p.2.
22 Chairman: H. Dovey; Secretary: Gibson; Dunrobin: W. Sutherland, H. Dovey; Oamaru: Orbell, Muir; Enfield: C.W. Reid, J. Mahoney; Windsor: Livingstone, Mackay, J. Don; Tokarahi: W. Gardiner; Westen: G. Harvey; Ngapara: T. Little, Shand, J. McCulloch. The NOT supports the OM's estimate of the people attending the meeting. NOT, 6 August 1907, p.1. On petitions and fund-raising note, for instance, OW, 14 August 1907, p.36.
23 OM, 6 August 1907, p.2.
24 OW, 14 August 1907, p.36. Earlier Prime Minister Joseph Ward had promised a deputation of North Otago farmers aid and money. OM, 3 August 1907, p.2.
In 1891, when the region last experienced a severe drought, North Otago residents had
decided to undertake rainmaking experiments. Rain, however, pre-empted their intentions.25
Nevertheless, many letter writers believed that successfully carrying through these
experiments would bring rain in 1907.26 Many also drew confidence from overseas
rainmaking efforts. Oamaru’s aborted 1891 plans had been modelled on rainmaking
experiments in Wyoming and Texas.27 In the 1890s, rainmaking experiments gripped the
imagination of residents of the Great Plains states of the United States.28 Texas rainmakers,
funded by a United States Congress grant of US$ 9,000, had exploded balloons containing
hydrogen and oxygen a mile into the air, following these with charges of dynamite attached to
kites. Torrential rain reportedly followed the blasts.29 In 1882 and 1902, Queensland
(Australia) also conducted its own rainmaking experiments, albeit unsuccessfully.30 The
importance residents placed on overseas experiments fully illustrates that environmental ideas
were not played out in a vacuum. Networks of correspondence, newspapers and people
distributed ideas and examples throughout the world that helped shape anxieties and policies
(chapter eight).31 This fact is borne out, too, by suggestions that new agricultural techniques
that had worked in South Africa and the United States should be introduced into North Otago
(see below).

The hopes of rainmakers rested on the erroneous but popular notion that rain followed
great battles.32 Reverend D.C. Bates, the Chief Government Meteorologist sent to observe the
rainmaking, explained that in principle explosions expand moisture-laden air and creates ‘a

25 For more details of the 1891 rainmaking experiments see, McDonald, History of North Otago, p.154; White
Stone Country, pp.187-8; McDonald, ‘Rain-makers at work: experiments in North Otago in 1891’, New Zealand
27 McDonald, History of North Otago, p.154.
28 Henry Nash Smith, ‘Rain Follows the Plow: The Notion of Increased Rainfall for the Great Plains, 1844-
and Baltimore, 1926, p.32.
31 On the general exchange of ideas, note Tony Ballantyne, ‘Empire, Knowledge and Culture: From Proto-
pp.115-140. On the environmental exchange of ideas in New Zealand see, Beattie, ‘Environment Anxiety in
New Zealand, 1841-1941: Climate Change, Soil Erosion, Sand Drift, Flooding and Forest Conservation’,
Environment and History, 9, 4 (2003), pp.379-392; Beattie, ‘W. L. Lindsay, Scottish environmentalism, webs of
information, and the ‘improvement’ of nineteenth-century New Zealand’, in Ballantyne and Judith A. Bennett,
ed., Landscapes and Communities (forthcoming, Dunedin, 2005).
32 Bates, ‘Report Upon’, 212. As Humphreys points out, it was purely coincidence that rainfall followed
battles. Humphreys, Rain Making and other weather vagaries, pp.29-32.
state of atmospheric instability. Condensation first takes place aloft, then possible drops fall, introducing a cooler current which might cause local showers.\textsuperscript{33}

**Religion and rainmaking**

'It is impossible to consider' the matter of rainmaking, explained one correspondent to the *Oamaru Mail* in July 1907, 'entirely apart from the religious belief of so many in our district'. This letter-writer held that rainmaking was not impious: 'I solemnly believe that man, in the act of endeavoring [sic] to bring water down from the clouds above, can do so with just as much reverence towards Him as in the act of endeavoring [sic] to obtain water by digging and boring in the earth beneath'. Some people may object to the experiment, conjectured the writer, because they believe 'the Creator is in the region of the clouds above' but, in fact, God is everywhere you look. The writer finished by enclosing a £1 donation with the hope that 'others, [from] both farmers and citizens, will promptly follow.'\textsuperscript{34} Another correspondent agreed. According to Scripture, rainmaking prayers and rainmaking experiments went hand-in-hand: 'Let them ask for much-needed rain, and “Prove me now, herewith, said the Lord of Hosts, if I will not open you the windows of Heaven and pour you out a blessing that there shall not be room enough to receive it” (Psalm XCV, from Malachi iii., 9 and 10)', wrote the correspondent.\textsuperscript{35}

At the second meeting of the Rain-Making Committee in August 1907, rainmakers acknowledged their '“dependence upon the Almighty for the success of our efforts”'. They did this by requesting '“the co-operation of the various religious bodies in the district, and desir[ing] that the clergy and leaders of denominations offer up special prayers in relation to the matter.”'\textsuperscript{36} The next day, churches in Oamaru held special prayers for rain.\textsuperscript{37} While Oamaru’s Presbyterian churches held indoor services, a group of Salvation Army faithful held a two-hour outdoor service in North Otago’s droughty interior punctuated by music and quiet reflection. With the Salvation Army in Oamaru holding a similar service, it was popularly said at the time that the fall of rain in each area would indicate the faithfulness of the respective branches.\textsuperscript{38}

\textsuperscript{34} OM, 23 July 1907, p.4.
\textsuperscript{35} OM, 25 July 1907, p.3.
\textsuperscript{36} OM, 10 August 1907, p.2.
\textsuperscript{37} OM, 12 August 1907, p.2.
\textsuperscript{38} Kathleen Stringer, North Otago Museum Curator, interview, 2 May, 2001. For a brief history of the reception received by the Salvation Army when it came to Oamaru in September, 1883, see S.A. Muirhead, ‘The Turbulent Years: Early Days in the Salvation Army’, unpublished manuscript, North Otago Museum [henceforth NOM], New Zealand, 97/2f.
Meanwhile, on the afternoon of 13 August during the third meeting of the Rain-Making Committee, a train conveyed Corporal Meikle and four men of the submarine miners to Oamaru. Rainmakers, perhaps buoyed by the impending arrival of the Defence Force members, were full of optimism. Rain following battles may be ‘coincidences’, wrote a reporter at the meeting, ‘but as coincidences they are remarkable’.

The rainmaking commences

The first rainmaking experiment took place on 16 August atop Raki’s Table. Lying 22 kilometres NNW from Oamaru (see Map 5.1, and Photographs 5.1 and 5.2), it was ‘a “flat-topped hill” ’ almost 323 metres above sea level. At 5 p.m., with the ‘cool of the evening’ approaching, Rev. Bates and the rainmakers, along with two journalists, made their way up to Raki’s Table. To Bates, an ordained Church of England clergyman, and future Director of the Meteorological Department, scattered rain in the distance, and 92 per cent humidity suggested that conditions did not favour rainmaking. North Otago’s rainmakers disagreed, so, under Corporal Meikle’s direction, three detonations went ahead, starting at 5.15 p.m. and continuing every fifteen minutes thereafter. The Oamaru Mail reported excitedly that a “great concussion” rented the air with the final explosion. Windows rattled in Mr Shand’s home. It seemed that rain might just fall, but, as had earlier happened, the clouds lifted. No rain fell near the site of the explosions. Yet, at the completion of the last explosion Hilderthorpe, a small community north-east of Oamaru, did enjoy a half-hour drenching. Heartened by this ‘success’, rainmakers vowed to continue with the experiments. The Oamaru Mail felt rainfall at Hilderthorpe following so close behind the last explosion was more than a mere coincidence. Bates, in contrast, doubted that rainmaking could have caused the rain.

A day before the second experiment, morning drizzle began to fall on the coast. Totara Station recorded 20 millimetres of precipitation. As in 1891 it seemed rain would pre-empt

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39 OM, 13 August 1907, p.4.
40 OM, 13 August 1907, p.4.
44 OM, 17 August 1907, p.4.
45 OM, 17 August 1907, p.4.
Map 5.1 Locations of Rainmaking Experiments, 1907.

Thanks to Bill Mooney of the Geography Department, University of Otago, for drawing the map.
Photograph 5.1 View inland from Raki's Table, Schaffer's farm, July 2002. Conditions in 2002 would have been very similar to those of 1907, with the area again under winter drought conditions.

Author's collection.
Photograph 5.2 Explosives canister left from the 1907 Rainmaking Experiments, at Shaffer's farm, Ngapara.

Author's photograph.
the experiments. Coastal rain continued on Monday (19 August), but it remained dry inland. Under skies threatening rain, then, excited artillerymen greeted Bates at Raki’s Table with reports that a detonation at 12.30 p.m. had brought a brief shower of rainfall. Bates remained sceptical. He could not see how explosions brought rain in a 40 kilometre an hour wind, in conditions of intermittent rainfall, nor at a point almost 20 kilometres away from the blast area. Rainmakers, however, Bates would write later, ‘were quite as decided in their opinions that the rain thickened heavily after each successive shot’.47

On the next day, sufficient rain fell for the Oamaru Mail to gleefully proclaim the end of the drought. On Sunday night, rain had begun to fall all over the district and still had not abated by Tuesday. Although the drought was breaking, the experiments continued because inland areas still required more rainfall to permit ploughing.48 In a grand finale to the experiments, the last of the detonations would be co-ordinated between three sites: Raki’s Table, used in the previous experiments; Round Hill (almost 153 metres high); and Dalgety’s Hill (247 metres high).49 Originally rainmakers had intended to use four sites, but they thought better of using Big Hill (Papakaio) as it lay rather too close for comfort for coal miners working in a mine there.50 During the second experiments, miners already had experienced, as one source put it, a ‘shock there so sharply that it resembled an earthquake’.51

Two groups of observers viewed the third and final set of experiments. Bates and his assistants went to Shand’s Ngapara home laden with meteorological equipment and cameras, taking up the same position they had when viewing the experiments at Raki’s Table. At 3.40 p.m. the first detonation of some 23 kilograms of explosives occurred at Round Hill.52 As Bates and his fellow observers sheltered from the light drizzle in a nearby haystack, they heard the day’s third detonation. The clouds thickened. Then heavy rain fell for a short period, so heavy in fact that it wet the fuse and only with the greatest of difficulty could it be lit for the next detonation. During this blast, Reverend Bates saw no perceptible increase in rainfall

48 OM, 21 August 1907, p.2. The day before, the OM noted that water had percolated to a depth of 3 inches into land in the lea of the falling rain. Water percolated to a depth of 7 to 8 inches into unsheltered land. OM, 20 August 1907, p.4. Other areas, such as South Canterbury, Waimate, Central Otago, and Kurow, also ‘shared in the welcome rain’, bringing an end to trying drought conditions. Some farmers seized the opportunity, and began to plough land. OM, 20 August 1907, p.4. For details of the breaking drought in Timaru, Christchurch, Dunedin, and the West Coast see CW, 21 August 1907, p.39. For the end of drought in Canterbury see TP, 24 August 1907, p.11.
49 NOT, 23 August 1907, p.4.
50 OM, 23 August 1907, p.4.
51 NOT, 23 August 1907, p.4.
52 OM, 23 August 1907, p.4.
after the explosion.\textsuperscript{53} The three stations kept firing until, by 4.16 p.m., they had spent their explosives. By far the most spectacular explosion occurred on Raki’s Table which, according to \textit{The Mail}, with over 90 kilograms of explosives lent ‘to the spectacle [of rainmaking] ... an element of grandeur’ with detonations reverberating and re-echoing ‘amongst the hills like thunder’.\textsuperscript{54} Observers certainly felt this blast since its concussion threw them backwards.\textsuperscript{55}

\textbf{Assessing the experiments and defining science}

What did observers make of the experiment? After the last blast, the \textit{Oamaru Mail} was enthusiastic. Three days later its tone had dampened. ‘[I]t has been demonstrated’, observed its correspondent, ‘that rain cannot be induced to fall by air concussion created through the medium of high explosion’, although it still gave the rainmakers hope. ‘[W]hether [rain fell] as a result of the committee’s enterprise, or was the natural sequence of the incomprehensible working of the mightier forces in Nature, the district was experiencing such a downfall as had not been its lot for considerable over [sic] a year, and that the hearts of the farmers and business people would be materially gladdened thereby.’\textsuperscript{56}

In contrast, right from the beginning of rainmaking discussions the \textit{Mail’s} rival, the country-focused \textit{North Otago Times}, had poured cold water on the experiments.\textsuperscript{57} At their conclusion, the \textit{Times} wrote that the rainmakers went ahead ‘in spite of [what] all the newspapers have written, in spite of scientific reasonings [sic] on the subject, and in spite of the failure of all the experiments made by the various governments of the world.’\textsuperscript{58} Other newspapers such as the \textit{Auckland Weekly News} and \textit{The Press} reported on the failure of the experiments.\textsuperscript{59} ‘ANTIFAKE’, a correspondent, even likened their effectiveness to ‘shooting boiled peas at Gibraltar’.\textsuperscript{60} Meteorologists also criticised the experiments. Measured criticism followed in Reverend Bates’ report on the rainmaking.\textsuperscript{61} ‘Until it can be shown’, he wrote, ‘that the temperature of the air can be controlled by gigantic cooling operations we may look in vain for any alteration in the natural order of events by way of the production of artificial

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\textsuperscript{53} OM, 20 August 1907, p.4.
\textsuperscript{54} OM, 23 August 1907, p.4.
\textsuperscript{55} OM, 20 August 1907, p.4.
\textsuperscript{56} OM, 23 August 1907, p.4.
\textsuperscript{57} NOT, 12 August 1907, p.2. For its earlier criticism see NOT, 9 August 1907, p.4.
\textsuperscript{58} NOT, 23 August 1907, p.2.
\textsuperscript{59} \textit{Auckland Weekly News} [henceforth AWN], 27 August 1907, p.49; TP, 23 August 1907, p.10. See also NZF 28 (December, 1907), p.1068.
\textsuperscript{60} Letter, OM, 10 August 1907, p.1.
\textsuperscript{61} Bates, ‘Report Upon’, p.212. For instance, noted Bates, ‘the condensation from vapour to water for an inch of rain to the square mile is estimated as equivalent to the work done by 100, 000, 000 horse-power for half an hour.’ Bates, ‘Report Upon’, p.213.
\end{flushleft}
Another meteorologist, probably Cleveland Abbe of the United States Weather Bureau, who edited the journal in which Bates published his report on the experiments, regarded the North Otago rainmaking as misguided and vain by all scientific meteorologists. Bates, unlike Abbe, at least found room to praise the worthy efforts of Oamaru’s ‘progressive, enlightened, and experienced farmers and business people’. According to Bates, in promoting the experiments they at least had ‘the best interests of the community at heart’.

In contrast, many people in North Otago poured their money and enthusiasm into the experiments, sincerely believing that these had ended the drought. Since rain had fallen almost immediately after the first explosion, many Ngapara residents, for instance, attributed it to the experiment. Indeed, one George White of Hilderthorpe felt sure that the experiment had caused rain in his area.

These contrasting environmental beliefs reveal a division both between popular and elite conceptions of science and between interpretations of the natural world. On the one hand, many local residents had placed their faith in rainmaking experiments. On the other, meteorologists such as Abbe and Bates regarded rainmaking as science in name only. By criticising the experiments, Abbe and Bates were trying to establish boundaries between what was legitimate and illegitimate science. They were trying to ‘make their claims and practices credible … by distinguishing them from unworthy claims and practices of some nether region of non-science.’ In essence, the meteorologists thought that the rainmaking experiments were not based on sound scientific principles. Around the turn of the twentieth century, New Zealand meteorologists, like other scientists and professionals, were attempting to bring increased legitimacy and status to their work. Perhaps this was because the Meteorological Department had suffered chronically low-levels of government funding and therefore its staff wished to demonstrate its professionalism and usefulness and thus justify its status.

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65 OM, 20 August 1907, p.4.
66 NOT, 19 August 1907, p.2.
68 Gieryn, Cultural Boundaries, p.xii.
too, because he did not have any formal training in meteorology, Bates wanted to establish his professional credentials. These attempts reflect that, only from the 1890s, were professionally trained scientists beginning to change the largely amateur-dominated New Zealand science scene. This process would take over a quarter of a century to achieve. Instrumental in this was the establishment, in 1926, of the government organisation, the Department of Science and Industrial Research. For meteorologists, the Oamaru experiments offered an excellent way of demonstrating the professionalism and superior scientific training of their department against the amateurism of the North Otago practitioners.

Religion and rainmaking

When the drought finally broke in late August, M. E. Davey of Hull Street, Oamaru, noted delightedly that the prayers for rain ‘have been abundantly answered’. ‘The lovely rain which is falling in such abundance as I write’, continued Davey, ‘ought to fill the heart of every man, women, and child with gratitude to Our Heavenly Father who has so abundantly supplied our need.’ Davey ended by imploring the Committee ‘in conjunction with the various ministers, [to] arrange for some plan whereby all may join in public thanks for His loving kindness.”

Oamaru’s churches, indeed, recognised His loving kindness. At St Luke’s (Anglican) Church, Reverend Hubert Jones led ‘a special thanksgiving for the plentiful rain’. At Wesley Church, Reverend T. N. Griffin mentioned ‘the need for gratitude to God for His bounties’, as did the Baptist Church, and the Church of Christ. Meanwhile, St Paul’s (Presbyterian) morning service began with the congregation singing the Doxology. And, Columba Church gave thanks for the ending of the drought. Unfortunately no details of these services survive. The silence of Roman Catholics on rainmaking prayers is interesting. Previously, as in 1868 over special fast days proclaimed by civil authority, they complained of interference of secular powers in religious matters and had refused to observe the fast

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70 For details of the lack of funds of the department and Bates’ informal training see de Lisle, Sails to Satellites, pp.30-42.
72 OM, 24 August 1907, p.1.
73 OM, 24 August 1907, p.2.
74 NOT, 26 August 1907, p.2.
75 ‘Oamaru Baptist Church: Minutes of the Oamaru Baptist Church’, uncatalogued, NOM; ‘Minutes of Managers’ Meetings of St Paul’s Church, Oamaru, from November 11 1891 to October 14 1907’, NOM, Box 2623 Shelf 27b; ‘Session Record, St. Paul’s Church, Oamaru’, Box 2619 Shelf 27b, NOM.
day. Perhaps their silence in North Otago indicates the desire to maintain social and religious coherence.

The rainmaking prayers and thanksgivings of 1907 demonstrate that in North Otago many people strongly believed that God remained actively involved in the natural world. The prayers also reflect changing religious beliefs. Had these prayers occurred in the middle of the nineteenth century, it is likely that a great deal of humiliation and much soul-searching would have occurred. Thanksgiving, not humiliation, greeted the end of the drought in North Otago because, by the 1900s, belief had moved away from a judgmental God towards a more beneficent Creator. From the beginning of the nineteenth century, the practice of calling special prayers like those for rain in North Otago enjoyed popularity in England and Scotland among Anglicans and Presbyterians alike. Special prayers addressed many important national issues, from drought and cattle plagues, cholera outbreaks to the health of the Prince of Wales. Increasingly from the mid-nineteenth century, however, rainmaking prayers in England and Australia were generating a great deal of criticism from the liberal Protestant intellectual élite and other social groups. In England, growing understandings of the natural world – the discovery of what would be termed ‘natural laws’ – were helping change notions of Providence, and in turn were leading some liberal Protestant élite and agnostics to question the efficacy of special prayers. To them, ‘solutions to human problems lay with human effort rather than through the protection of the Church.’ Another important reason behind the increasing criticism of special prayers is to be found in social changes occurring in England. Liberal-minded clerics, scientists and professionals challenged the wealth and influence of other clergy by criticising special prayers and the like. Although some professionals attempted to undermine the church’s status and authority, and thus create a niche for themselves, some liberal clergy wanted to broaden the appeal of the church. One consequence of these changes came in 1853, when Lord Palmerston, the British Home

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81 Turner, Contesting Cultural Authority, p.158.
Secretary, limited the use of prayers to cure cholera because he believed poor sanitary conditions, not divine displeasure, explained its spread. Controversy raged over the next decades on the efficacy of special prayers, and not just in England.

In Australia in 1882, the Anglican Bishop of Melbourne, Dr Moorhouse, became embroiled in scandal when he refused to endorse prayers for rain. Moorhouse argued that ‘God indicated by His providential arrangements that it was His will that we should conserve the water sent to us in winter.’ The Australasian’s editor drew comparisons between Moorhouse’s reply and that of Lord Palmerston. Later the editor praised Moorhouse for his ‘logic’, ‘eloquence’ and ‘freedom of thought’ in supporting science against theology. The editor presented Moorhouse as expressing views that formed ‘a well-defined milestone on the road to intellectual progress.’ The editor implied that Moorhouse’s action would abolish ‘that large part of church ritual which is directed to enlist the aid of heavenly agencies on our behalf.’ Moorhouse’s views scandalised others. One resident of Victoria described the Bishop’s standpoint as ‘impious’, another as ‘hopelessly antagonistic to the doctrine of his own, and all other Protestant Churches.’ Indeed, ‘his respected lieutenant in command, Dean Macartney’ and several other clergymen took it upon themselves to hold their own rainmaking prayers in defiance of the Bishop’s view.

Although religious beliefs changed over the period of the nineteenth century, I do not wish to suggest that religious belief substantially declined. To some theists and some Christians, God was the Divine Clockmaker, and Nature a mechanised entity. Except for a small but growing minority of agnostics and atheists, these changes scarcely undermined the sovereignty of God. Science could reveal the marvellous adaptation and organisation of the natural world God created. Many ordinary folk, similarly, retained their faith in Providence, their belief unaffected by the intellectual controversies swirling above them in some élite circles.

**Explaining North Otago’s religious reaction**

Why did similar controversy not attend the rainmaking prayers in New Zealand? Most settlers consciously wanted to avoid bringing to New Zealand the class and religious conflict that was inherent in the British society they came from. Sectarian tensions certainly did exist

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82 Turner, Contesting Cultural Authority, pp.154-155.
83 TA, 4 March 1882, p.273.
84 TA, 8 April 1882, p.433.
in New Zealand, but few incidents in the colony ‘spilled over into direct and violent confrontation.’ 88 Unlike both England and Scotland, New Zealand had no state religion and therefore ‘no powerful church, supported by the state, able to dictate to and discriminate against non-adherents.’ 89 The dominance of the state church in England over educational institutions, politics and government meant that many of the newly emerging classes in England such as lawyers and doctors had to fight against this body for power and prestige. New Zealand’s greater social opportunities enabled Catholics in nineteenth-century New Zealand to enjoy greater educational and economic opportunities than in Australia, and probably Ireland, thus reducing the potential for religious grievances in the colony. 90 A measure of its greater religious tolerance is that in the 1880s the Stout-Vogel Government was led by a freethinker, Sir Robert Stout (1844-1930), and a non-observing Jew, Sir Julius Vogel. Later, in 1889, John Balance (1839-1893), an energetic and likeable Irish freethinker, became New Zealand’s Prime Minister. 91 Rainmaking prayers did generate some discussion in New Zealand, but it is important to note that most came from an overseas source. The American meteorologist Clement Abbe mocked the rainmakers’ belief in the efficacy of their experiments and prayers, chiding that the Oamaru people ‘now stood ready to denounce both religion and science if rain did not follow the cannonading’. Rainmaking, Abbe fulminated, provided yet ‘another illustration of the waste of public money consequent upon popular ignorance and superstition.’ 92

According to James Belich, scientific rationalism formed ‘a strong secular element in New Zealand’s moral ideology.’ 93 Yet, this secularising aspect of science may be overstated. One way to avert inflaming religious tensions involved the avoidance of religious language in scientific papers. Avoidance of religious language did not mean that most scientists had suddenly renounced religion, rather that they now practised their faith in private. 94 The

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90 Stenhouse, ‘Sectarian Conflict’, pp.8-12.
91 Thanks to John Stenhouse for the information on Ballance.
93 Belich, Making Peoples, p.165. On further examples of the assumption that science and rationalism brought about secularisation in New Zealand, note Stenhouse, ‘God’s Own Silence.’ On this topic in a wider context, see Numbers, ‘Science without God’; Brooke, ‘Science and Secularization’, pp.229-238.
94 Stenhouse, ‘Battle’.
Government Meteorologist sent to observe the rainmaking experiments, Rev Bates (Photograph 5.3), is an interesting exception. Bates was an ordained Anglican cleric and a Government Meteorologist, who later served as the director of meteorology (1908-1927). On 18 August 1907, Bates preached at St Luke’s Anglican Church’s morning and evening services, choosing for his evening service: “Thy mercy O Lord is in the heavens and Thy faithfulness reacheth unto the clouds” (Psalm xxxvi., 5). Bates presented a theistic interpretation of clouds. As objects of beauty, clouds glorified the Divine, he observed, and reminded mankind of the wonder of the Resurrection. Clouds underlined God’s ‘wise design’ of the firmament, continued Bates, illustrating that God had ‘fitted the earth to be the home of organic life.’ Indeed, said Bates, ‘Nature’ was ‘a book written in cypher by the finger of God’, a book which imparts:

‘...all the lore its scholars need
Pure eyes and Christian hearts.’”

God had created clouds so as ‘to give pleasure to man.’ According to Bates, they ‘spoke of the Divine mercy and faithfulness... [and] were also types of sorrow, sin, and forgiveness.’ Just as clouds rose ‘from various places... in glory and purity: so might humanity be glorified in the resurrection, and, though poor and weak and sinful now, be numbered amongst those who stand around the throne of God.’ A theistic sermon about clouds preached by the future head of the country’s meteorology branch indicates that historians have underplayed the role of religion in early twentieth century New Zealand science. Equally, the assumption that rationalism automatically precludes religious sensibility must be questioned.

Approaching the drought: environmental learning, change and stability

The North Otago drought of 1906-7 brought changes to farming practices. Dairy farming, which suffered severely during the drought, virtually disappeared from the region and only recently has re-emerged. Irrigation networks and fertilizer use also increased. Other suggested changes, including tree planting to encourage rainfall and the adoption of dry farming techniques failed to be widely implemented. Their failure indicates the popular limitations of environmental learning. Earlier, extreme climatic events in New Zealand also had caused land use changes. The 1895 snowstorm, which swept through the South Island, for

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95 OM, 19 August 1907, p.2.
96 Dairying began in North Otago in November 1883 with the opening of a cheese factory at Weston by the Waireka Dairy Factory Company. In the 1890s and 1900s a succession of local and outside companies variously established creameries or went out of business. For instance, in 1892 the New Zealand Dairy Supply Company of Dunedin established a co-operative butter factory at Oamaru and Hampden, quickly followed in 1894 by proprietary ones at Enfield and Reidston. McDonald, Whistone, pp.185, 214-215.
Photograph 5.3 Reverend D.C. Bates, the government meteorologist sent to observe the 1907 rainmaking experiments.

instance, highlighted the problem of overstocking. As chapter four has demonstrated, extensive periods of drought, likewise, often heightened fears of human-induced climate change caused by deforestation.

Bates believed that deforestation had caused climate change in North Otago, and thus could ‘be combatted [sic] on scientific lines’ through tree planting. Bates drew attention to archaeological evidence from the region that indicated North Otago’s wetter climate, since, he wrote, ‘[i]n ancient times ... long before European settlement, trees seem to have flourished in the Oamaru district’. He recommended planting ‘larger and more varied plantations’, especially ‘in belts intercepting the northwest and southwest winds’, to ‘act as shelters and windbreaks’, and to ‘conserve the rainfall which now runs off in floods or evaporates in hot, dry weather.’ Although Bates avoided the question of ‘[w]hether forest trees increase the rainfall or are themselves the result of an abundant precipitation’, he nevertheless upheld their influence on climate. Deep-rooted trees, he explained, ‘prevent surface evaporation by the winds, but also, as they transpire freely in the summer, create a beneficial humidity in their neighborhood [sic]. The excessive heat of a bare, sun-baked soil drives away the rain from a drought-stricken district and thus diminishes the “probability of rain”’. Bates’ confidence that tree planting brought rainfall appears curious given his strong view that farming techniques should be adjusted to the climate of a region (see below). However, as he indicated in a public lecture on meteorology given in Oamaru, he felt that tree planting could only bring about local climatic changes rather than significant changes in a region’s climate.

As the previous chapter demonstrated, the forests-rainfall link enjoyed a great deal of popularity among foresters and the public alike and led to the establishment of climatic reserves and forestry departments throughout the world. By the early twentieth century, however, increasing doubt was being thrown on this theory both overseas and in New Zealand (chapters four and seven). In the United States, engineers and meteorologists, including Clement Abbe, were vocal critics of the forests-rainfall link as well as the idea that forests controlled flooding and soil erosion. In New Zealand, by the 1910s, most professionally

101 ‘Except where local changes in physical conditions had taken place, as in the case of tree planting on the Canterbury plains...there could be no real change in the climate.’ NOT, 21 August 1907, p.4. Bates’ other publications do not mention the forests-rainfall link. *Bulletin No. 9: Meteorology in Relation to Farming*, [put out by New Zealand Department of Agriculture, Divisions of Biology and Horticulture] (Wellington, 1905); *Meteorology of New Zealand: Supplied to schools for school purposes by the Education Department* [pamphlet taken from *New Zealand Year-Book*] (Wellington, 1912).
trained scientists had dismissed the forests-rainfall theory outright, although they supported
the influence of forests on erosion and flooding. Yet, two prominent New Zealand meteorologists, Bates and Meeson, continued to promote this idea, perhaps a reflection of their non-professional training in meteorology.

Bates also advocated environmental learning, for, he noted, although ‘our seasons are usually so temperate, regular, and fruitful’, drought showed that ‘climatic variations are of the greatest concern to the colony’. ‘We are only a young country’, he had declared to the Mail, ‘and have perhaps tried to follow the Old Country too closely with regard to our productions. We have many things to learn with regard to plants most suitable to the soil and the climate.’ Bates recommended that North Otago farmers cultivate ‘species of crop best suited [to] a dry climate’. They could learn much from South African and North American farmers, he noted, who cultivated land in arid areas. Use of South African and North American examples reinforces the environmental links connecting New Zealand to the rest of the world (chapter eight). The tenor of Bates’ message, that its farmers struggled to maintain agricultural productivity because their farming practices did not suit a semi-arid region, challenged not only the popular image of New Zealand as a well-watered and temperate land. Bates threatened the very ideological taproot upon which the prosperity of New Zealand was founded: its agricultural potential as a neo-Europe. Bates feared that farming practices still had not adapted to the soil and climate of a new country. Others shared his views. In June, 1907, for instance, The Oamaru Mail reproduced a two-column story on dry farming in the Rocky Mountain West, indicating that this technique should be considered in North Otago. Climatic extremes thus forced some to re-evaluate existing agricultural practices and to recognise the need to adopt methods better suited to the region’s environment.

Most North Otago farmers did not follow Bates’ advice about dry farming, and it is difficult to find out whether tree planting resulted from his suggestion. Instead, they turned to...
irrigation and artificial fertilizers to maintain agricultural productivity. These were popular choices because they did not force the significant change which dry farming techniques would have required. As noted in this thesis, these changes in agricultural methods originated in settlers' views that a productive, farmed landscape, fertilized by plentiful rainfall, figured as the norm. Anything else, particularly a droughty, unproductive environment exemplified its antithesis and, more than that, a moral failure, since cultivation stood for the apogee of a civilized, Christian society. As this chapter shows, these cultural assumptions underpinned a variety of environment actions, from determination to 'restore' treeless areas and sand dunes to fertility, to devotion to green city spaces and increases in rainfall through tree planting. For settlers, expecting a productive and well-watered landscape, the drought of 1906-7 seemed an aberration, but it was one which they later would realise actually formed a regular part of this region's climate.

**Conclusion**

Reactions to drought offer the opportunity to investigate the variety of responses elicited by environmental anxieties. In the nineteenth and twentieth centuries, drought gnawed away at the confidence of some farmers and public alike and nowhere more so than in the South Island provinces of Canterbury and Otago. These provinces, the powerhouses of the nineteenth century New Zealand economy, relied on abundant rainfall for the production of grain, meat and milk. In 1906-7, drought struck North Otago, severely curtailing agricultural production. For succour from these harsh conditions, residents of North Otago turned to rainmaking prayers and rainmaking experiments. Special prayers thanking the Almighty for the end of the drought show that for many North Otago Protestants God remained directly involved in the natural world. In contrast to the widespread acceptance of rainmaking prayers in North Otago by commentators from around New Zealand, rainmaking experiments, involving the detonation of explosives atop hills to attract rainfall, attracted the opprobrium of meteorologists and some newspapers. Rainmaking reveals much about New Zealand's society and its religious and scientific institutions. It also offers a fascinating way of exploring contested notions of science in a European settler society such as New Zealand. While local residents enthusiastically embraced the bombadeering, meteorologists led the criticism of this

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by decrying it as unscientific and amateurish. This reflected attempts by meteorologists to increase the legitimacy of their own profession by criticising the amateurism of non-professionals. Residents of North Otago viewed prayer and experiment, religion and science, as complementary activities designed to meet the same ends. D.C. Bates, meteorologist and clergyman, neatly exemplifies that, to many in early twentieth-century New Zealand society, there was no distinctive, hermetically sealed division between the secular and the profane, or between science and religion. Science and religion were not mutually exclusive fields, locked in battle for the minds of modern Westerners.\(^\text{111}\) The continuing strength of religion and science question two dominant paradigms about New Zealand society: first, that scientific rationalism was automatically antipathetic to religion and, second, that by the early twentieth century New Zealand scientific ideas were secularising society. Certainly, for some agnostics and a smaller number of atheists, scientific ideas allowed them to question religious belief. For the vast majority, however, Christianity remained important and relevant to their lives. Rainmaking also has a wider relevance outside New Zealand. As this chapter shows, other societies, such as those in England and Australia, undertook similar prayers and experiments yet responded to them in very different ways. These differences reflected the special social and cultural characteristics of each country and, in New Zealand's case, its greater religious tolerance and social opportunities compared to those of the other two societies.

Drought also encouraged changes to existing farming techniques, including the use of dry farming methods, tree planting, fertilizers and irrigation. In suggesting dry farming methods, some settlers rejected the dominant image of New Zealand as a fecund and well-watered land ideally suited to European agricultural practices. They took an important step in recognising that not all of New Zealand enjoyed regular rainfall. Just as fears about climate change and sand drift, rested on expectations of a productive, well-watered land, so did they in North Otago. Most settlers simply could not accept that North Otago was not temperate or fecund. A number of agricultural developments bolstered this long-held view. Improved fertilizers allowed agricultural techniques to remain unchanged. Tree planting offered another way of improving the droughty North Otago interior by encouraging rainfall to the region. As with the episodes surrounding the North Otago drought of 1906-7, studying particular environmental events adds colour and complexity to historical assumptions about religion and rationalism, secularism and science, humanity and environment. They illustrate that local

environments sometimes challenged established environmental expectations. This complexity is further explored in the next chapter, which unfurls environmental anxieties surrounding the spread of shifting sands in New Zealand.
Chapter 6: ‘[H]elpless witnesses of the destruction’: sand encroachment in New Zealand

If many people thought that deforestation would bring drought and climate change to New Zealand, a number of scientists and politicians feared it would increase sand drift and destroy New Zealand’s productive pastures. Employing the same rhetoric of fear as climatic and catchment conservationists (see chapters four, five and seven), they viewed spreading sand as an ‘evil’ imperilling New Zealand’s fertile plains and prosperity. Dating from the 1870s, many scientists implored government to intervene and rid the land of the worst of this problem. Only after 1903, with the Sand-drift Act, did parliament officially recognise this problem. Earlier, local councils and other voluntary organisations, sometimes with government support, had taken local-scale action to arrest shifting sands. This string of local-level initiatives effectively continued with the 1903 Act. With a few exceptions, and contrary to the experience of drainage (see chapter one), provincial governments did not address the problem of shifting sands, possibly because its impacts, although significant, were local in scale. While conservationists highlighted the potentially devastating consequences for the nation’s agriculture, much of the action against sand-drift actually took place in urban areas threatened by encroachment. When it came to reclamation, areas of closest settlement had an advantage over less densely populated areas. The former areas generated more rating revenue than the latter and thus could contribute more to reclamation. Densely populated areas also had more people and expertise available to organise reclamation work. Although on paper the 1903 Sand-drift Act increased the role of government in arresting shifting sands in partnership with local authorities, its passing did not stop local recovery measures. Government also commissioned scientific reports on the extent of, and likely solutions to, sand drift. This reflected the Liberal Party’s increasing reliance on scientific solutions to problems and its belief in the powers of rational action to overcome environmental challenges. Rational action, in the form of scientific reporting that defined the problem and legal proscription that alleviated it, did not translate into success. Neither the resources nor the necessary
will existed to translate these policies into action. Although still hampered by lack of funds, only after 1914 did government action enjoy any success. As scientists of Wellington’s Philosophical Institute had done in highlighting climatic and catchment concerns (chapters four, five and seven), so they played a similar role in highlighting the problem of sand drift. As with these other concerns, too, scientists and legislators looked to human action as the cause of, and the solution to, such problems. Beginning with a discussion of the extent of shifting sands, this chapter then moves onto a discussion of local and national reclamation efforts.

**Sand dune ecology**

Sand dunes border approximately 1,090 km of New Zealand’s estimated 11,000 km long coastline. These sands originate from coastal or upland erosion, when rivers brought to the coast great volumes of eroded material. Becoming trapped by the shore current, this material accumulated with other deposits. Winds then blew this sand inland, forming it into dunes. Although considerably simple in comparison to other ecological associations, thanks largely to New Zealand’s lack of browsing animals and plant specialisation, in pre-European times sand dune areas supported vegetation adapted to micro-climatic sites. In an idealised example of the natural stabilisation of a sand dune in pre-human times, pingao (*Desmoschoenus spiralis*) would be a pioneer plant, helping to build up a foredune. Its seeds would then entangle in driftwood above the high water mark, perhaps germinate under favourable conditions, and eventually stabilise the dunes. Next, silvery sand grass (*Spinifex*) would lodge among the pingao, gradually overtaking the former until it totally covered the foredune. Depending upon soil and climatic conditions, larger trees would eventually grow.

The arrival of humans in New Zealand changed these processes. Although ecologist W.J. Wendelken contends that Māori settlement ‘had not appreciably affected

4 Whitehead, ‘Sand Dune Reclamation’, p.150.
the natural balance' of sand dunes, the author actually contradicts his argument by also arguing that Māori 'brought about significant changes in native vegetation'. Subsequent research has highlighted the significant impact Māori made on the natural environment. Aside from sometimes causing species reduction and extinction, Polynesian deforestation, which reduced the forest cover to approximately half that of pre-European New Zealand, also caused soil erosion and most likely also affected coastal dunes. From the nineteenth century onwards, European agriculture, grazing animals, and deforestation, appreciably increased this disturbance. This, essentially, is the process recognised by many of the following observers and scientists.

**Views of sand dunes as unproductive environments**

Europeans knew of sand dunes from their initial exploration of New Zealand. Their descriptions reflected the pervasive belief that sand dunes, like other agriculturally unproductive areas, required the hand of civilisation to improve them. Sand dunes embodied the very notion of waste that so many European writers deplored. One can see this idea referred to in the name explorer James Cook gave in 1769 to Northland's coast: the 'Desert Coast'. Many other inland travellers also referred to the spread of sands. In 1820, Church Missionary Society (CMS) leader, the Rev. Samuel Marsden (1765-1838), encountered high, shifting sand dunes along the west coast of the North Island. In 1843, the German naturalist, Ernst Dieffenbach, referred to sand drift in Kaitaia, northern New Zealand. According to Dieffenbach, '[t]he destruction of the forest, which was a barrier to the encroachment of sand, has sealed the doom of this northern part of the island'.

'Evidence that this overwhelming sand-drift', he continued, 'is of a modern date, and is owing to the destruction of the forest, may be seen on the western coast.' He described small oases of vegetation protruding twenty to thirty feet above the sand as evidence of

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5 W.J. Wendelken, 'New Zealand Experience', pp.145-146.
7 Wendelken, 'New Zealand Experience in Stabilization', pp.145-146.
9 Whitehead, 'Sand Dune Reclamation', p.147
its rapid drift.\textsuperscript{11} Dieffenbach clearly linked the activities of timber cutters and settlers with the increasing spread of sands. Other writers confirmed the spread of sands. In 1849, within a year of Ngati Awa leaving Waikanae for their ancestral home of Taranaki, sand had blocked the windows on one side of their abandoned church.\textsuperscript{12} And, in 1868, settler Robert Pharazyn noted the ancient remains of a forest since covered by sand drifts near Dunedin.\textsuperscript{13}

When on 25 September 1872, C.D. Whitcombe addressed the Wellington Philosophical Institute on New Zealand’s problem of shifting sands, people had been aware of it for some time. Whitcombe pointed out that for Taranaki, for New Zealand’s west coast generally and possibly even for the east coast, ‘reclaiming land devastated by the encroachment of sand is one of the greatest importance’. The north to south and south to north tide, allied with rivers bringing ‘loose virgin soil’ downstream, he warned, would increase river bars and impede river navigation. Sands, he continued, ‘choke up the smaller streams’, forming ‘swamps and marshes along the line of their course’. If left unchecked the inland drift of sand would create ‘ever-increasing areas of desert land’.\textsuperscript{14}

Were anyone to doubt his message, Whitcombe presented an image designed to rattle the confidence of any Victorian eyeing the agricultural and pastoral potential of New Zealand. Employing a language of fear, he wrote: ‘Everyone can see with their own eyes the rapidity with which ... land is drifting in this [Taranaki] province and elsewhere in the colony from fruitfulness to desolation.’\textsuperscript{15} This message was particularly appalling for, as chapter seven shows, settlers and propagandists popularly presented Taranaki as a veritable Garden of Eden. What could be done to save it?

The French Government passed legislation that aimed to check sand drift, noted Whitcombe. And, he noted, it seemed to work. In 1807, observed Whitcombe, the French Government had granted settlers free land affected by shifting sands in return for tree planting and reclamation. In 1833, if settlers chose not to purchase land, the French

\begin{itemize}
\item Dieffenbach, \textit{Travels in New Zealand}, Volume 1, p.201. See also p.207.
\item Gadgil and Ede, ‘Application of Scientific Principles to Sand Dune Stabilization’, p.133.
\item Whitcombe, ‘On the Reclamation of Land’, p.111.
\end{itemize}
Government had the option of buying back and reclaiming land. As with arguments about the effects of deforestation on aesthetics, climate and waterways, Whitcombe employed a highly alarming rhetoric which challenged images of New Zealand's fecundity. Like these other processes, he believed the process of sand drift threatened New Zealand's economic and agricultural management. As with many of these authors, Whitcombe appealed to the New Zealand Government to stop this problem, seeing sand drift as a national problem. As noted in previous chapters, many writers agreed that environmental problems needed to be addressed but, instead of viewing it as the prerogative of national government to do so, they saw measures taken by local and provincial authorities as sufficient to meet this problem. In the end, as noted below, government reached a compromise between local and government plans.

Whitcombe pursued his campaign beyond the confines of the Transactions. He published a two-page letter to the Legislative Council, New Zealand's upper house. Whitcombe repeated the argument he used in his earlier article, that drifting sand formed bars at river mouths, that it choked up smaller streams, and that, if left unchecked, its advance would turn increasing areas of New Zealand into a desert. He also discussed French legislation, and the most appropriate system of planting. While his letter appeared in the parliamentary notes for that year, it seems to have had no legislative impact.

Around this time, other authors were beginning to campaign for sand-drift prevention. In 1873, a year after Whitcombe's appeal, two articles on sand drift appeared in the Transactions. One, an abstract of a paper read before the Wellington Philosophical Institute, reproduced a letter most probably written by William Keene, Inspector of Mines to the Government of New South Wales. Though Keene listed the most suitable plants for reclamation, he did not use the strong discourse of sand drift to argue for reclamation. The other paper read that year by Thomas Kirk, the future Conservator of Forests (1886-7), went further than Keene's. Presented to the Auckland Institute, Kirk made an impassioned plea for reclamation, conveying an overwhelming sense of the alarm.

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17 Whitcombe to Carrington, New Plymouth, 26 August, 1872, Journals and Appendix to the Journals of the Legislative Council of New Zealand, 16, 1872, pp.1-4.
It would ultimately prove advantageous to the Colony if a small portion of the money now being spent on public works could be applied to the reclamation of sand wastes. The magnitude of the evil to be remedied is admitted by all who have paid the slightest attention to the subject. In several localities the natives are compelled, year by year, to abandon their cultivations as the sand-wave advances, and settlers are helpless witnesses of the destruction of their paddocks from the same cause. Fences, large trees, and patches of bush, have been overwhelmed within the memory of settlers of comparatively recent standing, and, in some cases, still more serious injury must result unless preventive measures are taken. The danger is not confined to any one district or province; it is general, and demands prompt attention.19

Kirk employed rhetoric even more impassioned and alarmist than Whitcombe had. Settlers looked on, he argued, ‘helpless witnesses’ to the ‘evil’ of sand drift, an evil which ‘is general, and demands prompt action.’ Kirk played up the economic threat posed by deforestation, echoing arguments used by supporters of climatic and catchment conservation (chapters four, five and seven). Members of the Wellington Philosophical Institute, among which Kirk numbered, read five of the six papers published in the Transactions on sand drift (Kirk read the other – at Auckland). As chapter four highlighted, Kirk, and other Wellington naturalists such as G.W. Williams and William Travers, were deeply troubled about the impact of humans on the New Zealand environment.

Williams’ paper, read before the Wellington Philosophical Society on 27 September 1879, appeared as an abstract in the Transactions that same year. Williams addressed ‘the evil results arising from the indiscriminate destruction of the forests, especially at the head-waters of our rivers … its climatic affect’, and ‘drew attention to the large sand-dunes which might be advantageously fixed by planting.20 Williams brought together concerns about climate, catchment and sand drift.

Two years later, in 1881, Travers presented to the Wellington Philosophical Institute a paper on the sand dunes of Wellington Province. Travers believed sand dunes north of Paekakariki (on the west coast of the lower North Island) increased most probably because of two reasons. In his opinion, this occurred either through human-instigated deforestation or grazing and burrowing animals which had disturbed plant growth and thus destabilised the dunes. 21 Travers’ informant, missionary Octavius Hadfield related that ‘the sands of the dunes between those [Otaki and Ohau] rivers are advancing inland at a rapid rate and threaten great injury, unless effectual steps be taken to prevent it.’ 22 According to Travers, ‘the inland advance of dune sands may be traced to man’s interference with natural operations’. He seems to have been well read on the subject of sand drift, for he quoted from G.P. Marsh on the advance of sand dunes in Prussia caused by deforestation. 23 Travers also referred to the rapid advance of dune sands on France’s west coast, in an area between Adoyr and the estuary of the Gironde, an example he had discussed two years before when debating Williams’ paper. 24

The model of French sand reclamation

By the time members of the Institute recognised the problem of shifting sands, France’s government and engineers already had invested a great deal of effort and expense in reclaiming sand drift areas. In southwest France, in the département of Gascony, a 240 kilometre belt of inland coastal dunes endangered farmland and forests. Earlier, sand had engulfed an entire village. Inland from Gascony, the landscape of Les Landes appeared to be a malarial morass of marshlands, its inhabitants and lowly shepherds reportedly reaching their flock in swamp areas on crude wooden stilts. 25 Under the direction of engineer N.T. Brémontier, coastal dune stabilisation in Gascony and parts of Les Landes began in the late eighteenth century. It continued into the nineteenth and was largely complete by 1817. In that time, the face of the countryside was irrevocably altered. Out of the marshlands, dune stabilisation, afforestation (principally in pine) and

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22 Travers, ‘Remarks on the Sand Dune of the West Coast’, p.90.
drainage created an area of 320,000 hectares, suitable both for agriculture and forestry. Until 1900 an official (Gardes cantonniers de la dune) was responsible for the maintenance of dunes. Other European states, like Denmark, Prussia, Hungary, southern Russia, and Britain faced similar problems of coastal and inland dune encroachment, and solved them using methods matching those used in France.

Members of the New Zealand Institute referred to shifting sands in France for three reasons: to emphasise the potential threat sand drift posed to New Zealand; to stress that redemption from this 'evil' was possible; and, finally, to lend authority to their arguments. In referring to the inland advance of dunes in France, Travers warned: 'of populous and fertile districts having by this means been converted into barren wastes.' Kirk likewise described the process of sand drift. 'In the Gulf of Gascony', he related, 'immense wastes of trackless sand were utterly destitute of vegetation, and during violent storms exhibited a complete change of surface, hills becoming valleys and valleys taking the place of hills, the sand being gradually carried into the interior, and covering cultivated fields, villages, and entire forests.' Yet, as humans had turned the garden into a desolate waste, so could they redeem it. 'This process of devastation has been completely arrested,' wrote Kirk confidently, 'and thousands of acres of former sand-waste now yield a handsome revenue, and support a considerable population.' Kirk, and his colleagues concerned about sand drift, deliberately pitched their argument. They emphasised the potential threat posed by sand drift to settlers' vision of New Zealand and its future greatness as an agricultural nation. And, what is more, they stressed, reclamation could make the Government money.

29 Travers, 'Remarks on the Sand Dune of the West Coast', p.90.
The battle against sand drift

Notwithstanding these pleas, sand drift continued to menace settlers. No greater threat could be posed by shifting sand than that described in an article published, in 1898, in the *New Zealand Farmer*. As keeping new land weed free and preventing rivers washing soil away have become difficult, related the article, so ‘in some places the sandhills have come to be looked upon as an enemy that has to be battled against’.\(^{33}\) Personified as an adversary, the article related how a farmer won the ‘battle’ against sand drift on his Okehu (near Wanganui) property. Writing about his victory, John Handley confessed ‘to a sense of relief in leaving the depressing influence of the sandhill wilderness and felt doubly glad that the fat pastures and rich wheatfields could be shielded against the grey invader.’\(^{34}\) This last sentence reveals a great deal about this farmers’ attitude towards nature and probably also typifies contemporary settler attitudes towards certain environments. As the introduction to this thesis established, most Europeans viewed wilderness, or as they frequently termed it, wasteland, as an unnatural state into which land had fallen. Leaving land waste also broke Biblical injunctions of productively using land. Handley therefore felt relieved at having redeemed this ‘fallen land’ from its parlous state of waste. Farmers, he warned, could not rest on their laurels until the threat had totally disappeared. Constant vigilance was required, noted Handley, lest the ‘grey invader’ attack the ‘fat pastures and rich wheatfields.’ Handley’s attitudes also reveal an ethos of environmental protection and care that many farmers shared: they were concerned with maintaining production and long term land quality. Personifying sand drift as an enemy also extended further the common metaphor of sand drift as an evil, and gave urgency to removing this threat. Echoes of such militaristic endeavour resonated into the next century. In the 1930s, New Zealand farmers would ‘battle’ yet more plants and animals in an attempt to bend nature to meet human will. Militaristic struggles against nature, in extreme form overseas, led to some especially environmentally damaging policies.\(^{35}\)

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\(^{32}\) For instance, Williams, ‘Remarks on Forest Planting and Conservation’, p.429.


\(^{34}\) ‘Sandhill Fighting at Okehu’, p.393.

Sand as a health resort?

In contrast to the tenor of most writings on sand drift, in 1891, M. Murphy presented before the New Brighton Improvement Society a confident and grand plan for the continued reclamation of sand in the New Brighton area, near Christchurch. Optimism pervades Murphy’s report. Instead of howling wastes crying out for reclamation, Murphy, while admitting that ‘there are drawbacks’ to the area, presented New Brighton as somewhere on which ‘nature has ... been lavish of her gifts.’ It ‘has one of the finest beaches in the world’, he pointed out. It had a river ‘teeming at times with native fish’ and ‘a salubrious clime never too cold or too hot and always invigorating’. ‘[N]ow all that Mother Nature requires at your hands is that you will do your part and complete the picture’, concluded Murphy in his introduction. As chapters one and three show, Europeans valued coastal areas for their health-giving and restorative properties and believed that human engineering could enhance nature. Murphy tapped into these ideas when promoting New Brighton.

Murphy praised the efforts of the Society in reclaiming sand areas at New Brighton. He held up the French sand reclamation in Gascony and the recommendations of Ferdinand von Mueller, Victoria’s botanist (see chapter eight), as models of dune reclamation that the Society ought to adopt. For New Brighton’s reclamation, Murphy recommended planting native and non-native grasses for binding (such as *Spinifex hirsutus* and *Lathyrus sylvestris*). Wooden walls, he elaborated, would block out sand, while shelter pines and grasses could be used for reclamation. His report went beyond planting recommendations. He advised, for instance, that the £4000 loan for road building in the area would be wasted unless it also was spent on sand reclamation. He suggested that district and city council planting should be resumed and perhaps transferred over to the authority of the Improvement Society. He recognised that, unless they were properly tended, plantations would be inundated by sand. In Murphy’s opinion, this job best fell to the lot of older unemployed men. His recommendations did not stop...
there. He advised the Society to apply for a low interest Government loan to commence reclamation work, and strongly urged the establishment of Arbor Day in New Zealand, pointing out the impetus this gave to tree planting in the United States. Murphy’s vision was, indeed, grand and involved private and public money. It also was voluntary. He believed a local improvement committee could improve the progress of a local area. As chapter four shows, Arbor Day was introduced into New Zealand on a nation-wide scale in 1892, the year after Murphy penned his suggestions.

**Improvement societies and sand reclamation: urban reclamation**

In cases outside Brighton, the government sometimes formed local urban bodies to combat the problem of shifting sands. In Dunedin, in 1884, management of the sandhills was beyond the resources of the municipal council. The government therefore formed the Ocean Beach Domain Board to manage the sandhills of this public reserve. In 1891, continued lack of funding and property threatened by imminent sea encroachment led the local MHR, Henry Fish, to constitute a new Domain Board. This consisted of elected members, who were to oversee reclamation. In 1892, the Ocean Beach Public Domain Act passed, giving the board, with the assent of burgesses, the authority to raise a loan of up to £10,000. Later, in 1894, it was amended to enable it to set rates, though only with ratepayer approval. In this decade, the Board not only drew up reports on the problem but also planted marram grass, trees and lupins. By early 1900 with the help of a government vote of £100, it had extended the plantings and fencing. By 1901, the Board could raise up to £20,000, evidence of the strong desire to find a solution to sand drift. Elsewhere in Dunedin, the story was mixed. Chalmers’ MHR, E.G. Allen, noted proudly that Road Board planting had largely arrested the spread of sand over the road between Musselburgh and Tomahawk Lagoon. Further down the Peninsula, near Tairoa Head, he observed, planting marram grass had failed; sand ‘has covered up an entire farm to a very great depth’.

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34 Murphy, ‘Possibilities’, pp.148-149, 151-152.
41 ‘Ocean Beach Domain Board’, 1/1, DCCA.
43 Allen, 28 September, 1903, NZPD, p.7.
If a mix of government and local action stimulated reclamation attempts in Dunedin, then voluntarism characterised the efforts of a local, rural community further up the coast. During debate on the Sand-drift Bill of 1903, Southern Maori District MHR, Tame Parata (1832?-1838?-1917), described the formation of an improvement society in Waikouaiti (approximately 30 kilometres north of Dunedin) in order to protect ‘a peninsula from being cut off by the sea from the mainland’. By collecting money and receiving help from other settlers in the district, he related that the society spent over £230 on protection measures. These included ‘a fence about 8 ft. high’ and an embankment fenced in with scrub and sown with marram grass. The Society planted a mixture of native and exotic plants, including lupin and marram grass. It ‘even went to the expense of bringing native plants from Stewart Island and the Chatham Islands’ to introduce into Waikouaiti. On Arbor Day, Māori and schoolchildren sowed these plants. Now, Parata noted proudly in 1895, toetoe and marram grass grow well there. ‘[A]ll along the South Island’, though, he observed, ‘sand is drifting on to the valuable land, and it wants to be arrested.’ Private planting, then, had successfully arrested the inland spread of coastal sands in Waikouaiti. Planters also took advantage of the opportunity of Arbor Day to use local schoolchildren to plant out the area. ‘The result’, Parata concluded, ‘was the formation of a sandhill along the line of fence which prevented the seas from coming through and into the Waikouaiti River’ upon which a road was built.

Parata detailed the process of reclamation and the reasons for its development. ‘In the early [eighteen] “forties” ’, described Parata, ‘the [now reclaimed] land used to be covered with flax and pingao, and toetoe-grass, and Mair patiti.’ The end of whaling in that decade, he continued, brought cattle to the area, which ‘killed the native grass’, loosened the soil and allowed the sea to take possession. Parata’s vivid portrayal of this ecological process is unique among his fellow parliamentarians and gives a real sense of the rapid ecological change grazing animals brought to sand dune areas. More particularly, it demonstrates that, by the early twentieth century, the resource loss faced by Ngai Tahu through over fifty years of land purchases had severely decreased their

44 The voluntary nature of the committee is emphasised by the words of Tame Parata, who related how citizens ‘formed ourselves into an improvement society’ Parata, 28 September 1903, NZPD, p.13.
45 Parata, 28 September 1903, NZPD, p.13.
46 Parata, 28 September 1903, NZPD, p.13.
people’s access to resources. A tribe faced with increasing economic hardships and possessed of a reduced land area, therefore, desperately did not want to lose any more land. Like some of the other tribes discussed in the introduction and in chapter two, economic necessity forced them to cultivate and secure relatively marginal land in order to maintain a resource base.

**Government aid in reclamation: the 1903 Sand-drift Bill**

In some cases, as in Waikouaiti, voluntarism provided the basis of reclamation. In others, it relied on a mix of government and local efforts. In an attempt to bolster local efforts, on 28 September 1903, the Native Minister, James Carroll (1857-1926) introduced into the House of Representatives the Sand-drift Bill. This targeted the spread of sand dunes onto agricultural land by empowering the Minister of Lands to delegate to local councils the necessary reclamation work. Under the proposal, settlers assumed the burden of paying for reclamation on their own land, but could appeal against any decision to a Stipendiary Magistrate, who, in conjunction with two Assessors, would then reach a decision.

During debate on this bill, parliamentarians agreed that sand drift was an evil that imperilled the agricultural and economic prosperity of the country. These men drew on alarming rhetoric to illustrate the nature and extent of the problem. Reclamation works, they also pointed out, offered the nation salvation, and profit. Parliamentarians discussed many examples of sand drift in New Zealand. Their discussion suggests that the problem had worsened since its recognition by explorers and settlers in the previous century.

Reports on sand drift in New Zealand, like those on climate change and soil erosion, became relatively commonplace by the early twentieth century. As with the problems of climate change and soil erosion, sand drift appeared to be a human-caused

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48 Carroll, 28 September 1903, NZPD, p.4.
problem that could be remedied through human action. Debate on the Sand-drift Bill opens a fascinating window onto the awareness politicians had of the problems posed by shifting sands, and on the general shift towards state intervention that had occurred since the idea was first posited. Furthermore, these accounts acknowledge that sand drift not only threatened agricultural land but also affected urban areas. As historical geographer Eric Pawson observes, environmental historians often overlook urban areas. As noted in the introduction, natural events such as snowstorms and climate change, fires and flooding, could imperil urban areas as much as agricultural communities.

In introducing the Sand-drift Bill, Carroll referred to the economic loss of lands ‘covered by drifting sand’. Sand encroachments ‘over an area of several hundreds of acres’, he noted, had turned land valued at £15 or £20 an acre into worthless wastelands. On the west coast of the North Island, he said, ‘the area of good land covered by drifting sand’ had increased in five years from 300 to 600 acres. ‘[A]cres and acres of land [are] being covered up in this way both in the North and South Island’, warned Carroll. ‘It is, therefore, becoming a serious question, especially in view of the fact that owing to settlement and cultivation our natural forest-growth is disappearing and consequently our lands are being rendered more exposed to the prevailing winds than they were before.’ According to Carroll, the land between Wellington and Paekakariki had become ‘nothing more or less than a long series of sand-hills or sand wastes’. With no forest arresting the inland spread of sands, ‘the danger of the valuable tracts of land lying along the coast being covered with sand is increasing every day.’

To add credence to his argument, Carroll quoted from an article printed in the Edinburgh Review on the evils of deforestation and sand drift: ‘The unfortunate experiences of Central Asia, which was once a garden of fertility and is now a desert peopled by nomads only, are repeating themselves [elsewhere in the region].’ Thanks to deforestation, observed Carroll, drought and flooding alternated in a cruel cycle of degradation. Carroll asked rhetorically:

If so much devastation and desolation has taken place in Russia, where the sand in one instance has covered eight hundred square miles, and has blocked up rivers, and rendered them absolutely dry, what must happen to our country in time? The same results will assuredly follow if no step is taken to check the moving sands which lie along our coast-line, and, on the principle of "a stitch in time saves nine," the earlier we set ourselves to the task of coping with this difficulty the quicker it will be overcome, and the more assuredly shall we reap the benefit. Besides, it will be far less costly to deal with the matter now than it would be later on.  

In a potent brew of alarming rhetoric and salvationary bombast, Carroll drew terrifying contrasts between what could eventuate in New Zealand and what had happened overseas. He linked New Zealand's future economic potential with the eradication of sand dunes. According to him, sand drift threatened the individual farmers whose land disappeared and 'by the damage done to its assets', the colony as a whole.  

The reception to the Bill

The Bill received a positive but critical response among MHRs. Only one, R.M. Houston (Bay of Islands) disagreed with W.H. Field (Otaki MHR), who spoke for most when he noted that 'the object of the Bill is a highly meritorious one, and the time has certainly come when this great evil should be dealt with'. As with almost all other MHRs, however, Field found fault with the Bill's provisions. Particular criticism focussed on the extensive powers granted to the Crown to proclaim any area in need of reclamation. Most MHRs preferred local authorities to reclaim sand drift areas rather than the Crown. Sir W.M. Steward (Waitaki) and W. Fraser (Wakatipu) questioned whether the Bill implied that the Crown would recoup the cost of sand reclamation on crown land. Robert McNab (Mataura) wondered how the Crown could reclaim the costs spent on reclamation on its own land. While both Steward and Houston doubted that settlers

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51 Carroll, 28 September 1903, NZPD, p.3.
52 Carroll, 28 September 1903, NZPD, p.4.
53 Carroll, 28 September 1903, NZPD, pp.3-4.
54 Field, 28 September 1903, NZPD, p.11.
55 Fraser, 28 September 1903, NZPD, p.6.
56 For instance, Fraser, 28 September 1903, NZPD, p.6; Allen, 28 September 1903, NZPD, p.7; Mander, 28 September 1903, NZPD, p.8.
57 Steward, 28 September 1903, NZPD, p.7; Fraser, 28 September 1903, NZPD, p.6; McNab, 28 September 1903, NZPD, p.9.
could afford the measure, Field believed that Māori could not. Of the fourteen MHRs who spoke during the debate, only the Caversham MHR, T.K. Sidey supported the Bill outright. Often, too, the tone was glum. According to McNab, an active proponent of forestry himself (see chapters seven and eight), ‘no doubt there are large areas ... in this country that you will never be able to protect from the drifting sand.’ He predicted that ‘the day will come when it will all be covered with sand, and the agriculturists will have to leave it, and then you will get the condition of things that exists in France. The State will have to take over that country and put it to the use that it was put to by the French Government.’

Both Houston and F. Mander (Marsden) actually doubted whether the drift could be stopped at all.

Although parliamentarians overwhelmingly accepted the need for protection against sand drift, they could not agree on the best means to achieve this. On the one hand, some feared the strong powers that central government would have were the Bill to pass, in a sense echoing what happened when the state withdrew support for an independent forestry service in 1874 and 1885 (chapters four and seven). This group overwhelmingly favoured relying on existing local methods of control. On the other hand, predicting that settlers could not afford this process, some worried that the Bill placed too much emphasis on private capital to finance reclamation, thereby implying that the state should intervene more. All politicians, though, agreed on the threat posed by sand drift. They evoked similar arguments and images to those used by authors whose work appeared in the Transactions. Instead of giving principally overseas examples, however, they drew theirs from within New Zealand. The next few pages describe some of these affected areas, which provide important illustrations of the New Zealand-wide problems posed by sand drift as well as the awareness many politicians had of this spread.

In the South Island, as noted above, sand drift threatened part of Dunedin and Waikouaiti (see above). In Canterbury, near Kaiapoi, D. Buddo (Kaiapoi MHR) identified that ‘at least twelve or fifteen miles of sandy beach ... is undoubtedly at some

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58 Steward, 28 September 1903, NZPD, p.8; Houston, 28 September 1903, NZPD, p.6; Field, 28 September 1903, NZPD, p.10.
59 Sidey, 28 September 1903, NZPD, p.12.
60 McNab, 28 September 1903, NZPD, p.8.
points encroaching on very valuable land.' Though broom had been planted, he believed that 'methods [of reclamation] are apt to be wrongly applied.' Pine trees, he felt, were not suitable introductions because the lee side prevented the wind from blowing the sand back. Insufficient foliage on their windward side did not hinder the spread of sand. Marram and lupin, he concluded, offer the most suitable means of arresting sand. Steward expressed confidence that tree planting 'will prevent further encroachment of sand, and will eventually turn into useful land[,] land which is now utterly useless because of being covered with sand.  

During the second reading of the Bill, on 20 October 1903, W.C.F. Carncross (Taieri) exhibited no such optimism. Instead, he presented a terrifying description of the uninhibited spread of sand as it swallowed up acres of good land.

I have seen sand drift for years over splendid country, travelling in some parts at the rate of 1000 yards a year. To see trees outcropping through feet of sand in places where a year before was grass with stock grazing on it, is, I think, one of the most deplorable sights one can witness. This sand-drift can be seen extending for miles, from Paikakariki up to Foxton, and I understand that in other parts of the colony it is much the same.  

He continued in a similar vein, describing in very personal terms the experience of being caught in a sand dune.

It may be that its onward march may be checked to some extent by planting near the sea-shore, and that the evil may be mitigated; but from the sandhills the sand flies in clouds with every wind, and on a day it is carried for miles. In the neighbourhood of the sandhills it is with difficulty that you can breathe on such days. Your eyes and nose are full of sand, and the experience is altogether disagreeable. However, something is now to be attempted, and better late than never.  

Robert McNab, also described the devastation caused to Taranaki’s landscape: ‘[O]ver three hundred acres of first-class country has been rendered absolutely useless.

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61 Houston, 28 September 1903, NZPD, p.6; Mander, 28 September 1903, NZPD, p.8.
62 Buddo, 28 September 1903, NZPD, p.11.
63 Steward, 28 September 1903, NZPD, p.8.
64 Carncross, 20 October, 1903, NZPD, p.590.
65 Carncross, 20 October, 1903, NZPD, p.590.
within recent years by drifting sand from the sea-shore. As noted in chapters four and seven, particular concerns were expressed about the effects of deforestation in Taranaki. Widely regarded as the bread basket of New Zealand, this province seemed to be groaning under a tide of environmental destruction, with climate change, soil erosion, and flooding touted as just some of the many problems facing this previously fruitful region. Other MHRs highlighted concerns elsewhere in New Zealand.

Sir W.M. Steward (Waitaki) related a cautionary tale of sand devastation. On a recent trip to the Chatham Islands, he ‘saw there some splendid land which is being utterly destroyed by the incursion of sand’. Deforestation produced the problem, he explained, ‘the bush having protected the surface soil. The winds, having now free access to the unprotected surface, have removed the surface soil, and are carrying sand over miles of country.’ Steward estimated that ‘there are hundreds and hundreds of acres rendered utterly useless’ through sand drift. Although the planting of marram grass had checked its spread, this appeared only a temporary measure. Steward warned that unless something is ‘done in the same direction by the Government, but on a more extended scale, in the Island of Wharekauri, there will be hundreds and hundreds of acres which will be rendered utterly useless.’ Illustrating the rapidity of sand advance, he noted that he had ‘walked over some ground that was entirely covered with sand to a depth of 2 ft. which no longer than fifteen months before had been covered with a beautiful turf, and, indeed, a part of it was actually used as a cricket-ground.’

Other MHRs presented a more confident assessment of their ability to stop sand drift. Legislation, proclaimed A.D. Willis (Wanganui), ‘will be the means of saving thousands of acres of fertile land which would otherwise be smothered.’ He spoke from experience. As ‘a member of the Wanganui Harbour Board I have had a great deal to do

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66 McNab, 28 September 1903, NZPD, p.9.
67 Hone Heke (Northern Maori District) doubted whether marram grass could arrest the problem of ‘sand mountains’ between Hokianga River and North Cape, since sand drifts over mountains and dense bush. Heke, 28 September 1903, NZPD, p.7.
68 Steward, 28 September 1903, NZPD, p.8.
69 Steward, 28 September 1903, NZPD, p.8.
70 Steward, 28 September 1903, NZPD, p.8.
71 Steward, 28 September 1903, NZPD, p.8.
72 Steward, 28 September 1903, NZPD, p.8.
73 Willis, 28 September 1903, NZPD, p.12.
with seeing that the drifts are planted with this grass'. He reported a recent case, which lent support to his confidence.

In one case the Board has leased some three hundred acres of a perfect wilderness of sand to a tenant, the only proviso being that the tenant should every year plant a certain number of acres. The plan has been very successful, and a very large amount of land has been reclaimed. Only a week to two ago myself and other member of the Board visited the locality, and one and all expressed ourselves very well satisfied with the result. A great deal of grass has been planted along our sea-coast, and in every case has proved a success. The amount of land reclaimed on private property has also been very great, and by means of this grass being planted a large amount of property has been prevented from being destroyed by the sand. 74

Vile (Manuwatu) and W.C. Buchanan (Wairarapa) echoed this success. Tree planting, noted Vile, had arrested sand drift over the railway lines near Foxton. 75 And, observed Buchanan, marram planting had been equally successful on the east coast of the North Island. 76

Parliament gave the Bill its final reading on 22 October 1903. 77 The Act empowered the Governor to proclaim sand-drift areas 'on the petition of any local authority or of any two or more persons interested'. The Minister of Lands, entrusted to find a scheme to prevent further encroachment, could delegate to a local authority the power to undertake the recommended sand-drift reclamation measures. Expenses would be recovered by rating the owners of the proclaimed areas. Those affected by the proclamation had two months within which to appeal against the decision before a Magistrate and two assessors. 78 The emphasis placed on government action at the local level echoes a main theme of this thesis, namely, that despite the emergence of nationalism and strengthening of central government, people continued to experience and alleviate environmental problems at the local level.

74 Willis, 28 September 1903, NZPD, p.11.
75 Vile, 28 September 1903, NZPD, p.13.
76 Buchanan, 28 September 1903, NZPD, p.10.
77 22 October, NZPD, p.713.
78 The Statutes of New Zealand, Wellington, 1903, pp.57-58.
Aside from its details, the debate leading up to this legislation further illustrates that parliamentarians used an alarming language of damnation (humankind removing coastal vegetation) and redemption (humankind legislating protection) that almost exactly mirrored that used by proponents of climatic and catchment conservation (chapters four, five and seven). To make their point, proponents of the Sand-drift Bill stressed the immediate threat coastal sand dunes posed to the economic potential of the country. They seized on emotive examples – of sands devouring acre upon acre of fertile land, of stinging sand reddening eyes and stifling breath – and promised that legislation could save these lands from desolation. In contrast to earlier proponents of sand drift who mainly had used foreign examples, during the 1903 debate politicians almost exclusively presented examples of sand drift from New Zealand. All parliamentarians agreed that, since the late nineteenth century, shifting sands had increased in their scope and that, because of this, they demanded immediate attention. Politicians probably perceived sand drift as such a serious threat because sand dunes spread so rapidly, enabling people to see the process of sand encroachment occurring within a relatively short time. The inclusion of sand dunes in popular literature also evinces how commonplace they were in New Zealand society.79

The effectiveness of the Sand-drift Act: Cromwell, Central Otago

How effective was the Act? According to some foresters and ecologists, although the Act made progress towards arresting sand drift, in reality it enjoyed little success.80 Another argues that the Act, while ineffective in sparsely populated areas, enjoyed success in areas of close settlement.81 Evidence underlines that Government did take an interest in arresting sand drift, especially in urban areas. It commissioned scientific reports on the problem, but did not undertake extensive sand reclamation outside urban areas until after 1914. The example of inland sand encroachment in Cromwell, Central Otago, bears out the increasing efforts of both government and local councils to stop sand

79 William Sylvester Walker’s Zealandia’s Guerdon, for instance, describes in detail the ecology of New Brighton sand dunes which in the novel provide a backdrop to some bad melodrama and the tragic disappearance of one of the picnic goers. William Sylvester Walker, Zealandia’s Guerdon, London, 1902, pp.275-276. Thanks to Dr. Julian Kuzma for this reference.
spread in areas of close settlement. It also suggests that the Act operated more effectively in areas of close settlement. Yet, hampered by bureaucratic lethargy and further slowed by the war effort, the problem actually had worsened by the time crucial decisions to arrest sand drift were made. This is an important reminder that environmental actions take place at a different pace to human time scales and lifetimes.82 The case-study of Cromwell demonstrates that non-human events do not necessarily react either in predictable or logical ways that rational state legislation and humans expect.

Towards the end of the nineteenth century, residents of Cromwell organised themselves to fight shifting sands. These were emerging on unoccupied land on ‘the bank of the Clutha River below Lowburn’.83 Despite earlier receiving compensation from the Government to solve the problem, observed W. Fraser, MHR for Wakitipu, locals ‘have had to spend from their own rates some hundreds of pounds to save the town from extinction from drifting sands.’84 According to a 1919 report commissioned to investigate the sand drift in the area, the problem originated in the great flood of 1878. This flood deposited ‘sand about 4 feet deep’ on the lower flats of the Clutha River, and added to existing problems of sand drift. Marram planting by the Council, though, temporarily succeeded in arresting the spread of sand drift.85 By 1915, sand drift once more was threatening the town. In that year, the Secretary of the Upper Clarke Fruitgrowers Association asked Cromwell’s mayor ‘for some steps to be taken to have the sand nuisance on Sugar Loaf Terrace controlled’.86 With a note that ‘a revival of the old sand drift trouble’ appears to be happening, the Public Works Department became involved in the issue.87 In 1916, the Government sent a deputation. By 1917, when Cromwell’s mayor again petitioned the Government for help, action still had not been taken.88

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81 Wendelken, ‘New Zealand Experience in Stabilization’, p.149.
83 Fraser, 28 September 1903, NZPD, pp.6-7.
84 Fraser, 28 September 1903, NZPD, p. 7.
85 Copy of report by J.R. Marks attached to letter from Baker, District Engineer, ‘Cromwell Borough – Sand Nuisance’, 5 August 1919 in ‘Sand Dunes – Cromwell, 1915-1924’, F1, 277, NA.
86 J. Wood, Secretary of the Upper Clarke Fruitgrowers Association to Mayor, Cromwell, Lowburn 21 June 1915, in ‘Sand Dunes – Cromwell’.
87 Town Clerk to Minister for Public Works, Cromwell, 5 July 1915, in ‘Sand Dunes – Cromwell’.
Meanwhile, Cromwell Borough Council had formed a subcommittee to report on the costs of ‘quelling the sand drift’. They estimated this would be £960.9 By 1916, the Council had spent £1,840 13s 1d on sand barriers, marram and lupin and tree plantations.90 Three years later, the situation had become desperate. The Town Clerk wrote imploringly to Sir William Fraser for £100, since ‘[t]he funds of the Borough are not enough to keep the roads in the Borough in proper order, and the main arterial road leading out of the Town on the west would in time be closed up if something was not done every year to keep the sand in check.’91 Government finally relented, commissioning a report into the problem and providing two grants each of £100 to plant marram. The money was only made available, though, if the Council contributed half the amount provided by Government.92 Sand problems continued in Cromwell into the 1920s, with both Council and Government money spent on reclamation. By 1923, the Council had spent over £3,500 on arresting sand.93

This case-study demonstrates that, albeit slowly, Government did make funds available to arrest sand drift. Government action bears out Wendelken’s contention that reclamation took place in areas of close settlement.94 Although it is tempting to see Cromwell Borough Council resorting to hyperbole to overplay the effects of sand drift to secure Government money, the fact that by 1923 the Council had spent over £3,500 on arresting sand drift, demonstrates quite clearly the enormous threat shifting sands posed to this town.95 The Cromwell case study, along with the experience of the Ocean Beach Domain Board (see above) also reveals that the Government had contributed money to reclamation efforts before the Sand-drift Act of 1903. Its passing betokens increasing government intervention in society, economy, and, particularly, agriculture that took place in this period. In the decade or so before the Act, the Liberal Government created,

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89 ‘Report of Sub-Committee appointed to prepare a report and estimate aof the cost of quelling the sand drift from its source in the vicinity of Lowburn to the northern boundary of the Cromwell Town Belt’, ‘Sand Dunes – Cromwell’.
90 Calculated from ‘Sand Dunes – Cromwell’.
91 Town Clerk, Borough of Cromwell, to Sir William Fraser, Cromwell, 2 July 1919, in ‘Sand Dunes – Cromwell’.
92 On these see R.W. Holmes, Public Works Department, Dunedin, code RWH/QD. 26 August 1919; G.C. Godfrey, memo, to District Engineer, Dunedin, 26 August 1920, in ‘Sand Dunes – Cromwell’.
93 See remaining files in ‘Sand Dunes – Cromwell’.
95 Memo to Minister of Public Works, 23 November 1923, in ‘Sand Dunes – Cromwell’.
and later expanded, new departments like those of Labour, Education, and Agriculture.\(^9\)
The last had been created in 1891, and shows the emphasis that the Liberals placed upon agriculture.\(^9\) Government actively sought to make available more land for settlement, through voluntary settlement, direct purchase from Māori and, perhaps most famously of all, John McKenzie’s (1839-1901) land for settlement scheme.\(^9\) Farmers also could improve their newly bought land with a loan from the government’s Advances to Settlers programme.\(^9\) Earlier, such government intervention would have been hotly debated and resisted. In the 1870s, many politicians fought central government control over New Zealand’s state forests (see chapter four). Sand drift clearly threatened the Liberal’s policies of land settlement and improvement. At first sight, too, it appears strange that the Act did not enjoy greater success. Its failure, though, perhaps reflected the Liberal’s preoccupation with many other issues at the same time: ‘bursting up’ the great estates, purchasing Māori land, providing loans for closer settlement, developing other labour legislation, consolidating its support base. Perhaps, like the Advances to Settlers programme, parliamentarians believed that they could legislate away the threat of sand drift, without the necessity of costly government expenditure. Whatever the case, war intervened to direct funds and attention away from issues such as sand drift.

**Legislative limitations**

If the Sand-drift Act formed part of this general increase in Liberal government activity in society and economy, it also stood for a compromise between the worst of unfettered capitalism on one hand and socialistic intervention on the other. The Act recognised that the Government could intervene in directing sand reclamation, but granted it the power to recoup the cost of reclamation through rates. That Government made funds available for Cromwell’s sand reclamation, provided that the Borough Council put up half of the Government’s sum, demonstrates this measure of compromise. It also demonstrates that Government could modify the provisions of the Sand-drift Act

to meet urgent needs. Its provision signals a shift in government thinking about this process, marking recognition that government should alleviate sand drift in these areas. Yet it had its limits. In 1908, for instance, Otaki's MHR, W.H. Field, requested the Minister of Lands to purchase an area of land on the North Island west coast on which sand drift experiments could take place. He also requested the production of a leaflet on sand-drift prevention. McNab, now Minister of Lands, informed him that no land purchase would occur, but that the Department of Lands and Survey was looking into the issue of sand reclamation.100

True to McNab's word, the Department, indeed, was looking into the issue. In 1909, at a cost of £130, the Minister of Lands commissioned Leonard Cockayne, the colony's leading botanist, to produce a 'Report on the Sand Dunes of New Zealand'.101 Such reliance on a professional scientist to investigate this environmental problem betokens the increasing faith the Liberal Government placed in science as a means of aiding agriculture, a move already signalled with its creation of a separate Agricultural Department. Increasingly, the future of New Zealand agriculture would be tied to scientific innovation, most notably with the formation of a separate Department of Scientific and Industrial Research in 1926.102 This bureau provided guidance and research into methods of improving agricultural production such as through the development of artificial fertilisers.103 The message was that science could increase agricultural productivity and prosperity.104

Although the Government had made a start by assessing the problem, sand drift continued to eat away at valuable agricultural land. A gap, then, existed between sanctioning initiatives and shaping the behaviour of the environment. As T.H. Potts had

100 Field, 5 August, NZPD, 1908, p.137.
101 L. Cockayne, 'Department of Lands: Report on the Sand Dunes of New Zealand: The Geology and Botany, with their economic bearing', AJHR, C 13, 1909, pp.1-30; Whitehead, 'Sand Dune Reclamation', p.148. Although Wairarapa MHR, Buchanan, objected to the cost of 130 pounds for this report, and argued that his work "was of no practical value to the farmer whose land was being destroyed by drifting sand", the MHRs for Ellesmere, Selwyn, Dunedin North, and the Prime Minister, all leapt to Cockayne's defence. 17 December, NZPD, 1909, p.1223.
noted over thirty years before the 1903 Sand-drift Act, ‘however well legislative enactments [sic] may be framed, the people themselves can alone determine what shall be allowed to exist.’\textsuperscript{105} To his statement might well be added the caveat that natural events themselves also could determine the success of legislation. With sand drift, the mixture of Government and private initiatives was largely failing. What other options could government turn to?

**Arbor Day**

Arbor Day, introduced nationally in 1892 to New Zealand appeared to offer hope for sand reclamation. So did the recently-established forestry branch, established in 1896 (see chapter four). Yet, although both measures were designed to encourage tree planting, neither featured prominently in sand reclamation. As noted above, on Arbor Day, Māori school children planted trees to help with the Waikouaiti reclamation project. In 1910, the MHR for Taumarumau requested the Minister of Agriculture to supply teachers with sand-binding plants in districts where sand-dunes are prevalent. He highlighted that sand drift was ‘a serious menace in many portions of the west coast beach-lines of the North Island.’ The Minister of Agriculture agreed with Jenning’s request. Promising to give any ‘application for roots of marram grass or seeds of lupin’ ‘sympathetic consideration’, he noted that it is ‘desirable to familiarize children, in districts where there are sand-dunes, with the use of sand-binding plants’\textsuperscript{106} Few other attempts during Arbor Day seem to have been directed against shifting sands. This possibly reflected the emphasis placed on planting for aesthetics and the ceremony attached to the event (see chapter four). Planters concentrated their efforts on school grounds and public reserves, not beaches and sand-affected zones.\textsuperscript{107} Reclaiming sand also required a great deal more maintenance and skill than planting on school grounds and reserves, and may have been an additional factor that discouraged sand reclamation on Arbor Day.

\textsuperscript{106} 2 November, NZPD, 1910, p.256.
\textsuperscript{107} See, for instance, Department of Agriculture, *Arbor Day, 1894*, Wellington, 1894, pp.1, 6.
If Arbor Day does not appear to have contributed much to sand reclamation, neither did the forestry branch.\textsuperscript{108} The single exception to this occurred near at Sandy Point (Southland). There, ‘[t]wo skilled tree-planters’, working for three weeks, planted some 16,100 Marram grass sets and 1,260 \textit{Pinus muricata}. They also erected 88 chains of wire-netting fencing and lined out 5,000 seedling pines for future operations.\textsuperscript{109} Given the concentration of the forestry branch on establishing nurseries and planting in treeless areas, the lack of sand reclamation work is puzzling. Perhaps the financial difficulties faced by the branch may have forced it to concentrate solely on its mandate to re-forest treeless areas.\textsuperscript{110}

**Scientific solutions to sand drift**

Meanwhile, in 1911, Cockayne’s more extensive report on sand drift in New Zealand appeared.\textsuperscript{111} Already, when he came to write this, Cockayne had made a major contribution to conservation in New Zealand by combining ecological arguments with nationalism. He urged that New Zealand’s native forests should be protected not only for their value to tourism and science, but also for their significance to national identity.\textsuperscript{112} In addition to his surveys of sand dune areas in New Zealand, Cockayne had produced Government-sponsored surveys of other ecologically important areas such as the Chatham Islands (1901), Kapiti Island, Tongariro National Park, Waipoua Forest and Stewart Island (1907-1909).\textsuperscript{113} According to scientists today, Cockayne’s 1911 report on sand dunes still presents a ‘masterly review of the problem and possible solutions’ to

\textsuperscript{108} I have looked through all the records of the forestry department since its inception in 1897. The records are held at the National Archives, Wellington.

\textsuperscript{109} Superintendent Nurseryman, Tapanui, ‘Report on Treecrowing operations for South Island nurseries and plantations, for August, 1911’, 3 September 1911, 1/44, 1270 in Historical Records Volume 6, 1908-1913, F1, 45/271/5, NA, Wellington.

\textsuperscript{110} On the financial difficulties see, for instance: ‘[A]s the State Forests Act, 1885, simply does not allow any part of the State Forest expenditure to be chargeable to the Consolidated Fund, we shall be compelled to fall back upon a loan, which, by the above Act, the Minister is empowered to raise but not more than £10,000.’ Under Secretary for Crown Lands to H.J. Matthews, Chief Forester, 22 February 1907, Historical Records Volume 5, 1907, F1, 45/271/5, NA, Wellington.

\textsuperscript{111} L. Cockayne, `Department of Lands: Report on the Dune-Areas of New Zealand. Their Geology, Botany, and Reclamation’, C 13, 1911, Chapman Pamphlet, volume 107, No. 7, HL.


\textsuperscript{113} Star and Lochhead, ‘Children of the Burnt Bush’, pp.128-130.
sand drift and 'remains a valuable reference document to this day.' In it, Cockayne undertook research into North and South Island sand dunes. He furnished detailed lists of plants suitable for dune reclamation. He investigated the extent of sand dunes in New Zealand and drew examples from southern France and northern German reclamation as methods that the colony could adopt. He concluded that in New Zealand, while inland dunes occur, coastal dunes remained the greatest problem. First, he noted, coastal dunes form a natural defence to the land against the encroachment of the sea, and, in the second place, their movement inland is a national concern [his emphasis], since through their advance much valuable land has been ruined in the past, while yearly further destruction takes place, the evil at the same time becoming more difficult to suppress.

By placing particular stress on its national threat, Cockayne echoed the earlier cries for action. 'The fact that we possess an area of more than 300,000 acres of sand,' he wrote imploringly, 'the greater part of which is not only worthless but a constant menace to the surrounding fertile land, is a fact of no small national importance.' He urged the Government to address the problem of shifting sands:

_Dune-reclamation, the world over has been considered rather the work of the State than of the individual._ [emphasis in text] The labour involved is too vast, and the interests too diverse, for it to be undertaken by private individuals. The most such can attempt is to make their holdings secure for the time being.

Continuing in a similarly impassioned tone, he asked rhetorically: 'Could this barren land be turned into forest, even were the cost greater than that of afforestation generally, the work would cry aloud for its accomplishment.' According to him, even if the costs of doing so would be uneconomic, Government had a duty to arrest sand drift. Cockayne, then, echoed the physiocratic cries of Whitcombe and others in implying that the state had a moral responsibility to protect its citizens from sand drift. Europeans clearly felt something distasteful, something unacceptable about land not being used.

115 See, for instance, pp. 5-6 of region by region estimates of sand dunes in New Zealand. Cockayne, ‘Report on the Dune-Areas of New Zealand’.
Cockayne advocated establishing research stations to investigate the best means of reclamation. Already, he said, he kept up a small experimental garden a mile from the New Brighton coast.\textsuperscript{118} Cockayne roundly criticised the Sand-drift Act, largely for being moribund. ‘The average owner of the dune land’, he wrote, ‘knows nothing of reclamation methods; and even in the light of this report ... he is not convinced that his land would be amenable to treatment.’\textsuperscript{119} To Cockayne’s prognosis, in 1913, Field again lobbied the Minister of Lands for the completion of Cockayne’s report. The Minister replied that Cockayne’s report had supplied sufficient information, adding that ‘it is not the duty of the State to protect and cover with vegetation areas of sandhills owned by private individuals, although the Government is only too pleased to afford such assistance and encouragement as lies in its power, which is largely determined by the funds for that purpose annually voted by Parliament.’\textsuperscript{120} Ward’s reply to Field highlights a central problem with the Sand-drift Act. Parliament willingly passed the Act, but stopped short of taking full responsibility for the problem on private land. With the limited funds granted to it by parliament, the Act only could assist reclamation efforts.

Finally, in 1913, the Government took a practical step towards stopping sand drift. In that year, the Department of Lands and Survey established an experimental sand reclamation station at the mouth of the Rangitata River, Canterbury.\textsuperscript{121} The following year, another report, by Australian forester E. Phillips Turner, appeared on sand drift. It summarised sand reclamation projects in Europe and South Africa. Phillips Turner found that in New Zealand ‘probably several thousand acres of privately owned sand dunes has already been reclaimed by means of either marram grass or tree-lupin’ along the Wellington and New Plymouth coast.\textsuperscript{122} According to Phillips Turner, the state had reclaimed ‘only a comparatively small area’ – a total of 7 kilometres of sand along riverbanks. ‘Small subsidies have been made’, he continued, ‘to a few settlers who have planted Crown lands to prevent the sand there from blowing on to their freeholds, and a fairly large area (perhaps 2000 acres) has been planted by leasees of Government runs’.

\textsuperscript{120} 3 July, NZPD, 1913, p.430.
\textsuperscript{121} McKelvey, \textit{Sand Forests: A historical perspective}, pp.36-37.
Leasees, he noted, were eligible to receive £2 per acre of every acre successfully planted out in marram grass. Furthermore, the Department had granted £100 to the trustees of Motutara Domain to plant 'a half mile strip at cost on their domain.' Although Phillips Turner's report underlines the limited effects of the Sand-drift Act, it does acknowledge that government action was beginning to address sand reclamation. Interestingly, too, in a measure reminiscent of the Tree Planting Encouragement Acts, the Government paid settlers on Crown land £2 per acre of successfully reclaimed land, a measure not discussed in the Sand-drift Act. During the First World War, as the example of Cromwell indicates, war spending curtailed many reclamation projects. After it ended, reclamation was taken over by the new State Forests Service (SFS), created in 1919 (see chapter four). It later relinquished this duty to the Public Works Department in the late 1920s. Thereafter, reclamation work by this service continued somewhat sporadically.

**Conclusion**

This chapter has traced concerns about sand drift in New Zealand. Early European writers in the colony highlighted the spread of shifting sand, warning that deforestation was helping to spread the menace. A few scientists in the latter third of the nineteenth century continued these warnings. They usually employed highly alarming language to play up the threat sand drift posed to New Zealand’s agriculture and to emphasise the urgency of redeeming this evil. Many of the same scientists and politicians who promoted state climatic forest conservation supported state reclamation of sand dunes. In the latter third of the nineteenth century, members of the Wellington Philosophical Institute dominated discussion on these topics, thus suggesting that Wellington’s Institute provided an important arena for discussion on environmental topics (see also chapters four and seven). The passing of the Sand-drift Act in 1903 marked recognition that Government would have to address the problem of sand drift. Before the 1903 Sand-drift

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123 For instance, the plan to afforest an area of land on Kaipara Harbour was also deferred due to the costs of war. Under Secretary of Lands and Survey to F.M. Dargaville, esq, Wellington, 20 April 1916, in 'Sand Dunes – Auckland- Kaitaia', 1915-1916, F 1, 27/1/1, NA, Wellington.
Act, some local authorities and private individuals had formed organisations. With the help of some government grants, they sought to arrest the spread of sand. Arbor Day and the New Zealand's forestry branch, both established in the 1890s, made relatively little impact on arresting sand drift. The difficulty of reclaiming sand areas possibly accounts for the former, while financial hardships possibly explain the failure of the latter. Debate generated by the Sand-drift Act demonstrates that politicians had a deep awareness of the problems posed by this process. Its introduction suggests that, within living memory of settlers, the impact of humans in introducing grazing animals and deforesting coastal vegetation may have accelerated the inland drift of sand. At the very least, parliamentarians and scientists believed that sand drift posed a serious economic threat to the colony's future. Where before they had used overseas examples of sand drift, most parliamentarians chose mainly New Zealand examples to support their points. Although the Act itself proved largely ineffective, particularly in areas of sparse settlement, parliament nevertheless initiated some reforms. Of great importance, it commissioned two reports into sand drift. These reports demonstrate that by the early twentieth century government was adopting a more scientific approach to environmental problems. This reflected the wider reliance Liberals placed on science to aid New Zealand agriculture. Although the Sand-drift Act still represented a compromise between private and public investment, these reports and the Sand-drift Act also indicate a more interventionist role for government. The scale on which these measures operated remained at the local level as people continued to experience environmental problems and seek solutions to these at this level. However rational, however scientific on paper, environmental legislation could not be introduced without the will to implement it. As the next chapter shows, greater success would attend attempts to stop flooding and soil erosion.

124 McKelvey, Sand Forests: A historical perspective.
Chapter 7: Sweeping away fertile fields: fears of flooding and soil erosion

As sand drift impelled forest conservation and tree planting in nineteenth century New Zealand, so too did fears about the effects of deforestation on flooding and soil erosion. Flooding fears emerged in the 1840s, around the same time as those about climate change. Their recognition and the adoption of forest conservation measures to stop their unwanted affects also followed the pattern of climatic fears. In the 1860s and 1870s, a number of natural scientists and politicians identified the problem, raising their fears not only before the various provincial New Zealand Institutes and in the association’s annual publication, but also before the provincial and national parliaments. The northernmost provinces of the South Island – Nelson and Marlborough – recognised this problem relatively early on by passing legislation to protect watersheds from deforestation. By the late 1860s, catchment conservation reached the national parliament. In the 1870s, parliament set aside areas specifically for the prevention of soil erosion, flooding and climate change. An indication of the importance of these ideas is that even when state forestry foundered, climatic and catchment reserves (termed, somewhat confusingly, ‘climatic reserves’) remained in place. They gradually increased in area over the decades. In the 1880s, popular farming journals also carried articles on this subject, and reported on popular lectures on this topic read before agricultural societies. Until the 1890s, calls for catchment conservation commonly appeared alongside those for climatic conservation – many conservationists clearly regarded both as consequences of deforestation. The two arguments had much in common. Both employed highly alarming language to play up the deleterious consequences of deforestation. As increasing periods of drought signalled climatic deterioration, so hydrological arguments stressed the dangers of flash flooding and its attendant concern, soil erosion. Both ideas emphasised the evil posed by deforestation to the aesthetic and economic well being of European agriculture and farming. Both highlighted the redemptive properties of trees. Both ideas focussed on upland areas. Focussing on upland reserves removed conservation from competition with
farmers over lowland forest and allowed conservationists to stress forest protection as a rational land-use policy. By safeguarding New Zealand’s ‘smiling fields’ in the lowlands from drought and inundation, supporters argued that conservation supported farming. New Zealand’s 1913 Royal Commission on Forestry marked the ascendance of catchment concerns over climatic fears. The rise of catchment fears had gathered momentum from the 1890s in response to increased evidence of land deterioration in New Zealand and the writings of overseas experts. Although still employing the same alarming arguments of the earlier century, professionally trained scientists dismissed the forest-climate link as inaccurate. As many scientists quickly realised, emotive language almost ensured attention and drummed up support for their programmes, the fruits of which were only truly reaped in the 1930s and 1940s. The mechanism (soil erosion and flooding) may have changed by the early twentieth century, but the means to inculcate a conservationist ethos (alarmist rhetoric) had not.

The role of forests in hydrology

What role did forests play in safeguarding lowland agriculture from devastating deluges and severe soil erosion? As Robert McNab explained in a 1903 article, forests and their leaf litter form

a sponge over the surface of the ground, which retains for long periods very large quantities of rain water. Giving this [rainwater] out little by little, the water which falls ... in few hours does not flood the ground and wash away the surface, but keeps a regular supply of water for weeks and months.  

Leaves also intercept rainwater, elucidated McNab in another article. He instanced that ‘the leaves of a 60ft elm have been estimated to cover five acres of land, and to absorb several tons of water in a day.’ Remove this ‘natural reservoir’, McNab warned, and rain ‘rushes down the hillside or along the plain in torrents or swollen streams ... denudes the

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2 McNab, *Forestry in its relation to the farmer: Four articles: the Farmer's Homestead Plantation, Forestry's Contribution to Agriculture, Forestry's Aid to the Farm, Forestry Supplies*, Gore, 1903, p.5.
land of its rich soil, and leaves bare clay or smooth rock, all to the detriment of agriculture." Aside from converting ‘the whole country into a barren and desolate waste’, floods cost lives and livelihoods, and stymied commerce and cultivation, concluded author, academic and environmentalist, J.P. Grossmann. Deforestation, Grossmann added, silted up harbour ports and rivers and ruined rivers suitable for future hydroelectric generation.

These ideas about the role of forests, like the forest-climate link, have a long history that date back to Antiquity. The Greek historian, soldier, and essayist Xenophon (c. 430-c. 355 B.C.) and the Roman agricultural writer of the first century A.D., Lucius Junius Moderatus Columella, for instance, admonished their fellows for neglecting land and causing soil erosion, since “Land, as all men know, responds to good treatment.” By the Middle Ages, writers such as Albert the Great (1193-1280) warned of the dangers of soil erosion. Not all, though, regarded deforestation as a bad thing. Some medieval Europeans believed that forests drew up all the moisture in soil and thus deprived crops of water. As early as the twelfth century, though, people in alpine areas of Europe enacted prohibitions forbidding the grazing of cattle and the cutting of timber. The express purpose of such regulations was to stop flooding and soil erosion. By the late eighteenth century, the work of individuals such as the French engineer Jean Antoine Fabre refined and popularised the link between deforestation, flooding and soil erosion. Fabre demonstrated the role foliage, soil and humus played in regulating water flow and even in controlling torrents. A catchment theory such as Fabre’s proved particularly popular in France. From here, it had spread to many other areas by the early nineteenth century.

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3 McNab, Forestry in its relation to the farmer, p.5-6.
4 See J.P. Grossmann, The Evils of Deforestation, Auckland, 1909, pp.30-34, 37, 41.
7 Glacken, Traces of the Rhodian Shore, pp.698-702.
century. From the middle of that century, many regions of alpine Europe, such as Switzerland, France and Austria, prohibited deforestation in alpine areas and initiated flood prevention schemes.

In the so-called New World, catchment theories influenced conservation from the eighteenth century. In the 1760s, Pierre Poivre, Commissaire-Intendant on Mauritius, worried about the relationship between soil erosion, deforestation and the silting up of waterways. In response to these anxieties, he enacted legislation prohibiting deforestation along waterways. In the 1780s, British administrators introduced some soil conservation measures on the islands of St Vincent, Grenada, St Lucia and Tobago. Other scientists visiting the New World, such as the Germans Alexander von Humboldt (South America) and Johann Forster (Pacific), also commented on the problem of soil erosion. North American writers in the eighteenth and early nineteenth centuries, similarly, drew attention to this process. In India (as they also would do in New Zealand), many Scottish-trained doctors drew attention to the influence of forests on climate as well as their beneficial role in preventing flooding and soil erosion. Dietrich Brandis, India’s first national forest conservator, maintained ‘that the guiding principle of state forestry in India “was to prevent the erosion of the mountain soil” – the washing away in the heavy rains of the loose soil, and the silting up of the beds of streams and to put a stop to destructive floods which arose from landslips and other disasters of the mountainside.’ As chapter eight shows, these writers had a significant influence on the introduction of

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11 Grove, Green Imperialism, pp.264-308.
catchment and climatic arguments in New Zealand as well as on the overall development of forest conservation in this country.

By the middle of the nineteenth century, the influence of forests on their basin’s hydrology was widely discussed in popular and scientific circles. In 1864, diplomat and environmentalist, G.P. Marsh, published *Man and Nature*. This popularised and refined catchment concepts yet further. While accepting that it was unlikely forests influenced rainfall, Marsh devoted a great deal of his book to demonstrating the influence of forests on waterways. According to Marsh, forests maintained regular stream flow while also protecting against frequent and violent flash flooding, falling rocks and avalanches.\(^{15}\)

Other studies on the influence of forests on stream flow appeared in the nineteenth century.\(^{16}\) All of these, however, relied not on scientific argument, but on estimates. As in Marsh’s case, they often presented historical evidence as proof of the influence of forests on waterways. Reliance on historical arguments and estimates provided ammunition for critics of these theories in New Zealand and elsewhere.

In 1893, for instance, B.F. Fernow, the former head of the Division of Forestry in the United States, recognised that forests ‘might reduce flood height and frequency’. However, he cautioned against relying on them to prevent inundations. As he noted, abnormal precipitation and unique topography often conspired to nullify the beneficial effects of forests.\(^{17}\) Fernow’s caution fell on deaf ears. At the end of that century, the forestry department (which had now become the United States Forestry Service) under the express direction of its first director, embarked ‘on a crusade to convert the country to conservation’.\(^{18}\) While invoking ‘the authority of science’, the USFS ‘also resorted to highly emotional appeals in an attempt to enlist support for its policies.’ Such evangelism biased its researchers into using insufficient evidence to support the link between forests and flooding.\(^{19}\) In the 1900s and 1910s, although faced with criticism from meteorologists and engineers, foresters ultimately succeeded in their immediate aim – to

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\(^{16}\) See Dr. A. Wjelkof, ‘The Results of the Destruction of Forests upon the River Wolga at Astracan [sic]’, TNPZI, 4, (1871), pp.374-376.


\(^{18}\) Schiff, *Fire and Water*, pp.4-5.
increase the area of forests. One can see the influence of the North American foresters' emphasis on flooding and soil protection on New Zealand forestry debates in the 1900s, most particularly in the 1913 Royal Commission. Equally, as was the case with the forests-rainfall link, New Zealand conservationists utilised highly emotive arguments for conservation that very often had little scientific basis.

**Catchment concerns in New Zealand**

These later debates made their first appearance in New Zealand thanks to the writing of Ernst Dieffenbach. Heir to the German Romantic and Enlightenment tradition of environmental writers such as Alexander von Humboldt and Johann Forster (who visited New Zealand with Cook’s first voyage), Dieffenbach came to New Zealand in 1839 as a naturalist for the New Zealand Company, staying only a few years before returning to Europe. In 1843, Dieffenbach published an important environmental and ethnographic text, the two-volume *Travels in New Zealand*. Offering a comprehensive discussion of New Zealand’s botanical and geological resources, Dieffenbach was one of the first to identify that ‘in New Zealand the plains are not, strictly speaking, the produce of the rivers’. Contrary to prevailing opinion, he held that soil fertility did not originate from flooding depositing rich alluvium. Instead, Dieffenbach explained, soil fertility came from decayed organic matter that had accumulated over a long period of years. This meant it was folly to pursue the popular settler policy of firing the forest, he argued, since within a short few years soil fertility would be exhausted. Based on what environmental historian Vaughan Wood terms a geological approach, Dieffenbach’s reading of the soil was correct. As settlers would discover to their detriment, deforestation eliminated the very source of the soil’s fertility. Dieffenbach’s assessment was a reaction to the popular idea, especially prevalent in the migrant firm, the New Zealand Company, that abundant vegetation above ground indicated fertile soils underneath. As Wood’s research

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19 Schiff, *Fire and Water*, p.165, 131.
shows, Dieffenbach’s assessment eventually was vindicated and the so-called biometric fallacy gradually disappeared out of popular currency.23

Another German-speaking naturalist and geographer, Ferdinand von Hochstetter, a member of the Austrian scientific expedition circumnavigating the world in the frigate Novara, undertook research in New Zealand. He presented this in two important books on New Zealand’s geography and geology, and in numerous articles (see chapter eight).24

In his geography of New Zealand, published in German in 1863 and translated into English in 1867, Hochstetter warned about the consequences of burning and cutting down kauri forests (Figure 7.1). Tracts formerly ‘covered with dense Kauri forests, and where large masses of Kauri gum are dug from the earth,’ he cautioned,

present now nothing, but waste, dreary, sunburnt heaths of notorious sterility, upon the white or yellowish clay-soil of which nothing but dwarfish Manuka shrubs (Leptospermum scoparium), and scanty ferns (Pteris esculenta) can grow. The colonists therefore say that Kauri forest indicate a poor soil and a rugged non-agricultural country. This ought to prove a lesson for the future; individuals should not be suffered to ravage those precious woods, and to turn the country into a desert to the detriment of whole generations to come.’25

Wholesale deforestation clearly horrified Hochstetter. Unless checked, Hochstetter believed that it would render New Zealand a desert. His moral repugnance for such shortsightedness is clear as he likened settler deforestation to that undertaken by ‘cannibal tribes as a stratagem to burn out the enemy’.26 In Hochstetter’s view, by deforesting the land, European settlers were just as savage, reckless and uncivilised as

23 Wood, ‘Appraising Soil Fertility’, pp.393-405. Dieffenbach’s interest in soils and soil chemistry, continued after his return to Europe in the early 1840s. He worked with the famous soil chemist Justus von Liebig on projects on organic and chemical fertilisers. See, Bell, Ernest Dieffenbach, pp.80-122.
25 Ferdinand von Hochstetter, New Zealand: Its physical geography, geology and natural history with special reference to the results of Government expeditions in the provinces of Auckland and Nelson, trans. by Edward Sauter, Stuttgart, 1867, p.142. This was originally published as Neu-Seeland, Stuttgart, 1863.
26 Hochstetter, New Zealand, p.142.
Figure 7.1 An example of the forests of northern New Zealand encountered by Hochstetter and his fellow crew. ‘Waldgruppe auf Neuseeland’ ['Forest Group in New Zealand'].

Māori. Hochstetter played up the popular contrast between native peoples. According to many authors, in contrast to the rational and organised mind of the European, native people were reckless and unable to think about the future. Hochstetter held that conservation – the ability to plan for the future – was one way of distinguishing Europeans from native peoples. In another sense, Hochstetter’s assertion that forest conservation represented civilised behaviour inverted the commonly held European idea that forests were unproductive land lying idle, areas often associated with savagery and barbaric peoples.27 As other conservationists would argue, Hochstetter viewed forests as vitally important to the welfare of agriculture, thereby establishing the close connection between the welfare of both forest and farmland. Hochstetter’s ideas would prove influential to many later New Zealand conservationists who often quoted his impassioned plea for conservation (chapter eight).

Provincial catchment conservation?

Did these flooding and soil erosion fears lead to action to curb deforestation? As the introduction to this thesis has discussed, some provinces, notably Otago and Canterbury, did enact limited forestry protection measures in the 1850s. They principally did this through timber licensing and forest reservation. These measures, however, seem designed to safeguard supply rather than to conserve catchments. In 1864, for instance, Otago enacted a Bush Fires Ordinance that aimed at preventing loss of property and crops through the lighting of forest fires rather than preventing the loss of soil erosion.28 From the 1850s, Canterbury, Nelson and Marlborough, however, did enact measures that appear designed to combat soil erosion and flooding. These included the protection of forests standing on catchments and the erection of flood banks.

In 1856, for instance, the Province of Canterbury enacted reserves of ‘standing timber in the river beds and on the islands of the Waimakariri, Rakaia, Ashburton, and

Rangitata’ most likely for flood protection. In 1864, the Crown Lands Office of Nelson reserved ‘all the Crown Land included within the watershed of the gorges of the Brook-street stream and its tributaries; bounded on the southward by the ridges of the hills forming the said watershed, and on all other sides by the sold lands’ for the purpose of the Nelson Waterworks. Possibly this was a measure designed to maintain water flow in the surrounding catchment to the waterworks, since at the time it was widely held that forests and vegetation increased stream flow. Another means of preventing the likely dangers of flooding included declaring reserves in areas liable to flood, in order to prevent people living on this land. Embankment strengthening and groynes also figured in some of the other solutions adopted.

In 1868, flooding fears reached the national parliament during debate on Potts’ Bill (for more details of this see chapter four). Aiming to investigate the country’s forest resources, it sparked a vigorous debate on the role and importance of forests. W.T.L. Travers blamed deforestation ‘in the upper portion of the large valleys’ for rapid rainfall run-off and the production of ‘the destructive floods that had become so common’ on Bank’s Peninsula, in Nelson and ‘on the Waimakariri and other rivers’. Edward Stafford, T.H. Potts and Charles O’Neill, similarly, referred to French, Spanish and Asian examples of the silting up of rivers, violent floods and the destruction of formerly fertile areas consequent upon deforestation. These conservationists couched their arguments in economic terms, emphasising the loss to farmland and potential revenue that floods and soil erosion caused. They believed this process was just beginning in New Zealand. Potts, for instance, was convinced that deforestation was causing flooding in the Hutt

30 New Zealand Government Gazette (Province of Nelson), 13, 27 (16 September, 1865), pp.132-133.
31 See, for instance, New Zealand Government Gazette. Province of Canterbury, 9, 15 (5 September, 1862), 96-97. This created reserves along the following rivers and tributaries: ‘Waipara, Hae Hae Te Moana, Kowai, Tumakaka, Ashley, Opihn, Waimakariri, Opawaha, Rakaia, Te Ngawai, Selwyn, Pareora, Ashburton, Otato, Hinds, Hook, Rangitata, Waihoo, Orari, Waiahi and such portions of the Hurunui and Waitangi Rivers and their tributaries as are in the Province of Canterbury.’
33 Travers, NZPD, 7 October 1868, p.191.
34 Potts, NZPD, 7 October 1868, pp.188-189 Stafford, 7 October 1868, pp.190-191; O’Neill, 7 October, 1868, 191-192.
35 See, for instance, Potts, NZPD, 7 October 1868, p. 189.
valley (Wellington Province). He predicted that in 'a very short time [deforestation] would effect a similar change in the rivers of Westland.'

Fears may have been heightened by the New Zealand wide floods of 1868. Writing in 1881, Travers devoted a paper to what he termed the 'great floods of February, 1868', believing that these indicated the evils attendant with deforestation. As an 1869 report intended to present an overview of the condition of New Zealand's forest indicates, many land officials supported the link between deforestation, soil erosion and flooding. The Chief Provincial Surveyor of Hawke's Bay, Charles Sealey, cited as evidence of the effects of deforestation, the disastrous floods affecting the province in 1861 and 1867. Indeed, one of the six questions levelled at officials in the report into forest resources specifically asked them to: 'State any damage which has occurred to agricultural districts, or other destruction of property, such as mills, &c., that has been imputed to floods, or droughts being rendered more severe through the destruction of the forests?' In contrast to officials' lack of support for the forests-rainfall theory (see chapter four), roughly one third (six out of a total of twenty) of them believed that deforestation had increased flooding. One indicated definitely that, although floods had not yet increased, they probably would with deforestation. Two implied a similar belief by stating that floods had 'not yet' increased. Thus roughly half (eleven) held that flooding had not increased.

36 Potts, NZPD, 7 October 1868, p.188.
37 Travers, 'Notes Upon the great floods of February, 1868', TPNZI, 14, (1881), pp.76-89.
38 Charles Sealey, Chief Provincial Surveyor, Hawke's Bay, to Stafford, Napier, 24 April, 1869, in 'Enclosure No. 10', AJHR, D22, p.11.
39 'Enclosure 2 in No. 1: Extract from Dr. Hector's Memorandum, 18 November, 1868', AJHR D-22, p.3.
40 The reporter for Kaukapakapa Highway District failed to answer the question. 'Enclosure No. 12', Province of Auckland, D22, p.15. Those supporting an increase in flooding include Wellington, Akaroa, Hawke's Bay, the West Coast, Waipu (Auckland Province) and Blenheim. Harry Jackson, Chief Surveyor, Wellington, to L. E. Featherston, Wellington, 7 January, 1869, in 'Enclosure No. 4', D22 p.5; Mr R. Townsend to Mr C. Davie, Christchurch, 23 March, 1869, in 'Sub-Enclosure in No. 8', D22, p.10; Charles Sealey, Chief Provincial Surveyor, Hawke's Bay, to Stafford, Napier, 24 April, 1869, in 'Enclosure No. 10', D22, pp.11-12; Malcolm Fraser, 22 December, 1868, Hokitika, in 'Enclosure in No. 12', D22, p.13; 'Enclosure No. 12', Province of Auckland, Waipu Highway District, D22, p.15; J. Heawood, Chief Clerk, 'Enclosure No. 11', Blenheim, 18 November, 1868, D22, p.12.
41 'I am not aware of any particular damage, but I certainly think that indiscriminate destruction of forests will in time produce destruction of property.' Mangapai Highway District (Auckland Province), p.16. Thomas Kelly, Deputy Superintendent, Taranaki, to Hon. E.W. Stafford, New Plymouth, 23 February, 1869, in 'Enclosure No. 7', D22, p.8; Waiuku Highway District (Auckland Province) p.16.
What does this survey indicate? First, it shows that officials disagreed about the influence forests had on flooding. Whereas land officials in Wellington and the Hawke’s Bay assigned major increases of flooding and destruction to deforestation, those in Canterbury and Blenheim held that, as Blenheim’s Chief Clerk put it, ‘No appreciable destruction appears to have taken place.’ Second, local experience of environments proved crucial to perceptions of environmental anxieties. These different experiences of flooding, in turn, probably reflected different rates of deforestation. As R. Townsend put it about the Christchurch area, ‘why other streams have not shown more sudden floods and lessened ordinary supply, is that the head feeding streams have still the covering of undisturbed bush’. Even where fire had ravaged the bush, he continued, ‘Mako-ngaio and other small trees’ quickly establish themselves. Townsend also highlighted one of the problems with the flooding-forest link – it relied not on experiment ‘but simply what several fancy they have noticed.’ He instanced Pigeon Stream as presenting ‘the most favourable features for observation, as nearly all the land in its course has been cleared of timber and laid in permanent grass.’ According to observations, noted Townsend, this stream flooded quicker and ran dry in summer. Third, the negative response by over half of the respondents does not discount officials’ belief that deforestation affected flooding. Question 6 specifically asked whether any material damage had occurred because of climatic changes or flooding. It did not inquire whether the reporters believed in the hydrological effects of deforestation or indeed, whether it had occurred without causing material damage. Fourth, the report reveals that some land officials had a sophisticated understanding of the mechanism by which forests affected stream flow. Burning bush, scrub and fern along gullies, observed the Chief Provincial Surveyor of Hawke’s Bay, increases the velocity and volume of water in rivers. This, he continued, carries ‘with it large quantities of silt and clay from the bare hills.’ He also recognised that local geography worsened the effects of flooding. Owing to the

fall from the base of the hills towards the sea being comparatively little, not only shingle, but likewise clay and fine sand are deposited in the river

42 J. Heawood, Chief Clerk, ‘Enclosure No. 11’, Blenheim, 18 November, AJHR, D22, 1868, p.12.
43 R. Townsend, AJHR, D22, 1869, p.10.
beds, which has caused their silting up (especially the Tutaekuri) to such an extent, that ... a rainfall of four inches within twenty-four hours (when the ground is previously saturated) causes more overflow than seven inches rainfall did formerly. The destruction to fencing and live stock from this cause has been very severe ... 44

Finally, because the report required officials to estimate the influence of deforestation on stream flow, without the basis of experiments, people had different impressions of the same area. For deforestation to be regarded as a threat, material damage to property or crops had to occur. Since large areas of New Zealand still lay outside areas of European settlement and had not been deforested, the perception of damage was not so great. Again, local conditions could reinforce preconceived environmental anxieties such as those about changes to catchments.

**Increasing catchment concerns in the 1870s**

As European settlements spread and as deforestation increased, so did concerns about the effects of deforestation on hydrology. In the 1870s, these regularly appeared in the Transactions of the New Zealand Institute and in parliament. Allied with arguments about preserving future timber supplies for development and the prevention of climatic change, catchment arguments provided strong incentives for forest conservation and forestation. Many influential New Zealand scientists, including James Hector (1834-1907) and Travers, upheld this theory (see chapter eight). 45 Along with discussions on the forest-rainfall theory, Travers utilised a highly alarmist language in an article of 1870. He charged that New Zealand’s rivers ‘have now in most instances become raging torrents, against whose injurious effects we are called upon to guard by expensive and difficult engineering works.’ This process caused, he pointed out, the loss of streams and soil, and created debris-choked waterways. 46

44 Charles Sealey, Chief Provincial Surveyor, Hawke’s Bay, to Stafford, Napier, 24 April, 1869, in ‘Enclosure No. 10’, AJHR, D22, p.11.
Next year, during discussion of the Canterbury Forest Trees Bill aimed at encouraging tree-planting (see chapter four), Thames parliamentarian Charles O’Neill echoed Travers’ apprehensions. ‘They had seen the evil effects of denuding the country of trees in the Province of Wellington’, stated O’Neill, ‘where, on one side of the Rimutaka hill, they had been burnt away ... the result was that there had been such floods as had never been known there before, clearing away culverts, bridges, and everything before them’.\(^{47}\) In support of the Bill, O’Neill noted that ‘the aridity of large tracts had been subdued by the planting of forest trees.’\(^{48}\) Although its final provisions did not detail the motives for tree planting, it is clear from O’Neill’s discussion that politicians had in mind the prevention of flooding and climate change as much as timber supply and shelter when they passed the Bill (see chapter four).

In 1873, after the poor response to his request of 1872 to investigate the nation’s forestry resources, O’Neill raised the subject of forest conservation the following year in a Conservation of Forests Bill.\(^{49}\) Again, he highlighted the problems caused by deforestation. These included declining rainfall and increased flooding. Minister of Lands Donald McLean (1820-1877) agreed with O’Neill. According to McLean, New Zealand’s rivers ‘were gradually shallowing [sic] owing to the disappearance of the timber; the climate, also, had very materially altered.’ He promised that the Government would ‘look into the matter during the recess, with the view of introducing a Bill next session.’\(^{50}\) Clearly, then, fears of increased flooding influenced many leading scientists, land officials and politicians in New Zealand, including notable figures such as James Hector, Thomas Potts, and Donald McLean.

In 1874, another influential figure, New Zealand Premier Julius Vogel, introduced a New Zealand Forests Bill (see chapter four for details). In addition to highlighting fears about a forthcoming timber famine and likely climatic deterioration, Vogel and three other politicians raised catchment concerns.\(^{51}\) Vogel believed that, if deforestation

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\(^{47}\) 15 September, NZPD, 1871, p.459.
\(^{48}\) 15 September, NZPD, 1871, p.459.
\(^{49}\) O’Neill, 25 October, NZPD, 1872, p.946; O’Neill, 1 October, NZPD, 1873, p.1546.
\(^{50}\) McLean, 1 October, NZPD, 1873, p.1545.
\(^{51}\) In addition to Vogel (NZPD, 14 July, 1874, p.80; NZPD, 4 August, pp.424-425) and O’Neill (31 July, p.365), these were John Sheelian (31 July, p.351), Stafford (31 July, p.365).
continued, New Zealand’s long and narrow geography would make the region especially prone to the loss of ‘large areas of valuable soil’. Future Premier, Edward Stafford steadfastly held that forests preserved on hill slopes ensured the fertility of a nation’s soil. Regardless of whether or not they were on valuable land, he maintained that they should be protected. Stafford referred to both rainfall and catchment conservation as requiring conservation for ‘climatic purposes’. It appears that from the 1870s writers often used ‘climatic reserves’ to refer to either or both the rainfall and hydrological influence of forests (see below). Notwithstanding this somewhat confusing terminology, it is still mostly possible to determine to which of the two, or indeed both, each writer referred. Catchment concerns mostly did not generate as much discussion as climatic arguments, probably because of the somewhat controversial nature of the latter theory (chapter four).

The success of Vogel’s Bill in 1874 coincided with the publication of Josiah Firth’s paper ‘On Forest Culture’. Firth, a wealthy Waikato landowner, enthusiastically embarked on tree planting on his own estate. Also in 1868, he distributed Coniferae seeds to Waikato settlers in a bid to encourage forestation. It is estimated that Firth planted some 10,000 willows along the banks of the river Thames. He also undertook work to improve the navigability of the river through the removal of snags. Wide concern about the effects of deforestation is evident in Firth’s 1874 paper. Asserting that: ‘Forests exert varied and important influences in the economy of nature’, Firth demonstrated the connection between forests, birds, insects, aesthetics, utility, climate and waterways. According to him, settlers’ continued deforestation demonstrated ‘a reckless and persistent disregard of a plain natural law. To strip a semi-tropical country of its forests is to convert it into an arid desert.’ Settlers ignored this ‘great natural law’ at their folly, he warned. Only with forest conservation, he pointed out, and the closure of ‘denuded

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52 NZPD, 4 August, 1874, pp.424-425.
53 NZPD, 31 July, p.365.
54 Firth, ‘On Forest Culture’, TPNZI, 7 (1874), pp.181-195.
55 Firth, ‘On Forest Culture’, p.182. Agricultural statistics reveal that in both 1881 and 1884 Firth planted some 256 trees. ‘Items relating to J.C. Firth’s Leasehold near Matamata, 1866-1870’ in Firth Family: Papers 1867-1951, MS-Papers-1491-02, ATL.
56 NZH, 29 July, 1935, p.8 in ‘Items relating to J.C. Firth’s Leasehold near Matamata, 1866-1870’ in Firth Family: Papers 1867-1951, MS-Papers-1491-02, ATL.
57 Firth, ‘On Forest Culture’, p.181.
forests', plantations of Eucalyptus and Coniferae and 'where necessary ... native seedlings', could this reckless destruction be ended. Firth presented a highly alarming and sophisticated understanding of the relationship between humans, forests and environment, in order to push for conservation and tree planting.

In the 1870s, a number of other articles appeared (and reappeared in some cases) on this topic in parliamentary papers and discussions, private publications and farming journals. In 1876 and 1877, New Zealand's new Conservator of Forests, whose writing did much to stimulate interest in the climatic effects of forests, also turned his attention to the need for catchment conservation. Inches Campbell Walker's articles appeared in parliamentary papers and the Transactions (chapter four). Although somewhat coy about the role of forests in influencing rainfall, Campbell Walker was adamant that: 'They not only prevent excessive evaporation, but [also] ... render the flow of water more regular and permanent, thus preventing disastrous floods and torrents during the winter or rainy season, and long droughts in summer.' Rarely for the time, too, Campbell Walker supported his contention by referring to a scientific investigation proving that deforestation decreased river flow. Only one other scientific report appeared in New Zealand on the influence of forests and river flow. Dr. Wjeikof's paper on the effects of flow on the River Volga was read before the Wellington Philosophical Institute in 1871. Two of its members (Blackett and Travers) commented that deforestation had increased in Nelson, the Hutt Valley and Canterbury.

These were exceptions in New Zealand, when the majority of conservationists utilised non-scientific evidence to support their claims. As noted above with the floods of 1868, extreme climatic events often inspired debate on the forests-flooding link. Southern South Island floods of November 1876 signalled to H.P. Higginson the need for a storage reservoir and tree planting: 'How much simpler would it have been to have reserved the

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58 Firth, 'On Forest Culture', p.195.
59 Campbell Walker, AJHR, v.1, C, p.47.
61 Wjeikof, 'Results of the Destruction', pp.374-376.
original bush!', despaired Higginson in 1877.\(^6\) Interestingly, unlike other writers, Higginson discounted the effectiveness of planting alongside riverbanks in Canterbury owing to the 'impetuosity of the floods and loose character of the banks.' \(^6\) Another localised study by G.W. Williams, this time of the Wellington area, highlighted the effects of deforestation on flooding and climate. It appeared before the Wellington Philosophical Society in the Transactions in 1879. Travers and the botanist T.H. Kirk spoke up in support of Williams' contention, adding that with deforestation, flooding had notably increased in New Zealand.\(^6\) Many leading conservationists of the New Zealand Institute notably Travers and Kirk, both of whom lived in Wellington, stressed catchment anxieties. These concerns probably reflected local problems with flooding. In the Wellington area, the Hutt River flooded regularly as it had done so from the early days of New Zealand Company settlement in the late 1830s. Much of the forests of the surrounding hillsides also had been cleared.\(^6\) Equally and perhaps most importantly, floods threatened the life and livelihood of a significant European settlement, many of whom made the connection between their action and flooding. Settlers may have created environmental hazards since their activities conflicted with already existing processes, such as the regular flooding of the Hutt River. Like Wellington, Christchurch also keenly felt the effects of floods. From the late 1850s, the local council had initiated a number of river control methods involving the alteration of channels designed to reduce floodwaters.\(^6\)

**Continuing catchment conservation: late 1870s and 1880s**

In 1876, parliament repealed the 1874 New Zealand Forests Act. Historical geographer Graeme Wynn has portrayed its revocation as the end of conservation until

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64 G.W. Williams, 'Remarks on Forest Planting and Conservation, with reference to particular Localities in the Wellington District', TPNZI, 12, (1879), pp.428-429.
1885, when a new forests bill passed through parliament. Certainly, it was the end of a state forest department, but it was not the end of state conservation of forests as the work of Peppercorne and Lecoy, and the continued reservation of land for catchment purposes demonstrates. In 1880, the enthusiastic conservationist Frederick Septimus Peppercorne backed catchment and climatic conservation. The report of French forester, A. Lecoy, reiterated Peppercorne’s standpoint. Lecoy had been commissioned by the New Zealand Government to report on the colony’s forestry resources. Earlier, many provisions of the defunct 1874 Act in fact carried on in the 1877 Land Act (chapter four). The most important of these was the power granted to the governor to proclaim forest reserves. Forest reserves actually increased after the revocation of the 1874 Act. This shows that, while state forestry might have disappeared, the interest of the state in protecting forests continued. In 1881, for instance, the annual report to parliament from the Crown Lands Department reveals that 547,785 acres of forests were reserved ‘not so much with the intention of conserving the bush, as of preventing the drying up of springs and streams from exposure to sun and wind.’ State conservation of over half a million acres expressly to prevent flooding and soil erosion demonstrates the importance catchment concerns played in government land policy. Continued state conservation is put into perspective when it is remembered that no state reserves were made for forest supply at this time.

Although the 1877 Land Act, as well as the earlier Forest Act of 1874, is symptomatic of the widening role of government in society, there were limits to this action. As the 1883 Crown Lands report shows with regard to tree planting, many saw the Government’s role as ‘supplement[ing] local efforts by the grant of sites for nurseries and plantations, and in some cases by money grants, always subject, however, to the condition that the local efforts and contributions are much greater, or in other words, that the settlers are in earnest in the matter.’ Lest it sap the energy and independence of

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70 ‘It is quite proper, however, that the Government should supplement local efforts by the grant of sites for nurseries and plantations, and in some cases by money grants, always subject, however, to the condition
settlers, state efforts should be encouraging but not paternalistic, supplementary but not supplanting. As chapter six demonstrates, parliament was often willing to legislate against environmental problems such as sand drift, but sometimes found it far more difficult addressing the difficulty itself. Environments, it seems, did not always respond to legislation.

Calls for conservation continued to appear in parliament in the 1880s. Conservationists stressed the state’s duty to protect its citizens and agriculture from the evil consequences of deforestation. In making these suggestions, they were helping to increase the extent of state involvement in society.

In 1883, Mr Chamberlain lobbied for the resumption of state conservation for rainfall and flooding purposes (chapter four): ‘[A]s surely as two and two makes four,’ he stated, ‘when the tops of the ranges were deforested the lands around and beneath them were bound to be flooded and devastated, and become perfectly useless through being covered with shingle and other rubbish.’ Action, he thundered, must be taken to prevent further deforestation and stop the ‘many-headed rivers’ of the South Island from wreaking destruction.71 Interestingly enough, Chamberlain held that so far only the South Island had felt the effects of devastating floods. As he explained, with the exception of the small areas owned by Europeans ‘put under grass’, most of the North Island still lay in forests and with Māori owners. He hoped that ‘when the Government obtained these lands from the Natives ... [it] would not neglect to make large reserves for forests purposes’. It had the further advantage, he pointed out, of pricking Māori interest in forest conservation and safeguarding their agricultural pursuits. Chamberlain advanced a paternalistic model that recognised the guiding hand of the state and its responsibility for both Māori and European welfare. Yet, giving primacy to Government control, it still parted Māori from their land. Although sometimes Māori (such as Ngāti Tūwharetoa chief Te Heuheu Tūkino) would gift land to the conservation estate to prevent it ending up in other people’s hands, later state reservation would indeed further lock out Māori

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71 NZPD, 1 August, vol. 45, 1883, p.212.
from access to land and resources. Compared to similar proposals of the time, however, Chamberlain’s suggestion was unusual. He wanted Māori removed from some of their land for reasons of conservation, not development.

**Farming support for catchment conservation**

Although Chamberlain received vigorous support both for his climatic theories (chapter four) and catchment arguments, the Bill failed. Evidence from newly established farming journals such as the northern North Island-based *North New Zealand Settler* (founded 1884); the Canterbury-based *New Zealand Country Journal* (founded 1877) and the North Island *New Zealand Farmer* (founded 1884) indicate farmers supported conservation. In 1884, for instance, J.W. Henderson read a paper before the Opotiki Farmers’ Club. He drew attention to the importance of tree planting for supplying timber and preventing devastating floods that render ‘tracts of rich alluvium into barren wastes of sand and shingle.’ This process would occur in the Opotiki Valley, he warned, ‘should the ranges which catch the rains … be stripped of their bush.’ Indeed, reported another article in 1885, in destroying forests ‘we are manifesting a similar disregard to future disagreeable consequences in our reckless destruction of the magnificent forests with which Providence has blessed this country.’ As with many other publications, the latter article argued that deforestation imperilled New Zealand’s natural fecundity. As noted in the previous chapters, this argument held high moral and religious importance for settlers. It implied that continued deforestation would forsake the blessings of

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73 Barnicoat, Johnson and Holmes supported Chamberlain’s catchment arguments. NZPD, 1 August, vol. 45, 1883, pp.214-215, 218.

74 Firth’s 1874 TPNZI article, ‘On Forest Culture’, was reprinted in the NZCJ. J.C. Firth, ‘On Forest Culture’ (part 1), NZCJ, 3, 3 (1 May 1879), pp.142-149; (part 2), NZCJ, 3, 4 (1 July 1879), pp.205-208. See also NNZS, 3, 1 (January, 1884), p.9; ‘About Forests’, 4, 2 (February, 1885), NZF, p.36. On articles against deforestation by fire see ‘The Timber Gazette’, 4, 5 (May, 1885), NZF, p.144; ‘Can we Conserve our Forests?’, 4, 8 (August, 1885), NZF, p.241.

75 A report of this was published in 1885. J.W. Henderson, ‘Tree Planting’, NZF, 4, 1 (January, 1885), p.3.

Providence and thus fly in the face of Christian values by despoiling, not developing, land. These farming journals reveal that catchment arguments provoked discussion and enjoyed some popular support among members of the farming community. It is equally clear that some contemporary newspapers carried articles on the subject. In 1869, the Otago Daily Times published an article and editorial comment on the same subject. An issue of the New Zealand Farmer of 1886 reprinted a piece on the conservation of the kauri for catchment and climatic conservation that came from the Thames Advertiser. A comprehensive reading of many provincial newspapers would undoubtedly reveal more and earlier discussions of climatic and catchment conservation.

The 1885 New Zealand State Forests Act

Such lobbying seems to have borne fruit for, in 1885, parliament passed another Vogel-introduced forest act, the New Zealand State Forests Act. Aside from its aim of subjecting forestry 'to skilled management and proper control' and the preservation of future supply, the Act specifically protected as Class I land use, elevated forests 'for the Conservation of the Water-supply, or for Climatic Reasons, irrespective of Altitude' (see the preceding chapter for fuller details). Unlike Vogel's earlier forestry act, which generated heated discussion among parliamentarians, the one of 1885 passed benignly into legislation. Not only does this indicate the increased acceptance of state involvement in general, since politicians paid little attention to these concerns during debate. It also demonstrates growing acceptance of climatic and catchment arguments. Support for such reserves is hardly surprising since before the act over half a million acres of forest had been so conserved. This policy effectively continued earlier principles of forestry reservation.

As would be the history of forest conservation in the nineteenth century, though, two steps forward would be followed by one step backwards. A stagnant economy forced the Government into retrenchment and forestry onto the back foot. In 1887, much to the

77 ODT, 14 September, 1869, c.3-4, p.2.
79 'The New Zealand State Forests Act, 1885', Statutes of New Zealand, Wellington, 1885, p.70.
chagrin of many politicians, it disbanded the fledgling State Forest Department.\textsuperscript{80} At least in the meantime, state forest conservation continued. By 1889, the area of forest controlled by the state had increased to over 1.3 million acres.\textsuperscript{81} Yet, later in the decade, this would be affected by the Liberal Party's attempts to kick-start the flagging New Zealand economy. In part, it pursued this aim by excising state forests while, somewhat ironically, also reserving forestland for the preservation of scenic beauty, flora and fauna (chapter four).

Government's disbanding of the Forest Department elicited criticism from some parliamentary members but attracted particular opprobrium when, in the early 1890s, it actually started to withdraw forests from state reserves. In 1891, for instance, some members of parliament objected to the removal of forest in Southland since some of the land in question 'was unfit for settlement'.\textsuperscript{82} Others such as Buckland pointed out the shortsightedness of this action, warning that 'if they denuded the hills of forest they might alter the climate so greatly that they might be subject to frightful droughts and sudden floods'.\textsuperscript{83} By removing forestland, 'danger loomed in the distance', cautioned Fisher, who also 'feared' that with this measure parliament 'were about to establish a very dangerous and undesirable precedent'.\textsuperscript{84} First, these men wanted to find out more about this area before debating such an amendment. The House, dividing, voted 33 to 20 against finding out more about the areas gazetted for excising.\textsuperscript{85}

In the 1890s depression, catchment arguments continued to appear in parliament, farming journals and scientific papers.\textsuperscript{86} A New Zealand Farmer article of 1891, for instance, quoted the writings of a Waikato farmer who warned that burning off bush on

\textsuperscript{82} See, for instance, Richardson, NZPD, 21 September, 1891, vol. 74, p.315; C.H. Mills, NZPD, 21 September, 1891, vol. 74, pp.315-316.
\textsuperscript{83} Buckland, NZPD, 21 September, vol. 74, p.816.
\textsuperscript{84} Fisher, NZPD, 21 September, vol. 74, p.817.
\textsuperscript{85} NZPD, 21 September, vol. 74, p.819.
\textsuperscript{86} For climatic, health and soil erosion arguments for forest conservation see, for instance, 'Bush Land Valuable', NZF, 9, 12 (December, 1888), p.466.
hill countries resulted in soil erosion. Experience of the widespread and devastating fires that swept through the Waikato in 1890 may well have prompted the farmer’s warnings about the dangers of burning off. This again demonstrates the continuing importance of local experiences in shaping environmental anxieties. Earlier, in 1889, objecting to the repeal of the Tree Planting Encouragement Act, the editor of the journal contributed an impassioned plea for the need for tree planting and the establishment of Arbor Day. ‘We consider the encouragement of tree planting a national moral obligation’, began the editorial. It then detailed the necessity of tree planting both for health and to prevent against soil erosion (see chapters four and six for further details on Arbor Day). By presenting tree planting and conservation as the moral duty of government, the editor echoed the cries of many other farmers, politicians and scientists.

Augustus Hamilton (1853-1913), ethnologist, biologist and Director of the Colonial Museum (1903-1913), provided an example of the growing scientific lobby for conservation that was emerging in the 1890s. In 1895, he read before the Canterbury Institute a paper ‘On the Forests of New Zealand’. The climate of New Zealand, wrote Hamilton, favoured ‘luxuriant Flora’ thanks to ‘vast reserves of moisture’ ‘stored up in the shady depths of the forest’. These, he explained, ‘acted as a reservoir for all the streams and rivers.’ He urged local authorities to ‘take care that the catchment areas ... are kept well covered with either bush or native scrub; otherwise ... the rainfall over the whole are is thrown off more quickly than it should be, and the town suffers from a flood or a water-famine.’ A similar warning followed from the exhaustive fifty-six page report of the Conservator of State Forests, Victoria. George Perrin was employed upon the recommendations of the 1896 Timber Conference held in Wellington. One of its four committees also supported catchment conservation of beech forests ‘especially in
districts where rivers have their sources. Perrin, seeing at first hand ‘the ruinous destruction by fire from one end of the colony to the other’ during his national forests tour, concluded that New Zealand forests ‘urgently needed’ protection from fire. High country pastoralists burning ‘timber off from the hilltops and above the head-waters of rivers’ were committing ‘a crime against the nation’, he charged. ‘Nature is never slow to avenge herself’, warned Perrin. ‘[S]uch reckless disregard of her natural conditions’, he pointed out, ‘results in flooded farms and ruined settlers’. South Island colonists, he continued, ‘have indeed only to use their eyes, and they can see for themselves the evil effect of the system I condemn so vehemently.’ Perrin personified nature, inverting the warning proffered by Xenophon some two millennia earlier (see the beginning of this chapter), that “Land, as all men know, responds to good treatment.” Nature ill-treated, Perrin presaged, took revenge with devastating consequences, a powerful message that was later used by conservationists of the 1930s.

Flooding and catchment fears

Next year’s experience seemed to bear out Hamilton and Perrin’s worst warnings. The Easter floods of 1897 left behind a trail of destruction in the colony. While roads were rendered impassable by slips, dead stock either bobbed above inundated fields or floated past the twisted remains of bridges swept aside in the floods. Flood damage in the Hawke’s Bay alone caused estimated £11,150 damage to roads and bridges. It also

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wrecked property to the tune of £100,000.97 One article from the New Zealand Farmer prompted by the floods discussed its cause and displayed a sophisticated understanding of how rivers operate. Recognising that floodwaters created the ‘grandly fertile plains that lie [sic] about Hastings’, the author described that efforts should limit their destruction while also obtaining ‘all the good we can from them’. ‘We cannot afford to fight Nature’, he wrote. ‘[O]ur safest way when she is in her tantrums’, noted the writer, ‘is to stand to one side, on some safe spot, and come back when the fit is over. Our business is rather to work hand in hand with Nature as far as we can.’ Unlike many writers who assigned almost total catchment control to deforestation, the engineer recognised that natural and human causes influenced river flow and floods. Rivers change course anyway, he observed, quite apart from the fact that the sea and human-made structures like weirs and groynes block up rivers and alter their channel. Bush clearance, he continued, also increases water flow.98 The writer recommended planting willows to encourage the pooling of water, limited dredging and some river embankment work, none of which, he was careful to point out, should obstruct the river channel itself.99 Lastly, he noted that people must realise that there is risk living on the riverbank. Areas like ‘[t]he lower parts of the plains’, he pointed out, ‘are humanly habitable at risk’.100 Unlike many at the time and earlier, this author actually acknowledged that non-human and human factors affected river runoff. Nor did he advocate the wholesale adoption of engineering works and tree planting designed to bend rivers to the will of humanity, as happened on river courses elsewhere.101 He recommended that people should adapt their lifestyle to the rhythms of rivers and recognise that floods brought benefits as well as destruction. The hyperbole and language of fear so evident in many writers on catchment and climatic conservation is wholly absent from this matter-of-fact discussion. The writer’s

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97 ‘Appendix No. 14: Roads and Bridges Damaged by the Easter Floods of 1897’, AJHR, Cl. 1898, pp.126-135. Figure for property damage from Perrin, ‘Conservation of New Zealand Forests’, p.2. See also ‘Through flood and storm’, NZF, 17, 5 (May, 1897), pp.156-157.
98 ‘Causes and Control of Flood in Lower Hawke’s Bay’, NZF, 17, 8 (August, 1897), p.250.
100 ‘Causes and Control’, p.251.
suggestions pertaining to the planting of willows along riverbanks echo those employed earlier, such as by Dobson and Firth (see above).

Flooding the following year also elicited other articles in the *New Zealand Farmer* that drew attention to the link between deforestation and inundation.\(^\text{102}\) Another blamed the floods of 1897 and 1898 not on deforestation but on the long, straight shape of river basins, thus implying that humans could alter the shape of river channels to prevent floods.\(^\text{103}\) At the end of the 1890s, Dunedin City Council began to plant trees in the headwaters of streams both to maintain a clean water supply and to prevent flooding and erosion (see chapter two).

The newly created Forests Branch, an offshoot of the Department of Lands, though principally charged with tree planting, clearly had flooding and climatic prevention in mind. Its director, H.J. Matthews, was a keen advocate of tree planting for catchment and climate (see also chapter four).\(^\text{104}\) So too was a correspondent of Matthew’s, the Southland parliamentarian, plantation owner and historian Robert McNab, who served as Minister of Lands in 1906.\(^\text{105}\) As the beginning of this chapter shows, McNab wrote extensively about the link between deforestation, soil erosion and flooding, drawing from a vast store of overseas and New Zealand correspondence and forestry publications (chapter eight). That McNab wanted to popularise these issues is apparent from the title of his work. ‘Tree Planting on the Farm’ was clearly pitched at a popular farming audience. In this series, McNab drew attention to the coastal effects of deforestation. According to him, for instance, deforestation was silting up Wellington harbour.\(^\text{106}\) Although he advocated conservation, as with most of his contemporary conservationists, he viewed forestry as a complementary and profitable form of land use.

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\(^\text{102}\) See, for instance, ‘Protective Works at Palmerston North’, NZF, 18, 11 (9 November, 1898), pp.393-394.
\(^\text{103}\) ‘Damages by Good and How to avoid them’, NZF, 18, 11 (9 November, 1898), p.393.
\(^\text{105}\) In 1904 Matthews wrote despairingly to McNab complaining about the Liberal policy of removing forests from conservation: ‘Everything seems to be subservient to land settlement now-a-days, but what about the future when we want lands for re-afforestation?’ HJ Matthews to McNab, Private, New Plymouth, 23 August, 1904 in Robert McNab, Papers relating to afforestation in New Zealand 1895-1908, HL, MS 0608.
Where too much forestry existed, as in parts of Southland, McNab requested that this land be opened up for farming, demonstrating as others his interest in economic development.107

The shift away from climatic concerns

These and other examples from the 1900s testify to increasing concern about the effects of deforestation on flooding and soil erosion. They also mark the beginning of a shift away from climatic conservation. In 1904, for instance, the New Zealand Farmer carried an article from the United States Department of Agriculture Year Book on the prevention of soil erosion108 Others followed, including in 1909 a major report on ‘Forestry in New Zealand’. Together with the Royal Commission of 1913, its findings characterise the end of official support for the forests-rainfall theory.109 This tome described New Zealand’s regional forest and conservation, forest utilisation and foreign timber supplies.110 Two contrasting articles also addressed catchment conservation.

Leonard Cockayne, the renowned ecologist, initially adopted a professional, distanced and scientific tone for his discussion of catchment and climatic theories. This contrasted with the bombast and hyperbole of lawyer and academic Professor Grossmann (see below). Cockayne first discredited forests-rainfall theory, carefully pointing out ‘that in estimating changes of climate individual experience based on memory is of no moment whatever, since meteorological facts can only be secured by accurate instruments in the hands of a careful observer during long periods of time.’ Cockayne clearly had no play for the somewhat wild and unscientific claims of those upholding the forests-rainfall theory. Although admitting ‘that forests may have a certain local effect’ on rainfall, his conclusion, indeed, was definite: ‘moist sea-winds and the mountain-ranges’ were the prime driving force behind New Zealand’s weather systems.111 Cockayne’s report was the first systematic discrediting of the forest-rainfall theory undertaken by a trained and

107 See NZPD, vol. 110, 3 October 1899, p.196.
respected scientist in New Zealand, one that would be repeated four years later with the 1913 Royal Commission on Forestry.

Nor did Cockayne, at least initially, resort to hyperbole to describe the effect of forests on hydrology. Although noting that trees ‘will have a powerful effect on moderating the run-off’, by acknowledging that other factors such as the intensity and duration of rainfall, he did not ascribe to forests universal control over floods. Soil permeability, he pointed out, determined ‘[t]he amount of water which penetrates into the ground, and the rate of penetration’. New Zealand’s characteristic ‘steep slopes’ and gullies ‘play their part in rapidly conducting the water downwards, and no forest, however dense or crowded with obstacles can altogether check their power.’\textsuperscript{112} Up to this point, Cockayne maintained a sober assessment of the effects of deforestation on flooding. Soon, however, like much of the soil he wrote about, Cockayne was carried away in gushing diatribes of the foolish consequences of deforestation. ‘[F]lood waters from the denuded areas pour down the streams and gullies’, he wrote. ‘Only the unfortunate sufferer whose acres are being borne away on or whose grazing-land has become a receptacle for stones and mud,’ he noted, ‘can bewail or ignorance which permits the mountain-forests, and those fringing streams, the natural ... to be destroyed.’\textsuperscript{113} Yet Cockayne’s writing differed from earlier ones. In contrast to these, he presented a detailed scientific discussion of the complexity of factors governing hydrology. However, he put these findings to one side when he detailed the terrifying effects of deforestation on flooding and soil erosion. Cockayne thus wove into the structures of scientific writing the typical alarmism of earlier catchment and climatic writing. In this melding of science with traditional conservationist alarm, Cockayne shared much in common with members of the USFD. These trained scientists embarked on a crusade to convert the country to conservation, often ignoring their own indecisive scientific evidence to push for catchment conservation.\textsuperscript{114} Faced with mounting criticism

\begin{footnotes}
\footnote{Cockayne, ‘Forestry in New Zealand’, pp.89-90.}
\footnote{Cockayne, ‘Forestry in New Zealand’, p.91.}
\footnote{Schiff, \textit{Fire and Water}, p.131, and pp.116-163.}
\end{footnotes}
from engineers and meteorologists. USFD foresters only partly toned down their claims.\footnote{Schiff, Fire and Water, pp.116-163.}

Since the vast majority of conservationists had no specific scientific training either in forestry or the earth sciences, Cockayne cut a rare figure in early twentieth century New Zealand. More common still was Auckland academic Professor Grossmann, who had no training in forestry science. Specifically targeting a popular audience, Grossmann cobbled together historical and current scholarship on the matter of soil erosion. He assembled these to argue for forest conservation.\footnote{See subsection ‘Deforestation and its Consequences’, in ‘Forestry in New Zealand’, 1909, pp.93-96.} ‘[I]t is no exaggeration to say that there is not a single district in the Dominion in which the native bush has been cleared away round the head-waters of the rivers’, thundered Grossmann, ‘that does not exhibit some of the disastrous consequences above described.’ Moreover, he warned, the worst was yet to come.\footnote{‘Deforestation and its Consequences’, pp.95-96.} That same year he published a similar tract that first had appeared in the Auckland Weekly News and later as a separate book.\footnote{Grossmann, Evils of Deforestation, preface, p.1.} Grossmann made no bones about what his book intended to do. ‘The object of these papers on the disappearance of our forests and the necessity for replacing them’, he wrote, ‘is not so much to supply information as to rouse public interest in a matter of vast national importance.’\footnote{Grossmann, Evils of Deforestation, p.5.}

\footnote{Emphasis in original. Grossmann, Evils of Deforestation, p.7.} Written in a highly alarmist style, Grossmann upheld the forests-rainfall link (chapter four), but emphasised the threat of soil erosion as well as the need to conserve existing forests and create new ones by planting. According to him, ‘the worst effect of deforestation is EROSION’.\footnote{Grossmann, Evils of Deforestation, p.5.} If Westland’s forests were not conserved, he wailed, ‘one may safely predict that the extermination of its trees will convert the whole country into a barren and desolate waste, forbidding, unproductive, and uninhabitable.’\footnote{Emphasis in original. Grossmann, Evils of Deforestation, p.7.}

Grossmann might have upheld the forests-rainfall theory and fallen back on hyperbole to argue his case, but times were changing. In 1910, Archdeacon Walsh published ‘The Effects of the Disappearance of the New Zealand Bush’. This drew attention to what its author termed the climatic (winds, blizzards, frosts, winds and
drought) and topographical (floods, erosion and silting, the drying-up of streams and scenic loss) effects of deforestation. In 1896 and 1898, Walsh had investigated the causes of deforestation and the future of New Zealand’s forests.\(^{122}\) In his article of 1910, Walsh dismissed the influence of forests on rainfall. Instead, he pointed out that forests moderated temperatures, worsened floods and prevented blizzards and frosts (chapter four). Unlike other earlier climatic conservationists, Walsh was careful to point out that both topography and geology determined the effects of deforestation on channel flow. According to him, silting occurs when a steep-angled and long river scoops out a soft or friable bed, eventually reducing the flow of the river. Most damage, he pointed out, is done when a flooded river flows over an alluvial plain. As the silt lodges on the riverbed, he explained, the river is forced out of its banks, cutting a new course. This process occurred repeatedly.\(^{123}\) Landslides, he noted similarly, happened on steeper-sided areas.\(^{124}\) Walsh also criticised the ‘foolish tradition’ of planting out willows along riverbanks. In his opinion, these trees would be undermined and swept away, and could even form a dam, thereby trapping silt and forcing the river to cut a new path.\(^{125}\) Walsh, like Cockayne, upheld catchment arguments but displayed a more sophisticated understanding of the complex relations between deforestation, relief, geology and flooding. Like Cockayne, Walsh dismissed the influence of trees on rainfall.

The movement towards wholly catchment fears continued when, in 1913, Parliament initiated the highly influential Royal Commission on Forestry. Its findings reflect the growth of ecological and aesthetic arguments for conservation. They indicate a clear shift away from climatic arguments in favour of catchment concerns. The Commission recommended establishing extensive areas of upland forest reserves for

\(^{121}\) Grossmann, *Evils of Deforestation*, p.38.


water and soil conservation purposes as well as shelter. It did not mention the forest-rainfall link at all. Growing concerns about erosion reflected the influence of overseas literature, the existence of land degradation in New Zealand and the opinion of influential scientists in New Zealand. The development of erosion arguments, though, did not spell an end to climatic arguments. As the minutes from the commission demonstrate, some land officials still believed that forests influenced rainfall (chapter four).

Made up of scientists, farmers, timber men and the Commissioner of Crown Lands, the six-strong Royal Commission inspected New Zealand’s forests and state nurseries, and interviewed land officials and foresters. The result was an exhaustive report. This included overviews of climatic and scenic reserves, indigenous forests, forestation and forest management.126 Its report stressed the importance of forests to the farming economy. It also pointed out the dangers inherent in deforesting uplands: ‘the mountains and hills of New Zealand would, if not forest-clad, be a constant source of danger to the farmlands on which the prosperity of the Dominion so greatly depends.’127

Defining a climatic reserve ‘as one for the purposes of protection of soil, prevention of denudation, water-conservation, prevention of floods, and, in addition, shelter from winds’, it ignored the forests-rainfall theory.128 Since a great deal of the original tree covering of highlands ‘has now been enormously reduced’ leaving many headwaters unprotected by forest, it recommended the extension of climatic reserves. It also wanted them established on waterways and in deep gullies, principally in areas that were useless for agricultural purposes. Furthermore, it suggested changing the designation of Waimakariri National Park from park status to climatic reserve.* This would involve reserving the entire upper portion of ‘the North Island dividing range’ and establishing ‘a climatic reserve’ on Mount Ruapehu. In declaring such reserves, rather than relying on a blanket policy that stipulated the height of reserves, the commission considered these on

* This suggestion was not taken up. Waimakariri National Park later became Arthur’s Pass National Park.
a case-by-case basis. According to this criteria, the climate reserve 'on Mount Ruapehu might have its lowest limit at an altitude of 3,000 ft., while one on the Longwood Range, Southland, might descend to 1,000 ft., or even lower.' As Table 7.1 shows, the Commission recommended the reservation of 1.689 million acres, all of which came from the South Island. This bias probably reflected the fact that a great deal of the North Island still lay in forest, where forests were still often seen as impediments to progress. Interestingly, the Report recommended the removal of deer, wild cattle and goats from such climatic reserves since they seriously reduced the vegetation cover, most probably a reflection of the work of Leonard Cockayne whose ecological studies highlighted the impact of ruminants on soil compaction. The Commission also emphasised its utilitarian orientation, and the penchant for settlement then current, by recommending some forest reserves to be uplifted for either settlement or forestry purposes, an area comprising 68,698 acres in total. The Commission’s report on climatic reserves expressed a change of emphasis from belief in the forest-rainfall link to fears of flooding and soil erosion.

**Table 7.1 Proposed Climatic Reserves**

<table>
<thead>
<tr>
<th>Land District</th>
<th>Area (Acres)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southland</td>
<td>119,200</td>
<td>On the Takitimu and Longwood Range, for conservation of the streams that have their sources thereon</td>
</tr>
<tr>
<td>Westland</td>
<td>534,600</td>
<td>For conservation of headwaters of various Westland rivers</td>
</tr>
<tr>
<td>Nelson</td>
<td>947,000</td>
<td>For conservation of headwaters of various Nelson rivers.</td>
</tr>
<tr>
<td>Marlborough</td>
<td>88,350</td>
<td>For conservation of headwaters of various Marlborough rivers.</td>
</tr>
</tbody>
</table>

'Table 7.1: Proposed Climatic Reserves as per Index-Map', 'Report of the Royal Commission on Forestry', AJHR, 1913, p.xlvii.

129 'Report of the Royal Commission on Forestry', AJHR, 1913, p.xv-xvi. On Cockayne, see *Protection Forests*. Others also highlighted this concern earlier. See, for instance, Walsh, who in 1896 published an article in which he argued that cattle, fire, and deforestation represented the principal causes of deforestation. Walsh, 'On the Disappearance of the New Zealand Bush', pp.490-496.

128 See Appendix 1 in 'Report of the Royal Commission on Forestry', AJHR.
Evidence from the Commission's interviews of forestry experts and officials further demonstrates both the shift towards soil erosion arguments and explains why this occurred. New Zealand scientists followed prevailing trends in United States forestry by reprinting some of the latest North American research on the forests-catchment link. As Ashley Schiff has shown, USFD officials strongly played up the woeful consequences of deforestation on flooding and soil erosion (see above). Growing evidence of soil erosion and flooding in New Zealand lent substance to these writings. Interviews conducted by the Commission reveal that although some still held to the influence of trees on rainfall (chapter four), many more supported catchment conservation. Respected scientists also emphasised the importance of soil erosion and flooding. Local experience of flooding and soil erosion, then, reinforced acceptance of overseas ideas about the effects of deforestation on hydrology.

In one of the articles reproduced in the report, C.A. Cotton's (1885-1970), lecturer of Geology at Victoria University College, Wellington, offered a complex scientific discussion of the effects of deforestation. Unlike most studies which detailed the effects of deforestation on arid climates, explained Chilton, the American work, "Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin, 1911" was 'of special value because it contains a very careful study of the results of reckless clearing in a climate which appears to be very similar to ours." The report, noted Chilton, reached two conclusions. First, he pointed out, the loss of tree roots following deforestation causes slips thereby eroding away surface soil and rendering the slopes absolutely barren.

The second result is, however, very much more far-reaching: the soil exposed by reckless clearing is washed off, and when clearing has been

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131 Edward Herring, a retired farmer from Fairlie, for instance, discussed shelter belts. According to him, they improved the value of property by 50 per cent, and benefited sheep in particular. Herring, 15 March, No. 13, 1913, in 'Report of the Royal Commission on Forestry', AJHR, 1913, p.13.
132 Field reiterated his earlier stance on the importance of forests in maintaining a regular water supply and preventing floods. Field, 15 May, Wellington, 1913, no. 83, in 'Report of the Royal Commission on Forestry', p.83. Thomas Dick Cummins, for instance, also expressed concern that deforestation was endangering water supplies. Cummins, 28 April, Wanganui, 1913, in 'Report of the Royal Commission on Forestry', AJHR, p.58.
133 Cotton, 15 May, Wellington, in 'Report of the Royal Commission on Forestry', AJHR, 1913, p.82.
resorted to too much at the headwaters of streams that material is carried
down-stream, leading in the lower courses of the rivers to a much greater
liability to flooding. 134

The report Cotton quoted was in fact similar to an earlier (1907) alarming tract full of
insufficient data and hyperbole that was used by the USFD to present the flooding-forest
link as definite and conclusive. 135 Although using scientific language, Cotton still used
the same scare-tactics as earlier conservationists. Interestingly, he too denied that forests
affected rainfall. 136

Charles Andrew Chilton’s (1860-1929), Professor at Canterbury College, ‘Remarks
on Erosion of Slopes in New Zealand’ also appeared in the report. Chilton discussed the
geological and vegetative factors affecting erosion. Although highlighting the problem of
erosion, the author emphasised that geology just as much as vegetation affected water
flow. 137 The report also referred to other international investigations. These included
Professor I. Bowman’s Physiography of the United States, and Principles of Soil in
Relation to Forestry (1911); Copenhagen Professor, Eugenius Warming’s Oecology of
Plants (1909); and Dr B.E. Fernow’s Economics of Forestry (1902). Bowman wrote of
the horrifying loss of soil occasioned by deforestation. In fifty years, warned Bowman, a
single lumber merchant may destroy soils that took thousands of years to develop. 138
Warming and Fernow, likewise, lectured on the importance of forests in maintaining soils
and, in Fernow’s case, of also protecting against flooding. 139 As chapter eight shows,
Warming’s ideas had reached New Zealand earlier, through the work of Leonard
Cockayne. As Schiff notes, Fernow, previously the head of the Division of Forestry (the
forerunner of the USFD) recognised that: ‘Forests might reduce flood height and

135 Schiff, Fire and Water, p.121.
136 Chilton, Fairlie, 15 March, 1913, No. 21, in ‘Report of the Royal Commission on Forestry’, AJHR,
1913, pp.17-18. Chilton also, interestingly, challenged the dominant ethos of swamps draining and sand
dune reclamation by stating that such areas ‘should be made into scenic reserves for educational purposes’,
noting that ‘our swamps are far more interesting fields of research’ than the Yorkshire Moors. p.18.
Royal Commission on Forestry’, AJHR, 1913, pp.lii-liii.
frequency, but he cautioned against relying on them to prevent inundations: abnormal precipitation and unique topography often conspired to nullify their beneficial effects.\textsuperscript{140} The Commission thus chose some works (such as those by Fernow and Cotton) that emphasised the relationship between forests and flooding. It also recognised the complexity of such systems and the danger of ascribing to forests an overriding influence on river flow. Yet, the Commission ignored its own sources and instead highlighted the danger deforestation posed to the economic well-being of New Zealand. If the colony was not forest-clad, it warned, its mountains and hills would ‘be a constant source of danger to the farm lands on which the prosperity of the Dominion so greatly depends.’\textsuperscript{141} New Zealand’s conservationists, including respected scientists such as Leonard Cockayne, continued to rely on a language of hyperbole and alarm. They used this as a deliberate stratagem in order to try to push for their ‘cause’ – the conservation of catchment districts.

Hyperbole and alarm continued to characterise discussion of soil erosion later in that century. Conservationists purposefully employed such rhetoric because they believed deforestation would bring such terrifying devastation. In the 1930s, geographer Kenneth Cumberland and soil conservationist Lance McCaskill (1900-1985) manned a vigorous and alarmist campaign for the conservation of soil erosion.\textsuperscript{142} The Commission’s use of such recent scientific literature betokens the flow of ideas operating within the world of forestry and emphasises that New Zealand scientists kept up-to-date with the latest publications in their field (see chapter eight). The Report likewise underlines a general shift occurring in environmental appraisal and in ideas about land and climatic degradation in general. In scientific circles, there appears to be a distinctive shift towards

\textsuperscript{140} Schiff, \textit{Fire and Water}, p.117.  
the problems of erosion and flooding and away from ideas that deforestation brings climatic change.

Evidence of land deterioration in New Zealand

One important reason why catchment concerns had such redolence was because of growing evidence of land deterioration in New Zealand. As one geographer recently noted, from the 1910s the expansion of land area could no longer mask "the extent of land deterioration and erosion" caused by over half a century of pastoralism. This problem, however, were manifest earlier than 1910. One example was rabbit infestations. Farmers recognised this problem as early as the 1870s, while later author likened the grey rabbit's progress into Southland to that "of the tidal wave - all pervading and irresistible". In 1887, rabbits in Otago cost the state an estimated £32,803 from abandoned tenants. By the next decade, some rabbiters in Central Otago were catching on average seven rabbits per hectare. And this seemingly without making any impact on the resident population!

Other problems also became evident around this time. An 1895 article published in the New Zealand Farmer worried about land scarcity, and recommended the adaptation of pastoralism to solve this problem. In 1903, Robert McNab pointed out the destruction wrought by gold dredging. He recommended that these 'waste' areas be planted with trees. Although concerns about the effects of mining on soil and agricultural land had been aired as early as the 1870s, only in 1910 could wardens "impose conditions on any [mining] licence to obviate the destruction of agricultural and

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143 Land intensification became the motive of Liberal Policy, a trend shown in the land under acreage which doubled from 20 million acres in 1891 to 40 million ten years later. Roche, Land and Water, pp.25-26.
146 'Land Settlement and High Farming', NZF, 16, 7 (July, 1895), pp.223-224.
pastoral land.\textsuperscript{148} In addition, drought regularly affected areas such as Central and North Otago, and Canterbury. It desiccated life from the land, spelling an end to agricultural pursuits like dairying in these areas (chapter five). High country farming seemed particularly affected by the problem of land degradation. An article of 1913 highlighted a myriad of problems facing high country pastoralists: overstocking, burning off, ‘the smallness of the rainfall’ and the constant plague of rabbits. Indeed, it noted, that: ‘The problem of how to bring back the high country of Central Otago to its former state is one that has been uppermost in the minds of pastoralists for years past.’\textsuperscript{149}

In response to these fears, the Department of Agriculture undertook experiments in re-grassing now-barren runs.\textsuperscript{150} Official government surveys of sand drift were undertaken in the 1900s (chapter six). As Michael Roche notes, the Canterbury Pastoral Lands Commission of 1910 reiterated the problem of land deterioration by devoting a great deal of its report to detailing its extent and seriousness.\textsuperscript{151} By the 1900s, then, not only had high country land deterioration been experienced in some areas for several years. It also had pricked parliament into action through the commissioning of reports and the passing of legislation.

Evidence of New Zealand land deterioration supported local and overseas writing that highlighted the flooding-forest link. These arguments appeared in the Report of the 1913 Royal Commission. Such evidence strengthened the emphasis on catchment concerns and weakened the case for the climatic influence of forests. Scientists in the Report criticised the forests-rainfall theory. Along with Cockayne’s ecological studies undertaken earlier and the 1909 report into forestry, the 1913 Royal Commission marks the start of the gradual professionalisation of New Zealand land studies and science. Similarly, it demonstrates the increasing reliance by government on science and scientists to recognise and solve problems (see chapter five).\textsuperscript{152} The report reveals that the only

\textsuperscript{148} Hearn, ‘Mining’, pp.94-95.
\textsuperscript{149} ‘The Farm: Re-grassing the Southern Runs: Experiments in Central Otago’, NZF, 34, 4 (April, 1913), pp.401-402.
\textsuperscript{150} ‘The Farm: Re-grassing’, NZF, 34, 5 (May, 1913), p.539.
\textsuperscript{152} On the development of New Zealand science, note Ross Galbreath, \textit{DSIR: making science work for New Zealand. Themes from the history of the Department of Scientific and Industrial Research, 1926-1992,}
support for the forests-rainfall theory came from non-scientists, either land officials or farmers. Those who later would support catchment concerns principally were drawn from a professional scientific background. These included geographers such as Kenneth Cumberland, soil scientists such as Lance McCaskill and ecologists such as Leonard Cockayne. These scientists, like their counterparts in the USFD of the first half of the twentieth century, continued to use the alarming language of earlier conservationists. Their assertions, however, were now buttressed not by historical example or observation but by ‘hard’, ‘irrefutable’ scientific ‘evidence’. One needs only look at the writing of geographer Kenneth Cumberland to hear the resonance of alarm echoing from the last century. In the 1950s, Cumberland and Fox described New Zealand’s Eastland as ‘a region scarred by soil erosion, of flooding rivers and fertile flats strewn and defiled by periodic silting’.153

If the 1913 Royal Commission marks the beginning of a scientific state and the end of catchment cries, so too does it signify the re-emergence of state forest conservation. Although World War I delayed plans, in 1919 the Government created a permanent and independent State Forestry Service (SFS), one notably stronger than earlier. Perhaps it is no coincidence that its emergence coincided with the end of agricultural expansion: high country land problems seem to have dented confidence in the suitability of these areas for pastoralism and consequently made them available to the new SFS. As well as undertaking extensive forestation and aside from its commercial functions, the SFS continued to undertake protection forestry through the conservation of headwaters and fire reserves.154

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Conclusion

Environmental anxieties about the effects of imprudent deforestation in upland areas arrived in New Zealand with some of the first European settlers. From the 1850s, officials in Nelson, Marlborough and Canterbury, set aside mountain forests for flooding and soil erosion protection. In 1868, these concerns reached the national parliament. They remained in such circles for the rest of the century, partly justifying the creation in 1874 and 1885 of a department of forestry charged with revenue collection and the preservation of catchment areas. Although these two forest Acts did not enjoy a long life, later land legislation (such as the 1877 Land Act) incorporated many provisions of the defunct Act in addition to reserving some 500,000 acres of forest for catchment reasons. Undertaken in a time of increasing government retrenchment following the disbanding of state forestry, government reservation specifically for the protection of catchment areas underlines how importantly the state viewed the protection of its soils and waterways. Already, by the 1880s, tree planting alongside riverbanks, undertaken privately and by local government in many areas, owed much to fears of flooding and soil erosion. So did private tree planting. Conservationists throughout New Zealand accepted the ethos of development and progress but questioned whether agriculture should be the dominant feature of the landscape. Instead, they favoured a mixed land-use, with forests both on the highlands and along waterways, and agriculture on the lowlands. By protecting the lowlands from inundation, soil erosion and other hazards such as silted-up harbours and waterways, conservationists argued that forests not only represented the most efficient use of upland areas unsuited to agriculture. They also played a central role in maintaining the fertility of farming. Part of their argument rested on demonstrating that upland deforestation imperilled the fertility of New Zealand soils and the very economy of the colony. They argued this by proffering terrifying overseas lessons of the follies of deforestation. Examples of vast tracts of lush agricultural land swept aside by furious floods and fertile fields made desert by deforestation were deliberate diatribes designed both to discontinue upland deforestation and to prick the conscience of parliament into conservation. In the 1870s, as settlement spread and deforestation increased, many conservationists used New Zealand evidence to support their claims. Examples of flooding in deforested areas near major settlements, such as Wellington and Christchurch,
proved particularly potent. People directly felt the effects of such inundation and reinforced the connection between deforestation and flooding. Extreme floods, such as those of 1868 and 1876, often influenced calls for catchment conservation. These illustrate that local experience of environments proved crucial in the formulation and acceptance of overseas environmental ideas such as hydrological concerns. For the most part, until the early 1900s evidence of the relationship between deforestation and flooding, like that between rainfall and forests, relied not on scientific investigation but on direct observation and historical experience of areas outside New Zealand. Catchment concerns, moreover, appeared regularly alongside climatic concerns and utilised the same language of fear as the latter. Until the late 1870s, land officials, naturalists and landowners dominated calls for catchment and climatic conservation, a reflection of the fact that most of their opinions in print consisted of either official or scientific publications. Specific journals reflecting the opinion of farmers only appeared in the late 1870s (New Zealand Country Journal, founded in 1877) or 1880s (North New Zealand Settler and New Zealand Farmer). Nevertheless, it is clear from earlier newspapers that catchment and climatic conservation appeared at least from the late 1860s, probably earlier. Many people would probably have been aware of these ideas, even if they themselves did not write about them. Reports from the 1880s and 1890s offer conclusive evidence that some farmers addressed local farming associations about the need to plant and protect trees for the maintenance of climate and catchment. Indeed, from their founding the three farming journals mentioned above, in particular The New Zealand Farmer, maintained a vigorous lobby for conservation. This lobby carried through into the new century. By then, both growing evidence of New Zealand land deterioration especially in highland areas and the writings of overseas authors swung opinion towards catchment theories. These same writers, as well as many of New Zealand’s prominent scientists, dismissed claims about the influence of forests on rainfall. In the 1909 report on New Zealand forestry and the 1913 Royal Commission of Forestry, they lobbied for the protection of forests for flooding prevention. Although these scientists often recognised the influence of topography and climate on flooding, following their colleagues in the USFD, they overplayed the link between forests and flooding. The language of alarm characteristic of almost all earlier conservationists remained, though
now it was couched in a scientific style. This style reflected the growth and increasing status of professionally trained scientists in New Zealand. The next chapter investigates the origins and transfers of these ideas to New Zealand, finding that the colony was intricately bound up with developments in international forestry, which shaped and in turn were shaped New Zealand policy.
Chapter 8: Transferring Ideas: conservation origins, influences and exchanges

International forest conservation ideas initiated and sustained environmental anxiety in New Zealand forest conservation throughout the nineteenth and twentieth centuries. Salient and continued influences on New Zealand forest conservation included those from India and East Asia, Scotland, France, Germany and Australia. New Zealand conservationists drew attention to overseas examples for two reasons. First, they used them to highlight the frightening effects of deforestation, such as climate change, sand drift, soil erosion and flooding. Second, conservationists chose areas which had successfully reversed the destruction through forest reservation and management. They upheld these as models to be applied to New Zealand. To drive home the importance of forest conservation, New Zealand conservationists contrasted overseas successes with failures. Narratives of conservation followed biblical storylines in which deforestation despoiled the Garden of Eden. Wise management of forests, however, promised to redeem the Fall. The importance of this narrative device is borne out with the use of biblical examples and those drawn from the Holy Lands to stress the importance of forest conservation. Highlighting this regular flow of personnel and papers, information and policies into and out of New Zealand illustrates that New Zealand participated in a global exchange of people and ideas. Exchanges operated and varied across space and time. Transfers of ideas occurred not only between colonies in the British Empire, but also from sources outside the Empire, such as Germany and France. The impact of these ideas depended as much on local circumstances and decisions as on international developments, since individuals in New Zealand were responsible for introducing such ideas into the colonial context. New Zealand’s first national forest conservation act of 1874 owed much to the advanced state of forestry in South Asia and continental Europe,
but so too to the interest of the premier in this subject.\(^1\) Influences also varied over time. South Asian forestry had an especially strong impact on New Zealand in the 1870s. This influence was due to the advanced state of forestry in that region, the appointment in New Zealand of an Indian forester and the political influence of former civil servants of India living in the colony. Some influences ebbed and flowed. Thanks to the visits of German-speaking scientists, the German link was particularly strong in the 1840s and 1850s. It ebbed thereafter because fewer German-speaking naturalists visited. In the 1890s, Cockayne’s language skills rekindled this link. Leonard Cockayne read German translations of ecological texts, and corresponded and met botanists educated in German and northern-European lands. Similarly, the American influence, which remained reasonably strong through the writing of G.P. Marsh and other correspondence, was significantly strengthened in the early 1900s with the development of a strong United States Forestry Service (USFD). The large publication output from US foresters reached New Zealand’s growing clique of professional scientists, who then relayed this information to a New Zealand audience. Before this period, professional scientists in New Zealand were rare. In the absence of such specialisation doctors, especially those trained in northern Europe, the German-speaking lands and Scotland, fostered conservation in New Zealand. This reflected their strong botanical training as much as their interest in the connections between health and environment (see chapters one and two) and the strong tradition of forestry enjoyed in these regions (see chapters three to seven). Probably because of the strong economic, social and political connections between these two areas, exchanges between Australian and New Zealand forest conservation ideas continued throughout the nineteenth century and into the twentieth. French foresters, thanks to their experience of sand reclamation and extensive forestry departments, appeared regularly in New Zealand publications on forestry. Although cross-influences also took place, as discussion of the influence of New Zealand policy on South Australia and in France reveals, New Zealand forestry occupied a marginal position in world forestry, thanks to its somewhat haphazard history of state forest

\(^1\) See, chapter four. On the relationship between international, national and local ideas in forestry, see James Beattie and Paul Star, ‘Origins and Influences of Forestry in New Zealand, 1850-1914’, in Tony Ballantyne...
conservation. Transfers of information and individuals did not occur neatly, from one country to the next. German forestry ideas might reach New Zealand via Australia, conservationists might serve in various countries, and printed material on one region might appear in the newspaper of another country. Correspondence and printed material, as much as the personal experience of many conservationists and the operations of overseas foresters and scientists in New Zealand, also bear out that nationalist writings of New Zealand forest history miss out the important exchange of information that shaped conservation in this country. Although this chapter partly discusses the wider development of New Zealand forestry within this period, it specifically focuses on the influence of South Asian, Australian, German, French and Scottish ideas on New Zealand climatic, catchment and sand-drift forestry. The reason is threefold. First, since Michael Roche’s histories already provide excellent overviews of the main currents of New Zealand forestry, a study into its overall development would be needless and repetitive. Second, because Roche’s study did not focus on climatic, catchment or sand forestry, it is important and illustrative to pursue these neglected areas and demonstrate how they contributed to overall forest policy. Third, in doing so, this chapter broadens not only the study of forest and environmental history. It also extends understandings of how flows of information and the transmission of ideas operated in New Zealand. These transfers demonstrate that New Zealand’s geographical position at the edge of the British Empire belied its interconnectedness with the rest of the world. Equally, it underlines that colonies generated policies and ideas, sending these not only to other colonies but also outside the British Empire. This realisation complicates studies that focus on the transfer of ideas from European centres to colonial peripheries. Furthermore, this chapter shows that New Zealand’s experience of rapid, large-scale deforestation significantly shaped the choice of forest ideas adopted in the colony.

Networks of information

Networks of information, policies, and individuals linked New Zealand forestry with the rest of the world. Forestry in New Zealand was bound up in ‘webs of empire’ –

and Judith A. Bennett, eds., Landscapes and Communities, Dunedin, 2005 (forthcoming).
flows of information, capital and personnel that linked together colonies and colonial powers within the British Empire. Some linkages bound New Zealand into forestry debates with fellow colonies in the British Empire, particularly India and Australia, Ceylon and Mauritius. Colonial transfers of knowledge demonstrate that colonies both generated and diffused knowledge. These findings challenge those of two types of studies: those focussed on the transfer of knowledge from the European centre to the colonial periphery; and those solely viewing the emergence of colonial science in a national framework. National and local factors shaped New Zealand forestry, but so too did trans-national transfers of knowledge and personnel. Growing New Zealand nationalism in the 1880s, for instance, contributed to the creation of scenic reserves and national parks. The idea of national parks, like that of Arbor Day, came to New Zealand from the United States. As the work of Roy MacLeod and Michael Hoare show, too, the 1880s, a period of growing New Zealand and Australian nationalism, also saw in 1888 the inauguration of formal scientific ties between the two areas through the creation of the Australian Association for the Advancement of Science (AAAS). Simultaneous with the development of separate Australasian nationalisms, then, both countries became increasingly incorporated into world-wide scientific debates. As C.A. Bayly notes, nationalism and internationalism are a characteristic of the increasingly global nineteenth century.


3 Ballantyne, *Orientalism and Race*.


As Ian Tyrrell’s superb study of Californian-Australian environmental reforms demonstrates, networks of information and exchange reached outside empires. Forestry practices from Germany, France and the United States influenced New Zealand along with those from areas in Australia, South Asia and South Africa. These connections underline the limitations in confining research to the British Empire. Networks, too, were dynamic, complex creations. They included transfers of letters, individuals and printed matter between places. Correspondence covered oceans and crossed continents, reducing the tyranny of distance and facilitating not only the exchange of ideas but also plants. Individuals took journeys and introduced their knowledge into New Zealand. Volumes of printed matter informed experts and the public alike on the latest ideas, a traffic that effectively circumvented national boundaries. The flow of biota did not follow a one-way path from one area to the next. Nor did the transfer of knowledge. Scottish-born South African naturalist, John Croumbie Brown, for instance, wrote a book on French forestry practices for reclaiming sand dunes that made its way to New Zealand. New Zealand newspapers, similarly, reprinted material on the climatic and hydrological effects of deforestation in Spain that had originated in an article published in the Edinburgh Review.

One problem with these models is that, by reducing transfers to mere structures of thought and behaviour, some studies of information lose sight of individuals and chance. Structures are certainly important. Shipping routes, news cartels and telegraphic cables, for instance, channelled where flows of printed and written material originated.

where they arrived and where they were dispersed. Yet studies of individuals reveal that, as today, people seldom acted rationally or predictably. Chance also played an important role. Indian forester, Inches Campbell Walker, owed his appointment to the position of New Zealand’s Conservator of Forests partly because of the premier’s and his brother chance meeting over a game of whist.

Scots, South Asia and Kew Gardens

Other individuals also made a significant impact on New Zealand forestry. Many Scottish-trained doctors voiced climatic and catchment concerns about deforestation. As chapters four to seven show, from the late eighteenth century medical officers trained at Scottish universities became radical and influential critics of wasteful forest destruction in India. Concerned about the effects of environmental degradation on health and society, they promoted state intervention by the East India Company (EIC) to stop deforestation and mitigate the effects of famine. Medical activism contributed to the development of Indian forest conservation. Regional forest conservancy began in Madras in 1837-1838 and in 1847 in Bombay. The Indian Forest Act (1865) brought this to a national scale. The passing of the latter marked the ascendance of scientific forestry management aimed at promoting long-term profit. The development of Indian conservation relied strongly

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12 See, for instance, Potter, *News and the British World*.
on climatic and hydrological arguments. Such aims also remained a central component of Indian forestry.\textsuperscript{18}

According to Gregory Barton, the model of Indian forest conservation was adopted by other countries in the British Empire and the United States, and laid the basis for what became modern environmentalism. Although Barton's thesis is often reductive, clearly over-simplistic and riddled with errors, his core arguments is correct, albeit in a muted form.\textsuperscript{19} Indian forest conservation undoubtedly had some influence on overseas conservation. For New Zealand, that influence was particularly strong in the 1870s, a decade which marks the beginnings of state forest conservation in New Zealand. In this decade, former civil-servants in India such as Sir John Cracroft Wilson pushed for state forest conservation, while the writings and examples of Indian foresters and forestry peppered forestry reports. In 1874, too, an Indian forester, Captain Inches Campbell Walker, became New Zealand's first Conservator of Forests.

During debate on the 1874 New Zealand Forests Bill, Sir John Cracroft Wilson supported climatic and catchment conservation. Described by one Canterbury newspaper as 'Toryism on two legs', 'Nabob' Wilson had earned a reputation as a straight-talking, straight-dealing politician who fiercely upheld the provincial interests he represented.\textsuperscript{20} Clearly, though, he thought forest conservation was a matter that warranted national legislation. Wilson referred to his own experience with South Asia forest conservation. According to Wilson, before he visited Mauritius, he was shown papers demonstrating

\begin{itemize}
\item \textsuperscript{18} Grove, \textit{Green Imperialism}, pp.380-473.
\item \textsuperscript{19} Gregory Barton, \textit{Empire Forestry and the Origins of Environmentalism}, Cambridge, 2002. Quote from p.7. To begin with, Gregory disregards the important work of Richard Grove, who demonstrates that Indian forest conservation originated in part with the work of Scottish-educated doctors employed by the EIC the eighteenth century. Gregory fundamentally overstates the influence of Indian forestry to the extent of ignoring all other non-Indian influences. In his discussion of New Zealand forestry, for instance, Barton's scholarship is sloppy. It also elides all non-Indian ideas shaping New Zealand forestry. For instance, Barton's insistence that: 'Very little scholarship is available on forestry in Australia and New Zealand in the nineteenth century' is patently absurd, as the secondary sources appearing in my thesis demonstrate. Similarly, his book is riddled with basic mistakes, such as the assertion that the French forester A. Lecoy was New Zealand's Minister of Lands in 1880 and the inconsistent and regular misspelling of Inches Campbell Walker's first initial as either 'J.' or 'I.' Barton, \textit{Empire Forestry}, footnote 82, pp.116, 118-119.
\end{itemize}
how deforestation had led to drought on the island. Only with ‘stringent rules’ prohibiting tree felling, he stated, had the ‘fertility of the Mauritius ... been restored to it, and the sugar-cane and other produce grow and flourish just as much as they did in the early days.’ His own observations in Mauritius bore out the accuracy of these descriptions. Wilson also encouraged conservation. He recalled that in 1843, as an officer in charge of a district bounded by the Himalaya Mountains, he had petitioned to stop the destruction of a belt of saul, which were being cut down indiscriminately as saplings, and what was the embryo of a most valuable forest was [being] allowed to be absolutely ruined ... by the neglect of the authorities. I brought the matter under the notice of the Government, and in vain asked for permission to preserve the trees on this promontory of land. I could get nothing done: other matters were considered of more importance...

Finally, related Wilson, when ‘there was great difficulty in getting saul timber for gun carriages’ the Lieutenant-Governor visited the district, whereupon Wilson ‘showed him how valuable the promontory alluded to would be hereafter.’ Only in about 1850, concluded Wilson, was a forestry department created. ‘[T]he forests have been conserved ever since.’ Wilson brought his pioneering conservationist ideas to New Zealand, where his experience of Indian forests proved crucial in championing the colony’s major forest bills of the 1870s. He also kept abreast of conservation legislation in other colonies. In 1873, for instance, he introduced the Grasslands and Fires Prevention Bill modelled on legislation in the Australian colony of Victoria. This would prosecute anyone lighting forest fires. Wilson also took action to prevent deforestation. He purchased seven acres of bush land in New Zealand on the Port Hills, above Lyttelton, to prevent its destruction. Sadly, a deliberately lit fire consumed what, Wilson related, ‘had gladdened my sight for six years’.

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21 John Cracroft Wilson, 31 July 1874, NZPD, p.361.
22 Wilson, 31 July, NZPD, p.361.
23 See chapter four.
24 Wilson, 31 July, NZPD, p.362.
Indeed, a particularly sustained period of writing on the forests-climate link occurred in the 1870s and 1880s, interspersed with a relative lull in the 1890s before again assuming prominence in the 1900s. In the 1870s, forestry and particularly climatic anxieties received quite prominent discussion in parliament. Climatic conservation received significant discussion in these debates and was promoted by New Zealand’s Chief Conservator, Captain Inches Campbell Walker. His views appeared in parliamentary papers, newspapers and the Transactions. From the 1880s, farming journals such as the New Zealand Country Journal and New Zealand Farmer reveal concern in popular circles for the effects of deforestation on climate. In the 1890s, climatic arguments were obscured by the emphasis placed on opening forests for settlement, by new arguments for scenic and island conservation and by the problems created by the Long Depression. By the 1900s, New Zealand was emerging out of depression. Government no longer coveted state forests for settlement while scenic and island conservation had become more commonplace, thus giving space for attention to focus on climatic conservation. Ultimately, tree planting for reasons of climatic conservation fell victim to a concurrence of two events. Growing land deterioration in New Zealand coincided with increasing scientific emphasis on the effects of deforestation on the hydrology of catchment. From their emergence in the 1860s, climatic arguments, though, did not enjoy universal support. Some doubted their very existence. A few held that forests influence temperature but not rainfall. Others supported the theory but thought that it had not occurred in a newly settled country like New Zealand. One of the problems for climatic conservationists, indeed, was challenging the image of New Zealand as a temperate land. Many solved this by relying on terrifying examples selected from around the world of fertile countries laid waste through the folly of deforestation. They pointed out that if conservation did not occur in the colony similarly terrifying events would follow in New Zealand. By the 1900s, experience with living in New Zealand had taught some European New Zealanders that New Zealand’s climate, while overall temperate, did have some drawbacks. Accordingly, many writers about climatic conservation in the 1900s drew their examples no longer from overseas but from New Zealand, a trend that also was mirrored in writing about sand drift and soil erosion. Paying attention to New Zealand examples reflected people’s growing perception of the problem as well as increasing
research undertaken into New Zealand's environment. As the following chapter
demonstrates, local experience of nature still proved very important in generating
environmental anxieties and in seeking solutions to these.
Chapter 5: Rethinking science, religion and nature in environmental history: drought in early twentieth century New Zealand

The previous chapter revealed widespread colonial environmental anxiety that deforestation was causing deleterious climate change. This one also focuses on drought but shows that this could stimulate a variety of settler responses and not just fears about deforestation. Looking at the reaction of the residents of North Otago, New Zealand, to the drought of 1906-7, reveals the importance of religious perception in environmental anxiety. Investigating the rainmaking experiments and rainmaking prayers which took place in 1907 uncovers a far more complex picture of religious and scientific ideas in New Zealand than many writers have recognised. Natural events, such as floods and fires, earthquakes and storms, comets and eclipses, have elicited a wide range of responses from different societies. Some people viewed them as evidence of divine displeasure brought on by human transgressions, some as omens of bad things to come, and others as extreme natural phenomena. Environmental historians can use these events as occasions to learn about contemporary ideas of nature, science and religion. So far, however, these debates have been ignored by New Zealand’s environmental historians. Nor have New Zealand historians paid them much attention. In his two-volume history of New Zealand, James Belich, for instance, argues that the growth of scientific rationalism between the 1880s and 1920s meant a decline in religious belief. Belich’s views form part of a general writing-out of religious history and the religious views of early twentieth century New Zealanders that is evident within the wider New Zealand historical profession. As this chapter shows, extending natural scientific explanations into new areas does not necessarily


undermine religious readings of the same phenomena.\textsuperscript{4} Nor do increasing scientific understandings invariably bring about secularisation in society. Many North Otago Protestants viewed prayer and experiment, religion and science as complementary activities designed to achieve the same ends. These findings complicate both the dominant historiographical picture of “modern society” in which science inevitably undermined faith, and the notion of hermetically-sealed divisions between the secular and the profane, science and religion. Reactions to drought also demonstrate the fascinating process by which emerging scientific groups, such as meteorologists, sought to strengthen their own claims of professional legitimacy by criticising the rainmaking experiments as scientifically unsound. This thereby demonstrates both the complexity of European environmental responses to the New Zealand environment and the variety of environmental explanations presented. Rainmaking prayers in North Otago received a different response to those in other countries. Controversy often attended rainmaking prayers in Australia and England for a variety of reasons. Liberal-minded clerics, scientists and professionals challenged the wealth and influence of other clergy by criticising special prayers and the like. In England, some professionals attempted to undermine the church’s status and authority. They attempted to create a niche for themselves by challenging the dominance of the state church over educational institutions, politics and government. New Zealand professionals, in contrast, did not have to challenge an established church to gain power since none existed in the colony. New Zealand’s greater social opportunities, similarly, reduced the potential for religious grievances in the colony. Drought also led to other reactions. For some, it threw into doubt the accuracy of assessments of the temperate nature of North Otago’s climate and the suitability of European farming practices there. These demonstrate the importance of local environments in changing environmental attitudes.

\textbf{Defining drought}

People define drought and natural events in different ways.\textsuperscript{5} A farmer may measure it primarily by the lack of crop or pasture growth, a meteorologist by the lack of rainfall or a deeply religious person by reference to God. Indeed, ‘the severity of a drought is controlled not just by the duration of the period without precipitation (meteorological drought), but by

the effect of weather on plant growth, water supplies, and human activity. There is no doubt that drought struck North Otago in 1906-7: vegetation and stock died, water supplies dried up, and people widely referred to this phenomenon as a drought. The dry spell began in January 1906 and by the end of the year, the rainfall of 1906 averaged 45.2 per cent below the annual mean of the last thirty-nine years (1867-1906). For the first half of 1907, North Otago fared no better. [T]he absence of rain’, worried a journalist in 1906, ‘is beginning to tell on the district’ since Ngapara’s soil was ‘as dry as dust’ while late-sown grain was ‘not germinating at all’. Another writer equated the area between Ngapara and Oamaru with the Sahara: dry, dusty and unproductive.

Although some rain fell in May 1907, it was insufficient to end the drought since, by now, the ground was extremely dry. A little later, on 15 July 1907, heavy clouds raced across the sky, and it seemed that the drought might soon end. Hopes, however, rapidly evaporated when by evening the skies cleared and once more the stars shone brightly. By mid-1907, the agricultural and domestic situation in the region had deteriorated further. Duntroon residents had to travel some distance to collect drinking water. North Otago pastoralists had to bring in truckloads of turnips as feed for stock from Southland, over 200 kilometres away. Many also faced the choice of either out-pasturing their stock or killing them. Grain farmers had their lowest average annual harvest yield in the past decade and the dairy farmers fared very badly. When the drought ended, and the cost counting began, estimates placed the financial impact of the drought at about £1 million. Butter producers alone lost £50,000, grain harvesters, £200,000. Ironically, while much of Central and North Otago as well as Canterbury were experiencing drought, many areas in Southland and most of

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1 On the different cultural, religious, social and economic definitions of drought, see Greg Bankoff, Cultures of Disaster: Society and Natural Hazard in the Philippines, London and New York, 2003.
4 Otago Witness [henceforth OW], 5 September 1906, p.40.
5 New Zealand Farmer [henceforth NZF], 28 (March, 1907), p.219.
6 Oamaru Mail [henceforth OM], 25 May 1907, p.2.
7 OM, 15 July 1907, p.2.
8 OM., 5 July 1907, p.1.
the North Island enjoyed excellent weather. One report described the North Island season as the ‘“most bounteous”’ in living memory.\textsuperscript{16}

**Organising rainmaking experiments**

‘[N]othing less than a flood will serve us now’, urged one Kakanui farmer. He urged farmers to embark upon rainmaking experiments. Detonating explosives in moisture-laden air worked in Oamaru ten years ago and more recently in Queensland, continued the agriculturist.\textsuperscript{17} Support for the farmer’s suggestion gathered pace, and not just in North Otago. Two letters of support, for instance, appeared in the paper of a neighbouring province, Canterbury.\textsuperscript{18} A North Otago correspondent, T.M. Whither, urged that ‘no time should be lost in again repeating these experiments’ while other letter-writers pledged support and money.\textsuperscript{19} Drought clearly generated a great deal of environmental anxiety in North Otago. Not all farmers, though, willingly championed rainmaking. Observing that his neighbour had contributed to the rainmaking fund, one canny Scots farmer declared that: ‘If the rain falls in his [the neighbour’s] paddock it’ll no miss mine.’\textsuperscript{20}

Without explaining the reason, Oamaru’s councillors declined the subscriptions that had been collected, so instead people began organising the experiments themselves.\textsuperscript{21} A Rain-Making Committee was formed on 6 August 1907. Soon, thanks to petitions and other fund-raising activities, a sizeable fund – £187 to be exact – had been collected for the experiments.\textsuperscript{22} Both farmers and citizens attended the meeting, indicating that concern for the drought was widespread, as indeed did the quick raising of such a large sum.\textsuperscript{23} Although the local council declined to support the experiments, the New Zealand Government did. It eventually contributed £200 to the experiments, cost-price dynamite, five Defence Force artillerymen, and one meteorologist.\textsuperscript{24}

\textsuperscript{16} Department of Agriculture’s annual report, 1906, quoted in OM, 24 August 1907, p.1.
\textsuperscript{17} OM, 15 July 1907, p.3.
\textsuperscript{18} OM, 19 July 1907, p.1. The Canterbury newspaper The Press [henceforth TP] also carried correspondence on rainmaking. TP, 13 August 1907, p.9.
\textsuperscript{19} OM, 23 July 1907, p.4; OM., 24 July 1907, p.3.
\textsuperscript{20} North Otago Times [henceforth, NOT], 12 August 1907, p.2.
\textsuperscript{21} OM, 24 July 1907, p.1.
\textsuperscript{22} Chairman: H. Dovey; Secretary: Gibson; Duntroon: W. Sutherland, H. Dovey; Oamaru: Orbell, Muir; Enfield: C.W. Reid, J. Mahoney; Windsor: Livingstone, Mackay, J. Don; Tokarahi: W. Gardiner; Westen: G. Harvey; Ngapara: T. Little, Shand, J. McCulloch. The NOT supports the OM’s estimate of the people attending the meeting. NOT, 6 August 1907, p.1. On petitions and fund-raising note, for instance, OW, 14 August 1907, p.36.
\textsuperscript{23} OM, 6 August 1907, p.2.
\textsuperscript{24} OW, 14 August 1907, p.36. Earlier Prime Minister Joseph Ward had promised a deputation of North Otago farmers aid and money. OM, 3 August 1907, p.2.
In 1891, when the region last experienced a severe drought, North Otago residents had decided to undertake rainmaking experiments. Rain, however, preempted their intentions. Nevertheless, many letter writers believed that successfully carrying through these experiments would bring rain in 1907. Many also drew confidence from overseas rainmaking efforts. Oamaru’s aborted 1891 plans had been modelled on rainmaking experiments in Wyoming and Texas. In the 1890s, rainmaking experiments gripped the imagination of residents of the Great Plains states of the United States. Texas rainmakers, funded by a United States Congress grant of US$ 9,000, had exploded balloons containing hydrogen and oxygen a mile into the air, following these with charges of dynamite attached to kites. Torrential rain reportedly followed the blasts. In 1882 and 1902, Queensland (Australia) also conducted its own rainmaking experiments, albeit unsuccessfully. The importance residents placed on overseas experiments fully illustrates that environmental ideas were not played out in a vacuum. Networks of correspondence, newspapers and people distributed ideas and examples throughout the world that helped shape anxieties and policies (chapter eight). This fact is borne out, too, by suggestions that new agricultural techniques that had worked in South Africa and the United States should be introduced into North Otago (see below).

The hopes of rainmakers rested on the erroneous but popular notion that rain followed great battles. Reverend D.C. Bates, the Chief Government Meteorologist sent to observe the rainmaking, explained that in principle explosions expand moisture-laden air and creates ‘a

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27 McDonald, History of North Otago, p.154.
32 Bates, ‘Report Upon’, 3212. As Humphreys points out, it was purely coincidence that rainfall followed battles. Humphreys, Rain Making and other weather vagaries, pp.29-32.
state of atmospheric instability. Condensation first takes place aloft, then possible drops fall, introducing a cooler current which might cause local showers.\textsuperscript{33}

**Religion and rainmaking**

‘It is impossible to consider’ the matter of rainmaking, explained one correspondent to the *Oamaru Mail* in July 1907, ‘entirely apart from the religious belief of so many in our district’. This letter-writer held that rainmaking was not impious: ‘I solemnly believe that man, in the act of endeavoring [sic] to bring water down from the clouds above, can do so with just as much reverence towards Him as in the act of endeavoring [sic] to obtain water by digging and boring in the earth beneath’. Some people may object to the experiment, conjectured the writer, because they believe ‘the Creator is in the region of the clouds above’ but, in fact, God is everywhere you look. The writer finished by enclosing a £1 donation with the hope that ‘others, [from] both farmers and citizens, will promptly follow.’\textsuperscript{34} Another correspondent agreed. According to Scripture, rainmaking prayers and rainmaking experiments went hand-in-hand: ‘Let them ask for much-needed rain, and “Prove me now, herewith, said the Lord of Hosts, if I will not open you the windows of Heaven and pour you out a blessing that there shall not be room enough to receive it” (Psalm XCV, from Malachi iii., 9 and 10)’, wrote the correspondent.\textsuperscript{35}

At the second meeting of the Rain-Making Committee in August 1907, rainmakers acknowledged their ‘dependence upon the Almighty for the success of our efforts’. They did this by requesting ‘the co-operation of the various religious bodies in the district, and desiring that the clergy and leaders of denominations offer up special prayers in relation to the matter.’\textsuperscript{36} The next day, churches in Oamaru held special prayers for rain.\textsuperscript{37} While Oamaru’s Presbyterian churches held indoor services, a group of Salvation Army faithful held a two-hour outdoor service in North Otago’s droughty interior punctuated by music and quiet reflection. With the Salvation Army in Oamaru holding a similar service, it was popularly said at the time that the fall of rain in each area would indicate the faithfulness of the respective branches.\textsuperscript{38}

\textsuperscript{34} OM, 23 July 1907, p.4.
\textsuperscript{35} OM, 25 July 1907, p.3.
\textsuperscript{36} OM, 10 August 1907, p.2.
\textsuperscript{37} OM, 12 August 1907, p.2.
\textsuperscript{38} Kathleen Stringer, North Otago Museum Curator, interview, 2 May, 2001. For a brief history of the reception received by the Salvation Army when it came to Oamaru in September, 1883, see S.A. Muirhead, ‘The Turbulent Years: Early Days in the Salvation Army’, unpublished manuscript, North Otago Museum [henceforth NOM], New Zealand, 97/25b.
Meanwhile, on the afternoon of 13 August during the third meeting of the Rain-Making Committee, a train conveyed Corporal Meikle and four men of the submarine miners to Oamaru. Rainmakers, perhaps buoyed by the impending arrival of the Defence Force members, were full of optimism. Rain following battles may be ‘coincidences’, wrote a reporter at the meeting, ‘but as coincidences they are remarkable’.40

The rainmaking commences

The first rainmaking experiment took place on 16 August atop Raki’s Table. Lying 22 kilometres NNW from Oamaru (see Map 5.1, and Photographs 5.1 and 5.2), it was ‘a “flat-topped hill” ’ almost 323 metres above sea level.41 At 5 p.m., with the ‘cool of the evening’ approaching, Rev. Bates and the rainmakers, along with two journalists, made their way up to Raki’s Table. To Bates, an ordained Church of England clergyman, and future Director of the Meteorological Department, scattered rain in the distance, and 92 per cent humidity suggested that conditions did not favour rainmaking.42 North Otago’s rainmakers disagreed, so, under Corporal Meikle’s direction, three detonations went ahead, starting at 5.15 p.m. and continuing every fifteen minutes thereafter.43 The Oamaru Mail reported excitedly that a “great concussion” rented the air with the final explosion. Windows rattled in Mr Shands home. It seemed that rain might just fall, but, as had earlier happened, the clouds lifted.44 No rain fell near the site of the explosions. Yet, at the completion of the last explosion Hilderthorpe, a small community north-east of Oamaru, did enjoy a half-hour drenching. Heartened by this ‘success’, rainmakers vowed to continue with the experiments. The Oamaru Mail felt rainfall at Hilderthorpe following so close behind the last explosion was more than a mere coincidence.45 Bates, in contrast, doubted that rainmaking could have caused the rain.46

A day before the second experiment, morning drizzle began to fall on the coast. Totara Station recorded 20 millimetres of precipitation. As in 1891 it seemed rain would pre-empt

39 OM, 13 August 1907, p.4.
40 OM, 13 August 1907, p.4.
44 OM, 17 August 1907, p.4.
45 OM, 17 August 1907, p.4.
Map 5.1 Locations of Rainmaking Experiments, 1907.

Thanks to Bill Mooney of the Geography Department, University of Otago, for drawing the map.
Photograph 5.1 View inland from Raki's Table, Schaffer's farm, July 2002. Conditions in 2002 would have been very similar to those of 1907, with the area again under winter drought conditions.

Author's collection.
Photograph 5.2 Explosives canister left from the 1907 Rainmaking Experiments, at Shaffer’s farm, Ngapara.

Author’s photograph.
the experiments. Coastal rain continued on Monday (19 August), but it remained dry inland. Under skies threatening rain, then, excited artillerymen greeted Bates at Raki’s Table with reports that a detonation at 12.30 p.m. had brought a brief shower of rainfall. Bates remained sceptical. He could not see how explosions brought rain in a 40 kilometre an hour wind, in conditions of intermittent rainfall, nor at a point almost 20 kilometres away from the blast area. Rainmakers, however, Bates would write later, ‘were quite as decided in their opinions that the rain thickened heavily after each successive shot’.47

On the next day, sufficient rain fell for the Oamaru Mail to gleefully proclaim the end of the drought. On Sunday night, rain had begun to fall all over the district and still had not abated by Tuesday. Although the drought was breaking, the experiments continued because inland areas still required more rainfall to permit ploughing.48 In a grand finale to the experiments, the last of the detonations would be co-ordinated between three sites: Raki’s Table, used in the previous experiments; Round Hill (almost 153 metres high); and Dalgety’s Hill (247 metres high).49 Originally rainmakers had intended to use four sites, but they thought better of using Big Hill (Papakaio) as it lay rather too close for comfort for coal miners working in a mine there.50 During the second experiments, miners already had experienced, as one source put it, a ‘shock there so sharply that it resembled an earthquake’.51

Two groups of observers viewed the third and final set of experiments. Bates and his assistants went to Shand’s Ngapara home laden with meteorological equipment and cameras, taking up the same position they had when viewing the experiments at Raki’s Table. At 3.40 p.m. the first detonation of some 23 kilograms of explosives occurred at Round Hill.52 As Bates and his fellow observers sheltered from the light drizzle in a nearby haystack, they heard the day’s third detonation. The clouds thickened. Then heavy rain fell for a short period, so heavy in fact that it wet the fuse and only with the greatest of difficulty could it be lit for the next detonation. During this blast, Reverend Bates saw no perceptible increase in rainfall

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48 OM, 21 August 1907, p.2. The day before, the OM noted that water had percolated to a depth of 3 inches into land in the lee of the falling rain. Water percolated to a depth of 7 to 8 inches into unsheltered land. OM, 20 August 1907, p.4. Other areas, such as South Canterbury, Waimate, Central Otago, and Kurow, also ‘shared in the welcome rain’, bringing an end to trying drought conditions. Some farmers seized the opportunity, and began to plough land. OM, 20 August 1907, p.4. For details of the breaking drought in Timaru, Christchurch, Dunedin, and the West Coast see CW, 21 August 1907, p.39. For the end of drought in Canterbury see TP, 24 August 1907, p.11.
49 NOT, 23 August 1907, p.4.
50 OM, 23 August 1907, p.4.
51 NOT, 23 August 1907, p.4.
52 OM, 23 August 1907, p.4.
after the explosion.\textsuperscript{53} The three stations kept firing until, by 4.16 p.m., they had spent their explosives. By far the most spectacular explosion occurred on Raki’s Table which, according to The Mail, with over 90 kilograms of explosives lent ‘to the spectacle [of rainmaking] ... an element of grandeur’ with detonations reverberating and re-echoing ‘amongst the hills like thunder’.\textsuperscript{54} Observers certainly felt this blast since its concussion threw them backwards.\textsuperscript{55}

Assessing the experiments and defining science

What did observers make of the experiment? After the last blast, the Oamaru Mail was enthusiastic. Three days later its tone had dampened. ‘[I]t has been demonstrated’, observed its correspondent, ‘that rain cannot be induced to fall by air concussion created through the medium of high explosion’, although it still gave the rainmakers hope. ‘[W]hether [rain fell] as a result of the committee’s enterprise, or was the natural sequence of the incomprehensible working of the mightier forces in Nature, the district was experiencing such a downfall as had not been its lot for considerable over [sic] a year, and that the hearts of the farmers and business people would be materially gladdened thereby.’\textsuperscript{56}

In contrast, right from the beginning of rainmaking discussions the Mail’s rival, the country-focused North Otago Times, had poured cold water on the experiments.\textsuperscript{57} At their conclusion, the Times wrote that the rainmakers went ahead in spite of [what] all the newspapers have written, in spite of scientific reasonings [sic] on the subject, and in spite of the failure of all the experiments made by the various governments of the world.\textsuperscript{58} Other newspapers such as the Auckland Weekly News and The Press reported on the failure of the experiments.\textsuperscript{59} ‘ANTIFAKE’, a correspondent, even likened their effectiveness to “shooting boiled peas at Gibraltar.”\textsuperscript{60} Meteorologists also criticised the experiments. Measured criticism followed in Reverend Bates’ report on the rainmaking.\textsuperscript{61} ‘Until it can be shown’, he wrote, ‘that the temperature of the air can be controlled by gigantic cooling operations we may look in vain for any alteration in the natural order of events by way of the production of artificial

\textsuperscript{53} OM, 20 August 1907, p.4.
\textsuperscript{54} OM, 23 August 1907, p.4.
\textsuperscript{55} OM, 20 August 1907, p.4.
\textsuperscript{56} OM, 23 August 1907, p.4.
\textsuperscript{57} NOT, 12 August 1907, p.2. For its earlier criticism see NOT, 9 August 1907, p.4.
\textsuperscript{58} NOT, 23 August 1907, p.2.
\textsuperscript{59} Auckland Weekly News [henceforth AWN], 27 August 1907, p.49; TP, 23 August 1907, p.10. See also NZF 28 (December, 1907), p.1068.
\textsuperscript{60} Letter, OM, 10 August 1907, p.1.
\textsuperscript{61} Bates, ‘Report Upon’, p.212. For instance, noted Bates, ‘the condensation from vapour to water for an inch of rain to the square mile is estimated as equivalent to the work done by 100, 000, 000 horse-power for half an hour.’ Bates, ‘Report Upon’, p.213.
Another meteorologist, probably Cleveland Abbe of the United States Weather Bureau, who edited the journal in which Bates published his report on the experiments, regarded the North Otago rainmaking 'as misguided and vain by all scientific meteorologists.' Bates, unlike Abbe, at least found room to praise the worthy efforts of Oamaru's 'progressive, enlightened, and experienced farmers and business people'. According to Bates, in promoting the experiments they at least had 'the best interests of the community at heart'.

In contrast, many people in North Otago poured their money and enthusiasm into the experiments, sincerely believing that these had ended the drought. Since rain had fallen almost immediately after the first explosion, many Ngapara residents, for instance, attributed it to the experiment. Indeed, one George White of Hilderthorpe felt sure that the experiment had caused rain in his area.

These contrasting environmental beliefs reveal a division both between popular and elite conceptions of science and between interpretations of the natural world. On the one hand, many local residents had placed their faith in rainmaking experiments. On the other, meteorologists such as Abbe and Bates regarded rainmaking as science in name only. By criticising the experiments, Abbe and Bates were trying to establish boundaries between what was legitimate and illegitimate science. They were trying to 'make their claims and practices credible ... by distinguishing them from unworthy claims and practices of some nether region of non-science.' In essence, the meteorologists thought that the rainmaking experiments were not based on sound scientific principles. Around the turn of the twentieth century, New Zealand meteorologists, like other scientists and professionals, were attempting to bring increased legitimacy and status to their work. Perhaps this was because the Meteorological Department had suffered chronically low-levels of government funding and therefore its staff wished to demonstrate its professionalism and usefulness and thus justify its status. Perhaps,
too, because he did not have any formal training in meteorology, Bates wanted to establish his professional credentials. These attempts reflect that, only from the 1890s, were professionally trained scientists beginning to change the largely amateur-dominated New Zealand science scene. This process would take over a quarter of a century to achieve. Instrumental in this was the establishment, in 1926, of the government organisation, the Department of Science and Industrial Research. For meteorologists, the Oamaru experiments offered an excellent way of demonstrating the professionalism and superior scientific training of their department against the amateurism of the North Otago practitioners.

Religion and rainmaking

When the drought finally broke in late August, M. E. Davey of Hull Street, Oamaru, noted delightedly that the prayers for rain ‘have been abundantly answered’. ‘The lovely rain which is falling in such abundance as I write’, continued Davey, ‘ought to fill the heart of every man, women, and child with gratitude to Our Heavenly Father who has so abundantly supplied our need.’ Davey ended by imploring the Committee ‘in conjunction with the various ministers, [to] arrange for some plan whereby all may join in public thanks for His loving kindness.’

Oamaru’s churches, indeed, recognised His loving kindness. At St Luke’s (Anglican) Church, Reverend Hubert Jones led ‘a special thanksgiving for the plentiful rain’. At Wesley Church, Reverend T. N. Griffin mentioned ‘the need for gratitude to God for His bounties’, as did the Baptist Church, and the Church of Christ. Meanwhile, St Paul’s (Presbyterian) morning service began with the congregation singing the Doxology. And, Columba Church gave thanks for the ending of the drought. Unfortunately no details of these services survive.

70 For details of the lack of funds of the department and Bates’ informal training see de Lisle, Sails to Satellites, pp.30-42.
72 OM, 24 August 1907, p.1.
73 OM, 24 August 1907, p.2.
74 NOT, 26 August 1907, p.2.
75 ‘Oamaru Baptist Church: Minutes of the Oamaru Baptist Church’, uncatalogued, NOM; ‘Minutes of Managers’ Meetings of St. Paul’s Church, Oamaru, from November 11 1891 to October 14 1907’, NOM, Box 2623 Shelf 27b; ‘Session Record, St. Paul’s Church, Oamaru’, Box 2619 Shelf 27b, NOM.
Perhaps their silence in North Otago indicates the desire to maintain social and religious coherence.

The rainmaking prayers and thanksgivings of 1907 demonstrate that in North Otago many people strongly believed that God remained actively involved in the natural world. The prayers also reflect changing religious beliefs. Had these prayers occurred in the middle of the nineteenth century, it is likely that a great deal of humiliation and much soul-searching would have occurred. Thanksgiving, not humiliation, greeted the end of the drought in North Otago because, by the 1900s, belief had moved away from a judgmental God towards a more beneficent Creator. From the beginning of the nineteenth century, the practice of calling special prayers like those for rain in North Otago enjoyed popularity in England and Scotland among Anglicans and Presbyterians alike. Special prayers addressed many important national issues, from drought and cattle plagues, cholera outbreaks to the health of the Prince of Wales. Increasingly from the mid-nineteenth century, however, rainmaking prayers in England and Australia were generating a great deal of criticism from the liberal Protestant intellectual elite and other social groups. In England, growing understandings of the natural world – the discovery of what would be termed 'natural laws' – were helping change notions of Providence, and in turn were leading some liberal Protestant elite and agnostics to question the efficacy of special prayers. To them, 'solutions to human problems lay with human effort rather than through the protection of the Church.' Another important reason behind the increasing criticism of special prayers is to be found in social changes occurring in England. Liberal-minded clergies, scientists and professionals challenged the wealth and influence of other clergy by criticising special prayers and the like. Although some professionals attempted to undermine the church's status and authority, and thus create a niche for themselves, some liberal clergy wanted to broaden the appeal of the church. One consequence of these changes came in 1853, when Lord Palmerston, the British Home

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81 Turner, Contesting Cultural Authority, p.158.
Secretary, limited the use of prayers to cure cholera because he believed poor sanitary conditions, not divine displeasure, explained its spread. Controversy raged over the next decades on the efficacy of special prayers, and not just in England.

In Australia in 1882, the Anglican Bishop of Melbourne, Dr Moorhouse, became embroiled in scandal when he refused to endorse prayers for rain. Moorhouse argued that ‘God indicated by His providential arrangements that it was His will that we should conserve the water sent to us in winter.’ The Australasian’s editor drew comparisons between Moorhouse’s reply and that of Lord Palmerston. Later the editor praised Moorhouse for his ‘logic’, ‘eloquence’ and ‘freedom of thought’ in supporting science against theology. The editor presented Moorhouse as expressing views that formed ‘a well-defined milestone on the road to intellectual progress.’ The editor implied that Moorhouse’s action would abolish ‘that large part of church ritual which is directed to enlist the aid of heavenly agencies on our behalf.’ Moorhouse’s views scandalised others. One resident of Victoria described the Bishop’s standpoint as ‘impious’, another as ‘hopelessly antagonistic to the doctrine of his own, and all other Protestant Churches.’ Indeed, ‘his respected lieutenant in command, Dean Macartney’ and several other clergymen took it upon themselves to hold their own rainmaking prayers in defiance of the Bishop’s view.

Although religious beliefs changed over the period of the nineteenth century, I do not wish to suggest that religious belief substantially declined. To some theists and some Christians, God was the Divine Clockmaker, and Nature a mechanised entity. Except for a small but growing minority of agnostics and atheists, these changes scarcely undermined the sovereignty of God. Science could reveal the marvellous adaptation and organisation of the natural world God created. Many ordinary folk, similarly, retained their faith in Providence, their belief unaffected by the intellectual controversies swirling above them in some élite circles.

**Explaining North Otago’s religious reaction**

Why did similar controversy not attend the rainmaking prayers in New Zealand? Most settlers consciously wanted to avoid bringing to New Zealand the class and religious conflict that was inherent in the British society they came from. Sectarian tensions certainly did exist.

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82 Turner, *Contesting Cultural Authority*, pp.154-155.
83 TA, 4 March 1882, p.273.
84 TA, 8 April 1882, p.433.
in New Zealand, but few incidents in the colony ‘spilled over into direct and violent confrontation.’

Unlike both England and Scotland, New Zealand had no state religion and therefore ‘no powerful church, supported by the state, able to dictate to and discriminate against non-adherents.’ The dominance of the state church in England over educational institutions, politics and government meant that many of the newly emerging classes in England such as lawyers and doctors had to fight against this body for power and prestige. New Zealand’s greater social opportunities enabled Catholics in nineteenth-century New Zealand to enjoy greater educational and economic opportunities than in Australia, and probably Ireland, thus reducing the potential for religious grievances in the colony. A measure of its greater religious tolerance is that in the 1880s the Stout-Vogel Government was led by a freethinker, Sir Robert Stout (1844-1930), and a non-observing Jew, Sir Julius Vogel. Later, in 1889, John Balance (1839-1893), an energetic and likeable Irish freethinker, became New Zealand’s Prime Minister. Rainmaking prayers did generate some discussion in New Zealand, but it is important to note that most came from an overseas source. The American meteorologist Clement Abbe mocked the rainmakers’ belief in the efficacy of their experiments and prayers, chiding that the Oamaru people ‘now stood ready to denounce both religion and science if rain did not follow the cannonading’. Rainmaking, Abbe fulminated, provided yet ‘another illustration of the waste of public money consequent upon popular ignorance and superstition.’

According to James Belich, scientific rationalism formed ‘a strong secular element in New Zealand’s moral ideology.’ Yet, this secularising aspect of science may be overstated. One way to avert inflaming religious tensions involved the avoidance of religious language in scientific papers. Avoidance of religious language did not mean that most scientists had suddenly renounced religion, rather that they now practised their faith in private. The

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90 Stenhouse, ‘Sectarian Conflict’, pp.8-12.
91 Thanks to John Stenhouse for the information on Ballance.
93 Belich, Making Peoples, p.165. On further examples of the assumption that science and rationalism brought about secularisation in New Zealand, note Stenhouse, ‘God’s Own Silence.’ On this topic in a wider context, see Numbers, ‘Science without God’; Brooke, ‘Science and Secularization’, pp.229-238.
94 Stenhouse, ‘Battle’.
Government Meteorologist sent to observe the rainmaking experiments, Rev Bates (Photograph 5.3), is an interesting exception. Bates was an ordained Anglican cleric and a Government Meteorologist, who later served as the director of meteorology (1908-1927). On 18 August 1907, Bates preached at St Luke’s Anglican Church’s morning and evening services, choosing for his evening service: “Thy mercy O Lord is in the heavens and Thy faithfulness reacheth unto the clouds” (Psalm xxxvi., 5). Bates presented a theistic interpretation of clouds. As objects of beauty, clouds glorified the Divine, he observed, and reminded mankind of the wonder of the Resurrection. Clouds underlined God’s ‘wise design’ of the firmament, continued Bates, illustrating that God had ‘fitted the earth to be the home of organic life.’ Indeed, said Bates, ‘Nature’ was ‘a book written in cypher by the finger of God’, a book which imparts:

“all the lore its scholars need

Pure eyes and Christian hearts.”

God had created clouds so as ‘to give pleasure to man.’ According to Bates, they ‘spoke of the Divine mercy and faithfulness... [and] were also types of sorrow, sin, and forgiveness.’ Just as clouds rose ‘from various places...in glory and purity: so might humanity be glorified in the resurrection, and, though poor and weak and sinful now, be numbered amongst those who stand around the throne of God.’ A theistic sermon about clouds preached by the future head of the country’s meteorology branch indicates that historians have underplayed the role of religion in early twentieth century New Zealand science. Equally, the assumption that rationalism automatically precludes religious sensibility must be questioned.

Approaching the drought: environmental learning, change and stability

The North Otago drought of 1906-7 brought changes to farming practices. Dairy farming, which suffered severely during the drought, virtually disappeared from the region and only recently has re-emerged. Irrigation networks and fertilizer use also increased. Other suggested changes, including tree planting to encourage rainfall and the adoption of dry farming techniques failed to be widely implemented. Their failure indicates the popular limitations of environmental learning. Earlier, extreme climatic events in New Zealand also had caused land use changes. The 1895 snowstorm, which swept through the South Island, for

95 OM, 19 August 1907, p.2.
96 Dairying began in North Otago in November 1883 with the opening of a cheese factory at Weston by the Waireka Dairy Factory Company. In the 1890s and 1900s a succession of local and outside companies variously established creameries or went out of business. For instance, in 1892 the New Zealand Dairy Supply Company of Dunedin established a co-operative butter factory at Oamaru and Hampden, quickly followed in 1894 by proprietary ones at Enfield and Reidston. McDonald, Whitestone, pp.185, 214-215.
Photograph 5.3 Reverend D.C. Bates, the government meteorologist sent to observe the 1907 rainmaking experiments.

instance, highlighted the problem of overstocking. As chapter four has demonstrated, extensive periods of drought, likewise, often heightened fears of human-induced climate change caused by deforestation.

Bates believed that deforestation had caused climate change in North Otago, and thus could ‘be combated [sic] on scientific lines’ through tree planting. Bates drew attention to archaeological evidence from the region that indicated North Otago’s wetter climate, since, he wrote, ‘[i]n ancient times ... long before European settlement, trees seem to have flourished in the Oamaru district’. He recommended planting ‘larger and more varied plantations’, especially ‘in belts intercepting the northwest and southwest winds’, to ‘act as shelters and windbreaks’, and to ‘conserve the rainfall which now runs off in floods or evaporates in hot, dry weather.’ Although Bates avoided the question of ‘[w]hether forest trees increase the rainfall or are themselves the result of an abundant precipitation’, he nevertheless upheld their influence on climate. Deep-rooted trees, he explained, ‘prevent surface evaporation by the winds, but also, as they transpire freely in the summer, create a beneficial humidity in their neighborhood [sic]. The excessive heat of a bare, sun-baked soil drives away the rain from a drought-stricken district and thus diminishes the “probability of rain”.’ Bates’ confidence that tree planting brought rainfall appears curious given his strong view that farming techniques should be adjusted to the climate of a region (see below). However, as he indicated in a public lecture on meteorology given in Oamaru, he felt that tree planting could only bring about local climatic changes rather than significant changes in a region’s climate.

As the previous chapter demonstrated, the forests-rainfall link enjoyed a great deal of popularity among foresters and the public alike and led to the establishment of climatic reserves and forestry departments throughout the world. By the early twentieth century, however, increasing doubt was being thrown on this theory both overseas and in New Zealand (chapters four and seven). In the United States, engineers and meteorologists, including Clement Abbe, were vocal critics of the forests-rainfall link as well as the idea that forests controlled flooding and soil erosion. In New Zealand, by the 1910s, most professionally

\[97\] McDonald, Whistestone, pp.210, 217.
\[101\] ‘Except where local changes in physical conditions had taken place, as in the case of tree planting on the Canterbury plains...there could be no real change in the climate.’ NOT, 21 August 1907, p.4. Bates’ other publications do not mention the forests-rainfall link. Bulletin No. 9: Meteorology in Relation to Farming, [put out by New Zealand Department of Agriculture, Divisions of Biology and Horticulture] (Wellington, 1905); Meteorology of New Zealand: Supplied to schools for school purposes by the Education Department [pamphlet taken from New Zealand Year-Book] (Wellington, 1912).
trained scientists had dismissed the forests-rainfall theory outright, although they supported the influence of forests on erosion and flooding. Yet, two prominent New Zealand meteorologists, Bates and Meeson, continued to promote this idea, perhaps a reflection of their non-professional training in meteorology.

Bates also advocated environmental learning, for, he noted, although ‘our seasons are usually so temperate, regular, and fruitful’, drought showed that ‘climatic variations are of the greatest concern to the colony’. ‘We are only a young country’, he had declared to the Mail, ‘and have perhaps tried to follow the Old Country too closely with regard to our productions. We have many things to learn with regard to plants most suitable to the soil and the climate.’ Bates recommended that North Otago farmers cultivate ‘species of crop best suited [to] a dry climate’. They could learn much from South African and North American farmers, he noted, who cultivated land in arid areas. Use of South African and North American examples reinforces the environmental links connecting New Zealand to the rest of the world (chapter eight). The tenor of Bates’ message, that its farmers struggled to maintain agricultural productivity because their farming practices did not suit a semi-arid region, challenged not only the popular image of New Zealand as a well-watered and temperate land. Bates threatened the very ideological taproot upon which the prosperity of New Zealand was founded: its agricultural potential as a neo-Europe. Bates feared that farming practices still had not adapted to the soil and climate of a new country. Others shared his views. In June, 1907, for instance, The Oamaru Mail reproduced a two-column story on dry farming in the Rocky Mountain West, indicating that this technique should be considered in North Otago. Climatic extremes thus forced some to re-evaluate existing agricultural practices and to recognise the need to adopt methods better suited to the region’s environment.

Most North Otago farmers did not follow Bates’ advice about dry farming, and it is difficult to find out whether tree planting resulted from his suggestion. Instead, they turned to

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106 Bates quoted in OM, 13 August 1907, p.4.
irrigation and artificial fertilizers to maintain agricultural productivity. These were popular choices because they did not force the significant change which dry farming techniques would have required. As noted in this thesis, these changes in agricultural methods originated in settlers' views that a productive, farmed landscape, fertilized by plentiful rainfall, figured as the norm. Anything else, particularly a droughty, unproductive environment exemplified its antithesis and, more than that, a moral failure, since cultivation stood for the apogee of a civilized, Christian society. As this chapter shows, these cultural assumptions underpinned a variety of environment actions, from determination to 'restore' treeless areas and sand dunes to fertility, to devotion to green city spaces and increases in rainfall through tree planting. For settlers, expecting a productive and well-watered landscape, the drought of 1906-7 seemed an aberration, but it was one which they later would realise actually formed a regular part of this region's climate.

**Conclusion**

Reactions to drought offer the opportunity to investigate the variety of responses elicited by environmental anxieties. In the nineteenth and twentieth centuries, drought gnawed away at the confidence of some farmers and public alike and nowhere more so than in the South Island provinces of Canterbury and Otago. These provinces, the powerhouses of the nineteenth century New Zealand economy, relied on abundant rainfall for the production of grain, meat and milk. In 1906-7, drought struck North Otago, severely curtailing agricultural production. For succour from these harsh conditions, residents of North Otago turned to rainmaking prayers and rainmaking experiments. Special prayers thanking the Almighty for the end of the drought show that for many North Otago Protestants God remained directly involved in the natural world. In contrast to the widespread acceptance of rainmaking prayers in North Otago by commentators from around New Zealand, rainmaking experiments, involving the detonation of explosives atop hills to attract rainfall, attracted the opprobrium of meteorologists and some newspapers. Rainmaking reveals much about New Zealand's society and its religious and scientific institutions. It also offers a fascinating way of exploring contested notions of science in a European settler society such as New Zealand. While local residents enthusiastically embraced the bombadeering, meteorologists led the criticism of this

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by decrying it as unscientific and amateurish. This reflected attempts by meteorologists to increase the legitimacy of their own profession by criticising the amateurism of non-professionals. Residents of North Otago viewed prayer and experiment, religion and science, as complementary activities designed to meet the same ends. D.C. Bates, meteorologist and clergyman, neatly exemplifies that, to many in early twentieth-century New Zealand society, there was no distinctive, hermetically sealed division between the secular and the profane, or between science and religion. Science and religion were not mutually exclusive fields, locked in battle for the minds of modern Westerners. The continuing strength of religion and science question two dominant paradigms about New Zealand society: first, that scientific rationalism was automatically antipathetic to religion and, second, that by the early twentieth century New Zealand scientific ideas were secularising society. Certainly, for some agnostics and a smaller number of atheists, scientific ideas allowed them to question religious belief. For the vast majority, however, Christianity remained important and relevant to their lives. Rainmaking also has a wider relevance outside New Zealand. As this chapter shows, other societies, such as those in England and Australia, undertook similar prayers and experiments yet responded to them in very different ways. These differences reflected the special social and cultural characteristics of each country and, in New Zealand’s case, its greater religious tolerance and social opportunities compared to those of the other two societies.

Drought also encouraged changes to existing farming techniques, including the use of dry farming methods, tree planting, fertilizers and irrigation. In suggesting dry farming methods, some settlers rejected the dominant image of New Zealand as a fecund and well-watered land ideally suited to European agricultural practices. They took an important step in recognising that not all of New Zealand enjoyed regular rainfall. Just as fears about climate change and sand drift, rested on expectations of a productive, well-watered land, so did they in North Otago. Most settlers simply could not accept that North Otago was not temperate or fecund. A number of agricultural developments bolstered this long-held view. Improved fertilizers allowed agricultural techniques to remain unchanged. Tree planting offered another way of improving the droughty North Otago interior by encouraging rainfall to the region. As with the episodes surrounding the North Otago drought of 1906-7, studying particular environmental events adds colour and complexity to historical assumptions about religion and rationalism, secularism and science, humanity and environment. They illustrate that local

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environments sometimes challenged established environmental expectations. This complexity is further explored in the next chapter, which unfurls environmental anxieties surrounding the spread of shifting sands in New Zealand.
Chapter 6: ‘[H]elpless witnesses of the destruction’: sand encroachment in New Zealand

If many people thought that deforestation would bring drought and climate change to New Zealand, a number of scientists and politicians feared it would increase sand drift and destroy New Zealand’s productive pastures. Employing the same rhetoric of fear as climatic and catchment conservationists (see chapters four, five and seven), they viewed spreading sand as an ‘evil’ imperilling New Zealand’s fertile plains and prosperity. Dating from the 1870s, many scientists implored government to intervene and rid the land of the worst of this problem. Only after 1903, with the Sand-drift Act, did parliament officially recognise this problem. Earlier, local councils and other voluntary organisations, sometimes with government support, had taken local-scale action to arrest shifting sands. This string of local-level initiatives effectively continued with the 1903 Act. With a few exceptions, and contrary to the experience of drainage (see chapter one), provincial governments did not address the problem of shifting sands, possibly because its impacts, although significant, were local in scale. While conservationists highlighted the potentially devastating consequences for the nation’s agriculture, much of the action against sand-drift actually took place in urban areas threatened by encroachment. When it came to reclamation, areas of closest settlement had an advantage over less densely populated areas. The former areas generated more rating revenue than the latter and thus could contribute more to reclamation. Densely populated areas also had more people and expertise available to organise reclamation work. Although on paper the 1903 Sand-drift Act increased the role of government in arresting shifting sands in partnership with local authorities, its passing did not stop local recovery measures. Government also commissioned scientific reports on the extent of, and likely solutions to, sand drift. This reflected the Liberal Party’s increasing reliance on scientific solutions to problems and its belief in the powers of rational action to overcome environmental challenges. Rational action, in the form of scientific reporting that defined the problem and legal proscription that alleviated it, did not translate into success. Neither the resources nor the necessary
will existed to translate these policies into action. Although still hampered by lack of funds, only after 1914 did government action enjoy any success. As scientists of Wellington’s Philosophical Institute had done in highlighting climatic and catchment concerns (chapters four, five and seven), so they played a similar role in highlighting the problem of sand drift. As with these other concerns, too, scientists and legislators looked to human action as the cause of, and the solution to, such problems. Beginning with a discussion of the extent of shifting sands, this chapter then moves onto a discussion of local and national reclamation efforts.

**Sand dune ecology**

Sand dunes border approximately 1,090 km of New Zealand’s estimated 11,000 km long coastline.¹ These sands originate from coastal or upland erosion, when rivers brought to the coast great volumes of eroded material. Becoming trapped by the shore current, this material accumulated with other deposits. Winds then blew this sand inland, forming it into dunes.² Although considerably simple in comparison to other ecological associations, thanks largely to New Zealand’s lack of browsing animals and plant specialisation, in pre-European times sand dune areas supported vegetation adapted to micro-climatic sites.³ In an idealised example of the natural stabilisation of a sand dune in pre-human times, pingao (*Desmocycus spiralis*) would be a pioneer plant, helping to build up a foredune. Its seeds would then entangle in driftwood above the high water mark, perhaps germinate under favourable conditions, and eventually stabilise the dunes. Next, silvery sand grass (*Spinifex*) would lodge among the pingao, gradually overtaking the former until it totally covered the foredune.⁴ Depending upon soil and climatic conditions, larger trees would eventually grow.

The arrival of humans in New Zealand changed these processes. Although ecologist W.J. Wendelken contends that Māori settlement ‘had not appreciably affected

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⁴ Whitehead, ‘Sand Dune Reclamation’, p.150.
the natural balance’ of sand dunes, the author actually contradicts his argument by also arguing that Māori ‘brought about significant changes in native vegetation’. Subsequent research has highlighted the significant impact Māori made on the natural environment. Aside from sometimes causing species reduction and extinction, Polynesian deforestation, which reduced the forest cover to approximately half that of pre-European New Zealand, also caused soil erosion and most likely also affected coastal dunes. From the nineteenth century onwards, European agriculture, grazing animals, and deforestation, appreciably increased this disturbance. This, essentially, is the process recognised by many of the following observers and scientists.

**Views of sand dunes as unproductive environments**

Europeans knew of sand dunes from their initial exploration of New Zealand. Their descriptions reflected the pervasive belief that sand dunes, like other agriculturally unproductive areas, required the hand of civilisation to improve them. Sand dunes embodied the very notion of waste that so many European writers deplored. One can see this idea referred to in the name explorer James Cook gave in 1769 to Northland’s coast: the ‘Desert Coast’. Many other inland travellers also referred to the spread of sands. In 1820, Church Missionary Society (CMS) leader, the Rev. Samuel Marsden (1765-1838), encountered high, shifting sand dunes along the west coast of the North Island. In 1843, the German naturalist, Ernst Dieffenbach, referred to sand drift in Kaitaia, northern New Zealand. According to Dieffenbach, ‘[t]he destruction of the forest, which was a barrier to the encroachment of sand, has sealed the doom of this northern part of the island’. ‘Evidence that this overwhelming sand-drift’, he continued, ‘is of a modern date, and is owing to the destruction of the forest, may be seen on the western coast.’ He described small oases of vegetation protruding twenty to thirty feet above the sand as evidence of

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9 Whitehead, ‘Sand Dune Reclamation’, p.147
its rapid drift.\textsuperscript{11} Dieffenbach clearly linked the activities of timber cutters and settlers with the increasing spread of sands. Other writers confirmed the spread of sands. In 1849, within a year of Ngati Awa leaving Waikanae for their ancestral home of Taranaki, sand had blocked the windows on one side of their abandoned church.\textsuperscript{12} And, in 1868, settler Robert Pharazyn noted the ancient remains of a forest since covered by sand drifts near Dunedin.\textsuperscript{13}

When on 25 September 1872, C.D. Whitcombe addressed the Wellington Philosophical Institute on New Zealand’s problem of shifting sands, people had been aware of it for some time. Whitcombe pointed out that for Taranaki, for New Zealand’s west coast generally and possibly even for the east coast, ‘reclaiming land devastated by the encroachment of sand is one of the greatest importance’. The north to south and south to north tide, allied with rivers bringing ‘loose virgin soil’ downstream, he warned, would increase river bars and impede river navigation. Sands, he continued, ‘choke up the smaller streams’, forming ‘swamps and marshes along the line of their course’. If left unchecked the inland drift of sand would create ‘ever-increasing areas of desert land.’\textsuperscript{14}

Were anyone to doubt his message, Whitcombe presented an image designed to rattle the confidence of any Victorian eyeing the agricultural and pastoral potential of New Zealand. Employing a language of fear, he wrote: ‘Everyone can see with their own eyes the rapidity with which ... land is drifting in this [Taranaki] province and elsewhere in the colony from fruitfulness to desolation.’\textsuperscript{15} This message was particularly appalling for, as chapter seven shows, settlers and propagandists popularly presented Taranaki as a veritable Garden of Eden. What could be done to save it?

The French Government passed legislation that aimed to check sand drift, noted Whitcombe. And, he noted, it seemed to work. In 1807, observed Whitcombe, the French Government had granted settlers free land affected by shifting sands in return for tree planting and reclamation. In 1833, if settlers chose not to purchase land, the French

\textsuperscript{11} Dieffenbach, \textit{Travels in New Zealand}, Volume 1, p.201. See also p.207.
\textsuperscript{13} Gadgil and Ede, ‘Application of Scientific Principles to Sand Dune Stabilization’, p.133.
\textsuperscript{15} Whitcombe, ‘On the Reclamation of Land’, p.111.
Government had the option of buying back and reclaiming land. As with arguments about the effects of deforestation on aesthetics, climate and waterways, Whitcombe employed a highly alarming rhetoric which challenged images of New Zealand's fecundity. Like these other processes, he believed the process of sand drift threatened New Zealand's economic and agricultural management. As with many of these authors, Whitcombe appealed to the New Zealand Government to stop this problem, seeing sand drift as national problem. As noted in previous chapters, many writers agreed that environmental problems needed to be addressed but, instead of viewing it as the prerogative of national government to do so, they saw measures taken by local and provincial authorities as sufficient to meet this problem. In the end, as noted below, government reached a compromise between local and government plans.

Whitcombe pursued his campaign beyond the confines of the Transactions. He published a two-page letter to the Legislative Council, New Zealand's upper house. Whitcombe repeated the argument he used in his earlier article, that drifting sand formed bars at river mouths, that it choked up smaller streams, and that, if left unchecked, its advance would turn increasing areas of New Zealand into a desert. He also discussed French legislation, and the most appropriate system of planting. While his letter appeared in the parliamentary notes for that year, it seems to have had no legislative impact.

Around this time, other authors were beginning to campaign for sand-drift prevention. In 1873, a year after Whitcombe's appeal, two articles on sand drift appeared in the Transactions. One, an abstract of a paper read before the Wellington Philosophical Institute, reproduced a letter most probably written by William Keene, Inspector of Mines to the Government of New South Wales. Though Keene listed the most suitable plants for reclamation, he did not use the strong discourse of sand drift to argue for reclamation. The other paper read that year by Thomas Kirk, the future Conservator of Forests (1886-7), went further than Keene's. Presented to the Auckland Institute, Kirk made an impassioned plea for reclamation, conveying an overwhelming sense of the alarm.

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17 Whitcombe to Carrington, New Plymouth, 26 August, 1872, Journals and Appendix to the Journals of the Legislative Council of New Zealand, 16, 1872, pp.1-4.
It would ultimately prove advantageous to the Colony if a small portion of the money now being spent on public works could be applied to the reclamation of sand wastes. The magnitude of the evil to be remedied is admitted by all who have paid the slightest attention to the subject. In several localities the natives are compelled, year by year, to abandon their cultivations as the sand-wave advances, and settlers are helpless witnesses of the destruction of their paddocks from the same cause. Fences, large trees, and patches of bush, have been overwhelmed within the memory of settlers of comparatively recent standing, and, in some cases, still more serious injury must result unless preventive measures are taken. The danger is not confined to any one district or province; it is general, and demands prompt attention.\(^9\)

Kirk employed rhetoric even more impassioned and alarmist than Whitcombe had. Settlers looked on, he argued, ‘helpless witnesses’ to the ‘evil’ of sand drift, an evil which ‘is general, and demands prompt action.’ Kirk played up the economic threat posed by deforestation, echoing arguments used by supporters of climatic and catchment conservation (chapters four, five and seven). Members of the Wellington Philosophical Institute, among which Kirk numbered, read five of the six papers published in the Transactions on sand drift (Kirk read the other — at Auckland). As chapter four highlighted, Kirk, and other Wellington naturalists such as G.W. Williams and William Travers, were deeply troubled about the impact of humans on the New Zealand environment.

Williams’ paper, read before the Wellington Philosophical Society on 27 September 1879, appeared as an abstract in the Transactions that same year. Williams addressed ‘the evil results arising from the indiscriminate destruction of the forests, especially at the head-waters of our rivers ... its climatic affect’, and ‘drew attention to the large sand-dunes which might be advantageously fixed by planting.’\(^{20}\) Williams brought together concerns about climate, catchment and sand drift.

Two years later, in 1881, Travers presented to the Wellington Philosophical Institute a paper on the sand dunes of Wellington Province. Travers believed sand dunes north of Paekakariki (on the west coast of the lower North Island) increased most probably because of two reasons. In his opinion, this occurred either through human-instigated deforestation or grazing and burrowing animals which had disturbed plant growth and thus destabilised the dunes. Travers’ informant, missionary Octavius Hadfield related that ‘the sands of the dunes between those [Otaki and Ohau] rivers are advancing inland at a rapid rate and threaten great injury, unless effectual steps be taken to prevent it.’ According to Travers, ‘the inland advance of dune sands may be traced to man’s interference with natural operations’. He seems to have been well read on the subject of sand drift, for he quoted from G.P. Marsh on the advance of sand dunes in Prussia caused by deforestation. Travers also referred to the rapid advance of dune sands on France’s west coast, in an area between Adoyr and the estuary of the Gironde, an example he had discussed two years before when debating Williams’ paper.

The model of French sand reclamation

By the time members of the Institute recognised the problem of shifting sands, France’s government and engineers already had invested a great deal of effort and expense in reclaiming sand drift areas. In southwest France, in the département of Gascony, a 240 kilometre belt of inland coastal dunes endangered farmland and forests. Earlier, sand had engulfed an entire village. Inland from Gascony, the landscape of Les Landes appeared to be a malarial morass of marshlands, its inhabitants and lowly shepherds reportedly reaching their flock in swamp areas on crude wooden stilts. Under the direction of engineer N.T. Brémontier, coastal dune stabilisation in Gascony and parts of Les Landes began in the late eighteenth century. It continued into the nineteenth and was largely complete by 1817. In that time, the face of the countryside was irrevocably altered. Out of the marshlands, dune stabilisation, afforestation (principally in pine) and

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22 Travers, ‘Remarks on the Sand Dune of the West Coast’, p.90.
drainage created an area of 320,000 hectares, suitable both for agriculture and forestry. Until 1900 an official (Gardes cantonniers de la dune) was responsible for the maintenance of dunes. Other European states, like Denmark, Prussia, Hungary, southern Russia, and Britain faced similar problems of coastal and inland dune encroachment, and solved them using methods matching those used in France.

Members of the New Zealand Institute referred to shifting sands in France for three reasons: to emphasise the potential threat sand drift posed to New Zealand; to stress that redemption from this ‘evil’ was possible; and, finally, to lend authority to their arguments. In referring to the inland advance of dunes in France, Travers warned: ‘of populous and fertile districts having by this means been converted into barren wastes.’ Kirk likewise described the process of sand drift. ‘In the Gulf of Gascony’, he related, ‘immense wastes of trackless sand were utterly destitute of vegetation, and during violent storms exhibited a complete change of surface, hills becoming valleys and valleys taking the place of hills, the sand being gradually carried into the interior, and covering cultivated fields, villages, and entire forests.’ Yet, as humans had turned the garden into a desolate waste, so could they redeem it. ‘This process of devastation has been completely arrested,’ wrote Kirk confidently, ‘and thousands of acres of former sand-waste now yield a handsome revenue, and support a considerable population.’ Kirk, and his colleagues concerned about sand drift, deliberately pitched their argument. They emphasised the potential threat posed by sand drift to settlers’ vision of New Zealand and its future greatness as an agricultural nation. And, what is more, they stressed, reclamation could make the Government money.

29 Travers, ‘Remarks on the Sand Dune of the West Coast’, p.90.
The battle against sand drift

Notwithstanding these pleas, sand drift continued to menace settlers. No greater threat could be posed by shifting sand than that described in an article published, in 1898, in the New Zealand Farmer. As keeping new land weed free and preventing rivers washing soil away have become difficult, related the article, so 'in some places the sandhills have come to be looked upon as an enemy that has to be battled against'.

Personified as an adversary, the article related how a farmer won the 'battle' against sand drift on his Okehu (near Wanganui) property. Writing about his victory, John Handley confessed 'to a sense of relief in leaving the depressing influence of the sandhill wilderness and felt doubly glad that the fat pastures and rich wheatfields could be shielded against the grey invader.' This last sentence reveals a great deal about this farmers' attitude towards nature and probably also typifies contemporary settler attitudes towards certain environments. As the introduction to this thesis established, most Europeans viewed wilderness, or as they frequently termed it, wasteland, as an unnatural state into which land had fallen. Leaving land waste also broke Biblical injunctions of productively using land. Handley therefore felt relieved at having redeemed this 'fallen land' from its par cus state of waste. Farmers, he warned, could not rest on their laurels until the threat had totally disappeared. Constant vigilance was required, noted Handley, lest the 'grey invader' attack the 'fat pastures and rich wheatfields.' Handley's attitudes also reveal an ethos of environmental protection and care that many farmers shared: they were concerned with maintaining production and long term land quality. Personifying sand drift as an enemy also extended further the common metaphor of sand drift as an evil, and gave urgency to removing this threat. Echoes of such militaristic endeavour resonated into the next century. In the 1930s, New Zealand farmers would 'battle' yet more plants and animals in an attempt to bend nature to meet human will. Militaristic struggles against nature, in extreme form overseas, led to some especially environmentally damaging policies.

32 For instance, Williams, 'Remarks on Forest Planting and Conservation', p.429.
33 'Sandhill Fighting at Okehu', NZF, 18, 119 (November, 1898), p.392.
34 'Sandhill Fighting at Okehu', p.393.
35 On New Zealand, see Michael Roche, 'The State as Conservationist, 1920-1960: 'Wise Use' of Forests, Lands, and Water', in Eric Pawson and Tom Brooking, eds., Environmental Histories of New Zealand,
Sand as a health resort?

In contrast to the tenor of most writings on sand drift, in 1891, M. Murphy presented before the New Brighton Improvement Society a confident and grand plan for the continued reclamation of sand in the New Brighton area, near Christchurch. Optimism pervades Murphy's report. Instead of howling wastes crying out for reclamation, Murphy, while admitting that 'there are drawbacks' to the area, presented New Brighton as somewhere on which 'nature has ... been lavish of her gifts.' It 'has one of the finest beaches in the world', he pointed out. It had a river 'teeming at times with native fish' and 'a salubrious clime never too cold or too hot and always invigorating'. 'Now all that Mother Nature requires at your hands is that you will do your part and complete the picture', concluded Murphy in his introduction. As chapters one and three show, Europeans valued coastal areas for their health-giving and restorative properties and believed that human engineering could enhance nature. Murphy tapped into these ideas when promoting New Brighton.

Murphy praised the efforts of the Society in reclaiming sand areas at New Brighton. He held up the French sand reclamation in Gascony and the recommendations of Ferdinand von Mueller, Victoria's botanist (see chapter eight), as models of dune reclamation that the Society ought to adopt. For New Brighton's reclamation, Murphy recommended planting native and non-native grasses for binding (such as Spinifex hirsutus and Lathyrus sylvestris). Wooden walls, he elaborated, would block out sand, while shelter pines and grasses could be used for reclamation. His report went beyond planting recommendations. He advised, for instance, that the £4000 loan for road building in the area would be wasted unless it also was spent on sand reclamation. He suggested that district and city council planting should be resumed and perhaps transferred over to the authority of the Improvement Society. He recognised that, unless they were properly tended, plantations would be inundated by sand. In Murphy's opinion, this job best fell to the lot of older unemployed men. His recommendations did not stop


Murphy, pp.143-148. Murphy also read a paper on French sand recovery by General F. Cotton, 'Notes on Sowing and Consolidation of the Dunes or Coast Sand-Hills of Gascony', Royal Agricultural Society's Journal, XI, 1875, quoted in Murphy, pp.145-146.
there. He advised the Society to apply for a low interest Government loan to commence reclamation work, and strongly urged the establishment of Arbor Day in New Zealand, pointing out the impetus this gave to tree planting in the United States. Murphy's vision was, indeed, grand and involved private and public money. It also was voluntary. He believed a local improvement committee could improve the progress of a local area. As chapter four shows, Arbor Day was introduced into New Zealand on a nation-wide scale in 1892, the year after Murphy penned his suggestions.

**Improvement societies and sand reclamation: urban reclamation**

In cases outside Brighton, the government sometimes formed local urban bodies to combat the problem of shifting sands. In Dunedin, in 1884, management of the sandhills was beyond the resources of the municipal council. The government therefore formed the Ocean Beach Domain Board to manage the sandhills of this public reserve. In 1891, continued lack of funding and property threatened by imminent sea encroachment led the local MHR, Henry Fish, to constitute a new Domain Board. This consisted of elected members, who were to oversee reclamation. In 1892, the Ocean Beach Public Domain Act passed, giving the board, with the assent of burgesses, the authority to raise a loan of up to £10,000. Later, in 1894, it was amended to enable it to set rates, though only with ratepayer approval. In this decade, the Board not only drew up reports on the problem but also planted marram grass, trees and lupins. By early 1900 with the help of a government vote of £100, it had extended the plantings and fencing. By 1901, the Board could raise up to £20,000, evidence of the strong desire to find a solution to sand drift. Elsewhere in Dunedin, the story was mixed. Chalmers' MHR, E.G. Allen, noted proudly that Road Board planting had largely arrested the spread of sand over the road between Musselburgh and Tomahawk Lagoon. Further down the Peninsula, near Tairoa Head, he observed, planting marram grass had failed; sand 'has covered up an entire farm to a very great depth'.

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38 Murphy, 'Possibilities', pp.148-149, 151-152.
41 'Ocean Beach Domain Board', 1/1, DCCA.
43 Allen, 28 September, 1903, NZPD, p.7.
If a mix of government and local action stimulated reclamation attempts in Dunedin, then voluntarism characterised the efforts of a local, rural community further up the coast. During debate on the Sand-drift Bill of 1903, Southern Maori District MHR, Tame Parata (1832?-1838?-1917), described the formation of an improvement society in Waikouaiti (approximately 30 kilometres north of Dunedin) in order to protect ‘a peninsula from being cut off by the sea from the mainland’.

By collecting money and receiving help from other settlers in the district, he related that the society spent over £230 on protection measures. These included ‘a fence about 8 ft. high’ and an embankment fenced in with scrub and sown with marram grass. The Society planted a mixture of native and exotic plants, including lupin and marram grass. It ‘even went to the expense of bringing native plants from Stewart Island and the Chatham Islands’ to introduce into Waikouaiti. On Arbor Day, Māori and schoolchildren sowed these plants. Now, Parata noted proudly in 1895, toetoe and marram grass grow well there. ‘[A]ll along the South Island’, though, he observed, ‘sand is drifting on to the valuable land, and it wants to be arrested.’

Private planting, then, had successfully arrested the inland spread of coastal sands in Waikouaiti. Planters also took advantage of the opportunity of Arbor Day to use local schoolchildren to plant out the area. ‘The result’, Parata concluded, ‘was the formation of a sandhill along the line of fence which prevented the seas from coming through and into the Waikouaiti River’ upon which a road was built.

Parata detailed the process of reclamation and the reasons for its development. ‘In the early [eighteen] “forties”’, described Parata, ‘the [now reclaimed] land used to be covered with flax and pingao, and toetoe-grass, and Mair patiti.’ The end of whaling in that decade, he continued, brought cattle to the area, which ‘killed the native grass’, loosened the soil and allowed the sea to take possession. Parata’s vivid portrayal of this ecological process is unique among his fellow parliamentarians and gives a real sense of the rapid ecological change grazing animals brought to sand dune areas. More particularly, it demonstrates that, by the early twentieth century, the resource loss faced by Ngai Tahu through over fifty years of land purchases had severely decreased their

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44 The voluntary nature of the committee is emphasised by the words of Tame Parata, who related how citizens ‘formed ourselves into an improvement society’ Parata, 28 September 1903, NZPD, p.13.
45 Parata, 28 September 1903, NZPD, p.13.
46 Parata, 28 September 1903, NZPD, p.13.
people's access to resources. A tribe faced with increasing economic hardships and possessed of a reduced land area, therefore, desperately did not want to lose any more land. Like some of the other tribes discussed in the introduction and in chapter two, economic necessity forced them to cultivate and secure relatively marginal land in order to maintain a resource base.

**Government aid in reclamation: the 1903 Sand-drift Bill**

In some cases, as in Waikouaiti, voluntarism provided the basis of reclamation. In others, it relied on a mix of government and local efforts. In an attempt to bolster local efforts, on 28 September 1903, the Native Minister, James Carroll (1857-1926) introduced into the House of Representatives the Sand-drift Bill. This targeted the spread of sand dunes onto agricultural land by empowering the Minister of Lands to delegate to local councils the necessary reclamation work. Under the proposal, settlers assumed the burden of paying for reclamation on their own land, but could appeal against any decision to a Stipendiary Magistrate, who, in conjunction with two Assessors, would then reach a decision.

During debate on this bill, parliamentarians agreed that sand drift was an evil that imperilled the agricultural and economic prosperity of the country. These men drew on alarming rhetoric to illustrate the nature and extent of the problem. Reclamation works, they also pointed out, offered the nation salvation, and profit. Parliamentarians discussed many examples of sand drift in New Zealand. Their discussion suggests that the problem had worsened since its recognition by explorers and settlers in the previous century.

Reports on sand drift in New Zealand, like those on climate change and soil erosion, became relatively commonplace by the early twentieth century. As with the problems of climate change and soil erosion, sand drift appeared to be a human-caused

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48 Carroll, 28 September 1903, NZPD, p.4.
problem that could be remedied through human action. Debate on the Sand-drift Bill opens a fascinating window onto the awareness politicians had of the problems posed by shifting sands, and on the general shift towards state intervention that had occurred since the idea was first posited. Furthermore, these accounts acknowledge that sand drift not only threatened agricultural land but also affected urban areas. As historical geographer Eric Pawson observes, environmental historians often overlook urban areas.\textsuperscript{49} As noted in the introduction, natural events such as snowstorms and climate change, fires and flooding, could imperil urban areas as much as agricultural communities.\textsuperscript{50}

In introducing the Sand-drift Bill, Carroll referred to the economic loss of lands ‘covered by drifting sand’. Sand encroachments ‘over an area of several hundreds of acres’, he noted, had turned land valued at £15 or £20 an acre into worthless wastelands. On the west coast of the North Island, he said, ‘the area of good land covered by drifting sand’ had increased in five years from 300 to 600 acres. ‘[A]crees and acres of land [are] being covered up in this way both in the North and South Island’, warned Carroll. ‘It is, therefore, becoming a serious question, especially in view of the fact that owing to settlement and cultivation our natural forest-growth is disappearing and consequently our lands are being rendered more exposed to the prevailing winds than they were before.’ According to Carroll, the land between Wellington and Paekakariki had become ‘nothing more or less than a long series of sand-hills or sand wastes’. With no forest arresting the inland spread of sands, ‘the danger of the valuable tracts of land lying along the coast being covered with sand is increasing every day.’\textsuperscript{51} To add credence to his argument, Carroll quoted from an article printed in the \textit{Edinburgh Review} on the evils of deforestation and sand drift: “‘The unfortunate experiences of Central Asia, which was once a garden of fertility and is now a desert peopled by nomads only, are repeating themselves [elsewhere in the region].’” Thanks to deforestation, observed Carroll, drought and flooding alternated in a cruel cycle of degradation. Carroll asked rhetorically:

If so much devastation and desolation has taken place in Russia, where the sand in one instance has covered eight hundred square miles, and has blocked up rivers, and rendered them absolutely dry, what must happen to our country in time? The same results will assuredly follow if no step is taken to check the moving sands which lie along our coast-line, and, on the principle of "a stitch in time saves nine," the earlier we set ourselves to the task of coping with this difficulty the quicker it will be overcome, and the more assuredly shall we reap the benefit. Besides, it will be far less costly to deal with the matter now than it would be later on.

In a potent brew of alarming rhetoric and salvationary bombast, Carroll drew terrifying contrasts between what could eventuate in New Zealand and what had happened overseas. He linked New Zealand's future economic potential with the eradication of sand dunes. According to him, sand drift threatened the individual farmers whose land disappeared and 'by the damage done to its assets', the colony as a whole.

The reception to the Bill

The Bill received a positive but critical response among MHRs. Only one, R.M. Houston (Bay of Islands) disagreed with W.H. Field (Otaki MHR), who spoke for most when he noted that 'the object of the Bill is a highly meritorious one, and the time has certainly come when this great evil should be dealt with'. As with almost all other MHRs, however, Field found fault with the Bill's provisions. Particular criticism focussed on the extensive powers granted to the Crown to proclaim any area in need of reclamation. Most MHRs preferred local authorities to reclaim sand drift areas rather than the Crown. Sir W.M. Steward (Waitaki) and W. Fraser (Wakatipu) questioned whether the Bill implied that the Crown would recoup the cost of sand reclamation on crown land. Robert McNab (Mataura) wondered how the Crown could reclaim the costs spent on reclamation on its own land. While both Steward and Houston doubted that settlers

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51 Carroll, 28 September 1903, NZPD, p.3.
52 Carroll, 28 September 1903, NZPD, p.4.
53 Carroll, 28 September 1903, NZPD, pp.3-4.
54 Field, 28 September 1903, NZPD, p.11.
55 Fraser, 28 September 1903, NZPD, p.6.
56 For instance, Fraser, 28 September 1903, NZPD, p.6; Allen, 28 September 1903, NZPD, p.7; Mander, 28 September 1903, NZPD, p.8.
57 Steward, 28 September 1903, NZPD, p.7; Fraser, 28 September 1903, NZPD, p.6; McNab, 28 September 1903, NZPD, p.9.
could afford the measure, Field believed that Māori could not. Of the fourteen MHRs who spoke during the debate, only the Caversham MHR, T.K. Sidey supported the Bill outright. Often, too, the tone was glum. According to McNab, an active proponent of forestry himself (see chapters seven and eight), ‘no doubt there are large areas … in this country that you will never be able to protect from the drifting sand.’ He predicted that ‘the day will come when it will all be covered with sand, and the agriculturists will have to leave it, and then you will get the condition of things that exists in France. The State will have to take over that country and put it to the use that it was put to by the French Government.’ Both Houston and F. Mander (Marsden) actually doubted whether the drift could be stopped at all.

Although parliamentarians overwhelmingly accepted the need for protection against sand drift, they could not agree on the best means to achieve this. On the one hand, some feared the strong powers that central government would have were the Bill to pass, in a sense echoing what happened when the state withdrew support for an independent forestry service in 1874 and 1885 (chapters four and seven). This group overwhelmingly favoured relying on existing local methods of control. On the other hand, predicting that settlers could not afford this process, some worried that the Bill placed too much emphasis on private capital to finance reclamation, thereby implying that the state should intervene more. All politicians, though, agreed on the threat posed by sand drift. They evoked similar arguments and images to those used by authors whose work appeared in the Transactions. Instead of giving principally overseas examples, however, they drew theirs from within New Zealand. The next few pages describe some of these affected areas, which provide important illustrations of the New Zealand-wide problems posed by sand drift as well as the awareness many politicians had of this spread.

In the South Island, as noted above, sand drift threatened part of Dunedin and Waikouaiti (see above). In Canterbury, near Kaiapoi, D. Buddo (Kaiapoi MHR) identified that ‘at least twelve or fifteen miles of sandy beach … is undoubtedly at some

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58 Steward, 28 September 1903, NZPD, p. 8; Houston, 28 September 1903, NZPD, p. 6; Field, 28 September 1903, NZPD, p. 10.
59 Sidey, 28 September 1903, NZPD, p. 12.
60 McNab, 28 September 1903, NZPD, p. 8.
points encroaching on very valuable land.' Though broom had been planted, he believed that ‘methods [of reclamation] are apt to be wrongly applied.’ Pine trees, he felt, were not suitable introductions because the lee side prevented the wind from blowing the sand back. Insufficient foliage on their windward side did not hinder the spread of sand. Marram and lupin, he concluded, offer the most suitable means of arresting sand. Steward expressed confidence that tree planting ‘will prevent further encroachment of sand, and will eventually turn into useful land[,] land which is now utterly useless because of being covered with sand.’

During the second reading of the Bill, on 20 October 1903, W.C.F. Carncross (Taieri) exhibited no such optimism. Instead, he presented a terrifying description of the uninhibited spread of sand as it swallowed up acres of good land.

I have seen sand drift for years over splendid country, travelling in some parts at the rate of 1000 yards a year. To see trees outcropping through feet of sand in places where a year before was grass with stock grazing on it, is, I think, one of the most deplorable sights one can witness. This sand-drift can be seen extending for miles, from Paikakariki up to Foxton, and I understand that in other parts of the colony it is much the same.

He continued in a similar vein, describing in very personal terms the experience of being caught in a sand dune.

It may be that its onward march may be checked to some extent by planting near the sea-shore, and that the evil may be mitigated; but from the sandhills the sand flies in clouds with every wind, and on a day it is carried for miles. In the neighbourhood of the sandhills it is with difficulty that you can breathe on such days. Your eyes and nose are full of sand, and the experience is altogether disagreeable. However, something is now to be attempted, and better late than never.

Robert McNab, also described the devastation caused to Taranaki’s landscape: ‘Over three hundred acres of first-class country has been rendered absolutely useless

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61 Houston, 28 September 1903, NZPD, p.6; Mander, 28 September 1903, NZPD, p.8.
62 Buddo, 28 September 1903, NZPD, p.11.
63 Steward, 28 September 1903, NZPD, p.8.
64 Carncross, 20 October, 1903, NZPD, p.590.
65 Carncross, 20 October, 1903, NZPD, p.590.
within recent years by drifting sand from the sea-shore. As noted in chapters four and seven, particular concerns were expressed about the effects of deforestation in Taranaki. Widely regarded as the bread basket of New Zealand, this province seemed to be groaning under a tide of environmental destruction, with climate change, soil erosion, and flooding touted as just some of the many problems facing this previously fruitful region. Other MHRs highlighted concerns elsewhere in New Zealand.

Sir W.M. Steward (Waitaki) related a cautionary tale of sand devastation. On a recent trip to the Chatham Islands, he ‘saw there some splendid land which is being utterly destroyed by the incursion of sand’. Deforestation produced the problem, he explained, ‘the bush having protected the surface soil. The winds, having now free access to the unprotected surface, have removed the surface soil, and are carrying sand over miles of country.’ Steward estimated that ‘there are hundreds and hundreds of acres rendered utterly useless’ through sand drift. Although the planting of marram grass had checked its spread, this appeared only a temporary measure. Steward warned that unless something is ‘done in the same direction by the Government, but on a more extended scale, in the Island of Wharekauri, there will be hundreds and hundreds of acres which will be rendered utterly useless.’ Illustrating the rapidity of sand advance, he noted that he had ‘walked over some ground that was entirely covered with sand to a depth of 2 ft. which no longer than fifteen months before had been covered with a beautiful turf, and, indeed, a part of it was actually used as a cricket-ground.’

Other MHRs presented a more confident assessment of their ability to stop sand drift. Legislation, proclaimed A.D. Willis (Wanganui), ‘will be the means of saving thousands of acres of fertile land which would otherwise be smothered.’ He spoke from experience. As ‘a member of the Wanganui Harbour Board I have had a great deal to do

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66 McNab, 28 September 1903, NZPD, p.9.
67 Hone Heke (Northern Maori District) doubted whether marram grass could arrest the problem of ‘sand mountains’ between Hokianga River and North Cape, since sand drifts over mountains and dense bush. Heke, 28 September 1903, NZPD, p.7.
68 Steward, 28 September 1903, NZPD, p.8.
69 Steward, 28 September 1903, NZPD, p.8.
70 Steward, 28 September 1903, NZPD, p.8.
71 Steward, 28 September 1903, NZPD, p.8.
72 Steward, 28 September 1903, NZPD, p.8.
73 Willis, 28 September 1903, NZPD, p.12.
with seeing that the drifts are planted with this grass'. He reported a recent case, which lent support to his confidence.

In one case the Board has leased some three hundred acres of a perfect wilderness of sand to a tenant, the only proviso being that the tenant should every year plant a certain number of acres. The plan has been very successful, and a very large amount of land has been reclaimed. Only a week to two ago myself and other member of the Board visited the locality, and one and all expressed ourselves very well satisfied with the result. A great deal of grass has been planted along our sea-coast, and in every case has proved a success. The amount of land reclaimed on private property has also been very great, and by means of this grass being planted a large amount of property has been prevented from being destroyed by the sand.\textsuperscript{74}

Vile (Manuwatu) and W.C. Buchanan (Wairarapa) echoed this success. Tree planting, noted Vile, had arrested sand drift over the railway lines near Foxton.\textsuperscript{75} And, observed Buchanan, marram planting had been equally successful on the east coast of the North Island.\textsuperscript{76}

Parliament gave the Bill its final reading on 22 October 1903.\textsuperscript{77} The Act empowered the Governor to proclaim sand-drift areas 'on the petition of any local authority or of any two or more persons interested'. The Minister of Lands, entrusted to find a scheme to prevent further encroachment, could delegate to a local authority the power to undertake the recommended sand-drift reclamation measures. Expenses would be recovered by rating the owners of the proclaimed areas. Those affected by the proclamation had two months within which to appeal against the decision before a Magistrate and two assessors.\textsuperscript{78} The emphasis placed on government action at the local level echoes a main theme of this thesis, namely, that despite the emergence of nationalism and strengthening of central government, people continued to experience and alleviate environmental problems at the local level.

\textsuperscript{74} Willis, 28 September 1903, NZPD, p.11.
\textsuperscript{75} Vile, 28 September 1903, NZPD, p.13.
\textsuperscript{76} Buchanan, 28 September 1903, NZPD, p.10.
\textsuperscript{77} 22 October, NZPD, p.713.
\textsuperscript{78} The Statutes of New Zealand, Wellington, 1903, pp.57-58.
Aside from its details, the debate leading up to this legislation further illustrates that parliamentarians used an alarming language of damnation (humankind removing coastal vegetation) and redemption (humankind legislating protection) that almost exactly mirrored that used by proponents of climatic and catchment conservation (chapters four, five and seven). To make their point, proponents of the Sand-drift Bill stressed the immediate threat coastal sand dunes posed to the economic potential of the country. They seized on emotive examples – of sands devouring acre upon acre of fertile land, of stinging sand reddening eyes and stifling breath – and promised that legislation could save these lands from desolation. In contrast to earlier proponents of sand drift who mainly had used foreign examples, during the 1903 debate politicians almost exclusively presented examples of sand drift from New Zealand. All parliamentarians agreed that, since the late nineteenth century, shifting sands had increased in their scope and that, because of this, they demanded immediate attention. Politicians probably perceived sand drift as such a serious threat because sand dunes spread so rapidly, enabling people to see the process of sand encroachment occurring within a relatively short time. The inclusion of sand dunes in popular literature also evinces how commonplace they were in New Zealand society.79

The effectiveness of the Sand-drift Act: Cromwell, Central Otago

How effective was the Act? According to some foresters and ecologists, although the Act made progress towards arresting sand drift, in reality it enjoyed little success.80 Another argues that the Act, while ineffective in sparsely populated areas, enjoyed success in areas of close settlement.81 Evidence underlines that Government did take an interest in arresting sand drift, especially in urban areas. It commissioned scientific reports on the problem, but did not undertake extensive sand reclamation outside urban areas until after 1914. The example of inland sand encroachment in Cromwell, Central Otago, bears out the increasing efforts of both government and local councils to stop sand

79 William Sylvester Walker’s Zealndia’s Guerdon, for instance, describes in detail the ecology of New Brighton sand dunes which in the novel provide a backdrop to some bad melodrama and the tragic disappearance of one of the picnic goers. William Sylvester Walker, Zealndia’s Guerdon, London, 1902, pp.275-276. Thanks to Dr. Julian Kuzma for this reference.
spread in areas of close settlement. It also suggests that the Act operated more effectively in areas of close settlement. Yet, hampered by bureaucratic lethargy and further slowed by the war effort, the problem actually had worsened by the time crucial decisions to arrest sand drift were made. This is an important reminder that environmental actions take place at a different pace to human time scales and lifetimes.\footnote{The classic view of structures of time, note Fernand Braudel. For a succinct overview of Braudel’s views, and those of the ‘Annales School’, note Peter Burke, \textit{The French Historical Revolution: The Annales School, 1929-39}, Sanford (California), 1990. And, for a more recent analysis of ‘deep time’, see Tom Griffiths, \textit{Deep Time and Australian History}, \textit{History Today}, 51, 11 (November, 2001), pp.2-7.}

The case-study of Cromwell demonstrates that non-human events do not necessarily react either in predictable or logical ways that rational state legislation and humans expect.

Towards the end of the nineteenth century, residents of Cromwell organised themselves to fight shifting sands. These were emerging on unoccupied land on ‘the bank of the Clutha River below Lowburn’.\footnote{Wendelken, \textit{‘New Zealand Experience in Stabilization’}, p.149.} Despite earlier receiving compensation from the Government to solve the problem, observed W. Fraser, MHR for Wakitipu, locals ‘have had to spend from their own rates some hundreds of pounds to save the town from extinction from drifting sands.’\footnote{Fraser, 28 September 1903, NZPD, pp.6-7.}

According to a 1919 report commissioned to investigate the sand drift in the area, the problem originated in the great flood of 1878. This flood deposited ‘sand about 4 feet deep’ on the lower flats of the Clutha River, and added to existing problems of sand drift. Marram planting by the Council, though, temporarily succeeded in arresting the spread of sand drift.\footnote{Copy of report by J.R. Marks attached to letter from Baker, District Engineer, ‘Cromwell Borough – Sand Nuisance’, 5 August 1919 in ‘Sand Dunes – Cromwell, 1915-1924’. F 1, 277, NA.} By 1915, sand drift once more was threatening the town. In that year, the Secretary of the Upper Clarke Fruitgrowers Association asked Cromwell’s mayor ‘for some steps to be taken to have the sand nuisance on Sugar Loaf Terrace controlled’.\footnote{J. Wood, Secretary of the Upper Clarke Fruitgrowers Association to Mayor, Cromwell, Lowburn 21 June 1915, in ‘Sand Dunes – Cromwell’.} With a note that ‘a revival of the old sand drift trouble’ appears to be happening, the Public Works Department became involved in the issue.\footnote{Town Clerk to Minister for Public Works, Cromwell, 5 July 1915, in ‘Sand Dunes – Cromwell’.}

In 1916, the Government sent a deputation. By 1917, when Cromwell’s mayor again petitioned the Government for help, action still had not been taken.\footnote{See ‘Sand Drift at Cromwell, 19 December 1916’, Memo 25 April 1917, in ‘Sand Dunes – Cromwell’.}
Meanwhile, Cromwell Borough Council had formed a sub-committee to report on the costs of 'quelling the sand drift'. They estimated this would be £960.\(^{89}\) By 1916, the Council had spent £1,840 13s 1d on sand barriers, marram and lupin and tree plantations.\(^{90}\) Three years later, the situation had become desperate. The Town Clerk wrote imploringly to Sir William Fraser for £100, since '[t]he funds of the Borough are not enough to keep the roads in the Borough in proper order, and the main arterial road leading out of the Town on the west would in time be closed up if something was not done every year to keep the sand in check'.\(^{91}\) Government finally relented, commissioning a report into the problem and providing two grants each of £100 to plant marram. The money was only made available, though, if the Council contributed half the amount provided by Government.\(^{92}\) Sand problems continued in Cromwell into the 1920s, with both Council and Government money spent on reclamation. By 1923, the Council had spent over £3,500 on arresting sand.\(^{93}\)

This case-study demonstrates that, albeit slowly, Government did make funds available to arrest sand drift. Government action bears out Wendelken's contention that reclamation took place in areas of close settlement.\(^ {94}\) Although it is tempting to see Cromwell Borough Council resorting to hyperbole to overplay the effects of sand drift to secure Government money, the fact that by 1923 the Council had spent over £3,500 on arresting sand drift, demonstrates quite clearly the enormous threat shifting sands posed to this town.\(^{95}\) The Cromwell case study, along with the experience of the Ocean Beach Domain Board (see above) also reveals that the Government had contributed money to reclamation efforts before the Sand-drift Act of 1903. Its passing betokens increasing government intervention in society, economy, and, particularly, agriculture that took place in this period. In the decade or so before the Act, the Liberal Government created,

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\(^{89}\) Report of Sub-Committee appointed to prepare a report and estimate of the cost of quelling the sand drift from its source in the vicinity of Lowburn to the northern boundary of the Cromwell Town Belt, 'Sand Dunes – Cromwell'.

\(^{90}\) Calculated from 'Sand Dunes – Cromwell'.

\(^{91}\) Town Clerk, Borough of Cromwell, to Sir William Fraser, Cromwell, 2 July 1919, in 'Sand Dunes – Cromwell'.

\(^{92}\) On these see R.W. Holmes, Public Works Department, Dunedin, code RWH/QD. 26 August 1919; G.C. Godfrey, memo, to District Engineer, Dunedin, 26 August 1920, in 'Sand Dunes – Cromwell'.

\(^{93}\) See remaining files in 'Sand Dunes – Cromwell'.

\(^{94}\) Wendelken, 'New Zealand Experience in Stabilization', p.149.

\(^{95}\) Memo to Minister of Public Works, 23 November 1923, in 'Sand Dunes – Cromwell'.

and later expanded, new departments like those of Labour, Education, and Agriculture.\textsuperscript{96} The last had been created in 1891, and shows the emphasis that the Liberals placed upon agriculture.\textsuperscript{97} Government actively sought to make available more land for settlement, through voluntary settlement, direct purchase from Māori and, perhaps most famously of all, John McKenzie's (1839-1901) land for settlement scheme.\textsuperscript{98} Farmers also could improve their newly bought land with a loan from the government's Advances to Settlers programme.\textsuperscript{99} Earlier, such government intervention would have been hotly debated and resisted. In the 1870s, many politicians fought central government control over New Zealand's state forests (see chapter four). Sand drift clearly threatened the Liberal's policies of land settlement and improvement. At first sight, too, it appears strange that the Act did not enjoy greater success. Its failure, though, perhaps reflected the Liberal's preoccupation with many other issues at the same time: 'bursting up' the great estates, purchasing Māori land, providing loans for closer settlement, developing other labour legislation, consolidating its support base. Perhaps, like the Advances to Settlers programme, parliamentarians believed that they could legislate away the threat of sand drift, without the necessity of costly government expenditure. Whatever the case, war intervened to direct funds and attention away from issues such as sand drift.

**Legislative limitations**

If the Sand-drift Act formed part of this general increase in Liberal government activity in society and economy, it also stood for a compromise between the worst of unfettered capitalism on one hand and socialistic intervention on the other. The Act recognised that the Government could intervene in directing sand reclamation, but granted it the power to recoup the cost of reclamation through rates. That Government made funds available for Cromwell's sand reclamation, provided that the Borough Council put up half of the Government's sum, demonstrates this measure of compromise. It also demonstrates that Government could modify the provisions of the Sand-drift Act

\textsuperscript{96} Len Richardson, 'Parties and Political Change', in Geoffrey W. Rice, ed., The Oxford History of New Zealand, 2\textsuperscript{nd} edn., 1997, pp.212-213.

\textsuperscript{97} Tom Brooking, 'Economic Transformation', Oxford History of New Zealand, p.237.

\textsuperscript{98} As Brooking notes, McKenzie's policies enjoyed more political and mythic, than actual economic, success. Brooking, 'Economic Transformation', p.241.

to meet urgent needs. Its provision signals a shift in government thinking about this process, marking recognition that government should alleviate sand drift in these areas. Yet it had its limits. In 1908, for instance, Otaki’s MHR, W.H. Field, requested the Minister of Lands to purchase an area of land on the North Island west coast on which sand drift experiments could take place. He also requested the production of a leaflet on sand-drift prevention. McNab, now Minister of Lands, informed him that no land purchase would occur, but that the Department of Lands and Survey was looking into the issue of sand reclamation.100

True to McNab’s word, the Department, indeed, was looking into the issue. In 1909, at a cost of £130, the Minister of Lands commissioned Leonard Cockayne, the colony’s leading botanist, to produce a ‘Report on the Sand Dunes of New Zealand’.101 Such reliance on a professional scientist to investigate this environmental problem betokens the increasing faith the Liberal Government placed in science as a means of aiding agriculture, a move already signalled with its creation of a separate Agricultural Department. Increasingly, the future of New Zealand agriculture would be tied to scientific innovation, most notably with the formation of a separate Department of Scientific and Industrial Research in 1926.102 This bureau provided guidance and research into methods of improving agricultural production such as through the development of artificial fertilisers.103 The message was that science could increase agricultural productivity and prosperity.104

Although the Government had made a start by assessing the problem, sand drift continued to eat away at valuable agricultural land. A gap, then, existed between sanctioning initiatives and shaping the behaviour of the environment. As T.H. Potts had

100 Field, 5 August, NZPD, 1908, p.137.
101 L. Cockayne, ‘Department of Lands: Report on the Sand Dunes of New Zealand: The Geology and Botany, with their economic bearing’, AJHR, C 13, 1909, pp.1-30; Whitehead, ‘Sand Dune Reclamation’, p.148. Although Wairarapa MHR, Buchanan, objected to the cost of 130 pounds for this report, and argued that his work ‘was of no practical value to the farmer whose land was being destroyed by drifting sand’, the MHRs for Ellesmere, Selwyn, Dunedin North, and the Prime Minister, all leapt to Cockayne’s defence. 17 December, NZPD, 1909, p.1223.
noted over thirty years before the 1903 Sand-drift Act, ‘however well legislative enactments [sic] may be framed, the people themselves can alone determine what shall be allowed to exist.’ To his statement might well be added the caveat that natural events themselves also could determine the success of legislation. With sand drift, the mixture of Government and private initiatives was largely failing. What other options could government turn to?

**Arbor Day**

Arbor Day, introduced nationally in 1892 to New Zealand appeared to offer hope for sand reclamation. So did the recently-established forestry branch, established in 1896 (see chapter four). Yet, although both measures were designed to encourage tree planting, neither featured prominently in sand reclamation. As noted above, on Arbor Day, Māori school children planted trees to help with the Waikouaiti reclamation project. In 1910, the MHR for Taumarunui requested the Minister of Agriculture to supply teachers with sand-binding plants in districts where sand-dunes are prevalent. He highlighted that sand drift was ‘a serious menace in many portions of the west coast beach-lines of the North Island.’ The Minister of Agriculture agreed with Jenning’s request. Promising to give any ‘application for roots of marram grass or seeds of lupin’ ‘sympathetic consideration’, he noted that it is ‘desirable to familiarize children, in districts where there are sand-dunes, with the use of sand-binding plants’. Few other attempts during Arbor Day seem to have been directed against shifting sands. This possibly reflected the emphasis placed on planting for aesthetics and the ceremony attached to the event (see chapter four). Planters concentrated their efforts on school grounds and public reserves, not beaches and sand-affected zones. Reclaiming sand also required a great deal more maintenance and skill than planting on school grounds and reserves, and may have been an additional factor that discouraged sand reclamation on Arbor Day.

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106 2 November, NZPD, 1910, p.256.
If Arbor Day does not appear to have contributed much to sand reclamation, neither did the forestry branch. The single exception to this occurred near at Sandy Point (Southland). There, ‘[t]wo skilled tree-planters’, working for three weeks, planted some 16,100 Marram grass sets and 1,260 *Pinus muricata*. They also erected 88 chains of wire-netting fencing and lined out 5,000 seedling pines for future operations. Given the concentration of the forestry branch on establishing nurseries and planting in treeless areas, the lack of sand reclamation work is puzzling. Perhaps the financial difficulties faced by the branch may have forced it to concentrate solely on its mandate to re-forest treeless areas.

Scientific solutions to sand drift

Meanwhile, in 1911, Cockayne’s more extensive report on sand drift in New Zealand appeared. Already, when he came to write this, Cockayne had made a major contribution to conservation in New Zealand by combining ecological arguments with nationalism. He urged that New Zealand’s native forests should be protected not only for their value to tourism and science, but also for their significance to national identity. In addition to his surveys of sand dune areas in New Zealand, Cockayne had produced Government-sponsored surveys of other ecologically important areas such as the Chatham Islands (1901), Kapiti Island, Tongariro National Park, Waipoua Forest and Stewart Island (1907-1909). According to scientists today, Cockayne’s 1911 report on sand dunes still presents a ‘masterly review of the problem and possible solutions’ to

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108 I have looked through all the records of the forestry department since its inception in 1897. The records are held at the National Archives, Wellington.

109 Superintendent Nurseryman, Tapanui, ‘Report on Treegrowing operations for South Island nurseries and plantations, for August, 1911’, 8 September 1911, 1/44, 1270 in Historical Records Volume 6, 1908-1913, F1, 45/271/5, NA, Wellington.

110 On the financial difficulties see, for instance: ‘[A]s the State Forests Act, 1885, simply does not allow any part of the State Forest expenditure to be chargeable to the Consolidated Fund, we shall be compelled to fall back upon a loan, which, by the above Act, the Minister is empowered to raise but not more than £10,000.’ Under Secretary for Crown Lands to H.J. Matthews, Chief Forester, 22 February 1907, Historical Records Volume 5, 1907, F1, 45/271/5, NA, Wellington.


sand drift and ‘remains a valuable reference document to this day.’ In it, Cockayne undertook research into North and South Island sand dunes. He furnished detailed lists of plants suitable for dune reclamation. He investigated the extent of sand dunes in New Zealand and drew examples from southern France and northern German reclamation as methods that the colony could adopt. He concluded that in New Zealand, while inland dunes occur, coastal dunes remained the greatest problem. First, he noted, coastal dunes ‘form a natural defence to the land against the encroachment of the sea, and, in the second place, their movement inland is a national concern [his emphasis], since through their advance much valuable land has been ruined in the past, while yearly further destruction takes place, the evil at the same time becoming more difficult to suppress.’

By placing particular stress on its national threat, Cockayne echoed the earlier cries for action. ‘The fact that we possess an area of more than 300,000 acres of sand,’ he wrote imploringly, ‘the greater part of which is not only worthless but a constant menace to the surrounding fertile land, is a fact of no small national importance.’ He urged the Government to address the problem of shifting sands:

*Dune-reclamation, the world over has been considered rather the work of the State than of the individual.* [emphasis in text] The labour involved is too vast, and the interests too diverse, for it to be undertaken by private individuals. The most such can attempt is to make their holdings secure for the time being.

Continuing in a similarly impassioned tone, he asked rhetorically: ‘Could this barren land be turned into forest, even were the cost greater than that of afforestation generally, the work would cry aloud for its accomplishment.’ According to him, even if the costs of doing so would be uneconomic, Government had a duty to arrest sand drift. Cockayne, then, echoed the physiocratic cries of Whitcombe and others in implying that the state had a moral responsibility to protect its citizens from sand drift. Europeans clearly felt something distasteful, something unacceptable about land not being used.

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115 See, for instance, pp. 5-6 of region by region estimates of sand dunes in New Zealand. Cockayne, ‘Report on the Dune-Areas of New Zealand’.
Cockayne advocated establishing research stations to investigate the best means of reclamation. Already, he said, he kept up a small experimental garden a mile from the New Brighton coast. Cockayne roundly criticised the Sand-drift Act, largely for being moribund. 'The average owner of the dune land', he wrote, 'knows nothing of reclamation methods; and even in the light of this report ... he is not convinced that his land would be amenable to treatment.' To Cockayne's prognosis, in 1913, Field again lobbied the Minister of Lands for the completion of Cockayne's report. The Minister replied that Cockayne's report had supplied sufficient information, adding that 'it is not the duty of the State to protect and cover with vegetation areas of sandhills owned by private individuals, although the Government is only too pleased to afford such assistance and encouragement as lies in its power, which is largely determined by the funds for that purpose annually voted by Parliament.' Ward's reply to Field highlights a central problem with the Sand-drift Act. Parliament willingly passed the Act, but stopped short of taking full responsibility for the problem on private land. With the limited funds granted to it by parliament, the Act only could assist reclamation efforts.

Finally, in 1913, the Government took a practical step towards stopping sand drift. In that year, the Department of Lands and Survey established an experimental sand reclamation station at the mouth of the Rangitata River, Canterbury. The following year, another report, by Australian forester E. Phillips Turner, appeared on sand drift. It summarised sand reclamation projects in Europe and South Africa. Phillips Turner found that in New Zealand 'probably several thousand acres of privately owned sand dunes has already been reclaimed by means of either marram grass or tree-lupin' along the Wellington and New Plymouth coast. According to Phillips Turner, the state had reclaimed 'only a comparatively small area' - a total of 7 kilometres of sand along riverbanks. 'Small subsidies have been made', he continued, 'to a few settlers who have planted Crown lands to prevent the sand there from blowing on to their freeholds, and a fairly large area (perhaps 2000 acres) has been planted by leasees of Government runs'.

120 13 July, NZPD, 1913, p.430.
121 McKelvey, Sand Forests: A historical perspective, pp.36-37.
Leasees, he noted, were eligible to receive £2 per acre of every acre successfully planted out in marram grass. Furthermore, the Department had granted £100 to the trustees of Motutara Domain to plant 'a half mile strip at cost on their domain.' Although Phillips Turner's report underlines the limited effects of the Sand-drift Act, it does acknowledge that government action was beginning to address sand reclamation. Interestingly, too, in a measure reminiscent of the Tree Planting Encouragement Acts, the Government paid settlers on Crown land £2 per acre of successfully reclaimed land, a measure not discussed in the Sand-drift Act. During the First World War, as the example of Cromwell indicates, war spending curtailed many reclamation projects. After it ended, reclamation was taken over by the new State Forests Service (SFS), created in 1919 (see chapter four). It later relinquished this duty to the Public Works Department in the late 1920s. Thereafter, reclamation work by this service continued somewhat sporadically.124

Conclusion

This chapter has traced concerns about sand drift in New Zealand. Early European writers in the colony highlighted the spread of shifting sand, warning that deforestation was helping to spread the menace. A few scientists in the latter third of the nineteenth century continued these warnings. They usually employed highly alarming language to play up the threat sand drift posed to New Zealand's agriculture and to emphasise the urgency of redeeming this evil. Many of the same scientists and politicians who promoted state climatic forest conservation supported state reclamation of sand dunes. In the latter third of the nineteenth century, members of the Wellington Philosophical Institute dominated discussion on these topics, thus suggesting that Wellington's Institute provided an important arena for discussion on environmental topics (see also chapters four and seven). The passing of the Sand-drift Act in 1903 marked recognition that Government would have to address the problem of sand drift. Before the 1903 Sand-drift

123 For instance, the plan to afforest an area of land on Kaipara Harbour was also deferred due to the costs of war. Under Secretary of Lands and Survey to F.M. Dargaville, esq, Wellington, 20 April 1916, in 'Sand Dunes - Auckland- Kaitaia', 1915-1916, F 1, 27/1/1, NA, Wellington.
Act, some local authorities and private individuals had formed organisations. With the help of some government grants, they sought to arrest the spread of sand. Arbor Day and the New Zealand’s forestry branch, both established in the 1890s, made relatively little impact on arresting sand drift. The difficulty of reclaiming sand areas possibly accounts for the former, while financial hardships possibly explain the failure of the latter. Debate generated by the Sand-drift Act demonstrates that politicians had a deep awareness of the problems posed by this process. Its introduction suggests that, within living memory of settlers, the impact of humans in introducing grazing animals and deforesting coastal vegetation may have accelerated the inland drift of sand. At the very least, parliamentarians and scientists believed that sand drift posed a serious economic threat to the colony’s future. Where before they had used overseas examples of sand drift, most parliamentarians chose mainly New Zealand examples to support their points. Although the Act itself proved largely ineffective, particularly in areas of sparse settlement, parliament nevertheless initiated some reforms. Of great importance, it commissioned two reports into sand drift. These reports demonstrate that by the early twentieth century government was adopting a more scientific approach to environmental problems. This reflected the wider reliance Liberals placed on science to aid New Zealand agriculture. Although the Sand-drift Act still represented a compromise between private and public investment, these reports and the Sand-drift Act also indicate a more interventionist role for government. The scale on which these measures operated remained at the local level as people continued to experience environmental problems and seek solutions to these at this level. However rational, however scientific on paper, environmental legislation could not be introduced without the will to implement it. As the next chapter shows, greater success would attend attempts to stop flooding and soil erosion.

Chapter 7: Sweeping away fertile fields: fears of flooding and soil erosion

As sand drift impelled forest conservation and tree planting in nineteenth century New Zealand, so too did fears about the effects of deforestation on flooding and soil erosion. Flooding fears emerged in the 1840s, around the same time as those about climate change. Their recognition and the adoption of forest conservation measures to stop their unwanted affects also followed the pattern of climatic fears. In the 1860s and 1870s, a number of natural scientists and politicians identified the problem, raising their fears not only before the various provincial New Zealand Institutes and in the association’s annual publication, but also before the provincial and national parliaments. The northernmost provinces of the South Island – Nelson and Marlborough – recognised this problem relatively early on by passing legislation to protect watersheds from deforestation. By the late 1860s, catchment conservation reached the national parliament. In the 1870s, parliament set aside areas specifically for the prevention of soil erosion, flooding and climate change. An indication of the importance of these ideas is that even when state forestry foundered, climatic and catchment reserves (termed, somewhat confusingly, ‘climatic reserves’) remained in place. They gradually increased in area over the decades. In the 1880s, popular farming journals also carried articles on this subject, and reported on popular lectures on this topic read before agricultural societies. Until the 1890s, calls for catchment conservation commonly appeared alongside those for climatic conservation – many conservationists clearly regarded both as consequences of deforestation. The two arguments had much in common. Both employed highly alarming language to play up the deleterious consequences of deforestation. As increasing periods of drought signalled climatic deterioration, so hydrological arguments stressed the dangers of flash flooding and its attendant concern, soil erosion. Both ideas emphasised the evil posed by deforestation to the aesthetic and economic well being of European agriculture and farming. Both highlighted the redemptive properties of trees. Both ideas focussed on upland areas. Focussing on upland reserves removed conservation from competition with
farmers over lowland forest and allowed conservationists to stress forest protection as a rational land-use policy. By safeguarding New Zealand’s ‘smiling fields’ in the lowlands from drought and inundation, supporters argued that conservation supported farming. New Zealand’s 1913 Royal Commission on Forestry marked the ascendance of catchment concerns over climatic fears. The rise of catchment fears had gathered momentum from the 1890s in response to increased evidence of land deterioration in New Zealand and the writings of overseas experts. Although still employing the same alarming arguments of the earlier century, professionally trained scientists dismissed the forest-climate link as inaccurate. As many scientists quickly realised, emotive language almost ensured attention and drummed up support for their programmes, the fruits of which were only truly reaped in the 1930s and 1940s. The mechanism (soil erosion and flooding) may have changed by the early twentieth century, but the means to inculcate a conservationist ethos (alarmist rhetoric) had not.

The role of forests in hydrology

What role did forests play in safeguarding lowland agriculture from devastating deluges and severe soil erosion? As Robert McNab explained in a 1903 article, forests and their leaf litter form

a sponge over the surface of the ground, which retains for long periods very large quantities of rain water. Giving this [rainwater] out little by little, the water which falls ... in few hours does not flood the ground and wash away the surface, but keeps a regular supply of water for weeks and months.¹

Leaves also intercept rainwater, elucidated McNab in another article. He instanced that ‘the leaves of a 60ft elm have been estimated to cover five acres of land, and to absorb several tons of water in a day.’² Remove this ‘natural reservoir’, McNab warned, and rain ‘rushes down the hillside or along the plain in torrents or swollen streams ... denudes the

² McNab, *Forestry in its relation to the farmer: Four articles: the Farmer’s Homestead Plantation, Forestry’s Contribution to Agriculture, Forestry’s Aid to the Farm, Forestry Supplies*, Gore, 1903, p.5.
land of its rich soil, and leaves bare clay or smooth rock, all to the detriment of agriculture. Aside from converting 'the whole country into a barren and desolate waste', floods cost lives and livelihoods, and stymied commerce and cultivation, concluded author, academic and environmentalist, J.P. Grossmann. Deforestation, Grossmann added, silted up harbour ports and rivers and ruined rivers suitable for future hydroelectric generation.

These ideas about the role of forests, like the forest-climate link, have a long history that date back to Antiquity. The Greek historian, soldier, and essayist Xenophon (c. 430-c. 355 B.C.) and the Roman agricultural writer of the first century A.D., Lucius Junius Moderatus Columella, for instance, admonished their fellows for neglecting land and causing soil erosion, since "Land, as all men know, responds to good treatment." By the Middle Ages, writers such as Albert the Great (1193-1280) warned of the dangers of soil erosion. Not all, though, regarded deforestation as a bad thing. Some medieval Europeans believed that forests drew up all the moisture in soil and thus deprived crops of water. As early as the twelfth century, though, people in alpine areas of Europe enacted prohibitions forbidding the grazing of cattle and the cutting of timber. The express purpose of such regulations was to stop flooding and soil erosion. By the late eighteenth century, the work of individuals such as the French engineer Jean Antoine Fabre refined and popularised the link between deforestation, flooding and soil erosion. Fabre demonstrated the role foliage, soil and humus played in regulating water flow and even in controlling torrents. A catchment theory such as Fabre's proved particularly popular in France. From here, it had spread to many other areas by the early nineteenth

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3 McNab, *Forestry in its relation to the farmer*, p.5-6.
From the middle of that century, many regions of alpine Europe, such as Switzerland, France and Austria, prohibited deforestation in alpine areas and initiated flood prevention schemes. In the so-called New World, catchment theories influenced conservation from the eighteenth century. In the 1760s, Pierre Poivre, Commissaire-Intendant on Mauritius, worried about the relationship between soil erosion, deforestation and the silting up of waterways. In response to these anxieties, he enacted legislation prohibiting deforestation along waterways. In the 1780s, British administrators introduced some soil conservation measures on the islands of St Vincent, Grenada, St Lucia and Tobago. Other scientists visiting the New World, such as the Germans Alexander von Humboldt (South America) and Johann Forster (Pacific), also commented on the problem of soil erosion. North American writers in the eighteenth and early nineteenth centuries, similarly, drew attention to this process. In India (as they also would do in New Zealand), many Scottish-trained doctors drew attention to the influence of forests on climate as well as their beneficial role in preventing flooding and soil erosion. Dietrich Brandis, India’s first national forest conservator, maintained ‘that the guiding principle of state forestry in India “was to prevent the erosion of the mountain soil” – the washing away in the heavy rains of the loose soil, and the silting up of the beds of streams and to put a stop to destructive floods which arose from landslips and other disasters of the mountainside.’ As chapter eight shows, these writers had a significant influence on the introduction of


11 Grove, Green Imperialism, pp.264-308.


catchment and climatic arguments in New Zealand as well as on the overall development of forest conservation in this country.

By the middle of the nineteenth century, the influence of forests on their basin’s hydrology was widely discussed in popular and scientific circles. In 1864, diplomat and environmentalist, G.P. Marsh, published *Man and Nature*. This popularised and refined catchment concepts yet further. While accepting that it was unlikely forests influenced rainfall, Marsh devoted a great deal of his book to demonstrating the influence of forests on waterways. According to Marsh, forests maintained regular stream flow while also protecting against frequent and violent flash flooding, falling rocks and avalanches.15 Other studies on the influence of forests on stream flow appeared in the nineteenth century.16 All of these, however, relied not on scientific argument, but on estimates. As in Marsh’s case, they often presented historical evidence as proof of the influence of forests on waterways. Reliance on historical arguments and estimates provided ammunition for critics of these theories in New Zealand and elsewhere.

In 1893, for instance, B.F. Fernow, the former head of the Division of Forestry in the United States, recognised that forests ‘might reduce flood height and frequency’. However, he cautioned against relying on them to prevent inundations. As he noted, abnormal precipitation and unique topography often conspired to nullify the beneficial effects of forests.17 Fernow’s caution fell on deaf ears. At the end of that century, the forestry department (which had now become the United States Forestry Service) under the express direction of its first director, embarked ‘on a crusade to convert the country to conservation’.18 While invoking ‘the authority of science’, the USFS ‘also resorted to highly emotional appeals in an attempt to enlist support for its policies.’ Such evangelism biased its researchers into using insufficient evidence to support the link between forests and flooding.19 In the 1900s and 1910s, although faced with criticism from meteorologists and engineers, foresters ultimately succeeded in their immediate aim – to

18 Schiff, *Fire and Water*, pp.4-5.
increase the area of forests. One can see the influence of the North American foresters' emphasis on flooding and soil protection on New Zealand forestry debates in the 1900s, most particularly in the 1913 Royal Commission. Equally, as was the case with the forests-rainfall link, New Zealand conservationists utilised highly emotive arguments for conservation that very often had little scientific basis.

**Catchment concerns in New Zealand**

These later debates made their first appearance in New Zealand thanks to the writing of Ernst Dieffenbach. Heir to the German Romantic and Enlightenment tradition of environmental writers such as Alexander von Humboldt and Johann Forster (who visited New Zealand with Cook’s first voyage), Dieffenbach came to New Zealand in 1839 as a naturalist for the New Zealand Company, staying only a few years before returning to Europe. In 1843, Dieffenbach published an important environmental and ethnographic text, the two-volume *Travels in New Zealand*. Offering a comprehensive discussion of New Zealand’s botanical and geological resources, Dieffenbach was one of the first to identify that ‘in New Zealand the plains are not, strictly speaking, the produce of the rivers’. Contrary to prevailing opinion, he held that soil fertility did not originate from flooding depositing rich alluvium. Instead, Dieffenbach explained, soil fertility came from decayed organic matter that had accumulated over a long period of years. This meant it was folly to pursue the popular settler policy of firing the forest, he argued, since within a short few years soil fertility would be exhausted. Based on what environmental historian Vaughan Wood terms a geological approach, Dieffenbach’s reading of the soil was correct. As settlers would discover to their detriment, deforestation eliminated the very source of the soil’s fertility. Dieffenbach’s assessment was a reaction to the popular idea, especially prevalent in the migrant firm, the New Zealand Company, that abundant vegetation above ground indicated fertile soils underneath. As Wood’s research

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19 Schiff, *Fire and Water*, p.165, 131.
20 For a useful biography of Dieffenbach see Gerda Bell, *Ernst Dieffenbach*, Palmerston North, 1976.
shows, Dieffenbach’s assessment eventually was vindicated and the so-called biometric fallacy gradually disappeared out of popular currency. 

Another German-speaking naturalist and geographer, Ferdinand von Hochstetter, a member of the Austrian scientific expedition circumnavigating the world in the frigate \textit{Novara}, undertook research in New Zealand. He presented this in two important books on New Zealand’s geography and geology, and in numerous articles (see chapter eight). In his geography of New Zealand, published in German in 1863 and translated into English in 1867, Hochstetter warned about the consequences of burning and cutting down kauri forests (Figure 7.1). Tracts formerly ‘covered with dense Kauri forests, and where large masses of Kauri gum are dug from the earth,’ he cautioned,

\begin{quote}

present now nothing, but waste, dreary, sunburnt heaths of notorious sterility, upon the white or yellowish clay-soil of which nothing but dwarfish Manuka shrubs (\textit{Leptospermum scoparium}), and scanty ferns (\textit{Pteris esculenta}) can grow. The colonists therefore say that Kauri forest indicate a poor soil and a rugged non-agricultural country. This ought to prove a lesson for the future; individuals should not be suffered to ravage those precious woods, and to turn the country into a desert to the detriment of whole generations to come.\textsuperscript{25}

Wholesale deforestation clearly horrified Hochstetter. Unless checked, Hochstetter believed that it would render New Zealand a desert. His moral repugnance for such shortsightedness is clear as he likened settler deforestation to that undertaken by ‘cannibal tribes as a stratagem to burn out the enemy’.\textsuperscript{26} In Hochstetter’s view, by deforesting the land, European settlers were just as savage, reckless and uncivilised as

\textsuperscript{23} \textit{Wood, ‘Appraising Soil Fertility’}, pp.393-405. Dieffenbach’s interest in soils and soil chemistry, continued after his return to Europe in the early 1840s. He worked with the famous soil chemist Justus von Leibig on projects on organic and chemical fertilisers. See, Bell, \textit{Ernest Dieffenbach}, pp.80-122.
\textsuperscript{25} Ferdinand von Hochstetter, \textit{New Zealand: Its physical geography, geology and natural history with special reference to the results of Government expeditions in the provinces of Auckland and Nelson}, trans. by Edward Sauter, Stuttgart, 1867, p.142. This was originally published as \textit{Neu-Seeland}, Stuttgart, 1863.
\textsuperscript{26} Hochstetter, \textit{New Zealand}, p.142.
Figure 7.1 An example of the forests of northern New Zealand encountered by Hochstetter and his fellow crew. 'Waldgruppe auf Neuseeland' ['Forest Group in New Zealand'].

Māori. Hochstetter played up the popular contrast between native peoples. According to many authors, in contrast to the rational and organised mind of the European, native people were reckless and unable to think about the future. Hochstetter held that conservation – the ability to plan for the future – was one way of distinguishing Europeans from native peoples. In another sense, Hochstetter’s assertion that forest conservation represented civilised behaviour inverted the commonly held European idea that forests were unproductive land lying idle, areas often associated with savagery and barbaric peoples. As other conservationists would argue, Hochstetter viewed forests as vitally important to the welfare of agriculture, thereby establishing the close connection between the welfare of both forest and farmland. Hochstetter’s ideas would prove influential to many later New Zealand conservationists who often quoted his impassioned plea for conservation (chapter eight).

**Provincial catchment conservation?**

Did these flooding and soil erosion fears lead to action to curb deforestation? As the introduction to this thesis has discussed, some provinces, notably Otago and Canterbury, did enact limited forestry protection measures in the 1850s. They principally did this through timber licensing and forest reservation. These measures, however, seem designed to safeguard supply rather than to conserve catchments. In 1864, for instance, Otago enacted a Bush Fires Ordinance that aimed at preventing loss of property and crops through the lighting of forest fires rather than preventing the loss of soil erosion. From the 1850s, Canterbury, Nelson and Marlborough, however, did enact measures that appear designed to combat soil erosion and flooding. These included the protection of forests standing on catchments and the erection of flood banks.

In 1856, for instance, the Province of Canterbury enacted reserves of ‘standing timber in the river beds and on the islands of the Waimakariri, Rakaia, Ashburton, and

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Rangitata’ most likely for flood protection. In 1864, the Crown Lands Office of Nelson reserved ‘all the Crown Land included within the watershed of the gorges of the Brook-street stream and its tributaries; bounded on the southward by the ridges of the hills forming the said watershed, and on all other sides by the sold lands’ for the purpose of the Nelson Waterworks. Possibly this was a measure designed to maintain water flow in the surrounding catchment to the waterworks, since at the time it was widely held that forests and vegetation increased stream flow. Another means of preventing the likely dangers of flooding included declaring reserves in areas liable to flood, in order to prevent people living on this land. Embankment strengthening and groynes also figured in some of the other solutions adopted.

In 1868, flooding fears reached the national parliament during debate on Potts’ Bill (for more details of this see chapter four). Aiming to investigate the country’s forest resources, it sparked a vigorous debate on the role and importance of forests. W.T.L. Travers blamed deforestation ‘in the upper portion of the large valleys’ for rapid rainfall run-off and the production of ‘the destructive floods that had become so common’ on Bank’s Peninsula, in Nelson and ‘on the Waimakariri and other rivers’. Edward Stafford, T.H. Potts and Charles O’Neill, similarly, referred to French, Spanish and Asian examples of the siltng up of rivers, violent floods and the destruction of formerly fertile areas consequent upon deforestation. These conservationists couched their arguments in economic terms, emphasising the loss to farmland and potential revenue that floods and soil erosion caused. They believed this process was just beginning in New Zealand. Potts, for instance, was convinced that deforestation was causing flooding in the Hutt

30 New Zealand Government Gazette (Province of Nelson), 13, 27 (16 September, 1865), pp.132-133.
31 See, for instance, New Zealand Government Gazette, Province of Canterbury, 9, 15 (5 September, 1862), 96-97. This created reserves along the following rivers and tributaries: ‘Waipara, Hae Hae Te Moana, Kowai, Tumakaka, Ashley, Opilii, Waimakariri, Opawa, Rakatia, Te Ngawai, Selwyn, Pareora, Ashburton, Otaio, Hinds, Hook, Rangitata, Waihao, Ora, Waitangi and such portions of the Hurunui and Waihao Rivers and their tributaries as are in the Province of Canterbury.’
33 Travers, NZPD, 7 October 1868, p.191.
34 Potts, NZPD, 7 October 1868, pp.188-189 Stafford, 7 October 1868, pp.190-191; O’Neill, 7 October, 1868, 191-192.
35 See, for instance, Potts, NZPD, 7 October 1868, p. 189.
valley (Wellington Province). He predicted that in 'a very short time [deforestation] would effect a similar change in the rivers of Westland.'

Fears may have been heightened by the New Zealand wide floods of 1868. Writing in 1881, Travers devoted a paper to what he termed the 'great floods of February, 1868', believing that these indicated the evils attendant with deforestation. As an 1869 report intended to present an overview of the condition of New Zealand's forest indicates, many land officials supported the link between deforestation, soil erosion and flooding. The Chief Provincial Surveyor of Hawke's Bay, Charles Sealey, cited as evidence of the effects of deforestation, the disastrous floods affecting the province in 1861 and 1867. Indeed, one of the six questions levelled at officials in the report into forest resources specifically asked them to: 'State any damage which has occurred to agricultural districts, or other destruction of property, such as mills, &c., that has been imputed to floods, or droughts being rendered more severe through the destruction of the forests?' In contrast to officials' lack of support for the forests-rainfall theory (see chapter four), roughly one third (six out of a total of twenty) of them believed that deforestation had increased flooding. One indicated definitely that, although floods had not yet increased, they probably would with deforestation. Two implied a similar belief by stating that floods had 'not yet' increased. Thus roughly half (eleven) held that flooding had not increased.

36 Potts, NZPD, 7 October 1868, p.188.
37 Travers, 'Notes Upon the great floods of February, 1868', TPNZI, 14, (1881), pp.76-89.
38 Charles Sealey, Chief Provincial Surveyor, Hawke's Bay, to Stafford, Napier, 24 April, 1869, in 'Enclosure No. 10', AJHR, D22, p.11.
39 'Enclosure 2 in No. 1: Extract from Dr. Hector's Memorandum, 18 November, 1868', in, AJHR D-22, 1869, p.3
40 The reporter for Kaukapakapa Highway District failed to answer the question. 'Enclosure No. 12', Province of Auckland, D22, p.15. Those supporting an increase in flooding include Wellington, Akaroa, Hawke's Bay, the West Coast, Waipu (Auckland Province) and Blenheim. Harry Jackson, Chief Surveyor, Wellington, to L. E. Featherston, Wellington, 7 January, 1869, in 'Enclosure No. 4', D22 p.5; Mr R. Townsend to Mr C. Davie, Christchurch, 23 March, 1869, in 'Sub-Enclosure in No. 8', D22, p.10; Charles Sealey, Chief Provincial Surveyor, Hawke's Bay, to Stafford, Napier, 24 April, 1869, in 'Enclosure No. 10', D22, pp.11-12; Malcolm Fraser, 22 December, 1868, Hokitika, in 'Enclosure in No. 12'; D22, p.13; 'Enclosure No. 12', Province of Auckland, Waipu Highway District, D22, p.15; J. Heawood, Chief Clerk, 'Enclosure No. 11', Blenheim, 18 November, 1868, D22, p.12.
41 'I am not aware of any particular damage, but I certainly think that indiscriminate destruction of forests will in time produce destruction of property.' Mangapai Highway District (Auckland Province), p.16. Thomas Kelly, Deputy Superintendent, Taranaki, to Hon. E.W. Stafford, New Plymouth, 23 February, 1869, in 'Enclosure No. 7', D22, p.8; Waiuku Highway District (Auckland Province) p.16.
What does this survey indicate? First, it shows that officials disagreed about the influence forests had on flooding. Whereas land officials in Wellington and the Hawke’s Bay assigned major increases of flooding and destruction to deforestation, those in Canterbury and Blenheim held that, as Blenheim’s Chief Clerk put it, ‘No appreciable destruction appears to have taken place.’ Second, local experience of environments proved crucial to perceptions of environmental anxieties. These different experiences of flooding, in turn, probably reflected different rates of deforestation. As R. Townsend put it about the Christchurch area, ‘why other streams have not shown more sudden floods and lessened ordinary supply, is that the head feeding streams have still the covering of undisturbed bush’. Even where fire had ravaged the bush, he continued, ‘Mako-ngaio and other small trees’ quickly establish themselves. Townsend also highlighted one of the problems with the flooding-forest link – it relied not on experiment ‘but simply what several fancy they have noticed.’ He instanced Pigeon Stream as presenting ‘the most favourable features for observation, as nearly all the land in its course has been cleared of timber and laid in permanent grass.’ According to observations, noted Townsend, this stream flooded quicker and ran dry in summer. Third, the negative response by over half of the respondents does not discount officials’ belief that deforestation affected flooding. Question 6 specifically asked whether any material damage had occurred because of climatic changes or flooding. It did not inquire whether the reporters believed in the hydrological effects of deforestation or indeed, whether it had occurred without causing material damage. Fourth, the report reveals that some land officials had a sophisticated understanding of the mechanism by which forests affected stream flow. Burning bush, scrub and fern along gullies, observed the Chief Provincial Surveyor of Hawke’s Bay, increases the velocity and volume of water in rivers. This, he continued, carries ‘with it large quantities of silt and clay from the bare hills.’ He also recognised that local geography worsened the effects of flooding. Owing to the

fall from the base of the hills towards the sea being comparatively little, not only shingle, but likewise clay and fine sand are deposited in the river

42 J. Heawood, Chief Clerk, ‘Enclosure No. 11’, Blenheim, 18 November, AJHR, D22, 1868, p.12.
43 R. Townsend, AJHR, D22, 1869, p.10.
beds, which has caused their silting up (especially the Tutaekuri) to such an extent, that ... a rainfall of four inches within twenty-four hours (when the ground is previously saturated) causes more overflow than seven inches rainfall did formerly. The destruction to fencing and live stock from this cause has been very severe ... 44

Finally, because the report required officials to estimate the influence of deforestation on stream flow, without the basis of experiments, people had different impressions of the same area. For deforestation to be regarded as a threat, material damage to property or crops had to occur. Since large areas of New Zealand still lay outside areas of European settlement and had not been deforested, the perception of damage was not so great. Again, local conditions could reinforce preconceived environmental anxieties such as those about changes to catchments.

**Increasing catchment concerns in the 1870s**

As European settlements spread and as deforestation increased, so did concerns about the effects of deforestation on hydrology. In the 1870s, these regularly appeared in the *Transactions* of the New Zealand Institute and in parliament. Allied with arguments about preserving future timber supplies for development and the prevention of climatic change, catchment arguments provided strong incentives for forest conservation and forestation. Many influential New Zealand scientists, including James Hector (1834-1907) and Travers, upheld this theory (see chapter eight). 45 Along with discussions on the forest-rainfall theory, Travers utilised a highly alarmist language in an article of 1870. He charged that New Zealand’s rivers ‘have now in most instances become raging torrents, against whose injurious effects we are called upon to guard by expensive and difficult engineering works.’ This process caused, he pointed out, the loss of streams and soil, and created debris-choked waterways. 46

44 Charles Sealey, Chief Provincial Surveyor, Hawke's Bay, to Stafford, Napier, 24 April, 1869, in 'Enclosure No. 10', AJHR, D22, p.11.
Next year, during discussion of the Canterbury Forest Trees Bill aimed at encouraging tree-planting (see chapter four), Thames parliamentarian Charles O’Neill echoed Travers’ apprehensions. ‘They had seen the evil effects of denuding the country of trees in the Province of Wellington’, stated O’Neill, ‘where, on one side of the Rimutaka hill, they had been burnt away … the result was that there had been such floods as had never been known there before, clearing away culverts, bridges, and everything before them’. In support of the Bill, O’Neill noted that ‘the aridity of large tracts had been subdued by the planting of forest trees.’ Although its final provisions did not detail the motives for tree planting, it is clear from O’Neill’s discussion that politicians had in mind the prevention of flooding and climate change as much as timber supply and shelter when they passed the Bill (see chapter four).

In 1873, after the poor response to his request of 1872 to investigate the nation’s forestry resources, O’Neill raised the subject of forest conservation the following year in a Conservation of Forests Bill. Again, he highlighted the problems caused by deforestation. These included declining rainfall and increased flooding. Minister of Lands Donald McLean (1820-1877) agreed with O’Neill. According to McLean, New Zealand’s rivers ‘were gradually shallowing [sic] owing to the disappearance of the timber; the climate, also, had very materially altered.’ He promised that the Government would ‘look into the matter during the recess, with the view of introducing a Bill next session.’ Clearly, then, fears of increased flooding influenced many leading scientists, land officials and politicians in New Zealand, including notable figures such as James Hector, Thomas Potts, and Donald McLean.

In 1874, another influential figure, New Zealand Premier Julius Vogel, introduced a New Zealand Forests Bill (see chapter four for details). In addition to highlighting fears about a forthcoming timber famine and likely climatic deterioration, Vogel and three other politicians raised catchment concerns. Vogel believed that, if deforestation...
continued, New Zealand's long and narrow geography would make the region especially prone to the loss of 'large areas of valuable soil'. Future Premier, Edward Stafford steadfastly held that forests preserved on hill slopes ensured the fertility of a nation's soil. Regardless of whether or not they were on valuable land, he maintained that they should be protected. Stafford referred to both rainfall and catchment conservation as requiring conservation for 'climatic purposes'. It appears that from the 1870s writers often used 'climatic reserves' to refer to either or both the rainfall and hydrological influence of forests (see below). Notwithstanding this somewhat confusing terminology, it is still mostly possible to determine to which of the two, or indeed both, each writer referred. Catchment concerns mostly did not generate as much discussion as climatic arguments, probably because of the somewhat controversial nature of the latter theory (chapter four).

The success of Vogel's Bill in 1874 coincided with the publication of Josiah Firth's paper 'On Forest Culture'. Firth, a wealthy Waikato landowner, enthusiastically embarked on tree planting on his own estate. Also in 1868, he distributed Coniferae seeds to Waikato settlers in a bid to encourage forestation. It is estimated that Firth planted some 10,000 willows along the banks of the river Thames. He also undertook work to improve the navigability of the river through the removal of snags. Wide concern about the effects of deforestation is evident in Firth's 1874 paper. Asserting that: 'Forests exert varied and important influences in the economy of nature', Firth demonstrated the connection between forests, birds, insects, aesthetics, utility, climate and waterways. According to him, settlers' continued deforestation demonstrated 'a reckless and persistent disregard of a plain natural law. To strip a semi-tropical country of its forests is to convert it into an arid desert.' Settlers ignored this 'great natural law' at their folly, he warned. Only with forest conservation, he pointed out, and the closure of 'denuded

52 NZPD, 4 August, 1874, pp.424-425.
53 NZPD, 31 July, p.365.
54 Firth, 'On Forest Culture', TPNZI, 7 (1874), pp.181-195.
55 Firth, 'On Forest Culture', p.182. Agricultural statistics reveal that in both 1881 and 1884 Firth planted some 256 trees. 'Items relating to J.C. Firth's Leasehold near Matamata, 1866-1870' in Firth Family: Papers 1867-1951, MS-Papers-1491-02, ATL.
56 NZH, 29 July, 1935, p.8 in 'Items relating to J.C. Firth's Leasehold near Matamata, 1866-1870' in Firth Family: Papers 1867-1951, MS-Papers-1491-02, ATL.
57 Firth, 'On Forest Culture', p.181.
forests', plantations of Eucalyptus and Coniferae and 'where necessary ... native seedlings', could this reckless destruction be ended.\(^58\) Firth presented a highly alarming and sophisticated understanding of the relationship between humans, forests and environment, in order to push for conservation and tree planting.

In the 1870s, a number of other articles appeared (and reappeared in some cases) on this topic in parliamentary papers and discussions, private publications and farming journals. In 1876 and 1877, New Zealand’s new Conservator of Forests, whose writing did much to stimulate interest in the climatic effects of forests, also turned his attention to the need for catchment conservation. Inches Campbell Walker’s articles appeared in parliamentary papers and the *Transactions* (chapter four). Although somewhat coy about the role of forests in influencing rainfall, Campbell Walker was adamant that: ‘They not only prevent excessive evaporation, but [also] ... render the flow of water more regular and permanent, thus preventing disastrous floods and torrents during the winter or rainy season, and long droughts in summer.’\(^59\) Rarely for the time, too, Campbell Walker supported his contention by referring to a scientific investigation proving that deforestation decreased river flow.\(^60\) Only one other scientific report appeared in New Zealand on the influence of forests and river flow. Dr. Wjeikof’s paper on the effects of flow on the River Volga was read before the Wellington Philosophical Institute in 1871. Two of its members (Blackett and Travers) commented that deforestation had increased in Nelson, the Hutt Valley and Canterbury.\(^61\)

These were exceptions in New Zealand, when the majority of conservationists utilised non-scientific evidence to support their claims. As noted above with the floods of 1868, extreme climatic events often inspired debate on the forests-flooding link. Southern South Island floods of November 1876 signalled to H.P. Higginson the need for a storage reservoir and tree planting: ‘How much simpler would it have been to have reserved the

\(^{58}\) Firth, ‘On Forest Culture’, p.195.
\(^{59}\) Campbell Walker, *AJHR*, v.1, C, p.47.
original bush!', despaired Higginson in 1877.\(^{62}\) Interestingly, unlike other writers, Higginson discounted the effectiveness of planting alongside riverbanks in Canterbury owing to the ‘impetuosity of the floods and loose character of the banks.’ \(^{63}\) Another localised study by G.W. Williams, this time of the Wellington area, highlighted the effects of deforestation on flooding and climate. It appeared before the Wellington Philosophical Society in the Transactions in 1879. Travers and the botanist T.H. Kirk spoke up in support of Williams’ contention, adding that with deforestation, flooding had notably increased in New Zealand.\(^{64}\) Many leading conservationists of the New Zealand Institute notably Travers and Kirk, both of whom lived in Wellington, stressed catchment anxieties. These concerns probably reflected local problems with flooding. In the Wellington area, the Hutt River flooded regularly as it had done so from the early days of New Zealand Company settlement in the late 1830s. Much of the forests of the surrounding hillsides also had been cleared.\(^{65}\) Equally and perhaps most importantly, floods threatened the life and livelihood of a significant European settlement, many of whom made the connection between their action and flooding. Settlers may have created environmental hazards since their activities conflicted with already existing processes, such as the regular flooding of the Hutt River. Like Wellington, Christchurch also keenly felt the effects of floods. From the late 1850s, the local council had initiated a number of river control methods involving the alteration of channels designed to reduce floodwaters.\(^{66}\)

**Continuing catchment conservation: late 1870s and 1880s**

In 1876, parliament repealed the 1874 New Zealand Forests Act. Historical geographer Graeme Wynn has portrayed its revocation as the end of conservation until

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\(^{64}\) G.W. Williams, ‘Remarks on Forest Planting and Conservation, with reference to particular Localities in the Wellington District’, TPNZI, 12, (1879), pp.428-429.


1885, when a new forests bill passed through parliament. Certainly, it was the end of a state forest department, but it was not the end of state conservation of forests as the work of Peppercorne and Lecoy, and the continued reservation of land for catchment purposes demonstrates. In 1880, the enthusiastic conservationist Frederick Septimus Peppercorne backed catchment and climatic conservation. The report of French forester, A. Lecoy, reiterated Peppercorne's standpoint. Lecoy had been commissioned by the New Zealand Government to report on the colony's forestry resources. Earlier, many provisions of the defunct 1874 Act in fact carried on in the 1877 Land Act (chapter four). The most important of these was the power granted to the governor to proclaim forest reserves. Forest reserves actually increased after the revocation of the 1874 Act. This shows that, while state forestry might have disappeared, the interest of the state in protecting forests continued. In 1881, for instance, the annual report to parliament from the Crown Lands Department reveals that 547,785 acres of forests were reserved 'not so much with the intention of conserving the bush, as of preventing the drying up of springs and streams from exposure to sun and wind.' State conservation of over half a million acres expressly to prevent flooding and soil erosion demonstrates the importance catchment concerns played in government land policy. Continued state conservation is put into perspective when it is remembered that no state reserves were made for forest supply at this time.

Although the 1877 Land Act, as well as the earlier Forest Act of 1874, is symptomatic of the widening role of government in society, there were limits to this action. As the 1883 Crown Lands report shows with regard to tree planting, many saw the Government's role as 'supplement[ing] local efforts by the grant of sites for nurseries and plantations, and in some cases by money grants, always subject, however, to the condition that the local efforts and contributions are much greater, or in other words, that the settlers are in earnest in the matter.' Lest it sap the energy and independence of...
settlers, state efforts should be encouraging but not paternalistic, supplementary but not supplanting. As chapter six demonstrates, parliament was often willing to legislate against environmental problems such as sand drift, but sometimes found it far more difficult addressing the difficulty itself. Environments, it seems, did not always respond to legislation.

Calls for conservation continued to appear in parliament in the 1880s. Conservationists stressed the state’s duty to protect its citizens and agriculture from the evil consequences of deforestation. In making these suggestions, they were helping to increase the extent of state involvement in society.

In 1883, Mr Chamberlain lobbied for the resumption of state conservation for rainfall and flooding purposes (chapter four): ‘[A]s surely as two and two makes four,’ he stated, ‘when the tops of the ranges were deforested the lands around and beneath them were bound to be flooded and devastated, and become perfectly useless through being covered with shingle and other rubbish.’ Action, he thundered, must be taken to prevent further deforestation and stop the ‘many-headed rivers’ of the South Island from wreaking destruction. Interestingly enough, Chamberlain held that so far only the South Island had felt the effects of devastating floods. As he explained, with the exception of the small areas owned by Europeans ‘put under grass’, most of the North Island still lay in forests and with Māori owners. He hoped that ‘when the Government obtained these lands from the Natives ... [it] would not neglect to make large reserves for forests purposes’. It had the further advantage, he pointed out, of pricking Māori interest in forest conservation and safeguarding their agricultural pursuits. Chamberlain advanced a paternalistic model that recognised the guiding hand of the state and its responsibility for both Māori and European welfare. Yet, giving primacy to Government control, it still parted Māori from their land. Although sometimes Māori (such as Ngāti Tūwharetoa chief Te Heuheu Tūkino) would gift land to the conservation estate to prevent it ending up in other people’s hands, later state reservation would indeed further lock out Māori

that the local efforts and contributions are much greater, or in other words, that the settlers are in earnest in the matter.” ‘Report Upon the Crown Lands Department for the years ended 31st March 1883’, AJHR, Vol. 1, C1, 1883, p.7.

71 NZPD, 1 August, vol. 45, 1883, p.212.
from access to land and resources. Compared to similar proposals of the time, however, Chamberlain’s suggestion was unusual. He wanted Māori removed from some of their land for reasons of conservation, not development.

**Farming support for catchment conservation**

Although Chamberlain received vigorous support both for his climatic theories (chapter four) and catchment arguments, the Bill failed. Evidence from newly established farming journals such as the northern North Island-based *North New Zealand Settler* (founded 1884); the Canterbury-based *New Zealand Country Journal* (founded 1877) and the North Island *New Zealand Farmer* (founded 1884) indicate farmers supported conservation. In 1884, for instance, J.W. Henderson read a paper before the Opotiki Farmers’ Club. He drew attention to the importance of tree planting for supplying timber and preventing devastating floods that render ‘tracts of rich alluvium into barren wastes of sand and shingle.’ This process would occur in the Opotiki Valley, he warned, ‘should the ranges which catch the rains … be stripped of their bush.’ Indeed, reported another article in 1885, in destroying forests ‘we are manifesting a similar disregard to future disagreeable consequences in our reckless destruction of the magnificent forests with which Providence has blessed this country.’ As with many other publications, the latter article argued that deforestation imperilled New Zealand’s natural fecundity. As noted in the previous chapters, this argument held high moral and religious importance for settlers. It implied that continued deforestation would forsake the blessings of

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73 Barnicoat, Johnson and Holmes supported Chamberlain’s catchment arguments. NZPD, 1 August, vol. 45, 1883, pp.214-215, 218.

74 Firth’s 1874 TPNZI article, ‘On Forest Culture’, was reprinted in the NZCJ. J.C. Firth, ‘On Forest Culture’ (part 1), NZCJ, 3, 3 (1 May 1879), pp.142-149; (part 2), NZCJ, 3, 4 (1 July 1879), pp.205-208. See also NNZS, 3, 1 (January, 1884), p.9; ‘About Forests’, 4, 2 (February, 1885), NZF, p.36. On articles against deforestation by fire see ‘The Timber Gazette’, 4, 5 (May, 1885), NZF, p.144; ‘Can we Conserve our Forests?’, 4, 8 (August, 1885), NZF, p.241.

75 A report of this was published in 1885. J.W. Henderson, ‘Tree Planting’, NZF, 4, 1 (January, 1885), p.3.

Providence and thus fly in the face of Christian values by despoiling, not developing, land. These farming journals reveal that catchment arguments provoked discussion and enjoyed some popular support among members of the farming community. It is equally clear that some contemporary newspapers carried articles on the subject. In 1869, the *Otago Daily Times* published an article and editorial comment on the same subject.\(^7\) An issue of the *New Zealand Farmer* of 1886 reprinted a piece on the conservation of the kauri for catchment and climatic conservation that came from the *Thames Advertiser*.\(^8\) A comprehensive reading of many provincial newspapers would undoubtedly reveal more and earlier discussions of climatic and catchment conservation.

**The 1885 New Zealand State Forests Act**

Such lobbying seems to have borne fruit for, in 1885, parliament passed another Vogel-introduced forest act, the New Zealand State Forests Act. Aside from its aim of subjecting forestry ‘to skilled management and proper control’ and the preservation of future supply, the Act specifically protected as Class I land use, elevated forests ‘for the Conservation of the Water-supply, or for Climatic Reasons, irrespective of Altitude’ (see the preceding chapter for fuller details).\(^9\) Unlike Vogel’s earlier forestry act, which generated heated discussion among parliamentarians, the one of 1885 passed benignly into legislation. Not only does this indicate the increased acceptance of state involvement in general, since politicians paid little attention to these concerns during debate. It also demonstrates growing acceptance of climatic and catchment arguments. Support for such reserves is hardly surprising since before the act over half a million acres of forest had been so conserved. This policy effectively continued earlier principles of forestry reservation.

As would be the history of forest conservation in the nineteenth century, though, two steps forward would be followed by one step backwards. A stagnant economy forced the Government into retrenchment and forestry onto the back foot. In 1887, much to the

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7. ODT, 14 September, 1869, c.3-4, p.2.
chagrin of many politicians, it disbanded the fledgling State Forest Department. At least in the meantime, state forest conservation continued. By 1889, the area of forest controlled by the state had increased to over 1.3 million acres. Yet, later in the decade, this would be affected by the Liberal Party’s attempts to kick-start the flagging New Zealand economy. In part, it pursued this aim by excising state forests while, somewhat ironically, also reserving forestland for the preservation of scenic beauty, flora and fauna (chapter four).

Government’s disbanding of the Forest Department elicited criticism from some parliamentary members but attracted particular opprobrium when, in the early 1890s, it actually started to withdraw forests from state reserves. In 1891, for instance, some members of parliament objected to the removal of forest in Southland since some of the land in question ‘was unfit for settlement’. Others such as Buckland pointed out the shortsightedness of this action, warning that ‘if they denuded the hills of forest they might alter the climate so greatly that they might be subject to frightful droughts and sudden floods’. By removing forestland, ‘danger loomed in the distance’, cautioned Fisher, who also ‘feared’ that with this measure parliament ‘were about to establish a very dangerous and undesirable precedent.’ First, these men wanted to find out more about this area before debating such an amendment. The House, dividing, voted 33 to 20 against finding out more about the areas gazetted for excising.

In the 1890s depression, catchment arguments continued to appear in parliament, farming journals and scientific papers. A New Zealand Farmer article of 1891, for instance, quoted the writings of a Waikato farmer who warned that burning off bush on

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82 See, for instance, Richardson, NZPD, 21 September, 1891, vol. 74, p.315; C.H. Mills, NZPD, 21 September, 1891, vol. 74, pp.315-316.
83 Buckland, NZPD, 21 September, vol. 74, p.816.
84 Fisher, NZPD, 21 September, vol. 74, p.817.
85 NZPD, 21 September, vol. 74, p.819.
86 For climatic, health and soil erosion arguments for forest conservation see, for instance, ‘Bush Land Valuable’, NZF, 9, 12 (December, 1888), p.466.
hills countries resulted in soil erosion. Experience of the widespread and devastating fires that swept through the Waikato in 1890 may well have prompted the farmer’s warnings about the dangers of burning off. This again demonstrates the continuing importance of local experiences in shaping environmental anxieties. Earlier, in 1889, objecting to the repeal of the Tree Planting Encouragement Act, the editor of the journal contributed an impassioned plea for the need for tree planting and the establishment of Arbor Day. ‘We consider the encouragement of tree planting a national moral obligation’, began the editorial. It then detailed the necessity of tree planting both for health and to prevent against soil erosion (see chapters four and six for further details on Arbor Day). By presenting tree planting and conservation as the moral duty of government, the editor echoed the cries of many other farmers, politicians and scientists.

Augustus Hamilton (1853-1913), ethnologist, biologist and Director of the Colonial Museum (1903-1913), provided an example of the growing scientific lobby for conservation that was emerging in the 1890s. In 1895, he read before the Canterbury Institute a paper ‘On the Forests of New Zealand’. The climate of New Zealand, wrote Hamilton, favoured ‘luxuriant Flora’ thanks to ‘vast reserves of moisture’ ‘stored up in the shady depths of the forest’. These, he explained, ‘acted as a reservoir for all the streams and rivers’. He urged local authorities to ‘take care that the catchment areas … are kept well covered with either bush or native scrub; otherwise … the rainfall over the whole area is thrown off more quickly than it should be, and the town suffers from a flood or a water-famine’. A similar warning followed from the exhaustive fifty-six page report of the Conservator of State Forests, Victoria. George Perrin was employed upon the recommendations of the 1896 Timber Conference held in Wellington. One of its four committees also supported catchment conservation of beech forests ‘especially in

88 On these fires see ‘Fires in the Waikato’, NZF, 10, 4 (April, 1890), p.126.
89 'Arbour Days', NZF, 9, 8 (August, 1889), pp.298-299.
districts where rivers have their sources.”

Perrin, seeing at first hand “the ruinous destruction by fire from one end of the colony to the other” during his national forests tour, concluded that New Zealand forests “urgently needed” protection from fire. High country pastoralists burning “timber off from the hilltops and above the head-waters of rivers” were committing “a crime against the nation”, he charged. “Nature is never slow to avenge herself”, warned Perrin. “[S]uch reckless disregard of her natural conditions”, he pointed out, “results in flooded farms and ruined settlers”. South Island colonists, he continued, “have indeed only to use their eyes, and they can see for themselves the evil effect of the system I condemn so vehemently.”

Perrin personified nature, inverting the warning proffered by Xenophon some two millennia earlier (see the beginning of this chapter), that “Land, as all men know, responds to good treatment.” Nature ill-treated, Perrin presaged, took revenge with devastating consequences, a powerful message that was later used by conservationists of the 1930s.

Flooding and catchment fears

Next year’s experience seemed to bear out Hamilton and Perrin’s worst warnings. The Easter floods of 1897 left behind a trail of destruction in the colony. While roads were rendered impassable by slips, dead stock either bobbed above inundated fields or floated past the twisted remains of bridges swept aside in the floods. Flood damage in the Hawke’s Bay alone caused estimated £11,150 damage to roads and bridges. It also


wrecked property to the tune of £100,000.\textsuperscript{97} One article from the \textit{New Zealand Farmer} prompted by the floods discussed its cause and displayed a sophisticated understanding of how rivers operate. Recognising that floodwaters created the ‘grandly fertile plains that lie [sic] about Hastings’, the author described that efforts should limit their destruction while also obtaining ‘all the good we can from them’. ‘We cannot afford to fight Nature’, he wrote. ‘[O]ur safest way when she is in her tantrums’, noted the writer, ‘is to stand to one side, on some safe spot, and come back when the fit is over. Our business is rather to work hand in hand with Nature as far as we can.’ Unlike many writers who assigned almost total catchment control to deforestation, the engineer recognised that natural and human causes influenced river flow and floods. Rivers change course anyway, he observed, quite apart from the fact that the sea and human-made structures like weirs and groynes block up rivers and alter their channel. Bush clearance, he continued, also increases water flow.\textsuperscript{98} The writer recommended planting willows to encourage the pooling of water, limited dredging and some river embankment work, none of which, he was careful to point out, should obstruct the river channel itself.\textsuperscript{99} Lastly, he noted that people must realise that there is risk living on the riverbank. Areas like ‘[t]he lower parts of the plains’, he pointed out, ‘are humanly habitable at risk’.\textsuperscript{100} Unlike many at the time and earlier, this author actually acknowledged that non-human and human factors affected river runoff. Nor did he advocate the wholesale adoption of engineering works and tree planting designed to bend rivers to the will of humanity, as happened on river courses elsewhere.\textsuperscript{101} He recommended that people should adapt their lifestyle to the rhythms of rivers and recognise that floods brought benefits as well as destruction. The hyperbole and language of fear so evident in many writers on catchment and climatic conservation is wholly absent from this matter-of-fact discussion. The writer’s

\textsuperscript{97} ‘Appendix No. 14: Roads and Bridges Damaged by the Easter Floods of 1897’, AJHR, C1, 1898, pp.126-135. Figure for property damage from Perrin, ‘Conservation of New Zealand Forests’, p.2. See also ‘Through flood and storm’, NZF, 17, 5 (May, 1897), pp.156-157.

\textsuperscript{98} ‘Causes and Control of Flood in Lower Hawke’s Bay’, NZF, 17, 8 (August, 1897), p.250.

\textsuperscript{99} ‘Causes and Control’, p.250.

\textsuperscript{100} ‘Causes and Control’, p.251.

suggestions pertaining to the planting of willows along riverbanks echo those employed earlier, such as by Dobson and Firth (see above).

Flooding the following year also elicited other articles in the *New Zealand Farmer* that drew attention to the link between deforestation and inundation. Another blamed the floods of 1897 and 1898 not on deforestation but on the long, straight shape of river basins, thus implying that humans could alter the shape of river channels to prevent floods. At the end of the 1890s, Dunedin City Council began to plant trees in the headwaters of streams both to maintain a clean water supply and to prevent flooding and erosion (see chapter two).

The newly created Forests Branch, an offshoot of the Department of Lands, though principally charged with tree planting, clearly had flooding and climatic prevention in mind. Its director, H.J. Matthews, was a keen advocate of tree planting for catchment and climate (see also chapter four). So too was a correspondent of Matthew's, the Southland parliamentarian, plantation owner and historian Robert McNab, who served as Minister of Lands in 1906. As the beginning of this chapter shows, McNab wrote extensively about the link between deforestation, soil erosion and flooding, drawing from a vast store of overseas and New Zealand correspondence and forestry publications (chapter eight). That McNab wanted to popularise these issues is apparent from the title of his work. 'Tree Planting on the Farm' was clearly pitched at a popular farming audience. In this series, McNab drew attention to the coastal effects of deforestation. According to him, for instance, deforestation was silting up Wellington harbour. Although he advocated conservation, as with most of his contemporary conservationists, he viewed forestry as a complementary and profitable form of land use.

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102 See, for instance, 'Protective Works at Palmerston North', NZF, 18, 11 (9 November, 1898), pp.393-394.
103 'Damages by Good and How to avoid them', NZF, 18, 11 (9 November, 1898), p.393.
105 In 1904 Matthews wrote despairingly to McNab complaining about the Liberal policy of removing forests from conservation: 'Everything seems to be subservient to land settlement now-a-days, but what about the future when we want lands for re-afforestation?' HJ Matthews to McNab, Private, New Plymouth, 23 August, 1904 in Robert McNab, *Papers relating to afforestation in New Zealand 1895-1908*, HL, MS 0608.
Where too much forestry existed, as in parts of Southland, McNab requested that this land be opened up for farming, demonstrating as others his interest in economic development.107

The shift away from climatic concerns

These and other examples from the 1900s testify to increasing concern about the effects of deforestation on flooding and soil erosion. They also mark the beginning of a shift away from climatic conservation. In 1904, for instance, the New Zealand Farmer carried an article from the United States Department of Agriculture Year Book on the prevention of soil erosion.108 Others followed, including in 1909 a major report on ‘Forestry in New Zealand’. Together with the Royal Commission of 1913, its findings characterise the end of official support for the forests-rainfall theory.109 This tome described New Zealand’s regional forest and conservation, forest utilisation and foreign timber supplies.110 Two contrasting articles also addressed catchment conservation.

Leonard Cockayne, the renowned ecologist, initially adopted a professional, distanced and scientific tone for his discussion of catchment and climatic theories. This contrasted with the bombast and hyperbole of lawyer and academic Professor Grossmann (see below). Cockayne first discredited forests-rainfall theory, carefully pointing out ‘that in estimating changes of climate individual experience based on memory is of no moment whatever, since meteorological facts can only be secured by accurate instruments in the hands of a careful observer during long periods of time.’ Cockayne clearly had no play for the somewhat wild and unscientific claims of those upholding the forests-rainfall theory. Although admitting ‘that forests may have a certain local effect’ on rainfall, his conclusion, indeed, was definite: ‘moist sea-winds and the mountain-ranges’ were the prime driving force behind New Zealand’s weather systems.111 Cockayne’s report was the first systematic discrediting of the forest-rainfall theory undertaken by a trained and

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107 See NZPD, vol. 110, 3 October 1899, p.196.
respected scientist in New Zealand, one that would be repeated four years later with the 1913 Royal Commission on Forestry.

Nor did Cockayne, at least initially, resort to hyperbole to describe the effect of forests on hydrology. Although noting that trees ‘will have a powerful effect on moderating the run-off’, by acknowledging that other factors such as the intensity and duration of rainfall, he did not ascribe to forests universal control over floods. Soil permeability, he pointed out, determined ‘[t]he amount of water which penetrates into the ground, and the rate of penetration’. New Zealand’s characteristic ‘steep slopes’ and gullies ‘play their part in rapidly conducting the water downwards, and no forest, however dense or crowded with obstacles can altogether check their power.’¹¹² Up to this point, Cockayne maintained a sober assessment of the effects of deforestation on flooding. Soon, however, like much of the soil he wrote about, Cockayne was carried away in gushing diatribes of the foolish consequences of deforestation. ‘[F]lood waters from the denuded areas pour down the streams and gullies’, he wrote. ‘Only the unfortunate sufferer whose acres are being borne away on or whose grazing-land has become a receptacle for stones and mud,’ he noted, ‘can bewail or ignorance which permits the mountain-forests, and those fringing streams, the natural ... to be destroyed.’¹¹³ Yet Cockayne’s writing differed from earlier ones. In contrast to these, he presented a detailed scientific discussion of the complexity of factors governing hydrology. However, he put these findings to one side when he detailed the terrifying effects of deforestation on flooding and soil erosion. Cockayne thus wove into the structures of scientific writing the typical alarmism of earlier catchment and climatic writing. In this melding of science with traditional conservationist alarm, Cockayne shared much in common with members of the USFD. These trained scientists embarked on a crusade to convert the country to conservation, often ignoring their own indecisive scientific evidence to push for catchment conservation.¹¹⁴ Faced with mounting criticism

¹¹³ Cockayne, ‘Forestry in New Zealand’, p.91.
¹¹⁴ Schiff, Fire and Water, p.131, and pp.116-163.
from engineers and meteorologists, USFD foresters only partly toned down their claims.\textsuperscript{115}

Since the vast majority of conservationists had no specific scientific training either in forestry or the earth sciences, Cockayne cut a rare figure in early twentieth century New Zealand. More common still was Auckland academic Professor Grossmann, who had no training in forestry science. Specifically targeting a popular audience, Grossmann cobbled together historical and current scholarship on the matter of soil erosion. He assembled these to argue for forest conservation.\textsuperscript{116} '[I]t is no exaggeration to say that there is not a single district in the Dominion in which the native bush has been cleared away round the head-waters of the rivers', thundered Grossmann, 'that does not exhibit some of the disastrous consequences above described.' Moreover, he warned, the worst was yet to come.\textsuperscript{117} That same year he published a similar tract that first had appeared in the \textit{Auckland Weekly News} and later as a separate book.\textsuperscript{118} Grossmann made no bones about what his book intended to do. 'The object of these papers on the disappearance of our forests and the necessity for replacing them', he wrote, 'is not so much to supply information as to rouse public interest in a matter of vast national importance.'\textsuperscript{119} Written in a highly alarmist style, Grossmann upheld the forests-rainfall link (chapter four), but emphasised the threat of soil erosion as well as the need to conserve existing forests and create new ones by planting. According to him, 'the worst effect of deforestation is EROSION'.\textsuperscript{120} If Westland's forests were not conserved, he wailed, 'one may safely predict that the extermination of its trees will convert the whole country into a barren and desolate waste, forbidding, unproductive, and uninhabitable.'\textsuperscript{121}

Grossmann might have upheld the forests-rainfall theory and fallen back on hyperbole to argue his case, but times were changing. In 1910, Archdeacon Walsh published 'The Effects of the Disappearance of the New Zealand Bush'. This drew attention to what its author termed the climatic (winds, blizzards, frosts, winds and

\begin{itemize}
\item \textsuperscript{115} Schiff, \textit{Fire and Water}, pp.116-163.
\item \textsuperscript{116} See subsection 'Deforestation and its Consequences', in 'Forestry in New Zealand', 1909, pp.93-96.
\item \textsuperscript{117} 'Deforestation and its Consequences', pp.95-96.
\item \textsuperscript{118} Grossmann, \textit{Evils of Deforestation}, preface, p.1.
\item \textsuperscript{119} Grossmann, \textit{Evils of Deforestation}, p.5.
\item \textsuperscript{120} Emphasis in original, Grossmann, \textit{Evils of Deforestation}, p.7.
\end{itemize}
drought) and topographical (floods, erosion and silting, the drying-up of streams and scenic loss) effects of deforestation. In 1896 and 1898, Walsh had investigated the causes of deforestation and the future of New Zealand's forests.\(^{122}\) In his article of 1910, Walsh dismissed the influence of forests on rainfall. Instead, he pointed out that forests moderated temperatures, worsened floods and prevented blizzards and frosts (chapter four). Unlike other earlier climatic conservationists, Walsh was careful to point out that both topography and geology determined the effects of deforestation on channel flow. According to him, silting occurs when a steep-angled and long river scoops out a soft or friable bed, eventually reducing the flow of the river. Most damage, he pointed out, is done when a flooded river flows over an alluvial plain. As the silt lodges on the riverbed, he explained, the river is forced out of its banks, cutting a new course. This process occurred repeatedly.\(^{123}\) Landslides, he noted similarly, happened on steeper-sided areas.\(^{124}\) Walsh also criticised the 'foolish tradition' of planting out willows along riverbanks. In his opinion, these trees would be undermined and swept away, and could even form a dam, thereby trapping silt and forcing the river to cut a new path.\(^{125}\) Walsh, like Cockayne, upheld catchment arguments but displayed a more sophisticated understanding of the complex relations between deforestation, relief, geology and flooding. Like Cockayne, Walsh dismissed the influence of trees on rainfall.

The movement towards wholly catchment fears continued when, in 1913, Parliament initiated the highly influential Royal Commission on Forestry. Its findings reflect the growth of ecological and aesthetic arguments for conservation. They indicate a clear shift away from climatic arguments in favour of catchment concerns. The Commission recommended establishing extensive areas of upland forest reserves for

\(^{121}\) Grossmann, *Evils of Deforestation*, p.38.


\(^{123}\) Walsh, 'Effectsof the Disappearance of the New Zealand Bush', *TPNZ*, 31, (1898), pp.471-482.


\(^{125}\) Walsh, 'Effects of the Disappearance of the New Zealand Bush', p.442.
water and soil conservation purposes as well as shelter. It did not mention the forest-rainfall link at all. Growing concerns about erosion reflected the influence of overseas literature, the existence of land degradation in New Zealand and the opinion of influential scientists in New Zealand. The development of erosion arguments, though, did not spell an end to climatic arguments. As the minutes from the commission demonstrate, some land officials still believed that forests influenced rainfall (chapter four).

Made up of scientists, farmers, timber men and the Commissioner of Crown Lands, the six-strong Royal Commission inspected New Zealand’s forests and state nurseries, and interviewed land officials and foresters. The result was an exhaustive report. This included overviews of climatic and scenic reserves, indigenous forests, forestation and forest management. Its report stressed the importance of forests to the farming economy. It also pointed out the dangers inherent in deforesting uplands: ‘the mountains and hills of New Zealand would, if not forest-clad, be a constant source of danger to the farmlands on which the prosperity of the Dominion so greatly depends.’

Defining a climatic reserve ‘as one for the purposes of protection of soil, prevention of denudation, water-conservation, prevention of floods, and, in addition, shelter from winds’, it ignored the forests-rainfall theory. Since a great deal of the original tree covering of highlands ‘has now been enormously reduced’ leaving many headwaters unprotected by forest, it recommended the extension of climatic reserves. It also wanted them established on waterways and in deep gullies, principally in areas that were useless for agricultural purposes. Furthermore, it suggested changing the designation of Waimakariri National Park from park status to climatic reserve. This would involve reserving the entire upper portion of ‘the North Island dividing range’ and establishing ‘a climatic reserve’ on Mount Ruapehu. In declaring such reserves, rather than relying on a blanket policy that stipulated the height of reserves, the commission considered these on

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* This suggestion was not taken up. Waimakariri National Park later became Arthur’s Pass National Park.
a case-by-case basis. According to this criteria, the climate reserve 'on Mount Ruapehu might have its lowest limit at an altitude of 3,000 ft., while one on the Longwood Range, Southland, might descend to 1,000 ft., or even lower.' As Table 7.1 shows, the Commission recommended the reservation of 1.689 million acres, all of which came from the South Island. This bias probably reflected the fact that a great deal of the North Island still lay in forest, where forests were still often seen as impediments to progress. Interestingly, the Report recommended the removal of deer, wild cattle and goats from such climatic reserves since they seriously reduced the vegetation cover, most probably a reflection of the work of Leonard Cockayne whose ecological studies highlighted the impact of ruminants on soil compaction.\textsuperscript{129} The Commission also emphasised its utilitarian orientation, and the penchant for settlement then current, by recommending some forest reserves to be uplifted for either settlement or forestry purposes, an area comprising 68,698 acres in total.\textsuperscript{130} The Commission's report on climatic reserves expressed a change of emphasis from belief in the forest-rainfall link to fears of flooding and soil erosion.

\textbf{Table 7.1 Proposed Climatic Reserves}

<table>
<thead>
<tr>
<th>Land District</th>
<th>Area (Acres)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southland</td>
<td>119,200</td>
<td>On the Takitimu and Longwood Range, for conservation of the streams that have their sources thereon</td>
</tr>
<tr>
<td>Westland</td>
<td>534,600</td>
<td>For conservation of headwaters of various Westland rivers</td>
</tr>
<tr>
<td>Nelson</td>
<td>947,000</td>
<td>For conservation of headwaters of various Nelson rivers.</td>
</tr>
<tr>
<td>Marlborough</td>
<td>88,350</td>
<td>For conservation of headwaters of various Marlborough rivers.</td>
</tr>
</tbody>
</table>

'Table 7.1: Proposed Climatic Reserves as per Index-Map', 'Report of the Royal Commission on Forestry', AJHR, 1913, p.xlvii.

\textsuperscript{129} 'Report of the Royal Commission on Forestry', AJHR, 1913, p.xv-xvi. On Cockayne, see \textit{Protection Forests}. Others also highlighted this concern earlier. See, for instance, Walsh, who in 1896 published an article in which he argued that cattle, fire, and deforestation represented the principal causes of deforestation. Walsh, 'On the Disappearance of the New Zealand Bush', pp.490-496.

\textsuperscript{130} See Appendix 1 in 'Report of the Royal Commission on Forestry', AJHR.
Evidence from the Commission’s interviews of forestry experts and officials further demonstrates both the shift towards soil erosion arguments and explains why this occurred. New Zealand scientists followed prevailing trends in United States forestry by reprinting some of the latest North American research on the forests-catchment link. As Ashley Schiff has shown, USFD officials strongly played up the woeful consequences of deforestation on flooding and soil erosion (see above). Growing evidence of soil erosion and flooding in New Zealand lent substance to these writings. Interviews conducted by the Commission reveal that although some still held to the influence of trees on rainfall (chapter four), many more supported catchment conservation. Respected scientists also emphasised the importance of soil erosion and flooding. Local experience of flooding and soil erosion, then, reinforced acceptance of overseas ideas about the effects of deforestation on hydrology.

In one of the articles reproduced in the report, C.A. Cotton’s (1885-1970), lecturer of Geology at Victoria University College, Wellington, offered a complex scientific discussion of the effects of deforestation. Unlike most studies which detailed the effects of deforestation on arid climates, explained Chilton, the American work, “Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin, 1911” was ‘of special value because it contains a very careful study of the results of reckless clearing in a climate which appears to be very similar to ours.’ The report, noted Chilton, reached two conclusions. First, he pointed out, the loss of tree roots following deforestation causes slips thereby eroding away surface soil and rendering the slopes absolutely barren.

The second result is, however, very much more far-reaching: the soil exposed by reckless clearing is washed off, and when clearing has been

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132 Field reiterated his earlier stance on the importance of forests in maintaining a regular water supply and preventing floods. Field, 15 May, Wellington, 1913, no. 83, in ‘Report of the Royal Commission on Forestry’, p.83. Thomas Dick Cummins, for instance, also expressed concern that deforestation was endangering water supplies. Cummins, 28 April, Wanganui, 1913, in ‘Report of the Royal Commission on Forestry’, AJHR, p.58.
resorted to too much at the headwaters of streams that material is carried
down-stream, leading in the lower courses of the rivers to a much greater
liability to flooding.\textsuperscript{134}

The report Cotton quoted was in fact similar to an earlier (1907) alarming tract full of
insufficient data and hyperbole that was used by the USFD to present the flooding-forest
link as definite and conclusive.\textsuperscript{135} Although using scientific language, Cotton still used
the same scare-tactics as earlier conservationists. Interestingly, he too denied that forests
affected rainfall.\textsuperscript{136}

Charles Andrew Chilton’s (1860-1929), Professor at Canterbury College, ‘Remarks
on Erosion of Slopes in New Zealand’ also appeared in the report. Chilton discussed the
geological and vegetative factors affecting erosion. Although highlighting the problem of
erosion, the author emphasised that geology just as much as vegetation affected water
flow.\textsuperscript{137} The report also referred to other international investigations. These included
Professor I. Bowman’s \textit{Physiography of the United States, and Principles of Soil in
Relation to Forestry} (1911); Copenhagen Professor, Eugenius Warming’s \textit{Oecology of
Plants} (1909); and Dr B.E. Fernow’s \textit{Economics of Forestry} (1902). Bowman wrote of
the horrifying loss of soil occasioned by deforestation. In fifty years, warned Bowman, a
single lumber merchant may destroy soils that took thousands of years to develop.\textsuperscript{138}
Warming and Fernow, likewise, lectured on the importance of forests in maintaining soils
and, in Fernow’s case, of also protecting against flooding.\textsuperscript{139} As chapter eight shows,
Warming’s ideas had reached New Zealand earlier, through the work of Leonard
Cockayne. As Schiff notes, Fernow, previously the head of the Division of Forestry (the
forerunner of the USFD) recognised that: ‘Forests might reduce flood height and

\textsuperscript{134} Cotton, 15 May, Wellington, in ‘Report of the Royal Commission on Forestry’, AJHR, 1913, p.82.
\textsuperscript{135} The report was entitled \textit{Final Report on the Southern Appalachian and White Mountain Watersheds}.
Schiff, \textit{Fire and Water}, p.121.
\textsuperscript{136} Chilton, Fairlie, 15 March, 1913, No. 21, in ‘Report of the Royal Commission on Forestry’, AJHR,
1913, pp.17-18. Chilton also, interestingly, challenged the dominant ethos of swamps draining and sand
dune reclamation by stating that such areas ‘should be made into scenic reserves for educational purposes’,
noting that ‘our swamps are far more interesting fields of research’ than the Yorkshire Moors. p.18.
\textsuperscript{137} Appendix C No. 2 C.A. Cotton, ‘Remarks on Erosion of Slopes in New Zealand’, in ‘Report of the
Royal Commission on Forestry’, AJHR, 1913, pp.lii-liii.
\textsuperscript{139} ‘Report of the Royal Commission on Forestry’, AJHR, 1913, p.xiv.
frequency, but he cautioned against relying on them to prevent inundations: abnormal precipitation and unique topography often conspired to nullify their beneficial effects.¹⁴⁰ The Commission thus chose some works (such as those by Fernow and Cotton) that emphasised the relationship between forests and flooding. It also recognised the complexity of such systems and the danger of ascribing to forests an overriding influence on river flow. Yet, the Commission ignored its own sources and instead highlighted the danger deforestation posed to the economic well-being of New Zealand. If the colony was not forest-clad, it warned, its mountains and hills would ‘be a constant source of danger to the farm lands on which the prosperity of the Dominion so greatly depends.’¹⁴¹ New Zealand’s conservationists, including respected scientists such as Leonard Cockayne, continued to rely on a language of hyperbole and alarm. They used this as a deliberate stratagem in order to try to push for their ‘cause’ – the conservation of catchment districts.

Hyperbole and alarm continued to characterise discussion of soil erosion later in that century. Conservationists purposefully employed such rhetoric because they believed deforestation would bring such terrifying devastation. In the 1930s, geographer Kenneth Cumberland and soil conservationist Lance McCaskill (1900-1985) manned a vigorous and alarmist campaign for the conservation of soil erosion.¹⁴² The Commission’s use of such recent scientific literature betokens the flow of ideas operating within the world of forestry and emphasises that New Zealand scientists kept up-to-date with the latest publications in their field (see chapter eight). The Report likewise underlines a general shift occurring in environmental appraisal and in ideas about land and climatic degradation in general. In scientific circles, there appears to be a distinctive shift towards

¹⁴⁰ Schiff, Fire and Water, p.117.
the problems of erosion and flooding and away from ideas that deforestation brings climatic change.

Evidence of land deterioration in New Zealand

One important reason why catchment concerns had such redolence was because of growing evidence of land deterioration in New Zealand. As one geographer recently noted, from the 1910s the expansion of land area could no longer mask 'the extent of land deterioration and erosion' caused by over half a century of pastoralism.\(^{143}\) These problems, however, were manifest earlier than 1910. One example was rabbit infestations. Farmers recognised this problem as early as the 1870s, while later author likened the grey rabbit's progress into Southland to that 'of the tidal wave - all pervading and irresistible'.\(^{144}\) In 1887, rabbits in Otago cost the state an estimated £32,803 from abandoned tenants. By the next decade, some rabbiters in Central Otago were catching on average seven rabbits per hectare. And this seemingly without making any impact on the resident population!\(^{145}\)

Other problems also became evident around this time. An 1895 article published in the *New Zealand Farmer* worried about land scarcity, and recommended the adaptation of pastoralism to solve this problem.\(^{146}\) In 1903, Robert McNab pointed out the destruction wrought by gold dredging. He recommended that these 'waste' areas be planted with trees.\(^{147}\) Although concerns about the effects of mining on soil and agricultural land had been aired as early as the 1870s, only in 1910 could wardens 'impose conditions on any [mining] licence to obviate the destruction of agricultural and

143 Land intensification became the motive of Liberal Policy, a trend shown in the land under acreage which doubled from 20 million acres in 1891 to 40 million ten years later. Roche, *Land and Water*, pp.25-26.
146 'Land Settlement and High Farming', NZF, 16, 7 (July, 1895), pp.223-224.
pastoral land. In addition, drought regularly affected areas such as Central and North Otago, and Canterbury. It desiccated life from the land, spelling an end to agricultural pursuits like dairying in these areas (chapter five). High country farming seemed particularly affected by the problem of land degradation. An article of 1913 highlighted a myriad of problems facing high country pastoralists: overstocking, burning off, 'the smallness of the rainfall' and the constant plague of rabbits. Indeed, it noted, that: 'The problem of how to bring back the high country of Central Otago to its former state is one that has been uppermost in the minds of pastoralists for years past.

In response to these fears, the Department of Agriculture undertook experiments in re-grassing now-barren runs. Official government surveys of sand drift were undertaken in the 1900s (chapter six). As Michael Roche notes, the Canterbury Pastoral Lands Commission of 1910 reiterated the problem of land deterioration by devoting a great deal of its report to detailing its extent and seriousness. By the 1900s, then, not only had high country land deterioration been experienced in some areas for several years. It also had pricked parliament into action through the commissioning of reports and the passing of legislation.

Evidence of New Zealand land deterioration supported local and overseas writing that highlighted the flooding-forest link. These arguments appeared in the Report of the 1913 Royal Commission. Such evidence strengthened the emphasis on catchment concerns and weakened the case for the climatic influence of forests. Scientists in the Report criticised the forests-rainfall theory. Along with Cockayne's ecological studies undertaken earlier and the 1909 report into forestry, the 1913 Royal Commission marks the start of the gradual professionalisation of New Zealand land studies and science. Similarly, it demonstrates the increasing reliance by government on science and scientists to recognise and solve problems (see chapter five). The report reveals that the only
support for the forests-rainfall theory came from non-scientists, either land officials or farmers. Those who later would support catchment concerns principally were drawn from a professional scientific background. These included geographers such as Kenneth Cumberland, soil scientists such as Lance McCaskill and ecologists such as Leonard Cockayne. These scientists, like their counterparts in the USFD of the first half of the twentieth century, continued to use the alarming language of earlier conservationists. Their assertions, however, were now buttressed not by historical example or observation but by ‘hard’, ‘irrefutable’ scientific ‘evidence’. One needs only look at the writing of geographer Kenneth Cumberland to hear the resonance of alarm echoing from the last century. In the 1950s, Cumberland and Fox described New Zealand’s Eastland as ‘a region scarred by soil erosion, of flooding rivers and fertile flats strewn and defiled by periodic silting’. 153

If the 1913 Royal Commission marks the beginning of a scientific state and the end of catchment cries, so too does it signify the re-emergence of state forest conservation. Although World War I delayed plans, in 1919 the Government created a permanent and independent State Forestry Service (SFS), one notably stronger than earlier. Perhaps it is no coincidence that its emergence coincided with the end of agricultural expansion: high country land problems seem to have dented confidence in the suitability of these areas for pastoralism and consequently made them available to the new SFS. As well as undertaking extensive forestation and aside from its commercial functions, the SFS continued to undertake protection forestry through the conservation of headwaters and fire reserves. 154


Conclusion

Environmental anxieties about the effects of imprudent deforestation in upland areas arrived in New Zealand with some of the first European settlers. From the 1850s, officials in Nelson, Marlborough and Canterbury, set aside mountain forests for flooding and soil erosion protection. In 1868, these concerns reached the national parliament. They remained in such circles for the rest of the century, partly justifying the creation in 1874 and 1885 of a department of forestry charged with revenue collection and the preservation of catchment areas. Although these two forest Acts did not enjoy a long life, later land legislation (such as the 1877 Land Act) incorporated many provisions of the defunct Act in addition to reserving some 500,000 acres of forest for catchment reasons. Undertaken in a time of increasing government retrenchment following the disbanding of state forestry, government reservation specifically for the protection of catchment areas underlines how importantly the state viewed the protection of its soils and waterways. Already, by the 1880s, tree planting alongside riverbanks, undertaken privately and by local government in many areas, owed much to fears of flooding and soil erosion. So did private tree planting. Conservationists throughout New Zealand accepted the ethos of development and progress but questioned whether agriculture should be the dominant feature of the landscape. Instead, they favoured a mixed land-use, with forests both on the highlands and along waterways, and agriculture on the lowlands. By protecting the lowlands from inundation, soil erosion and other hazards such as silted-up harbours and waterways, conservationists argued that forests not only represented the most efficient use of upland areas unsuited to agriculture. They also played a central role in maintaining the fertility of farming. Part of their argument rested on demonstrating that upland deforestation imperilled the fertility of New Zealand soils and the very economy of the colony. They argued this by proffering terrifying overseas lessons of the follies of deforestation. Examples of vast tracts of lush agricultural land swept aside by furious floods and fertile fields made desert by deforestation were deliberate diatribes designed both to discontinue upland deforestation and to prick the conscience of parliament into conservation. In the 1870s, as settlement spread and deforestation increased, many conservationists used New Zealand evidence to support their claims. Examples of flooding in deforested areas near major settlements, such as Wellington and Christchurch,
proved particularly potent. People directly felt the effects of such inundation and reinforced the connection between deforestation and flooding. Extreme floods, such as those of 1868 and 1876, often influenced calls for catchment conservation. These illustrate that local experience of environments proved crucial in the formulation and acceptance of overseas environmental ideas such as hydrological concerns. For the most part, until the early 1900s evidence of the relationship between deforestation and flooding, like that between rainfall and forests, relied not on scientific investigation but on direct observation and historical experience of areas outside New Zealand. Catchment concerns, moreover, appeared regularly alongside climatic concerns and utilised the same language of fear as the latter. Until the late 1870s, land officials, naturalists and landowners dominated calls for catchment and climatic conservation, a reflection of the fact that most of their opinions in print consisted of either official or scientific publications. Specific journals reflecting the opinion of farmers only appeared in the late 1870s (New Zealand Country Journal, founded in 1877) or 1880s (North New Zealand Settler and New Zealand Farmer). Nevertheless, it is clear from earlier newspapers that catchment and climatic conservation appeared at least from the late 1860s, probably earlier. Many people would probably have been aware of these ideas, even if they themselves did not write about them. Reports from the 1880s and 1890s offer conclusive evidence that some farmers addressed local farming associations about the need to plant and protect trees for the maintenance of climate and catchment. Indeed, from their founding the three farming journals mentioned above, in particular The New Zealand Farmer, maintained a vigorous lobby for conservation. This lobby carried through into the new century. By then, both growing evidence of New Zealand land deterioration especially in highland areas and the writings of overseas authors swung opinion towards catchment theories. These same writers, as well as many of New Zealand’s prominent scientists, dismissed claims about the influence of forests on rainfall. In the 1909 report on New Zealand forestry and the 1913 Royal Commission of Forestry, they lobbied for the protection of forests for flooding prevention. Although these scientists often recognised the influence of topography and climate on flooding, following their colleagues in the USFD, they overplayed the link between forests and flooding. The language of alarm characteristic of almost all earlier conservationists remained, though
now it was couched in a scientific style. This style reflected the growth and increasing status of professionally trained scientists in New Zealand. The next chapter investigates the origins and transfers of these ideas to New Zealand, finding that the colony was intricately bound up with developments in international forestry, which shaped and in turn were shaped New Zealand policy.
International forest conservation ideas initiated and sustained environmental anxiety in New Zealand forest conservation throughout the nineteenth and twentieth centuries. Salient and continued influences on New Zealand forest conservation included those from India and East Asia, Scotland, France, Germany and Australia. New Zealand conservationists drew attention to overseas examples for two reasons. First, they used them to highlight the frightening effects of deforestation, such as climate change, sand drift, soil erosion and flooding. Second, conservationists chose areas which had successfully reversed the destruction through forest reservation and management. They upheld these as models to be applied to New Zealand. To drive home the importance of forest conservation, New Zealand conservationists contrasted overseas successes with failures. Narratives of conservation followed biblical storylines in which deforestation despoiled the Garden of Eden. Wise management of forests, however, promised to redeem the Fall. The importance of this narrative device is borne out with the use of biblical examples and those drawn from the Holy Lands to stress the importance of forest conservation. Highlighting this regular flow of personnel and papers, information and policies into and out of New Zealand illustrates that New Zealand participated in a global exchange of people and ideas. Exchanges operated and varied across space and time. Transfers of ideas occurred not only between colonies in the British Empire, but also from sources outside the Empire, such as Germany and France. The impact of these ideas depended as much on local circumstances and decisions as on international developments, since individuals in New Zealand were responsible for introducing such ideas into the colonial context. New Zealand’s first national forest conservation act of 1874 owed much to the advanced state of forestry in South Asia and continental Europe,
but so too to the interest of the premier in this subject. Influences also varied over time. South Asian forestry had an especially strong impact on New Zealand in the 1870s. This influence was due to the advanced state of forestry in that region, the appointment in New Zealand of an Indian forester and the political influence of former civil servants of India living in the colony. Some influences ebbed and flowed. Thanks to the visits of German-speaking scientists, the German link was particularly strong in the 1840s and 1850s. It ebbed thereafter because fewer German-speaking naturalists visited. In the 1890s, Cockayne’s language skills rekindled this link. Leonard Cockayne read German translations of ecological texts, and corresponded and met botanists educated in German and northern-European lands. Similarly, the American influence, which remained reasonably strong through the writing of G.P. Marsh and other correspondence, was significantly strengthened in the early 1900s with the development of a strong United States Forestry Service (USFD). The large publication output from US foresters reached New Zealand’s growing clique of professional scientists, who then relayed this information to a New Zealand audience. Before this period, professional scientists in New Zealand were rare. In the absence of such specialisation doctors, especially those trained in northern Europe, the German-speaking lands and Scotland, fostered conservation in New Zealand. This reflected their strong botanical training as much as their interest in the connections between health and environment (see chapters one and two) and the strong tradition of forestry enjoyed in these regions (see chapters three to seven). Probably because of the strong economic, social and political connections between these two areas, exchanges between Australian and New Zealand forest conservation ideas continued throughout the nineteenth century and into the twentieth. French foresters, thanks to their experience of sand reclamation and extensive forestry departments, appeared regularly in New Zealand publications on forestry. Although cross-influences also took place, as discussion of the influence of New Zealand policy on South Australia and in France reveals, New Zealand forestry occupied a marginal position in world forestry, thanks to its somewhat haphazard history of state forest

1 See, chapter four. On the relationship between international, national and local ideas in forestry, see James Beattie and Paul Star, ‘Origins and Influences of Forestry in New Zealand, 1850-1914’, in Tony Ballantyne
conservation. Transfers of information and individuals did not occur neatly, from one country to the next. German forestry ideas might reach New Zealand via Australia, conservationists might serve in various countries, and printed material on one region might appear in the newspaper of another country. Correspondence and printed material, as much as the personal experience of many conservationists and the operations of overseas foresters and scientists in New Zealand, also bear out that nationalist writings of New Zealand forest history miss out the important exchange of information that shaped conservation in this country. Although this chapter partly discusses the wider development of New Zealand forestry within this period, it specifically focuses on the influence of South Asian, Australian, German, French and Scottish ideas on New Zealand climatic, catchment and sand-drift forestry. The reason is threefold. First, since Michael Roche’s histories already provide excellent overviews of the main currents of New Zealand forestry, a study into its overall development would be needless and repetitive. Second, because Roche’s study did not focus on climatic, catchment or sand forestry, it is important and illustrative to pursue these neglected areas and demonstrate how they contributed to overall forest policy. Third, in doing so, this chapter broadens not only the study of forest and environmental history. It also extends understandings of how flows of information and the transmission of ideas operated in New Zealand. These transfers demonstrate that New Zealand’s geographical position at the edge of the British Empire belied its interconnectedness with the rest of the world. Equally, it underlines that colonies generated policies and ideas, sending these not only to other colonies but also outside the British Empire. This realisation complicates studies that focus on the transfer of ideas from European centres to colonial peripheries. Furthermore, this chapter shows that New Zealand’s experience of rapid, large-scale deforestation significantly shaped the choice of forest ideas adopted in the colony.

Networks of information

Networks of information, policies, and individuals linked New Zealand forestry with the rest of the world. Forestry in New Zealand was bound up in ‘webs of empire’ –

and Judith A. Bennett, eds., *Landscapes and Communities*, Dunedin, 2005 (forthcoming).
flows of information, capital and personnel that linked together colonies and colonial powers within the British Empire. Some linkages bound New Zealand into forestry debates with fellow colonies in the British Empire, particularly India and Australia, Ceylon and Mauritius. Colonial transfers of knowledge demonstrate that colonies both generated and diffused knowledge. These findings challenge those of two types of studies: those focussed on the transfer of knowledge from the European centre to the colonial periphery; and those solely viewing the emergence of colonial science in a national framework. National and local factors shaped New Zealand forestry, but so too did trans-national transfers of knowledge and personnel. Growing New Zealand nationalism in the 1880s, for instance, contributed to the creation of scenic reserves and national parks. The idea of national parks, like that of Arbor Day, came to New Zealand from the United States. As the work of Roy MacLeod and Michael Hoare show, too, the 1880s, a period of growing New Zealand and Australian nationalism, also saw in 1888 the inauguration of formal scientific ties between the two areas through the creation of the Australian Association for the Advancement of Science (AAAS). Simultaneous with the development of separate Australasian nationalisms, then, both countries became increasingly incorporated into world-wide scientific debates. As C.A. Bayly notes, nationalism and internationalism are a characteristic of the increasingly global nineteenth century.


Ballantyne, Orientalism and Race.


As Ian Tyrrell’s superb study of Californian-Australian environmental reforms demonstrates, networks of information and exchange reached outside empires. Forestry practices from Germany, France and the United States influenced New Zealand along with those from areas in Australia, South Asia and South Africa. These connections underline the limitations in confining research to the British Empire. Networks, too, were dynamic, complex creations. They included transfers of letters, individuals and printed matter between places. Correspondence covered oceans and crossed continents, reducing the tyranny of distance and facilitating not only the exchange of ideas but also plants. Individuals took journeys and introduced their knowledge into New Zealand. Volumes of printed matter informed experts and the public alike on the latest ideas, a traffic that effectively circumvented national boundaries. The flow of biota did not follow a one-way path from one area to the next. Nor did the transfer of knowledge. Scottish-born South African naturalist, John Croumbie Brown, for instance, wrote a book on French forestry practices for reclaiming sand dunes that made its way to New Zealand. New Zealand newspapers, similarly, reprinted material on the climatic and hydrological effects of deforestation in Spain that had originated in an article published in the Edinburgh Review.

One problem with these models is that, by reducing transfers to mere structures of thought and behaviour, some studies of information lose sight of individuals and chance. Structures are certainly important. Shipping routes, news cartels and telegraphic cables, for instance, channelled where flows of printed and written material originated.


where they arrived and where they were dispersed. Yet studies of individuals reveal
that, as today, people seldom acted rationally or predictably. Chance also played an
important role. Indian forester, Inches Campbell Walker, owed his appointment to the
position of New Zealand’s Conservator of Forests partly because of the premier’s and his
brother chance meeting over a game of whist.

Scots, South Asia and Kew Gardens

Other individuals also made a significant impact on New Zealand forestry. Many
Scottish-trained doctors voiced climatic and catchment concerns about deforestation. As
chapters four to seven show, from the late eighteenth century medical officers trained at
Scottish universities became radical and influential critics of wasteful forest destruction
in India. Concerned about the effects of environmental degradation on health and society,
they promoted state intervention by the East India Company (EIC) to stop deforestation
and mitigate the effects of famine. Medical activism contributed to the development of
Indian forest conservation. Regional forest conservancy began in Madras in 1837-1838
and in 1847 in Bombay. The Indian Forest Act (1865) brought this to a national scale.
The passing of the latter marked the ascendance of scientific forestry management aimed
at promoting long-term profit. The development of Indian conservation relied strongly

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11 A glaring example of this dull-as-dust and overly theoretical approach comes from Alan Lester, Imperial
12 See, for instance, Potter, News and the British World.
13 See, Mary Stewart, ‘Notes from New Zealand: A window into the settler world of William McCaw’,
14 See, Lanna Brown and A.D. McKinnon, Captain Inches Campbell Walker: New Zealand’s First
16 Satpal Sangwan, ‘Making of a popular debate: The Indian Forester and the emerging agenda of state
forestry in India, 1875-1904’, Indian Economic and Social History Review, 36, 2 (1999), p.191; Grove,
Green Imperialism, pp.428-453.
New Haven and London, 2000, pp.229-238. In India, conflict developed between Forestry Department
officials and local communities over access to forests by the latter. Conflict varied with the nature of
control enjoyed by the Department, but generally increased from after 1878 with the passing of
amendments to the Act of 1865. Atluri Murali, ‘Whose Trees? Forest Practices and Local Communities in
Andhra, 1600-1922’, in David Arnold and Ramachandra Guha, eds., Nature, Culture and Imperialism:
Essays on the Environmental History of South Asia, Delhi, reprint, 1996, pp.86-122; Jacques Pouchepadass,
‘British Attitudes Towards Shifting Cultivation in Colonial South India: A Case Study of South Canara
District, 1880-1920’, Nature, Culture and Imperialism, pp.123-151; Ramachandra Guha, ‘Colonialism and
on climatic and hydrological arguments. Such aims also remained a central component of Indian forestry.\textsuperscript{18}

According to Gregory Barton, the model of Indian forest conservation was adopted by other countries in the British Empire and the United States, and laid the basis for what became modern environmentalism. Although Barton’s thesis is often reductive, clearly over-simplistic and riddled with errors, his core arguments is correct, albeit in a muted form.\textsuperscript{19} Indian forest conservation undoubtedly had some influence on overseas conservation. For New Zealand, that influence was particularly strong in the 1870s, a decade which marks the beginnings of state forest conservation in New Zealand. In this decade, former civil-servants in India such as Sir John Cracroft Wilson pushed for state forest conservation, while the writings and examples of Indian foresters and forestry peppered forestry reports. In 1874, too, an Indian forester, Captain Inches Campbell Walker, became New Zealand’s first Conservator of Forests.

During debate on the 1874 New Zealand Forests Bill, Sir John Cracroft Wilson supported climatic and catchment conservation. Described by one Canterbury newspaper as ‘Toryism on two legs’, ‘Nabob’ Wilson had earned a reputation as a straight-talking, straight-dealing politician who fiercely upheld the provincial interests he represented.\textsuperscript{20} Clearly, though, he thought forest conservation was a matter that warranted national legislation. Wilson referred to his own experience with South Asia forest conservation. According to Wilson, before he visited Mauritius, he was shown papers demonstrating

\textsuperscript{18} Grove, \textit{Green Imperialism}, pp.380-473.

\textsuperscript{19} Gregory Barton, \textit{Empire Forestry and the Origins of Environmentalism}, Cambridge, 2002. Quote from p.7. To begin with, Gregory disregards the important work of Richard Grove, who demonstrates that Indian forest conservation originated in part with the work of Scottish-educated doctors employed by the EIC the eighteenth century. Gregory fundamentally overstates the influence of Indian forestry to the extent of ignoring all other non-Indian influences. In his discussion of New Zealand forestry, for instance, Barton’s scholarship is sloppy. It also elides all non-Indian ideas shaping New Zealand forestry. For instance, Barton’s insistence that: ‘Very little scholarship is available on forestry in Australia and New Zealand in the nineteenth century’ is patently absurd, as the secondary sources appearing in my thesis demonstrate. Similarly, his book is riddled with basic mistakes, such as the assertion that the French forester A. Lecoy was New Zealand’s Minister of Lands in 1880 and the inconsistent and regular misspelling of Inches Campbell Walker’s first initial as either ‘J.’ or ‘I.’ Barton, \textit{Empire Forestry}, footnote 82, pp.116, 118-119.

how deforestation had led to drought on the island. Only with ‘stringent rules’ prohibiting
tree felling, he stated, had the ‘fertility of the Mauritius … been restored to it, and the
sugar-cane and other produce grow and flourish just as much as they did in the early
days.’ His own observations in Mauritius bore out the accuracy of these descriptions.\textsuperscript{21}
Wilson also encouraged conservation. He recalled that in 1843, as an officer in charge of
a district bounded by the Himalaya Mountains, he had petitioned to stop the destruction
of a belt of saul, which

\begin{quote}
were being cut down indiscriminately as saplings, and what was the
embryo of a most valuable forest was [being] allowed to be absolutely
ruined … by the neglect of the authorities. I brought the matter under the
notice of the Government, and in vain asked for permission to preserve the
trees on this promontory of land. I could get nothing done: other matters
were considered of more importance…
\end{quote}

Finally, related Wilson, when ‘there was great difficulty in getting saul timber for
gun carriages’ the Lieutenant-Governor visited the district, whereupon Wilson ‘showed
him how valuable the promontory alluded to would be hereafter.’ Only in about 1850,
concluded Wilson, was a forestry department created. ‘[T]he forests have been conserved
ever since.’\textsuperscript{22} Wilson brought his pioneering conservationist ideas to New Zealand, where
his experience of Indian forests proved crucial in championing the colony’s major forest
bills of the 1870s.\textsuperscript{23} He also kept abreast of conservation legislation in other colonies. In
1873, for instance, he introduced the Grasslands and Fires Prevention Bill modelled on
legislation in the Australian colony of Victoria. This would prosecute anyone lighting
forest fires. Wilson also took action to prevent deforestation. He purchased seven acres of
bush land in New Zealand on the Port Hills, above Lyttelton, to prevent its destruction.
Sadly, a deliberately lit fire consumed what, Wilson related, ‘had gladdened my sight for
six years’.\textsuperscript{24}

\begin{enumerate}
\item \textsuperscript{21} John Cracroft Wilson, 31 July 1874, NZPD, p.361.
\item \textsuperscript{22} Wilson, 31 July, NZPD, p.361.
\item \textsuperscript{23} See chapter four.
\item \textsuperscript{24} Wilson, 31 July, NZPD, p.362.
\end{enumerate}
If direct experience of Mauritius contributed to Wilson’s support of conservation in New Zealand, then papers on this island’s fate inspired conservationists in New Zealand. Forestry papers presented before parliament during discussions of New Zealand’s 1874 Forests Bill included those from the Earl of Kimberley’s warnings about deforestation written to the Governor of Ceylon, W.H. Gregory (1872-1877). Kimberley cautioned that ‘the experience of Mauritius and other countries has so clearly shown the evil effect upon climate resulting from the destruction of forests’. Other writers, such as Frederick Septimus Peppercorne in 1879 and 1880, also upheld Mauritius as a cautionary tale of the effects of deforestation. Peppercorne’s articles appeared in the Transactions (1879) and as a pamphlet (1880). On 8 July 1882, the Transactions also published the summary of a paper on Mauritius that was read before the Wellington Philosophical Institute. The Mauritius link with New Zealand continued into the 1880s through the correspondence of its Chief Forester, T.H. Kirk, with the Mauritius Acclimatization Society in 1887.

Other examples of forestry in South Asia appeared in print and reinforced the claims of conservationists in New Zealand. Ceylon provided alarming examples of drought and infertility brought by deforestation. These were published in the Appendices among the 1874 forestry papers. John Douglas, Acting Colonial Secretary to the Government Agent, Central Province, Colombo, described deforestation as ‘an evil which presses hard on the natives, who are in consequence debarred from obtaining fence-sticks and wood for building and agricultural purposes. It is an evil’, continued Douglas, ‘which will ere long make itself felt among the planters themselves, when they find themselves unable to procure timber for general use, and specially firewood for their coolies.’ As previous chapters have noted, New Zealand conservationists followed a similar argument to Douglas. They presented deforestation as an evil that threatened the

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26 See chapter four.
28 Kirk to W. Dr Grandpré, President Acclimatization Society, Port Louis, Mauritius, 28 May 1887, Official Correspondence of Thomas Kirk, Chief Conservator of Forests 1885-1888, qMS-1469-1470, ATL.
fertility and economic viability of New Zealand. Discussion of Sri Lankan and Mauritius forestry also bound New Zealand into webs of correspondence with Kew Gardens and into the ambit of influence of its director, Sir William Hooker. Under Sir William and his son Joseph, Kew Gardens and others of the empire met important economic roles. As well, they disseminated information through its museums and libraries, provided employment to colonial botanists and plant hunters and acted ‘as agricultural research stations’.

By the 1840s, Kew Gardens was the nexus of an imperial orbit of botanical gardens, a nexus nurtured and developed largely through the Hookers’ efforts. Its prominence arose from the imperialism of the Victorian age. Without this expansionism and the need for botanical gardens, the efforts of Hooker and his successors would have come to little.

As with Kew Gardens, in this period, science often served as the handmaiden of imperialism, seeking to generate revenue and utilise resources.

As noted above and in chapters four and six, Indian forestry aimed to meet these targets, but also to safeguard the country from drought and declining soil fertility. New Zealand’s first conservator of forests was Scottish-born Captain Inches Campbell Walker. Walker had served as deputy conservator of Madras Presidency before coming to New Zealand and introducing many Indian forestry practices. His two papers published in the Transactions (1876) and Appendices (1877), promoted forestry for the protection of soil and climate. He also used the work of many overseas theorists who wrote on this connection.

His 1877 report, which largely followed that of the previous year, twice quoted from the work of many theorists. These included the American diplomat, G.P. Marsh, who wrote Man and Nature.... Walker used Marsh’s work to prove that forests encourage moisture, the “permanency and regularity of springs” and protected “against the escape of moisture from the soil”.

The Conservator also cited the work of other theorists who explored the forests-climate-catchment link. These included J.D. Hooker (the British naturalist), Joseph Boussingault (the French agricultural chemist), Alexander

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33 See chapters four and seven.
von Humboldt (the German explorer and father of geography), and Dr. Croumbie Brown (the Cape Colony botanist). Campbell Walker paid particular attention to the latter's work. Praising Croumbie Brown's 'good service by publishing a series of works bearing on the subject', Walker heartily recommended Croumbie Brown's works to New Zealand readers. His recommendations included Croumbie Brown's *The Hydrology of South Africa, Reboisement in France, Forests and Moisture; or, Effects of Forests on Humidity of Climate.* These examples testify to the international nature of forestry ideas, the importance of print culture and the direct influence played by such foresters as Campbell Walker in transferring these ideas. Transfers of information illustrate that the ideas of forestry experts did not simply move from one country to the next in a stage-by-stage process. They often circulated in derived form as references and abridgements. Indeed, five of the 1874 forestry papers that appeared in the *Appendices* originated in the research of Indian foresters on forest practices outside South Asia, such as Germany and Scotland.\footnote{Campbell Walker, 'Report of the Conservator of State Forests', C-3, AJHR, 1877, p.47.}

The influence of Walker continued after his departure, as many later references to his New Zealand publications attest. In 1909, for instance, conservationist J.P. Grossmann quoted from Campbell Walker's 1877 paper.\footnote{Grossmann, *The Evils of Deforestation*, Auckland, 1909, pp.5-6.} Other published sources also referred to his work.\footnote{See, for instance, H.J. Matthews, *Tree Culture in New Zealand*, Wellington, 1905, p.1; 'The Passing of the Forest', NZF, 26, 9 (September, 1905), p.770.} The Indian and Kew Garden connection also continued after the
1870s. W. Edgar Spooner, selected by Sir Joseph Hooker to become ‘Superintendent, Agri-Horticultural grounds in Lahore, Punjab’, became superintendent of the Kioreroot reserve in 1887, but resigned six weeks later.39

**Scottish-trained doctors**

In India, doctors trained at Scottish universities promoted forest conservation. Concerned about the effects of environmental degradation on health and society, they pressed the East India Company (EIC) to stop deforestation and mitigate the effects of famines. Their Hippocratic concerns contributed to the later emergence of a strong Indian state-wide forestry department in the 1860s.40 Scottish-trained doctors had an equally important influence on forestry practice in New Zealand as well as in other fields that encompassed health, botany and botanical gardens.41 Their diverse interests reflected the widespread importance ascribed to environment in the eighteenth and nineteenth centuries (see chapters one and two). People believed environment caused sickness and disease, shaped economic life and culture, and provided both economic resources and *materia medica*.42 Many Scottish-trained doctors also served as engineers, physicians, administrators, naturalists and government officials throughout the British Empire. Their wide service reflected not only the strong and broad-based Scottish medical training. It also, crucially, underlined that Scotland already had a surfeit of well-qualified workers.43

Education and health played an important role in developing the interests of Scottish-trained doctors in conservation. Since knowledge about plants often furnished

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42 Chapters one and two.
important materia medica, the particularly broad-based education afforded to Scottish medical graduates often incorporated strong practical and theoretical training in botany. Medical curricula at Scottish universities such as those at Edinburgh often employed botanical gardens and museums in teaching.\textsuperscript{44} Such interest in botany, botanical gardens and education formed part of a wider interest in developing resources in a systematic and sustainable manner. Interest in resource development also encompassed wider European concerns about improving resources and people.\textsuperscript{45} Just as for their Scottish contemporaries, some Scottish-educated doctors in New Zealand believed improvement meant promoting scientific forestry, climatic and catchment protection.

As briefly noted in chapter four, Edinburgh-educated doctor William Lauder Lindsay patronised these very causes in a series of publications dating from the early 1860s. In a pamphlet of 1862, Lindsay recommended the establishment of a ‘Conservator of Forests’ in Otago and, later in 1868 upheld climatic arguments. According to him,

Evidence already exists of the production of an artificial climate in some parts of Otago, or of the modification of the natural climate, by man’s operations, especially as to drainage and timber-felling. These operations tend, in Otago, to render the climate drier and warmer; and such a change has already been experienced in the settled districts around Dunedin, as the result of swamp-draining and forest-clearing.\textsuperscript{46}

In 1868, he published an article promoting scientific forestry in New Zealand. Aside from possibly being the first technical paper of its type published about New Zealand forests, ‘On the Conservation of Forests in New Zealand’ championed a far-sighted forest policy that was at least a decade ahead of its time. Lindsay’s pamphlet pulled no punches. Its author launched into an attack on ‘colonial governments and colonists’ for exhibiting ‘a blind indifference to, or ignorance of, the importance of forest preservation and the ‘systematic cultivation of new forests’. Dividing the causes of deforestation into natural

\textsuperscript{45} See, for instance, Drayton, Nature’s Government.
\textsuperscript{46} Contributions, p. 28.
and artificial, he charged settlers with ‘reckless and improvident, or illegal and culpable timber-felling’. Lindsay, equally, blamed Māori for deforestation, an early example of a European writer acknowledging Māori agency in landscape alteration. Reckless destruction, charged Lindsay, could be alleviated through systematic forestry, known today as scientific forestry. Lindsay envisaged a New Zealand ‘Board of Forests’ overseeing the protection of existing forests and the systematic cultivation of new ones. Acclimatising trees ‘of a hardier kind’ such as wattle or blue gum, he held, would become a necessity because ‘the present forests are doomed, in great measure at least, to ultimate decay and disappearance’. Lindsay’s ideas probably followed the popular idea that New Zealand plants and animals inevitably succumb to the superior European species. They reflected practicalities, too, for Australian and Eurasian and American trees grew at a faster rate than New Zealand species, an important practical consideration for economically-driven forestry.

James Hector, another Scottish-trained doctor, also promoted forest conservation in New Zealand. Hector, as Lindsay, had studied medicine at the University of Edinburgh, taking lectures in botany. Arriving in New Zealand in 1861, Hector became director of the Geological Survey of Otago and enjoyed a spectacular rise up the ladder of colonial science. By the latter part of the nineteenth century he was arguably the most influential scientist in the colony. Aside from his interest in the development of science, geology and botanical gardens, Hector followed Lindsay’s lead in forest conservation. At the 1870 Committee on Colonial Industries, Hector displayed a sophisticated understanding of forest influences. Hector pointed out that: ‘Large tracts of land in the north of Auckland which naturally possess great capabilities for agriculture, [but] have

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49 On this, see Beattie and Star, ‘Forest Influences’.
50 Historian Michael Hoare has coined the term ‘Hectorian Centralism’ to describe Hector’s influence on New Zealand science between 1865 and 1895. Hoare, *Reform in New Zealand Science*. 
been rendered absolutely worthless for centuries to come' by deforestation. Newly fired and open bush, explained Hector, did not allow young trees to develop. As a consequence, 'the air and sun dry up the surface soil of ... freshly-cleared bush land, and it is washed away by the rains.' In 1871, Hector read a paper on behalf of Dr Wjeikof before the Wellington Philosophical Institute. Wjeikof's paper investigated the relationship between deforestation and increased flooding and droughts in Russia. Hector supported Wjeikof's theories. Wjeikof's paper prompted Hector to note that 'the effects on the climate produced by the clearing of forests can be observed in this country without the complications due to distant influences which affect continental climates.' On a more practical level, too, Hector was commissioned by the New Zealand Government to undertake surveys of the colony's forests. As with Lindsay, Hector promoted the application of science to using New Zealand's resources wisely, while also recommending that some forests should be retained in order to protect climate and soil.

Hector worried about the impact of settlers on New Zealand's forested landscape and believed their actions were causing flooding, soil erosion and even climate change. Another doctor trained in London and Aberdeen, Indian-born Alfred Kingcombe Newman, also lobbied for the transfer of forests into state hands. According to Newman, this would ensure their protection and stop their 'mad and reckless' destruction, for which only 'future generations will blame us.'

**A Scottish influence on conservation in New Zealand?**

Some Scottish-trained doctors in New Zealand thus promoted Hippocratic conservation. Following the lead of their predecessors and contemporaries in India, they wrote about the importance of scientific forestry, soil and climate protection and generating forest revenue. Scottish-trained doctors formed part of a global Scottish-

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diaspora that reached out to most of the British Empire. James Belich asserts that ‘outside Scotland itself, there probably is no other country in the world in which Scots had more influence’. Although Belich overestimates the influence of Scots in New Zealand, along with other groups they did have an important numerical, social and religious influence in the colony. ‘Scottishness’ alone, of course, did not determine whether one was a conservationist. Yet, the particular social and religious history of Scotland may have led to an interest in forests, conservation and gardens. Richard Grove, for instance, argues that, directed by ‘a critique of the social and ecological impact of [English] settler rule’, ‘a nascent Scottish environmentalism’ was ‘becoming a major vehicle for the expression of a national identity constructed and asserted against Englishness and English rule.’ Although the conventional interpretation accepted by Grove and many others is that Highlands deforestation accelerated in part as a consequence of English rule, this may actually overstate the impact of English rule on accelerating deforestation.

The perception of English-directed deforestation and the reality of a scarce woodland environment, nevertheless, led some Scots to value forestland and many estate owners to create plantations for utility, beauty and profit. A few examples suffice to illustrate such eagerness. Over a period of one hundred years from the early eighteenth century, three successive Dukes of Atholl planted some 21 million trees. Others, such as the 6th Earl of Haddington planted and wrote about forestry. Such action has fostered discussion about a ‘Golden Age’ of tree planting that existed in Scotland from the early eighteenth century to about 1830. During this time, plantations became an increasingly

common presence over much of the Scottish landscape.\textsuperscript{58} Scottish enthusiasm for forestry and particularly forestation actually contrasts with English disinterestedness in such matters.\textsuperscript{59} It is quite possible, then, that experience with forests and forestry shaped the ideas of some Scots who came to New Zealand.

If a near-mania for tree planting influenced Scots, then so too did Presbyterianism. Most Scots in New Zealand continued to practise their Presbyterian faith seemingly without the major doctrinal splits characteristic of Scotland. In the case of Otago’s colonisation in 1848, Free Church Presbyterianism provided the moral and social glue of this new religious settlement in the southern seas. Presbyterianism condoned mixing labour with land, turning forest to farm.\textsuperscript{60} Yet, as Grove shows with Calvinism, this faith also gave religious and moral urgency to the wise use of resources. A faith that ‘encouraged the individual to take a personal and unmediated responsibility for a relationship with God and for the consequences of that relationship’, also encouraged the individual to take responsibility for a relationship with nature and for the consequences of that relationship.\textsuperscript{61} Despoiling lands and diminishing the number of species, similarly, flew in the face of notions of ‘stewardship’. Presbyterianism thus often encouraged the wise use of nature, rather than its abuse.\textsuperscript{62}

Influenced by the ideals of stewardship and given their numerical size in the colony, it is not surprising that other, non-medically trained Scots also tried to balance resource use and stewardship. As I argue in a forthcoming article, many Scots in New Zealand served as gardeners, botanists, and foresters.\textsuperscript{63} Not all foresters, of course, upheld catchment or climatic concerns, but a significant number did. References to


\textsuperscript{61} Grove, \textit{Green Imperialism}, p.151.


\textsuperscript{63} Beattie, ‘W.L. Lindsay and Scottish environmentalism’.
Scottish examples of forestry and to Scottish environmentalists also attest to the influence of Scottish environmentalism in New Zealand.

In parliament, Glasgow-born civil engineer and surveyor Charles Gordon O'Neill pressed for state forestry for climatic and catchment protection in New Zealand. As parliamentary representative for the goldfields districts of Otago and Thames, O'Neill probably would have been aware of the insatiable demand mining placed on forestry resources, particularly in the relatively forest poor regions that he represented. His concerns, though, extended beyond mere questions of supply and demand. He maintained a vocal conservation lobby throughout the 1870s. In 1873, for instance, as chapter four showed, O'Neill introduced a Conservation of Forests Bill, ‘so that history might not be able to relate that they received a fertile country, but, by a criminal want of foresight, transmitted to posterity a desert.’ Although O’Neill’s Bill of 1873 was not passed, it clearly demonstrates its creators’ concern about the effects of unfettered capitalism on the New Zealand landscape and the damage caused by unwise deforestation. Highlands-born Duncan McArthur (1806/07-1888) pressed for similar measures in New Zealand. As Southland’s Chief Inspector of Forests, McArthur encouraged the development and sustainability of forestry resources. This role demanded the compilation of reports on forests and cutting rates and, when the occasion required it, the seizure of illegally-cut timber. In 1882, he presented to the Southland Institute, ‘On the Importance of Forestry’. This encouraged forest protection to protect agriculture against droughts and timber famine and provide a means of draining wetlands. Planting and draining a ‘large extent of cold, wet, inert peat [bog]’ between Peebles and Edinburgh, he asserted, had changed the climate of this area and converted it ‘into fine fertile fields.’ McArthur warned those in New Zealand who claim that this country has an abundant supply of

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65 See chapter four.
timber to think again. As he noted, 'the fact that in many parts of Europe and elsewhere' deforestation 'resulted in converting countries formerly fertile and well peopled into absolute deserts ... ought to be a warning to the people of this grand country to conserve their native forests ere it be too late.' Aside from his publication in the Transactions, McArthur also lobbied for forestry in provincial newspapers. Later that century, G.M. Thomson also promoted catchment conservation, as well as acclimatisation, in newspapers, the Transactions and his own journal. Thomson was born in India but spent one year at Edinburgh University taking papers in chemistry and botany, before coming to New Zealand in 1868 and teaching science in Otago schools.

As noted above, the work of the Scottish environmentalist the Rev. John Croumbie Brown had an important influence on Walker and others in New Zealand. The product of 'an intensely religious and Calvinistic' upbringing, Dunbar-born Brown joined the London Missionary Society. In 1844, he arrived in the Cape Colony, South Africa. There, Brown preached sermons of an explicitly environmental nature. He often railed against deforestation and veldt-burning as 'evils' that only could be redeemed through irrigation and tree planting. For him, the state of landscape indicated the moral and religious standing of its inhabitants. Returning to Scotland in 1848, he pursued his interest in arboriculture and in 1853 was appointed lecturer in botany at King's College, Aberdeen. In 1862, Brown returned to the Cape Colony as Colonial Botanist only to be dismissed for his outspoken criticism of deforestation in 1866. Thereafter he devoted himself to publishing works highlighting the importance of forest conservation and tree planting in maintaining rainfall, soil fertility and reclaiming sand wastes. Brown's ideas reached New Zealand through the wholehearted recommendations of Walker, but also via other authors. Auckland-based academic, J.P. Grossmann, quoted Brown's work, Reboisement en France, to highlight the necessity of conservation and replanting in New Zealand.

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73 Grove, 'Scotland in South Africa', pp.139-155.
Zealand. Copies of this and Brown’s *Forests and Moisture; or, Effects of Forests on Humidity and Climate* (1877) also circulated in New Zealand. A more direct link between Brown and New Zealand was forged in 1887. New Zealand’s Chief Conservator of Forests, T.H. Kirk, received copies of papers directly from Brown. In return, Kirk sent Brown details ‘of our young Forest Department.’ Although unfortunately the list of these papers no longer exists, the example is sufficient to illustrate that Brown’s work had a hand in New Zealand’s forestry department. Aside from the influence of Brown and the work of Scottish-trained doctors and foresters in New Zealand, colonial conservationists only made passing references to Scottish forestry.

**Scientists trained in Germany and elsewhere in northern-Europe**

If Scotland and the Scottish university system often produced highly educated professionals serving in the British Empire and articulating environmental concerns, then so too did many of the Free Cities, Principalities, and States of northern Europe. As with the Scots, Germans and northern Europeans emphasised improvement through education (*Bildung*). By the nineteenth century, many German regions had strong universities and schools. These offered a thorough and broad-based, as well as professional, education. Since the 1840s, many German schools and universities also emphasised scientific education. Romanticism pervaded European society at this time and influenced

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74 Grossmann, *Evils of Deforestation*, p.11.
75 *Forests and Moisture: or, Effects of Forests on Humidity and Climate*, Edinburgh and London, 1877. A copy of Brown’s was held in Ranfurly. Copy owned by me.
76 Kirk to Rev. J.C. Brown, Haddington, Scotland, 29 June 1887, Official Correspondence of Thomas Kirk, Chief Conservator of Forests 1885-1888, qMS-1469-1470, ATL.
education and university curricula, no less than the rest of society and the arts. Generally, romanticism in science typified a movement away from mechanistic conceptions of nature. Instead, emphasis fell on the harmony between self and nature, the individual and the organic.\textsuperscript{79} One early example of this outlook came from the remarkable and highly influential Alexander von Humboldt (1769-1859). A true polymath who viewed aesthetics and science as ways of comprehending nature as an organised whole, Humboldt’s organic view of nature led him to look at the influence of climate and geography on the distribution of plants. He acknowledged that vegetation also influenced the aesthetic and racial development of humanity.\textsuperscript{80} Von Humboldt’s views also had links to New Zealand.

New Zealand authors often referred to Humboldt’s \textit{Personal Narrative of a Journey to the Equinoctial Regions of the New Continent}. This recounted many of its authors’ adventures in South America. In this widely-read book, Humboldt upheld the idea that deforestation had decreased rainfall and dried up streams, thereby diminishing the size of Lake Valencia in Venezuela.\textsuperscript{81} Humboldt’s observations appeared when O’Neill introduced his Conservation of Forests Bill of 1873. Similarly, Walker used Humboldt’s example of Lake Valencia in 1877; so too did Peppercorne in 1879 and 1880.\textsuperscript{82} An earlier link bound Humboldt’s writing to New Zealand. Father and son naturalists, J.R. and Georg Forster sailed on Cook’s second voyage to the Pacific (1772-1775).\textsuperscript{83} The writing of the Forsters, mixing scientific observation with vivid descriptions


\textsuperscript{81} Humboldt, \textit{Personal Narrative}, pp.150-151.


of lands, people and flora, provided a model for later European explorers, one of whom included Humboldt. Humboldt, in turn, had contacts to later German-speaking scientists to visit New Zealand.

Ferdinand von Hochstetter visited the young colony in 1859 as part of the Austrian scientific expedition circumnavigating the world in the frigate Novara. Interestingly, von Humboldt had written a warm letter of goodwill for the journey ahead, thus continuing von Humboldt’s link that went back to the Forsters. Hochstetter’s interest in natural history, as with Humboldt’s, had been forged in youth. Hochstetter’s father keenly pursued his pastime of natural history while Hochstetter also corresponded with scientists from his early days. Ferdinand von Hochstetter undertook theological and scientific training and in 1852 completed a Ph.D. on mineralogy at Tübingen University. An invitation to join the Novara expedition appealed to this young man. The expedition aimed to promote scientific study and research, and ‘initiate connections and exchanges [Tauschverkehr] with the different scientific institutes of the countries visited’, an early illustration of the importance of scientific exchanges. At the behest of the Auckland Provincial Government, Hochstetter remained in the colony. He undertook a geological survey of the coal resources in the Drury region while the rest of the voyage sailed on from New Zealand. He stayed on after this survey and in all spent nine months in the colony. This detailed research time allowed him to produce two important books

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85 A letter wishing the journey well was published as a supplement 1 (p.4 supplements), and as ‘Physical and Geographical Memories of Alexander von Humboldt’ (supplement 2, pp.7-28) in Übersichtliche Darstellung der unter dem Titel: „Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair“ erschienenen Publicationen [Overview of the presentation of the publication appearing under the title ‘Journey of the Austrian Frigate Novara around the world in the Years 1857, 1858, 1859, under the command of Commodore B. von Wüllerstorff-Urbair’], Vienna, 1877.

86 Gerhard Holzer, ‘Ferdinand von Hochstetter, inbesonders als Neuseelandforscher’ [‘Ferdinand von Hochstetter, in particular as New Zealand Researcher’], Diplomarbeit in Geschichte, University of Vienna, 1984, pp.8-9.

87 Johann Spitzka, Reise der österreichischen Fregatte, p.ii.
on New Zealand’s geography and geology in addition to numerous articles. As chapters four and seven illustrate, Hochstetter also highlighted the foolish policy of firing forests, which he believed might lead to the onset of desert conditions. A measure of the influence of Hochstetter’s short passage is seen by the many references to it in New Zealand works. Thomas Potts and O’Neill quoted Hochstetter’s passage in full to emphasise the need for forest conservation in New Zealand. It also appeared in the 1874 forestry papers and again in full during parliamentary debate on Vogel’s Forests Bill. Although there are few references to his work after the 1870s, the popularity of Hochstetter’s works on geology and geography mean it is likely his views continued in New Zealand. The relative paucity of New Zealand-wide natural history publications of the standard of Hochstetter’s work probably guaranteed it a wide and continuing readership.

An earlier German scientist to visit New Zealand was Ernst Dieffenbach. He had a similar upbringing to Hochstetter, one which underlines the important connection between religion and science in the German lands at this time. Dieffenbach came from a strongly religious family (his father was Professor of Theology at the University of Giessen). While he studied for a doctorate in medicine at Giessen, Dieffenbach pursued his political ideas as a member of the Young Men’s Association (Burschenschaften) and it is over these that he fell foul of local authorities. His views, highly critical of the ruling authorities, forced him into exile, first to France and thence England. In England, he applied for the job of naturalist with the New Zealand Company’s (NZC) settlement expedition to Port Nicholson. It was while on exile in Berlin, too, that Dieffenbach met Humboldt on several occasions. As with Humboldt, Dieffenbach produced an important work on the interaction between people, plants and animals in the so-called ‘New World’. As chapters one, four and seven illustrate, Dieffenbach’s two-volume *Travels in New*

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89 Potts, NZPD, 7 October 1868, p.188; Charles O’Neill, NZPD, 1 October 1873, p.1545; ‘The Forests of the Colony [from Harsard 7th October, 1868]’, in ‘Papers relating to state forests, their conservation, planting, management, &c.’, AJHR, H-5, Vol. 2, 1874, p.1; Wood, NZPD, 31 July, 1874, pp.380-381.

Zealand... provided a detailed look at the impact of humans on the colony’s environment as well as detailed environmental criticism of settler deforestation.

Dieffenbach, along with the Forsters and von Hochstetter, formed a group of Germans who furthered science not only in nineteenth century New Zealand but also throughout the British Empire. India’s first three Chief Conservators of Forests all hailed from German lands, as did many foresters on the staff of the Indian Forestry Department. Similarly, in Australia and South Africa many German and northern European scientists advocated conservation (see below). Their prominence reflected not only the excellent scientific education offered by many German institutions, but more specifically the strength of German forestry. Cameral sciences (the science of state finances and bureaucracy) revolutionised government in many German states and principalities in the late eighteenth century. It also influenced forestry science. By the early 1800s, in the German-speaking lands it emerged as a systematic method of mathematics applied to the harvesting and growing of forests. In the nineteenth century, German scientific forestry then influenced the development of forestry science in many countries, including France, India and, eventually, England (via India).

Some aspects of German scientific forestry directly shaped New Zealand forestry. In 1874, a report on forestry in German lands compiled by Walker appeared in the 1874 forestry papers. Walker had spent four-and-a-half months visiting German forestry academies. In the 1880s, an Austrian forester worked for New Zealand’s Forestry...
Department. In the 1900s, too, one can discern the influence of German forestry, particularly on the ideas of Robert McNab, an advocate of both forestry science and catchment conservation.\(^{95}\) Aside from his wide reading of North American forestry techniques, McNab's scrapbook reveals that he possessed a number of reports on German forestry science. These included *Instruction in Forestry and Forest Economy in Germany*, a consular report that looked at the importance and principles of scientific forestry and their influence on rainfall, flood prevention and health.\(^{96}\) McNab also possessed references to other reports on German forestry. Two postcards from Königlichen Forst-Akademie (Royal Forest Academy) at Tharandt also are included in his forestry collection. Perhaps these indicate that he had corresponded with German foresters or visited the academy.\(^{97}\) Germany forestry certainly influenced his own forestry methods. McNab related to schoolchildren and a journalist that on his own plantation at his home in Knapdale, Southland, he had:

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 decided to adopt the German method, which cost about one-twelfth of the other [English and Scottish tree planting methods]. This made it possible to plant much more extensively than had hitherto been possible. He had noticed while in Wellington this session that the report of the Imperial Royal Commission on Forestry...advised the abandonment of the old method of tree planting in England and Scotland and the adoption of the German.\(^{98}\)

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\(^{95}\) Grossmann, for instance, quoted from Professor Schwappach's text *Forestry* to highlight the value of forests. Grossmann, *Evils of Deforestation*, p.6.

\(^{96}\) Diplomatic and Consular Reports. No. 596 Miscellaneous Series, Foreign Office, September 1903 in Rober McNab: Papers relating to afforestation in New Zealand 1895-1908, HL, MS 0608.

\(^{97}\) These references to previous Consular Reports on German include: Misc Series nos. 540, 561, 566, 572, 573, 591, 594, 595. McNab also possessed a copy of Dr. Frederick Rose, His Majesty's Consul at Stuttgart, 'Report on Instruction in Forestry and the Present Condition of Forest Economy in Germany'. The first postcard, one showing building of forest academy at Tharandt, Saxony, is dated 28 Sept. 1903; another of photograph of small town with labels pointing out buildings, including that of the Forst Akademie, dates from 1 Dec. 1903. A third, also dated 1 Dec., 1903, is from a trout hatchery from Saxony. All references are in McNab Papers.

\(^{98}\) 'Practical Forestry: Schoolboys at Knapdale', 20 August, 1903, *The Ensign*, in McNab Papers.
This German method apparently involved closer planting of trees.99

By the 1900s, ecological ideas took the German influence in new directions and new forms. Leonard Cockayne and G.M. Thomson, two important members of New Zealand science and both self-trained scientists, upheld ecological ideas.100 Cockayne’s German fluency allowed him to access the ecological ideas of the Dane, Eugenius Warming. Warming’s seminal ecological text, *Plantesamfund*, appeared in German in 1895, a decade or so before its translation into English. Linguistic fluency, therefore, gave Cockayne a head-start among his non-German speaking peers, and allowed him to introduce these ideas into New Zealand. Ecology encouraged forest protection by increasing understandings of plant communities and their significance. It furnished detailed investigations of the interrelationship between environment, climate and vegetation, and recognised the impact of humans on these systems. For Cockayne, this was translated into the protection of forests for catchment purposes as well as for arresting the spread of sand dunes (chapters six and seven). Cockayne also corresponded with and met leading German botanists. In 1898, for instance, he met with German botanist Karl von Goebel.101 G.M. Thomson, who translated a number of articles from German for his *New Zealand Journal of Science*, pressed for catchment conservation and ecology. Also, both Cockayne and Thomson played an important role in the 1913 Royal Commission on Forestry that signalled the end of the climatic arguments for forestry (see chapters four and seven). German ideas thus had an imprint on New Zealand conservation throughout the nineteenth and early twentieth centuries. In the 1840s and 1850s, this came through two German scientists, one of whose work often appeared in parliamentary bills and forestry papers of the 1870s alongside other material on German

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100 Both Cockayne and Thomson worked as science teachers in Otago.
forestry. The influence of German ideas also extended to the 1890s and 1900s, through the work of McNab, Cockayne and Thomson on forestry and ecology.\(^{102}\)

**French forestry**

The other major powerhouse of European forestry in the nineteenth century was France. Initially influenced by the German model, the French government established its own School of Forestry in 1817 in Nancy to provide forestry training. French scientists, from the eighteenth century onwards, also produced theoretical and mathematical works looking into the influence of forests on rainfall and hydrology.\(^{103}\) New Zealand conservationists often quoted these works to illustrate the connection between forests, climate and hydrology. Peppercorne, for instance, relied upon the research of M. Mathieu, a French forester based at the School of Forestry, Nancy. Matthieu extensively studied the influence of forests on evaporation, rainfall and ground flow.\(^{104}\) Other sources, too, referred to the work of French foresters. The *New Zealand Country Journal* of 1890, for instance, provided a précis of M. Prosper Demontzey's paper, "On the prevention of torrents and the re-afforesting of mountains".\(^{105}\) Many conservationists in New Zealand used examples of the problems of flooding and erosion caused by deforestation in highland parts of France to illustrate further the follies of deforesting upland areas.\(^{106}\)

In the 1880s, a retired French forester, A. Lecoy, visited New Zealand at the behest of the Colonial Government. Lecoy compiled reports on forestry in New Zealand, which appeared in the parliamentary papers of 1880 and 1881 as well as the *Transactions*. He pressed for scientific state forestry by stressing the need to protect

\(^{102}\) On the general influence of German-speaking scientists, note Braund, 'German-speaking scientists in New Zealand'.

\(^{103}\) See chapters three and seven.


\(^{105}\) Demontzey was an administrator in the Forest Department of France. ‘Beneficial Effects of Forests’, *NZCJ*, 14, 6 (November, 1890), p.520.

upland forests against flooding, erosion and climatic deterioration. His work for the New Zealand Government clearly indicates the high esteem in which French forestry was held. Countless conservationists in New Zealand also referred to the success of French forestry in arresting sand drift and redeeming the sand ‘wastes’ of Gascony and Les Landes (see chapter six). The French example served as the model for similar techniques in New Zealand. Cockayne and others looked in detail at this in their recommendations for reclamation in New Zealand. It should be remembered, too, that John Croumbie Brown’s book on French replanting in dune areas also was circulating in New Zealand (see above). By the 1900s, French reclamation received the attention of Edward Philips Turner, New Zealand’s first head of the administratively-independent Forests Branch. In 1913, he referred extensively to French dune reclamation techniques in an unpublished report on New Zealand sand dunes. Philips Turner also co-translated from the French, Édouard Harlé’s technical treatise on sand reclamation. His translation both establishes Turner’s connection with French conservationists and underlines the importance of translated material as a source for conservation ideas. France’s link with New Zealand continued into the next century. In a letter of 1920, S.G. Clarke related that in 1913 he had visited the Department of Water and Forests in Paris. Clarke recommended sending a New Zealand forester there for two or three years to learn about sand dune reclamation, commenting that ‘the whole problem is too big to be mastered in the course of a passing visit’. Later, in 1924, New Zealand’s Director of Forestry sent a letter and photograph to his French counterpart in Bordeaux requesting him to assess New Zealand’s sand reclamation methods.

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107 See chapters three and four.
108 See chapter six for Cockayne.
111 S.G. Clarke to F.H.D. Bell, Auckland, 3 January 1920, Sand Dunes – National Policy, 1920-1925, F1, 27/0, NA.
112 Director of Forestry to Directeur-General, 6 Rue David-Johnston, Bordeaux, France, 5 May 1924, Sand Dunes – National Policy, 1920-1925, F1, 27/0, Nat Archives, Wellington. Unsurprisingly, the reply came that it was ‘impossible to give a review of the work due to such simple photographs and without visiting the terrain; but according to the view ... the work of the regime in New Zealand is well executed and resembles
Cautionary tales of deforested lands

If methods of sand reclamation developed by French foresters offered a means of salvation to New Zealand’s sand drift problems, then other European and Middle Eastern countries offered cautionary tales of the folly of deforestation. In Russia, particularly from the 1860s, foresters began to criticise the destruction of forests. Utilising a ‘rhetoric of catastrophe’ very similar to that used by conservationists in New Zealand and elsewhere in the world, Russian foresters argued that deforestation caused severe erosion, declining water tables and climatic deterioration. A few writers and artists, the latter including painter Ilya Repin (1844-1930), also portrayed such destruction. English-speaking writers quickly picked up the Russian problem. Their views reached New Zealand through the Edinburgh Journal. In 1903, James Carroll, when introducing his Sand-drift Bill in New Zealand, quoted extensively from E.J.F. Law’s article from the Edinburgh Journal. Law had drawn attention to the catastrophic consequences of deforestation – sand drift, diminishing rainfall, dried-up rivers and destructive erosion and flooding. These woeful environmental possibilities prompted Carroll to ask:

If so much devastation and desolation has taken place in Russia, where the sand in one instance has covered eight hundred square miles, and has blocked up rivers, and rendered them absolutely dry, what must happen to our country in time? The same results will assuredly follow if no step is taken to check the moving sands which lie along our coast-line, and, on the principle of “a stitch in time saves nine,” the earlier we set ourselves to the task of coping with this difficulty the quicker it will be overcome, and the more assuredly shall we reap the benefit.


Costlow, ‘Imaginations of Destruction’.

Carroll, NZPD, 28 September, 1903, p.4.
McNab referred to the same article, using it as a measure to prick the New Zealand government into action to protect against sand drift. Furthermore, Law and other New Zealand writers specifically referred to the example of deforestation in Astrakhan, probably echoing the views of climatologist Dr. A. Wjeikof (see above).

Aside from Russia, cautionary tales from the Middle East, southern Europe and northern Africa described deforestation rendering lands infertile. These drove forward the environmental anxieties of New Zealand conservationists. Unlike the Russian examples, their provenance is often difficult to discover because most conservationists did not refer in detail to these. One exception is an 1869 article from the *Otago Daily Times* that came from the *British Medical Journal*. According to the article, irrigation and tree planting in Ismailia, northern Egypt, had increased the soil fertility of the area as well as changing its climate. Ismailia offered a clear lesson: “Rain ceases to fall on a country deprived of its forests, or only falls in violent storms. Here we see rain returning to the desert on restoring the trees.” Unsurprisingly, given his penchant for collecting forestry papers, Robert McNab possessed a detailed account of contemporary state conservation efforts in the Ottoman Empire. This included an almost de rigueur discussion of climatic and catchment forestry. Most other sources gave only general references to the deleterious historical consequences of deforestation, as when Charles O’Neill introduced his *Conservation of Forests Bill (1873)*:

In modern times, Ali Pacha burnt down the forests of the Peloponnesus, and these came famine and drought. Then, the Russians burnt down the fine forest of the Caucasus...and the climate of the county [sic] changed completely: the land became barren, drought ensued, and whole tribes had, in consequence, been obliged to seek new homes in foreign lands, their own soil having become unfit for human habitation. Other parts of the world show the same result; parts of Spain, Palestine, Asia, Northern

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117 The article is entitled ‘CLIMATIC CHANGES THROUGH THE AGENCY OF MAN [sic]’ and comes from the *British Medical Journal*. ODT, 13 September, 1869, c.5, p.3.
118 ‘CLIMATIC CHANGES’, c.5, p.3.
Africa, which were once fertile and flourishing, were now arid wastes by
the destruction of the forests...\textsuperscript{120}

Similarly, for Arbor Day in 1895, the Government instructed speakers to compare the
‘present conditions of countries that have despoiled their forests with their former
prosperity – Palestine, Persia, Colorado.’\textsuperscript{121}

It is possible that these environmental anxieties sprang from the work of George
Perkins Marsh. His 1864 book \textit{Man and Nature}... brought together a great diversity of
material on the importance and influence of forests.\textsuperscript{122} Marsh’s examples and thesis, that
humanity had a profound impact in altering the natural environment, proved influential
throughout the world.\textsuperscript{123} As a diplomat and skilled linguist, Marsh had seen for himself
the dismal consequences of deforestation that he wrote about in \textit{Man and Nature}.... His
linguistic skills also enabled him to access material in languages other than English.\textsuperscript{124}

Current scholars of New Zealand’s environment correctly recognise the importance of
\textit{Man and Nature}..., but overstate its influence.\textsuperscript{125} In a recent article, Graeme Wynn has
admitted that his earlier articles of New Zealand forest conservation over-emphasised the
influence of Marsh.\textsuperscript{126} Walker (1877) and Grossmann (1909), for instance, quoted from
\textit{Man and Nature}... (Grossmann referred to it as a ‘classical work’) as did many others.\textsuperscript{127}

Marsh undoubtedly shaped the views of many New Zealand conservationists, but his was
only one of many such sources in the colony. In the 1870s, for instance, Sir James

\textsuperscript{120} O’Neill, NZPD, 1 October 1873, p.1546
\textsuperscript{121} Department of Agriculture, \textit{Arbor Day, 1895}, Wellington, p.6.
\textsuperscript{123} David Lowenthal, ‘Nature and morality from George Perkins Marsh to the millennium’, \textit{Journal of
Historical Geography}, 26, 1 (2000), pp.3-27. On his influence see, for instance, Marcus Hall, ‘Restoring
the Countryside: George Perkins Marsh and the Italian Land Ethic (1861-882)’, \textit{Environment and History},
\textsuperscript{124} See Lowenthal, ‘Nature and morality’.\textsuperscript{122}
\textsuperscript{125} Ross Alan Galbreath, ‘Colonisation, Science, and Conservation: The Development of Colonial Attitudes
toward the native life of New Zealand with particular reference to the career of the colonial scientist Walter
Lawry Buller (1838-1906)’, Ph.D., University of Waikato, 1989, pp.189-191; Graeme Wynn, ‘Pioneers,
politicians and the conservation of forests in early New Zealand’, \textit{Journal of Historical Geography}, 5, 2
(1979), pp.171-188, especially pp.179-181, 185; Wynn, ‘Pioneers, politicians and the conservation of
\textsuperscript{126} Wynn, ‘“On Heroes, Hero-Worship, and the Heroic” in Environmental History’, \textit{Environment and
p.33.
Fergusson requested information on United States forestry. He received a letter and information about the Timber Culture Act of 1873. Replying to Fergusson, Edward Thornton noted that:

very little has as yet been done in this country with that object [tree planting and conservation]. On the contrary there has been such careless use and destruction of forests that some alarm has been exited by the danger that the United States will soon be completely denuded of timber.128

Thornton’s opinion reinforces the fact that, only from the late nineteenth century, did the United States develop a nation-wide forest policy and establish a state forestry department (see below). As for the Timber Culture Act that Thornton forwarded, it contained details of forestry reports from America, Europe and India, including Campbell Walker’s report on German forestry.129

Later North American forestry sources proved more effectual than Marsh and the Timber Culture Act. The work of the United States Forestry Department (USFD) in the 1900s on the way deforestation increased flooding and soil erosion played an especially important role in New Zealand forestry. It helped to effect a movement away from climatic arguments in favour of catchment conservation that was signalled by New Zealand’s 1913 Royal Commission on Forestry (chapters four and seven). Charles Cotton, lecturer of Geology at Victoria University College (Wellington) strongly recommended the applicability of Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin (1911) to New Zealand.130 As some of Robert McNab’s holdings reveal, America published many magazines on forestry. These included Forest Leaves and Arboriculture: A Magazine of the International Society of Arboriculture.131 Ties with United States forestry demonstrate that information networks flowed outside the British Empire and that they varied over time. In the 1860s and 1870s,

128 Edward Thornton to His Excellency the Governor, Sir James Ferguson, Washington, 22 April, 1874 in ‘State Forests: The United States’, Le 1/1874/133, No. 46, NA.
129 Timber Culture Act of March 13, 1874: Instructions of the Commissioner of the General Land Office, 6 April 1874, included in folder with Thornton’s letter. Le 1/1874/133, NA.
the United States link was felt through the work of American Marsh, who looked at forestry throughout the world. In the 1900s, it became focussed on the example of forestry theory and organisation in the United States, a reflection of the growing importance of state forestry in that country. These formed part of an enduring environmental connection between the States and New Zealand. \(^{132}\)

South Australia and Victoria

The influence of Australian forest conservation remained throughout the nineteenth and twentieth centuries. This illustrates the importance of information flows between colonies. It reflects the relatively close geographical, social and political connections between these Tasman neighbours, the latter of which continued to the century’s end. \(^{133}\) In political terms, New South Wales governed New Zealand until 1840. Indeed, between 1867 and 1883 New Zealand attended four of the nine inter-colonial conferences. \(^{134}\) Many immigrants also moved between these two countries. In the 1860s, gold attracted miners from the Victorian goldfields to those of the South Island. This transfer reversed during the Long Depression of 1880, when many New Zealanders moved to Australia. \(^{135}\) New Zealand often borrowed legislation from Australia. \(^{136}\) Australasian scientific ties also continued throughout the nineteenth century. These included the inter-colonial exhibitions of the 1860s promoted by New Zealand’s provincial governments as well as the 1879 Australasian Meteorological Conference in Melbourne. \(^{137}\) As noted above, the creation in 1888 of the AAAS (later the Australian-New Zealand Association for the Advancement of Science) formally instituted a trans-

\(^{131}\) McNab Papers.


\(^{133}\) Adrian Chan, ‘New Zealand: Environmentally Determined?’, New Zealand Geographer, 27, 1 (April, 1971), pp.65-68.


Tasman scientific dialogue which had been going on some time. From the 1850s, forestry papers, correspondence and personnel also travelled between many of the Australian colonies and New Zealand.

Correspondence between foresters criss-crossed over the Tasman. Baron Ferdinand von Mueller, German-educated with a doctorate in pharmacy, directed Victoria's botanical gardens and became a leading proponent of the eucalyptus, arboriculture and forest conservation. Mueller corresponded with many authors around the world, including some in New Zealand. In the 1860s, Mueller had shipped seeds to the Dunedin Botanical Gardens. (Ironically, in 1872 when nurserymen did not want seeds bought by the Otago Provincial Council for £500, the Council on-sold them to Melbourne.) In 1886, at Kirk's request, Mueller sent eucalyptus and wattle seeds to New Zealand. Aside from correspondence, von Mueller's views also appeared in print in New Zealand, such as in 1890 with his romantic appeal for forestry protection.

'Would there were moves in this country [New Zealand] of rich and beautiful forests', commented the author of a New Zealand article on forest conservation, 'to act up to the spirit of such noble sentiments' that Mueller had expressed. Mueller's views probably reflected the influence of German romanticism.

Other material from Victoria also appeared in New Zealand parliamentary papers, especially during the 1874 forest debate. For this debate, the Victorian politician J.G. Francis provided New Zealand's Colonial Secretary with six copies of Victoria's 1869 Land Act; six of an 1867 report on recommendations for establishing state forests; and

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139 McGlashan, NZPD, 31 July 1874, p.368.

140 See, for instance, Kirk to von Mueller, 14 June, 1886; Kirk to Mueller, n.d. poss. June 25 or 26?; Elliot to Mueller, 16 November 1886 in Official Correspondence of Thomas Kirk, Chief Conservator of Forests 1885-1888, qMS-1469-1470, ATL.

141 'I regard forests as a heritage given by Nature, not for spoil or to be devastated, but to be used reverently, honoured, and carefully maintained, entrusted to us only for a brief space of time, and to be cared for and surrendered to posterity as an unimpaired property, with increased riches and augmented blessings, to pass as a sacred patrimony from generation to generation.'

142 'Forest Preservation', NZF, 10, 1 (January, 1890), p.5.
three copies of the first annual report issued by the Department of Agriculture, 1873. Nor was discussion of this 1867 report confined to the 1874 debate. In 1868, during Potts’ New Zealand Forests Bill, Charles O’Neill referred to the same report. An 1869 editorial in the *Otago Daily Times* also quoted from the Report of the Royal Commission in Victoria on the importance of forest supply for pit props in the Victorian gold fields.

With the exception of George Perrin’s visit in 1896, the influence of Victorian forestry legislation on New Zealand ebbed after the 1870s because of the relatively weak position of state forestry in that colony. South Australian forestry, nevertheless, continued to influence New Zealand catchment and climatic forestry throughout that century and into the next. South Australia’s Surveyor-General Goyder corresponded with Walker. Goyder posted Walker clippings from the *Adelaide Gazette* on forestry practice in South Australia, which Walker then gave to Vogel. He also sent Walker a copy of a public auction at the Land Office, Adelaide on 23 March 1876 for the Lease of the Pasturage of the Bundaleer Forest Reserve for 14 years. Section 8 of the agreement stipulated that lessees had ‘no right whatever over the timber growing or lying upon the land under the lease, or to interfere with or prevent its removal by persons acting under the authority of the Board.’ Walker noted that Goyder recommended ‘a similar course being adopted here

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145 O’Neill, NZPD, 1868, p.191; 14 September 1869, ODT, column 4, p.2.

146 For instance, Forest Bills introduced into the Victorian Parliament in 1879 and 1881 did not carry sufficient parliamentary support to pass; only in 1890 did parliament pass legislation forbidding timber cutting on all, and even then the Governor effectively could nullify its provisions. Francis Robert Moulds, *The Dynamic Forest: A History of Forestry and Forest Resources in Victoria*, Richmond (Victoria), 1991, pp.14-15 (for an overview of legislation and policy see pp.13-28); see also Legg, ‘Debating Forestry’. In 1880, Peppercorne commented on the same, noting that proposals in Victoria to clear one twentieth of a forest and then replace that same area cleared by new saplings were not acted upon. Peppercorne, *Influence*, pp.16-17.
[in New Zealand] as from [the] result of his observations on careful examination of South Island he was convinced it would be very successful.¹⁴⁸ Walker's observation illustrates that some Australasian officials visited New Zealand and kept closely informed of forestry developments in the colony. Clearly, they indicate the closeness of trans-Tasman forestry connections. They also suggest that Goyder had visited the South Island, since Walker referred to the Australian's 'observations' and 'careful examination of the South Island'.

Frederick Septimus Peppercombe's interest in the human modification of climate and waterways brought another trans-Tasman perspective to environmental anxieties. He published not only on the influence of forests on climate, but also on irrigation works, transportation networks, geology and the interaction of water bodies and climate in New Zealand and Australia.¹⁴⁹ His 1879 paper, *Australian Meteorology and Hydrology*, promoted tree planting and irrigation works as means of altering Australia's climate and increasing rainfall. Referring to Indian examples of drought and monsoon occurring on either side of the Bay of Bengal, he also threw doubt on the theory that sun-spot activity influenced global weather patterns.¹⁵⁰ Shortly after publishing his works on New Zealand forestry in 1880, it seems Peppercombe left New Zealand for Australia. In New South Wales, Peppercombe urged the conservation of forests and creation of waterways to modify Australia's dry climate as well as investigating further the influences on global climatic patterns.¹⁵¹

In the 1880s, as well as into the new century, examples from South Australian forestry still appeared in New Zealand conservation debates. Take 1885, when a

¹⁴⁷ Campbell Walker to the Commissioner of State Forests, State Forests Office, 8 September 1876, F 10, 76/2 September 1876, NA.
¹⁴⁸ Campbell Walker to the Commissioner of State Forests, State Forests Office, NA.
parliamentarian advocated that New Zealand’s new forestry department should be modelled on South Australia’s, since this was both successful and self-financing.\footnote{Wakefield, NZPD, 7 July 1885, pp.449-450.} In 1889, an early boost for the introduction of Arbor Day into New Zealand came from the work of South Australian forester J.E. Brown, whose paper that was read before South Australia’s Bureau of Agriculture re-appeared in the editorial of the *New Zealand Farmer*.\footnote{‘Arbour Days’ [editorial], NZF, 9, 8 (August, 1889), pp.298-299.} Victorian forestry made a re-appearance in the late 1890s too. In 1896, George Perrin, Conservator of State Forests, Victoria, attended New Zealand’s Timber Conference in Wellington. Perrin pressed for catchment and climatic conservation.\footnote{‘Timber Conference’, AJHR, H-24, Vol. 3, 1896, p.33.} He also corresponded with Kirk, sending him *Forest Reports of Tasmania*, 1886.\footnote{Elliot to G.S. Perrin, Hobart, 7 October 1886, Official Correspondence of Thomas Kirk, Chief Conservator of Forests 1885-1888, qMS-1469-1470, ATL.} The following year, Perrin was employed by the New Zealand Government. They wanted him to make an extensive survey of New Zealand forests. Perrin did this and advised on the organisation of what became New Zealand’s new forestry branch.\footnote{George S. Perrin, ‘Conservation of New Zealand Forests’, AJHR, Sess. II, C-8, 1897, pp.1-56.} In 1903, the colourful Australian climatologist, self-styled ‘Boss weather prophet’, Clement Wragge gave a series of lectures in New Zealand. Already a champion of rainmaking experiments in Australia, Wragge urged tree planting in Invercargill to increase rainfall.\footnote{See ‘The Charleville Rainmaker’, *Federation and Meteorology: The Weather Prophets*, www.austhec.unimelb.edu.au/fam/0007.html; Inigo Jones, ‘The life and work of Clement Lindley Wragge’, *Queensland Geographical Journal*, 54 (1949); pp.43-52. On his lecture in Invercargill, see chapter four.} Given that town’s heavy rainfall, it is doubtful if Wragge drummed up much support for measures that actually *increased* precipitation. South Australian forestry appeared in other New Zealand publications as well as the private papers of Robert McNab.\footnote{See, for instance, ‘Forestry on the Farm: An Important Question to Every Landholder’, NZF, 30, 5 (May, 1909), p.324; McNab possessed the following copies of Australian forestry reports: Walter Gill, Conservator of Forests, ‘South Australia: Woods and Forestry Department: Annual Progress Report upon State Forest Administration in South Australia for the Year 1902-3’, Adelaide, 1903; *Western Australia: Royal Commission on Forestry: Final Report*, 1904, Perth, 1904; G. G. Richardson, ‘Annual Report of the
New Zealand's influence overseas

What influence did New Zealand forestry have overseas? Although limited access to overseas libraries makes this a difficult question to answer, focusing on trans-Tasman exchanges can indicate cross-influences. In 1874, the Melbourne botanist Ferdinand von Mueller wrote to James Hector, New Zealand's leading nineteenth century scientific leader, of his admiration for the passing of Vogel's Forest Bill. Mueller related that an Otago friend of his had sent him a copy of Vogel's speech of 14 July 1874 on forest conservation. "The whole attempt by Vogel" wrote von Mueller impressed, "evinces much true statesmanship and wise foresight; and which I have preached here for years to deaf ears your colony has made the first real step to the State administration of the forests and also South Australia".159 In the 1870s, von Mueller's friend, Friedrich Krichauff, the Danish botanist and later South Australian parliamentarian, introduced into his state parliament a number of tree planting and forest conservation bills.160 As historical geographer Stephen Legg notes, Krichauff's 1873 tree planting bill was 'closely modelled on New Zealand's' tree planting encouragement acts of 1871 and 1872.161 In December 1873, for instance, Krichauff admitted that, for his Bill, he 'had adopted the bonus of £4 from the New Zealand' tree planting legislation.162 The following year, when promoting his Forest Board Bill, Krichauff extensively discussed, and quoted from, Vogel's address of 1874 to the New Zealand Parliament. He paid particular attention to Vogel's discussion of the climatic effects of forestry.163 Other examples reinforced the influence of New Zealand in Australia. In 1874, a South Australian parliamentarian asked whether South Australia's Forests Board 'would be similar to the Forest Board of New Zealand, where the Chairman was paid.' Krichauff also admitted that, 'upon the recommendation of His Excellency [the Governor] they could alienate certain lands, as..."
under the New Zealand Bill.\textsuperscript{164} South Australia’s early forestry legislation owed much to the example of New Zealand’s and clearly demonstrates the cross-fertilisation of forestry ideas and legislation between these areas. These connections should not be surprising. As noted above, people moved freely between these areas while political and scientific connections had been close since the early days of colonisation.

Nor were such interactions confined to trans-Tasman relations. Charles Flahault provides an interesting reverse of European forestry providing the model for New Zealand’s. His comparative piece, ‘Forêts et industrie des bois, France et Nouvelle-Zélande’ ['Forests and wood industry, France and New Zealand'] upheld New Zealand’s forest regulations as an exemplar of what France should follow.\textsuperscript{165} ‘If we cannot dream of protecting our singing birds’, he wrote with a flourish, ‘the best accessories of our agriculture, the great charm of our forests, against the vandalism of the French, we should, at least, applaud the good taste of New Zealanders and the Maori and accept the lessons they give us.’\textsuperscript{166} And applaud and accept New Zealand’s forestry legislation, its island sanctuaries and national parks, Flahault did. In particular, he praised the setting aside of forest areas in river catchment areas for the maintenance of waterways and the prevention of flooding and erosion.\textsuperscript{167} From some areas, then, New Zealand’s forest legislation attracted praise and sometimes imitation, fostering overseas environmental anxiety of which further research in overseas libraries is only likely to reveal more.

**Conclusion**

Overseas foresters, ideas and papers sustained New Zealand’s conservation effort and environmental anxieties throughout the nineteenth and early twentieth centuries. At the same time, a body of scholarship and expertise in forestry was developing in New Zealand. Australian influences, principally from the states of Victoria and South Australia, continued throughout the nineteenth century with the exchange of

\textsuperscript{164} Debates in the Houses of Legislature. 9 September 1874. p.1597.
\textsuperscript{166} Flahault, ‘Forêts et industrie’, pp.130-131.
\textsuperscript{167} Flahault, ‘Forêts et industrie’, p.131.
correspondence, forestry papers and foresters. These reflected the relatively close political, geographical and social position enjoyed by the two regions, in which the exchange of people, material and ideas took place on a regular basis. South Australian forestry stands out as a particularly strong connection, thanks to the relatively strong position of climatic and catchment forestry in this state. Other colonial lands also featured in New Zealand forestry, but often had less of a sustained influence than that from across the Tasman Sea. Indian forestry was particularly important in the 1870s. At a parliamentary level, former Indian administrators such as Wilson, now settled in the colony, introduced forestry bills modelled on their knowledge and experience of Indian and South Asian forestry. New Zealand’s first Conservator of Forests came from the Indian Forestry Service. Although he stayed in the colony a short time, Walker’s ideas continued to influence later conservationists in New Zealand. Indeed, perhaps the greatest influence from South Asia came from the published papers and reports on Indian and Ceylonese forestry that made up the bulky documents assembled by Julius Vogel to justify New Zealand state forestry. If Australian and South Asian influences testify to the generation of scientific knowledge from colony to colony and their transfer within the British Empire, then the use of American, German and French forestry ideas demonstrate enduring non-imperial ties. American forestry ideas appeared in New Zealand debates in the 1870s and 1880s, but only really from the 1900s with the emergence of the USFD did they catch on. Publications of the USFD helped swing New Zealand forestry away from climatic ideas and towards catchment conservation, as the colony’s professional scientists read and drew widely on this material. German ideas of nature and forestry arrived in New Zealand in the 1840s, first through the work of the naturalist Dieffenbach and, later, the geologist Hochstetter. The influence of Hochstetter proved particularly important. Later New Zealand writers frequently quoted from his works warning against the consequences of deforestation. The German-speaking regions, world leaders in scientific forestry, also received some attention in forestry papers published in New Zealand. In the late nineteenth and early twentieth centuries, this influence took a new direction through the work of Leonard Cockayne. Cockayne used ecological ideas to justify catchment forestry and the protection of special natural areas. Although Marsh’s influence on nineteenth century New Zealand probably has been overstated, his work on European and
Middle Eastern forestry sustained environmental anxieties in New Zealand. Biblical and Russian instances of the folly of deforestation supplied other material for use by colonial conservationists. They fed a highly alarming narrative that conservationists presented of the consequences of deforestation. In its denouement of pristine and fecund nature imperilled by the folly of humanity, this narrative resembled biblical tales relating to the Garden of Eden and the Fall. Thankfully, humanity could redeem this Fall from environmental grace through tree-planting and forest conservation. By the 1900s, professional scientists increasingly took over the mantle of forest conservation and the use of highly alarming language. Professional scientists such as Cotton and others, though, preferred scientific experiment and fact to the observation and historical examples provided by this largely non-scientific material. Not all lobbying for conservation, though, was carried out by amateurs. The retired French forester, A. Lecoy, was commissioned by the New Zealand Government to report on the colony’s forests. Indeed, the French influence on New Zealand endured from the 1870s. In part it continued due to the extensive research French foresters undertook into the forests-climate-hydrology link and to the success they enjoyed in arresting sand drift. The reliance on German and French sources also indicates that, through translation and language fluency, non-English forestry sources were available to many New Zealand writers. Individuals as much as institutions shaped New Zealand forestry. One such group were Scottish-trained doctors. As elsewhere in the British Empire, in New Zealand they promoted the scientific development of natural resources and, particularly, forests. Another was those educated in northern-European and German universities and technical colleges. As with the Scots, they often enjoyed a practical scientific training, especially in botany and forestry. These groups illustrate both the significance of education in shaping environmental perception and the importance of New Zealand’s experience of deforestation. Individuals also made a difference. They established connections, collected papers and disseminated information. Frederick Septimus Peppercorne’s publications on

* As noted in chapters four and seven, the scare-mongering and alarming nature used by Russian, Biblical and other material actually continued within scientific circles. Scientific language and experiment often masked the inadequacy and insubstantial nature of scientists' claims.
Australian and New Zealand climatic and catchment forestry brought together a great deal of forestry writing from around the world. Both Julius Vogel and, later, Robert McNab, established personal connections with foresters and avidly collected forestry sources and lore from throughout the world. These, and the connections discussed in this chapter, testify to the significance of local, national and worldwide debates in informing anxieties and shaping forest policy in New Zealand.

168 On the importance of translation and language fluency note, for instance, Kanz, *Nationalismus und Internationale*. 
Conclusion: Environmental Anxiety in New Zealand

A key component of European environmental attitudes in the nineteenth century was a sense of anxiety about environments and the role of humans in changing them. These sprang from the very material and economic success English, and later Europeans, enjoyed. The development of modern methods of production (industrialisation), living (urbanisation) and its associated social changes brought material improvements to the lives of many Europeans. Yet, the very material improvements so characteristic of modern life also came at a high social, political and environmental cost not only in Europe but also in European colonies. In the latter, many colonists believed they saw evidence of the deleterious impact of environmental change in everything from climate change to health. Environmental anxieties, then, are one example of the way Europeans reacted to different facets of modernity and to the changes they were making to colonial environments. Fears about rapid changes in the natural world were heightened by awareness of the dynamic connections between human society and environment. If environment influenced everything from physical and mental development to the creation of national wealth and national character, just what effects did these rapid environmental changes have? Did urban living endanger health? Did pollution retard human and economic development?

These contradictions contained within modernity led thousands to migrate from Britain, western Europe and elsewhere. Migrants to New Zealand came from a diverse range of places and backgrounds. The vast majority were of British stock, but there were also significant numbers of people from northern Europe, France, China and elsewhere. Each brought a distinctive perspective to New Zealand. The quality scientific education received by doctors and scientists in Scotland and northern Europe, for instance, led to their interest in the natural world and its connection to health. They also took the lead in drawing attention both to environmental problems and their solutions. Farmers and stock agents, labourers and artisans believed that cultivation signified Christianity and that they could better themselves by bettering the land. Yet, to their dismay, many farmers
discovered that their very enthusiasm for rapidly improving the New Zealand landscape appeared to them to be having the very opposite effect to that intended.

By clearing forest to make way for farms, some farmers, scientists and politicians believed that their actions were bringing unwanted and frightening environmental results. Uncontrolled tree felling seemed to be transforming New Zealand’s climate, eroding away its fertile soils and laying waste to its productive lands. Many doctors, residents and engineers also fretted that the development of cities created unhealthy conditions of putrefaction and pollution, ideal breeding grounds for dangerous miasmas that poisoned the air. Some artists complained about the loss of aesthetically pleasing environments.

Environmental anxieties took a variety of forms and came from many different quarters. Individuals, communities, committees, provinces and the state all reacted in different ways. Popular reactions included reports, artworks, talks and letters to the editor which often appeared in newspapers and farming journals. Official responses came through royal enquiries, parliamentary and council debates, and scientific publications. Through these diverse media, settlers attempted to define problems and identify solutions that would protect the land, its resources and the future of the colony. Officials generally favoured legislative solutions, often with a mixture of private and public funding. Legislation, however, did not always translate into success. The worthy aims of the 1903 Sand-drift Act, for instance, did not work as effectively as many had hoped. Government and private funds simply did not stretch far enough to meet the widespread problem of shifting sands, particularly in isolated areas. By contrast, attempts to reserve land for climate and catchment reasons worked better. The Crown owned this land and it required little more than the reservation of existing areas of forest to safeguard these areas compared to the great effort and expense required to reclaim sand-infested land.

Officials generally looked to the advice of experts to solve environmental problems. In the nineteenth century, Scottish-trained doctor, William Lauder Lindsay, was typical of many others of that period in the variety of interests he pursued. Lindsay prepared reports on forestry, geology, mental health, natural history, public health, philosophy and education. By the early twentieth century, such polymaths were becoming rarer. Towards the end of the nineteenth century, Government had responded in new ways to environmental problems. As evinced with rainmaking experiments and
the 1913 Royal Commission on Forests, the Crown increasingly relied on scientific experts to ascertain the extent and likely solutions to such problems. Greater reliance on experts reflected both increasing specialisation in science and growing Government intervention in society. Previously, talented individuals had straddled a number of different fields.

Highlighting the environmental anxieties such scientists and others identified complicates traditional portrayals of nineteenth century colonists as confident and arrogant agents of environmental transformation. It also paints a different picture of Christianity, which many commentators have seen as justifying such destruction. In fact, Christianity provided a strong moral imperative to conservation. Christianity obliged settlers to cultivate and thereby improve land, but it also gave them a strong moral responsibility to ensure that land remained fertile. So, when it did not, settlers had a moral duty to restore the land to its ‘natural’ state of fertility. Colonists viewed a temperate and fecund environment as the norm. When their own actions created a dry and infertile environment or when they found environments that did not meet their cultural expectations, they set about ‘restoring’ these areas to fertile and temperate states. Aside from the importance of Christianity in justifying stewardship, settlers used a biblical narrative to frame the environmental history of their new land. The arguments of many New Zealand conservationists were underpinned by the archetype of the Garden of Eden. Often by ignoring the presence of Māori, colonists believed they were coming to a veritable Garden of Eden. They feared their own actions endangered this state of nature. Deforestation threatened to bring a new Fall since colonists believed that timber cutting brought drought, sand drift, soil erosion and soil infertility. Ultimately, however, most settlers believed that humans could redeem this fallen nature. Planting trees, providing parks and conserving nature could improve unproductive environments caused either by their own mismanagement or by events outside their control.

These environmental anxieties and solutions operated at different levels. Local legislation responded to local problems. Even when parliament enacted national environmental reforms, the local remained important since measures had to be introduced at this level. The success of legislation also depended on the response of settlers to local environments. National tree planting legislation, for instance, originated in laws passed
by provinces with relatively scant forest resources. The national tree planting regulations only enjoyed success in the same provinces of scarce forestland. Tracing environmental anxieties thus shows the way settlers’ experience of local environments often reinforced or supported pre-existing beliefs about the natural world. Settlers saw temperate and fecund environments as the norm.

Global environmental events also shaped colonial anxieties. Warming of the eastern Pacific influences world weather patterns, including New Zealand’s. Under El Niño conditions, rainfall decreases in northern and eastern New Zealand hindered farming in colonial New Zealand. Drought reinforced the connection between deforestation, rainfall decline and temperature extremes. These anxieties contributed to the publication of numerous tracts calling for greater forest conservation and tree planting measures to safeguard the colony’s economy.

Global environmental threats and global ideas both had local level impacts. Experience of tropical climates forged Europeans’ ideas and fears about places and races, heat and cold, health and climate. Health and racial fears came to the fore not just in lively discussions about the prospects for British settlement and Māori health in New Zealand. Fears of hot and damp places also shaped patterns of settlement and environmental actions in the colony. These overseas ideas entered New Zealand in a variety of different ways. Individuals often provided vectors of information that shaped policies, practices and arguments. Indian forester Captain Inches Campbell Walker introduced many ideas of Indian forestry into New Zealand. He also produced reports on continental forestry that appeared in New Zealand debates.

Complex transfers of knowledge evince not only the importance of imperial and non-imperial connections. They also establish that colonies generated scientific ideas and exchanged these with fellow colonies. Knowledge flowed into and out of New Zealand through the publication of scientific papers and newspaper articles. Seldom, though, did these transfers occur neatly or take a simple route from one place to the next. Information about Arbor Day came to New Zealand through the work of the then South Australian forester, John Ednie Brown. An article from the *British Medical Journal* on irrigation and tree planting in Ismailia, northern Egypt, appeared in New Zealand’s *Otago Daily Times*. New Zealand’s forestry legislation shaped South Australia’s in the 1870s. Such findings
significantly broaden understandings about colonial culture and its environmental history. They demonstrate that New Zealand was not simply situated in the mental world of the British Empire. Intellectually, individuals maintained important connections with non-imperial and non-English-speaking countries. Plant botanist Leonard Cockayne had a thorough knowledge of the German language which gave him access to the very first ecological ideas. It also brought him into regular correspondence with many leading European scientists of the period. By highlighting the complexity and diversity of these vectors of policy and practice, this thesis has questioned the findings of those studies that see colonial science as derived from the imperial centre in Europe. Instead, it has drawn attention to the production and exchange of environmental knowledge between colonies and between non-British powers and colonies.

Colonial cities were also sites for generating knowledge. The colonial city generated fears about the healthiness of urban living. Doctors, engineers and councillors pointed out both the dangers of people living too close together and near swamps. Considerable environmental reforms aimed to improve city living. Drainage removed marshy land and unhealthy miasmas, as did better sewerage systems and the provision of clean water. Sand stabilisation rid towns of drifting sands. Trees and parks also enhanced health. Parks offered places in which to exercise and, with the plants growing in them, conferred considerable benefits on urbanites. Settlers believed that certain trees and vegetation, like pines and eucalypti, drew poisonous miasmas from the air, thereby purifying the atmosphere of urban environments.

Settlers measured a region’s healthiness in different ways. For much of the nineteenth century, medical geographers attempted to assess a country’s suitability for settlement. They provided detailed statistical breakdowns of a region’s climate, its daily, monthly and yearly temperatures, average barometric pressure and so on. Propagandists also employed these techniques to present the colony as a suitable destination for migration. Trained in the Hippocratic tradition of medical practice that considered the influence of airs, waters and places upon disease, though, doctors were ideally suited and educated to perform these functions. Revelling in the developing statistical techniques of measurement and assessment, doctors undertook district surveys of health.
Colonial doctors, settlers and Māori also applied observations from the natural world to human health. Since introduced plants from Europe flourished in New Zealand, many settlers and doctors reasoned that European acclimatisation into New Zealand would be equally successful. After all, they were coming to live in a climate largely resembling Europe’s. It had neither excessive moisture nor extreme temperature fluctuations. These prognoses worked both ways. Drawing from the high morbidity and mortality rate of Māori, a number of commentators reached a similar conclusion: moving from a tropical to a temperate climate had proved dangerous and, possibly even lethal for Polynesian people in New Zealand. The success of European flora and fauna* in New Zealand appeared to come at the cost of native plants and birds. As if guided by some natural law, it seemed to increasing numbers of European and Māori that as inferior indigenous plants and animals succumbed to superior ones, so too did Māori people. By the 1880s, when the drop in Māori numbers was apparent to all, settlers and Māori alike frequently drew upon Darwinian theory to articulate the reasons for this decline. Such fears often generated calls for recording and conserving a rapidly changing New Zealand people and nature. For most settlers, these gloomy pronouncements occasioned sadness and regret at the perceived inevitability of such decimation. That these ideas proved incorrect underlines the often difficult process of environmental learning characteristic of the coming of people to a land unfamiliar to them. Often these lessons were learnt the hard way; sometimes not at all. Environmental anxieties illustrate the ambiguities and contradictions in settler attempts to mediate between the benefits and disadvantages of modernity.

Applying the concept of environmental anxiety to settler New Zealand expands understandings about the way humans responded to changing environments. It can point to new directions of research and ask fresh questions about established historical opinions. As this thesis has demonstrated, studying environmental anxiety in settler New Zealand moves debate beyond simple narratives of colonial environmental destruction. Instead, this thesis has shown the ambiguities and complexity of colonial views of the natural world. Studying settler views of the environment also sheds light on how settlers

* Of course, the irony is that the very plants and animals many settlers regarded as European actually had been imported into Europe from overseas.
saw themselves. Colonists viewed their society, economy and bodies as intimately attuned to environmental changes. Most significantly, perhaps, this thesis has underlined both that many settlers displayed an emotional attachment to the New Zealand environment and that most colonists wanted to ensure the long-term productivity of its lands. It is likely that in New Zealand, local studies based on newspapers probably will reveal further and earlier anxieties about deforestation, health, climate and hydrology.

Environmental anxiety is also an analytic tool allowing for the investigation and integration of Māori and European history. Investigating the complexity of Māori environmental anxieties probably will reveal as great a spectrum of belief as that among settler society. It may also draw attention to the specific impacts environmental transformations like swamp drainage had on Māori society, and point to the environmental reforms generated by these anxieties. What impact did Christianity, with its emphasis on cultivation, have upon Māori environmental anxieties? Did Christianity create anxieties among Māori groups that they were not cultivating enough land? Did this lead Māori to drain swamps to increase productive land and remove unhealthy miasma as many European settlers did? Indeed, how did Māori mediate between their existing environmental views and the emphasis European land law and Christianity placed on cultivation as denoting ownership?

Investigating the way people responded to specific resources is one way of illuminating the interaction between different groups, whether they are hapū, whalers, Chinese gold miners or whatever. It moves beyond simple distinctions between Māori and European by demonstrating the diversity of groups and opinions. Many groups utilised marine and freshwater environments; their views can be fruitfully researched through the idea of environmental anxiety. In the 1840s, declining whale numbers concerned early explorers and officials such as Ernst Dieffenbach and Edward Shortland.¹ What came of such apprehension? Diminishing fish stocks are discussed today, but where, when and why did these fears originate? The introduction of new animals transformed agriculture and society not only in New Zealand but throughout the world. Did anxieties about animal welfare arrive in this country with the first animals or

¹ See, James Beattie, ‘Whaling and over-fishing in New Zealand, some early views’, draft paper.
did they develop later? What role did the local environment and sentiment play in fostering such concerns? Is there a connection between humanitarianism and environmental concern? Which animals were particularly valued, by whom and for what reason? The role of food supplies and production is another under researched area. When did fears surface about the safety and hygiene of mass- and locally-produced food supplies? Similar questions relate to aesthetics and environmental views. What was the relationship between art societies and environmental protection? Did settler aesthetic appraisals of New Zealand differ from those made in other countries? To what extent did people’s experience of where they grew up, shape their aesthetic views? If so, why and what were its implications? These are just some of the very many topics that could be pursued using the concept of environmental anxiety.

It is perhaps fitting to give the last word to a settler of the nineteenth century. Reverend W.B. Clarke’s advice to his fellow New South Welshmen is pertinent to many environmental historians of New Zealand and aptly describes the double-bind in which many of this colony’s settlers found themselves.

It may, perhaps, have never been seriously contemplated by numerous persons who have traversed this territory, that the progress of clearing land in such a forest region as New South Wales must have various effects on Climate and Sanitary conditions, and that civilization has destructive as well as conservative tendencies.²

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Photograph 3.1 Origins unknown.

Photograph 3.2 Ralph Snowball, ‘Sulphide Works at Cockle Creek’, 28/03/1903, NPL00101/0010154.

Photograph 3.3 Pohutakawa remain a feature of Newcastle’s parks and verges, as this recent photograph shows. Author’s photograph.

Photograph 3.4 Pohutakawa around the upper part of Hill Reserve, now called King Edward Park. Author’s photograph.

Photograph 3.5 ‘King Edward Park Showing Band Rotunda’, NPL00600/00600064.

Photograph 3.6 ‘King Edward Park’, NPL/05600/05600282.

Photograph 3.7 ‘Islington Park’, NPL00103/00103642.

Photograph 3.8 ‘Hamilton Park’, NPL14400/14400080.


Photograph 5.1 View inland from Raki’s Table, Schaffer’s farm, July 2002. Author’s photograph.

Photograph 5.2 Explosives canister left from 1907 Rainmaking Experiments, at Shaffer’s farm, Ngapara. Author’s photograph.

Tables

Table 7.1 Proposed Climatic Reserves as per Index-Map, ‘Report of the Royal Commission on Forestry’, AJHR, 1913, p.xlvii.

Paintings

Figure 1.1 Converting forest to farm in the province of Taranaki. Thomas Good, ‘Bush Clearing near Oeo’, 1893. 136 x 224 mm. ink and wash on sheet. ATL, A-329-005.

Figure 1.2 Joseph Selleny (?). ‘Urwald in der Umgebung von Drury [‘Primeval Forest in the area of Drury’]’ Karl Scherzer, Reise der oesterreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wullerstorff-Urbair [Journey of the Austrian Frigate Novara around the world in the Years 1857, 1858, 1859, under the command of Commodore B. von Wüllerstorff-Urbair], Volume 3, Vienna, 1861-2, p.146.

Figure 3.1 Alfred Sharpe, ‘Burial Place of Hone Heke, Bay of Islands, 1885’, B.041287, 1977-0027-1, TP.

Figure 3.2 Alfred Sharpe, ‘Entrance to Cadman’s Creek, Coromandel’, 1880, watercolour, 443 x 667 mm, in Roger Blackley, The Art of Alfred Sharpe, Auckland, 1992, plate 13, p.45.

Figure 3.3 Alfred Sharpe, 'Among the kauri, Castle Rock, Coromandel', 1884, watercolour, 532 x 883 mm, in Blackley, Art of Alfred Sharpe, plate 26, p.74.

Figure 3.4 Alfred Sharpe, ‘A Golden Eve, Waiheke Island’, 1885, watercolour, 456 x 689 mm, in Blackley, Art of Alfred Sharpe, plate 27, p.75.

Figure 3.5 Alfred Sharpe, ‘Near view of smelting works, with several men at work, 1902’, from larger illuminated address, 1902, black and white photograph of a watercolour. Original measurements 10.4 cm by 17.7 cm. ‘Lent for copying by Miss G. Savage, November 1977’: Permission obtained from Miss Savage by author, ML, PXB174, folio 4.

Figure 3.6 Alfred Sharpe, ‘Sulphide Corporation Smelting Works, Cockle Creek’, 1902, watercolour, 104 x 177 mm, in Blackley, Art of Alfred Sharpe, plate 43, p.106.

Figure 3.7 Alfred Sharpe, 'Devonport and the Waitemata Harbour from the Domain', 1877, watercolour, 415 x 620mm. ATL, C-126-001.

Figure 3.8 Birkenhead Park. Roger Blackley.
Figure 7.1 Joseph Selleny (?). ‘Waldgruppe auf Neuseeland’ [‘Forest group in New Zealand’]. Scherzer, Reise der österreichischen Fregatte Novara um die Erde..., Volume 3, p.138.

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Map 5.1 Locations of Rainmaking Experiments, 1907. Bill Mooney, Geography Department, University of Otago.
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**Interviews**

Kathleen Stringer, North Otago Museum Curator, interview, 2 May, 2001, Oamaru.
# Appendix 1


<table>
<thead>
<tr>
<th>Zone</th>
<th>Mean summer temperature (Fahrenheit)</th>
<th>Average range (Fahrenheit)</th>
<th>Type of climate</th>
<th>Good</th>
<th>Bad</th>
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<tr>
<td>I: Auckland</td>
<td>66.56 (p.24)</td>
<td>66-90 (p.24)</td>
<td>'wholesome, warm climate' (p.20)</td>
<td>skin diseases of strumous origins</td>
<td>rheumatism, typhoid (at summer's end) (p.23)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>rickets</td>
<td>worst aspect is high humidity, which has an 'enervating effect upon highly nervous persons' (p.24)</td>
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<td></td>
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<td>enlarged joints</td>
<td>summer insomnia in high humidity</td>
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<td></td>
<td>scrofula (p.22)</td>
<td>tuberculosis phthisis* (p.25)</td>
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<td>typhoid (at summer's end)</td>
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<td>'enervating effect upon highly nervous persons' (p.24)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>summer insomnia in high humidity</td>
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<td></td>
<td></td>
<td></td>
<td>tuberculosis phthisis* (p.25)</td>
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</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>II: Palmerston North</td>
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<tr>
<td>II: Wanganui</td>
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</tbody>
</table>


* Moore notes this could be solved by moving to a higher temperature, such as Mounts Eden, Hobson, Albert, or Victoria. (p.23)

* Moore also notes that Auckland may offer the possibility of a cure for tubercular phthisis. (p.25)
<table>
<thead>
<tr>
<th>Region</th>
<th>Climate Data</th>
<th>Health Notes</th>
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<tr>
<td>II: Wellington</td>
<td>55.50 (p.28) 17.00 (p.30)</td>
<td>very interesting to the traveller' (p.28) boring too windy 'a delicious, restful climate' (p.29) pulmonary tuberculosis</td>
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| II: Nelson   | 54.86 (p.30) | slow, chronic consumption chronic bronchitis rheumatism senile decay (p.29) better than Nelson for: asthma nerve-irritability 
|              |              | 'delicate strumus [sic] children thrive well here' (p.31)                     |
| II: Picton   | 53.40 (p.31) 21.50 (p.31) | drier and colder than Nelson (p.31)                                             |
| III: Christchurch | 53.88 (p.32) 63.00 (p.32) | unhealthy for sickly due to extreme temperature difference, and hot summer nor'wester (p.32) unhealthy because of temperature variation (p.33) sickly people young children invalids with chest complaints or liver or kidney problems |
| III: Westland | 14.76 (p.33) | four seasons in one day; invigorating, though healthier than most English towns (35) pneumonia pleurisy bronchitis phthisis tuberculosis diptheria catarrh sore throats (p.35) |
| III: Dunedin | 56.72        | like Wellington – suitable only for the sturdy (p.37)                              |
| III: Invercargill | 50.00 (p.37) 63.00 (p.37) | 'dry, pumicesous, and scoria soil and a capital mountain air' 'stimulating atmosphere and cool nights' (p.37) asthma emphysema
| IV: sub-alpine plateau (over 1,000 feet) | | 'shaken nervous systems' (p.37) consumptive – due to stormy weather (p.38) |
Appendix 2

'Schedule of Sections forming the Napier Town Swamp'

<table>
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<tr>
<th>Section no.</th>
<th>acres</th>
<th>roods</th>
<th>perches</th>
<th>Name of Grantee</th>
<th>Quantity covered by Swamp</th>
<th>Remarks (Napier Swamp unless otherwise stated)</th>
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<tr>
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<td></td>
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<td>carpenter</td>
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<tr>
<td>183</td>
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<td></td>
<td></td>
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<td>surveyor</td>
</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>185</td>
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<td></td>
<td></td>
<td>about 5/6</td>
<td>surveyor</td>
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<tr>
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<td></td>
<td>about 1/7</td>
<td>surgeon</td>
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<td></td>
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<td>setter</td>
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<td></td>
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<tr>
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1. Charles Leckey, Engineers' Office, 1 May 1870 appended to 'Memorandum as to Napier Swamp Nuisance Act', HB 4/1873/Letter No.195, NAW.
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<td>about 5/8</td>
<td>“”</td>
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<tr>
<td>352</td>
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<td>about 5/6</td>
<td>Auckland, trader (deceased)</td>
<td></td>
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<tr>
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<td>2</td>
<td>ditto</td>
<td>Wellington, merchant</td>
<td></td>
</tr>
<tr>
<td>354</td>
<td>1</td>
<td>about 1/3</td>
<td>“”</td>
<td></td>
</tr>
</tbody>
</table>
| 355 | 1 | about 2/3 | Auckland, trader (dece?)
| 356 | 1 | about 3/5 | Auckland |
| 357 | 1 | nearly all | Auckland, trader |
| Reserve | 1 | 2 | about 1/10 | Railway Station |
| 358 | 1 | about 1/3 | Wellington, merchant |
| 359 | 1 | about 3/5 | “” |
| 360 | 1 | small portion | “” |
| 361 | 1 | about 4/10 | Wellington at present |
| 362 | 1 | about 15/16 | [unclear], sheepfarmer |
| 363 | 1 | about 2/9 | Wellington, merchant |
| 364 | 1 | 1 | 18 | small portion |
| 365 | 1 | about 2/7 | “” |
| 366 | 1 | all | Oparao [unclear], sheepfarmer |
| 367 | 1 | all | “” |
| 368 | 0 | 3 | 37 | about 1/7 | Wellington, merchant |
| 369 | 1 | all | Oparawa[''], sheepfarmer |
| 370 | 1 | all | “” |
| 371 | 1 | 3 | 7 | about 1/6 | Wellington, merchant |
| 372 | 1 | all | clerk |
| 373 | 1 | all | “” |
| 374 | 3 | 10 | about 1/8 | bootmaker |
| 375 | 1 | all | clerk |
| 376 | 2 | about 6/7 | Auckland, trader |
| 377 | 1 | all | Melbourne, gentleman |
| 378 | 1 | all | “” |
| 379 | 1 | all | “” |
| 380 | 1 | all | “” |
| 381 | 1 | nearly all | “” |
| 382 | 1 | about 4/5 | “” |
| 383 | 1 | about 4/5 | clerk |
| 384 | 2 | 28 | about 2/5 | civil engineer |
| 385 | 1 | 2 | 30 | about 6/10 | Auckland, trader |
Appendix 3

‘Return to an Order of the House of Representatives’ No. 32, 13 August, 1883, LE 1
(Legislative Department), 1/1883/136 (156), Box 207
[NB, no. in brackets refers to temporary shelving no.]

‘Return showing: - (1) The names of persons who have planted land in accordance with
The “Forest Trees Planting Encouragement Act 1871” – (2) The number of acres so
planted; - and, (3) The names of Provincial Districts in which such lands have been
planted: Also the names of Local Bodies who have taken advantage of the “Amendment
Act 1879.” And the number of acres planted by the above local Bodies.”

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