



Palgrave Studies in  
World Environmental History

# EMPIRE AND ENVIRONMENTAL ANXIETY

*Health, Science, Art and Conservation in  
South Asia and Australasia, 1800–1920*



James Beattie



*Palgrave Studies in World Environmental History*

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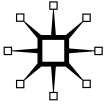
# Empire and Environmental Anxiety

Health, Science, Art and Conservation in  
South Asia and Australasia, 1800–1920

James Beattie

*Associate Professor in History, University of Waikato, New Zealand*

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© James Beattie 2011  
Corrected Printing 2011  
Softcover reprint of the hardcover 1st edition 2011 978-0-230-55320-0

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First published 2011 by  
PALGRAVE MACMILLAN

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Palgrave Macmillan in the US is a division of St Martin's Press LLC, 175 Fifth Avenue, New York, NY 10010.

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ISBN 978-1-349-36301-8      ISBN 978-0-230-30906-7 (eBook)  
DOI 10.1057/9780230309067

This book is printed on paper suitable for recycling and made from fully managed and sustained forest sources. Logging, pulping and manufacturing processes are expected to conform to the environmental regulations of the country of origin.

A catalogue record for this book is available from the British Library.

Library of Congress Cataloging-in-Publication Data

Beattie, James, 1977–

Empire and environmental anxiety : health, science, art and conservation in South Asia and Australasia, 1800–1920 /

James Beattie.

p. cm.

Includes index.

1. Imperialism—South Asia—History—19th century. 2. Imperialism—Australasia—History—19th century. 3. Environmental policy—South Asia—History—19th century. 4. Environmental policy—Australasia—History—19th century. 5. Public health administration—South Asia—History—19th century. 6. Public health administration—Australasia—History—19th century. 7. Science and state—South Asia—History—19th century. 8. Science and state—Australasia—History—19th century. I. Title.

JV141.B43 2011

333.70954—dc22

2011004888

10 9 8 7 6 5 4 3 2 1  
20 19 18 17 16 15 14 13 12 11

*To my girls, Eloise, Ida and Ondine,  
and to the memory of my late father, John.*



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# Foreword

James Beattie's interdisciplinary and transnational approaches make *Empire and Environmental Anxiety* an exciting book. Beattie's PhD on environmental anxiety in nineteenth-century New Zealand traversed health, science and art history, as well as the history of ideas, the influence of the British and German diasporas and environmental history. He adds to that promising beginning by expanding his study to include Australia and India. Normally, Australasia is not compared with India because Australia and New Zealand are usually categorised as white settler colonies, or colonies of settlement, rather than as colonies of extraction, even though multiple extractions of timber, minerals, flora, fauna and land occurred in Australasia as well as India, especially during the so-called 'quarry' phase of development that dominated in the nineteenth century and persists in more attenuated form to the present.

But the Australasian colonies also belonged to the same Empire as India, and all of these places were linked in myriad ways: through trade and shipping; exchange of plants, animals and materials; the movement of officialdom, including administrators, scientists, doctors and foresters; the army and navy; ideas; and individuals such as retired Colonels and Magistrates from India setting themselves up as sheep farmers in Australia and New Zealand. By utilising Alan Lester's idea of 'imperial careering' and Tony Ballantyne's notion of 'webs of Empire', Beattie demonstrates that the histories of India and the Australasian colonies were bound together in terms of influences that ran both ways across the equator, as well as via the rather longer loops radiating out from the centre of the Empire in London. Sometimes, he shows, the individuals who connected these histories and added to anxieties such as the deleterious impacts of deforestation came from outside the formal Empire.

Applied science, Beattie's scholarship reinforces, developed more rapidly in countries such as Germany and Denmark than in Britain itself, meaning that knowledge bases and skill sets acquired in those places better suited the needs of British colonies. This pattern replicated the development of introduced pasture plants in both New Zealand and Australia, because Swedish and German scientists had displayed much more interest in pasture improvement than their British peers. Pasture development, along with environmental anxiety, thereby linked Australasia and India to Leipzig, Copenhagen and Uppsala, as well as

Kew. Later, Beattie shows, the growing corpus of environmental writing emanating from the USA via George Perkins Marsh and others began to shape concerns in Australia, New Zealand and India, as well as in North America. Beattie's story thereby becomes international as well as Imperial.

It is this broad sweep and ambition that have made this book so popular with audiences in many places because it reminds us that all people, at all times and in all places, have been concerned with environmental degradation. Beattie builds thereby on the work of scholars such as Clarence Glacken, Carolyn Merchant, John F. Richards and James R. Fleming, whose study of the classical and early modern eras reminds us that current alarm at climate change and environmental despoliation is just the latest in a long and deep line of environmental anxieties. Beattie adds growing concern with the impact of environmental degradation and change (especially deforestation) on health, including declining ozone production and the spread of epidemic disease. His work on 'romantic' concerns regarding damage to aesthetically pleasing landscapes and utilisation of the perceptions of art historians is all too rare amongst environmental historians. So too is his respectful but critical appraisal of some of the big ideas of pioneer environmental historians, such as Richard Grove.

Palgrave Macmillan's decision to produce a paperback edition of *Empire and Environmental Anxiety* becomes understandable when Beattie's clear writing and meticulous scholarship, reflected in his impressive footnotes and his deft use of both archival and net-based sources, is added to his clever conceptualisations and intellectual curiosity and courage. This book is, therefore, an important contribution to environmental history that should be read by as many practitioners and students as possible, especially as we struggle to come to terms with the challenges and fears related to global warming.

Tom Brooking,  
Professor of History, University of Otago,  
Dunedin, New Zealand.

# Acknowledgements

In researching and writing this book, I am indebted to the support, encouragement and generosity of many people and institutions from around the world that I visited. *Empire and Environmental Anxiety* grew out of a PhD dissertation undertaken at the Department of History, University of Otago, New Zealand. I thank my supervisors – Tom Brooking, Tony Ballantyne, Judith Bennett and John Stenhouse – for their support, and to Tony for suggesting that it might one day become a book. I also acknowledge Palgrave Macmillan’s Peter Cary and Jade Moulds for their support for the paperback version of *Empire and Environmental Anxiety*.

In conducting research on different continents, I have incurred numerous debts to existing friends, as well as making new ones along the way. In Wellington, I received board and support from my parents-in-law, Geoff and Donnella Coker; Andrew and Libby Joel (not to mention some testing cricket nets from Andrew and Michael); and James, Roopali, Ellora and Sefton Johri-Mitchell. Elsewhere in New Zealand I received similarly generous encouragement: in Christchurch, from Lara and Hamish Temple-Doig and Jamie, and Tracy and Zoe Croot; and in Dunedin, from my ‘Best Woman’ Donna Keen. In Sydney, Tanja and the Mikulič family looked after me very well, as did Duncan Campbell, Jonette and Gracie in Canberra and, more latterly, San Marino. In London, Rachel and Nathan Masters always gave me a warm kiwi welcome, as did Dom and Alice, and the Stewart family. In Edinburgh, it was always a treat to catch up and stay with other old kiwi friends, Julian Kuzma and Katharine Glover; likewise in Bremen, I thank Karina, Raphael, Olaf and Luca de Santis.

Many people gave generously of their advice and time in reading through and commenting on aspects of the book. For their critical engagement in reading various drafts of this work, in various stages of completion and un-completion, I especially thank: Brett Bennett, James Braund, Cathy Coleborne, Derek Dow, Andrea Gaynor, Don Garden, Ondine Godtschalk, Katie Holmes, Stephen Legg, David Lowe, Douglas Symes and Rowland Weston. Discussion, advice and help came from many people, including: Tony Ballantyne, Greg Barton, James Braund, Bruce Clarkson, Tom Brooking, Warwick Brunton, Linda Bryder, Duncan M. Campbell, Nancy Cushing, Vinita Damodaran,

Paul D'Arcy, Ian Duggan, Georgina Endfield, Maureen Garbutt, Eric Godley, Tom Griffiths, Ruhi Grover, John Hall-Jones, Ruth Harvey and Mikey Fay, Jasper Heinzen, Sue Heydon, Rod Home, Hilary Howes, William Jennings, Jeyamalar Kathirithamby Wells, Martin Lodge, Marjan Lousberg, Julian Kuzma, John M. MacKenzie, Kirstine Moffat, Brian Moloughney, Jan Oosthoek, Geoff Park, Eric Pawson, John Pearn, Joe Powell, Michael Reilly, Libby Robin, Mike Roche, Peter Stanley, John Stenhouse, Alistair Swale, Sue Sweetman, Ian Tyrrell, David Walker, Hilda and Stan Watkins, Pamela Wood, and David Young.

On numerous visits to Melbourne, Stephen Legg and Val Tarrant immersed me in Victoria's fascinating landscape, experiences which significantly deepened my understanding of its history. My mentor from the University of Otago's Department of History, Ruhi Grover, gave generously of her time and, more latterly, her books on Indian environmental history. Roger Blackley encouraged and aided my study of Alfred Sharpe through loans of books and images, and by depositing his Sharpe sources in the Auckland Art Gallery in the first place. Roger Collins, Jill Davidson, Richard Lummis, Mark Stocker and Peter Stupples kindly introduced me to some of the principles and sources of art history while restraining my wilder interpretations. Working as a research assistant, John P. Adam's detective work unearthed a rich vein of material I would never have come across, while Petra Edmunds helped with photocopying. My friend and colleague, Alison Clark, compiled this book's index, while Simon Dench drew the wonderful maps, which do much to enhance it.

My wife, Ondine Godtschalk, has lived with this book for as long as she has known me. Throughout, she has been an inspiration and a wonderful support, right down to critically reading through drafts of the book. No one could ask for more. Between publication of the hardback and paperback, we have had two wonderful daughters –Eloise and Ida, who have enriched our lives in so many ways. My parents, friends and family have also been so supportive, even if half the time they might wonder what I was doing. Badminton and cricket and the friendship of many provided a wonderful outlet to the demands of writing. Thank you: Ben Delany, John Fountain, Mairead Harnett, John and Maureen Garbutt, Sue Lang, Andreas Penckwitt, Ajay Sud, Dave and Margaret Taylor, Hilda and Stan Watkins, Lew and Fionna Williams, Vernon Wybrow, the Waikato, Punjabi and Otago badminton teams and East Link Cricket Club.

I thank the research staff at the various institutions I have worked in: Hocken Library, Dunedin; National Archives: Dunedin, Christchurch, Wellington and Auckland; Canterbury Museum; Puke Ariki, New

Plymouth; Alexander Turnbull Library, Wellington; Auckland Museum; SCION Library, Rotorua; Mitchell Library, State Library of New South Wales; Royal Botanic Gardens, Sydney, Library, Sydney; State Library of Victoria, Melbourne; Melbourne University Library; Newcastle Region Public Library, Newcastle; British Library, London; University of Edinburgh Library. Staff of The University of Waikato Library inter-loaned works from around the world. Thank you Trisha Kruyff, Jenny McGhee, Maria McGuire, Kathryn Parsons, John Robson and Alison Watkins, and Helen de Barry and Ariel Liu for scanning in many of images for this book. The University's Map Library and New Zealand Collection is a treasure essential to serious scholarship. I benefited from its wonderful collection through reproducing some of the images in the book. E. Savage and Mark Widdup, respectively, generously granted permission to reproduce images held in their possession.

I received generous support for research from: 'Asia New Zealand' Research Cluster, University of Otago; Foundation for Research, Science and Technology, New Zealand Government; 'Faculty of Arts and Social Sciences Contestable Research Grant', The University of Waikato. Some research for the book was also completed while at The Stout Research Centre, Victoria University, Wellington, and World Centre of Environmental History, The University of Sussex. The final draft took shape amid the wonderful surroundings of the Manning Clark House, Canberra.

Parts of various chapters have appeared elsewhere. I thank *Environment and History* for their permission to include a small section in Chapter 2 from: 'Colonial Geographies of Settlement: Vegetation, Towns, Disease and Well-Being in Aotearoa/New Zealand, 1830s–1930s', *Environment and History*, 14(4) (November, 2008): 583–610. Chapter six includes material discussed in 'Tropical Asia and Temperate New Zealand: Health and Conservation Connections, 1840–1920', in Brian Moloughney and Henry Johnson, eds., *Asia in Making of New Zealand* (Auckland: Auckland University Press, 2007), 36–57. Chapter 3 is a version of 'Alfred Sharpe, Australasia, and Ruskin', *Journal of New Zealand Art History*, 27 (December, 2006): 38–56, while Chapter 4, thanks to the University of Otago's Editor, Wendy Harrex, draws in part from my chapter, 'W.L. Lindsay, Scottish environmentalism, and the "improvement" of nineteenth-century New Zealand', in Tony Ballantyne and Judith A. Bennett, eds., *Landscape/Community: Perspectives from New Zealand History* (Dunedin: University of Otago Press, 2005), 43–56.

I hope in its small way this book is a testimony to the ideals of scholarship that are under threat in so many institutions around the world, particularly in the Arts.



# About the Author

James is Associate Professor and Director, Historical Research Unit, University of Waikato, New Zealand, where he teaches imperial, environmental, garden and world history. He has published over 50 articles and chapters on topics in imperial environmental history, history of science, garden history and art history covering China, Australasia and South Asia. He has also written and co-edited seven books, including most recently *Environment, Modernization and Development in East Asia: Perspectives from Environmental History* (2016), edited with Ts'ui-jung Liu. He is Founding Editor of *International Review of Environmental History* (ANU Press) and Co-Principal Investigator with Richard Bullen of a Marsden Royal Society project on Rewi Alley, Art and Chinese Cultural Diplomacy. He is working on three current book projects: *Chinese Art and Cultural Diplomacy during the Cold War: Rewi Alley, Museums and the Politics of Art Display* (with Bullen); *People and Environment since the Holocene* (with Bruce Clarkson); and *Chinese Migrant Landscapes: Environmental Exchanges between South China and New Zealand*.

## *Also by the Author*

*Environment, Modernization and Development in East Asia: Perspectives from Environmental History*, editor with Ts'ui-jung Liu (2016)

*Eco-Cultural Networks and the British Empire: New Views on Environmental History*, editor with Edward Melillo and Emily O'Gorman (2015)

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*蘭園 Lan Yuan – The Garden of Enlightenment: Essays on the Intellectual, Cultural, and Architectural Background to the Dunedin Chinese Gardens*, editor

# List of Abbreviations

IFS	Indian Forest Service
NSW	New South Wales
WA	Western Australia

# Introduction

Many of us live in societies forged by the experience of empire. Its legacies are manifold: in the political, educational and other institutional systems that shape and regulate our societies; in the beliefs and values we espouse; in the language we speak; not least, in the pressing inequalities which still affect certain groups.

Scholars hotly debate imperialism's ambiguities and legacies. Several historians have examined the environmental impacts of the British Empire. Most present European expansion as reckless, confident and profligate, especially in an environmental sense. Imperialism destroyed forests, uprooted native populations, polluted rivers, decimated wildlife and left in its wake degraded ecologies. Notwithstanding the very real social and environmental impacts of imperialism, this study presents a picture of greater complexity.

This book examines the interlinked processes of imperialism and environmental change through the concept of environmental anxiety. Environmental anxiety refers to concerns generated when environments did not conform to European preconceptions about their natural productivity or when colonisation set in motion a series of unintended environmental consequences that threatened everything from European health and military power, to agricultural development and social relations. Encountering unhealthy climates or infertile land prompted anxieties that motivated a series of remedial measures designed to ensure resources were neither despoiled nor wasted and that environments did not adversely affect European health or aesthetic sensibilities. A range of responses ensued. Environmental modification resulted, as did the development of bureaucratic and legislative solutions to health and environmental problems. Geographical relocation and the production of artwork also took place.

## 2 *Empire and Environmental Anxiety*

This book examines a series of interrelated environmental anxieties, specifically, those about health, aesthetics, climate, timber supply, hydrology and desertification in relation to European perceptions of existing environments and environmental modification. It reveals that anxieties about human-induced climate change, soil erosion and a looming timber famine caused by large-scale deforestation occupied the minds of colonial planners throughout Australasia and Asia. It demonstrates colonial fears about the power of environments – and environmental change – to affect health. It illuminates concerns at the ugliness of urban environments and attempts to improve their appearance. But it also argues that some of the conservation policies and bureaucracies that resulted from such expressions of environmental anxiety represented a form of imperial control designed to generate revenue and to enable the more efficient exploitation of resources.

In other words, this book does not deny the centrality of improvement – and especially of agricultural improvement – to imperialism, but argues that environmental anxieties in some cases moderated such policies through the creation, for instance, of forest bureaucracies, urban improvement societies and medical bureaucracies and conservation. In some cases even, concerns about resource waste led to more efficient practices of forest management which often took on a spatial dimension as conserved forests in the uplands protected the agricultural lowlands from drought, soil erosion and flooding.

The search for solutions to similar environmental problems fused together different parts of the British Empire in different ways that changed over time. This study examines the similarities and differences in the environmental anxieties and solutions articulated in South Asia (primarily India) and the Australasian colonies from 1800 to 1920. It investigates the manner in which a colony's locality – its particular environmental, political and economic circumstances – moderated the impact of empire-wide anxieties and solutions as well as the exchanges that developed between different colonies. In examining South Asian-Australasian environmental anxieties and responses, it challenges the traditional distinction between colonies of extraction and colonies of settlement that has meant scholars seldom study the two regions together. This book reveals that the distinctions between colonies of extraction and settlement belie the interactions – in the exchange of people, environmental ideas and, to a lesser extent, organisms – between these areas. And, it demonstrates the way in which perceptions of India's unsuitability for permanent European migration impacted in hitherto unacknowledged ways on Australasian settlement.

Finally, in examining the interrelationship of anxieties (from aesthetic concerns to those about health), sources (from artwork and newspapers to legislation and maps) and individuals and groups (from artists to medical doctors and German-trained scientists), this work demonstrates the intimate interconnections between topics historians have largely studied separately. Through the use of biography and the examination of contemporary intellectual ideas, it demonstrates that imperial environmental history cannot be studied without recourse to considering together settler ideas about environment, conservation, landscape aesthetics and health.

# 1

## Origins of Environmental Anxieties

Human action has produced great changes in the physical condition of the earth's surface. Vast tracts of swampy wilderness have been converted into fresh pastures or cultivated fields, and barren uplands have been covered with stately trees. On the other hand, many regions, in all parts of the world, which were once clothed with verdure are now treeless and arid wastes. All these changes are the work of man ... the best methods of counteracting evils which may be caused by these extensive clearances is one of the most important questions that occupy the attention of physical geographers.<sup>1</sup>

C. R. Markham, 1866

Behind Victorian confidence, even arrogance, in the power of science and technology to bring constant material improvement and to aid in conquering ever more parts of the globe, lurked complex and sometimes contradictory environmental anxieties. C. R. Markham's statement captures the ambivalence surrounding development and its environmental impacts. Through their experience of industrialisation, Europeans brought to colonies concerns about both the pace and direction of urban, social and environmental change. Across Australasia and South Asia, the rapid transformation of unfamiliar environments also fed new kinds of anxiety, creating unintended problems that threatened agricultural improvement and human health. Problems demanded new solutions or the adaptation of existing scientific, bureaucratic models and policies to local colonial circumstances. These shared experiences of rapid environmental change propelled exchanges of anxiety and

solutions between Australasia and India, Europe and North America, the nature and extent of which is the subject of this study.

This chapter provides an introduction to environmental anxiety, and to the geographical, environmental, political and social scope of the book. It begins by framing the book within imperial environmental historiography before examining the origins, attitudes and exchanges of colonial anxieties, emphasising in particular the importance of locality in modifying general environmental anxieties and in encouraging exchanges between different places. For the first time in a monograph-length study, *Empire and Environmental Anxiety* examines the parallel, and at times intertwined, environmental histories of Australia, New Zealand and India from the early 1800s to the close of the First World War, the end of which marked a period of increased nationalism and heightened moves towards scientific professionalisation across Australasia and India.<sup>2</sup> Through responses to local particularities of place, environment, culture and politics, this work examines interactions but also attempts to explain dissimilarities, why, in other words, similar patterns did not emerge in one place as they did in another.

## **Perspectives and frames**

To capture the way environmental anxieties promoted the movement of ideas and people between different parts of Australasia and South Asia, I draw on Tony Ballantyne's concept of 'webs of empire'. Ballantyne's model acknowledges the emergence of imperial connections. Like a spider's web, these connections were constantly being broken and re-formed in new ways. And, also like a spider's web, each point of intersection connected up with many other such nodes.<sup>3</sup> Employing Ballantyne's model, *Empire and Environmental Anxiety* evaluates environmental connections and interactions between India and Australasia while at the same time examining the influence of other regions and models, notably the role of German- and Scottish-educated scientists, and conservation ideas from North America and France. Much in the same way that Thomas R. Metcalf has identified India as 'a nodal point from which peoples, ideas, goods and institutions ... radiated outwards' within the Indian Ocean world, so might this book contribute to the idea of India as a sub-imperial hub for the dissemination of environmental and health ideas in the southern Pacific Ocean through its influence on Australia and New Zealand at different points in the nineteenth century.<sup>4</sup> Of course, in this period other connections existed, not least among the Australasian colonies, some of which I explore in

more detail in this book.<sup>5</sup> As well as highlighting regional connections, this study also argues that anxieties were moderated by particular local, colonial, environmental, political and cultural situations. It also asks, in regard to educational and political, social and environmental circumstances, why certain groups in one area were more prominent in expressing concerns than elsewhere.

The present work examines the concerns generated when environments did not conform to European preconceptions about their natural productivity or when colonisation set in train unintended environmental consequences that endangered everything from European health and military power to agricultural development and social relations. Encountering unhealthy climates or infertile land prompted anxieties that motivated a series of remedial measures designed to ensure resources were neither despoiled nor wasted and that environments did not adversely affect European health or affront aesthetic sensibilities. Different responses followed. Environmental modification resulted, as did the development of bureaucratic and legislative solutions to particular health and environmental problems. Geographical relocation and the production of artwork also took place.

*Empire and Environmental Anxiety* fundamentally examines the connections individuals made between different concepts (health, forest conservation, aesthetics, sand-drift) and regions (Australasia and South Asia, urban and rural, and a variety of other localities). Commonly historians have studied these regions and concepts in isolation. Instead, this work looks at, but also beyond, national boundaries, to examine both the porosity of ideas moving around and beyond empire and the way environmental anxiety created links between seemingly discreet scientific and cultural concepts. For instance, as Gregg Mitman notes, 'conceptions of health have been integral to environmental experience and understanding' but historians have mostly ignored them<sup>6</sup> despite, notes Warwick Anderson, 'It seems that nature and politics, regardless of historiographic trends, are continually plotting to reassert the importance of geography, of spatial patterning, in the understanding of disease and health care.'<sup>7</sup> The book also examines the interconnections between rural and urban environments, a relatively underdeveloped aspect of Indian and Australasian urban environmental history notwithstanding Australasia's high rates of urbanisation.<sup>8</sup> Examining a variety of anxieties, this study attempts to recover the complexity of contemporary understandings of environment, health and aesthetics in different places. The next section considers the contribution of this work to imperial historiography



in general, before examining the origins, spread and development of imperial environmental anxieties.

## **Imperial environmental history**

Imperial environmental history is a growing area of study, pioneered by John M. MacKenzie, among others. Historians have since examined everything from colonial resistance and botanical exchange to early pollution legislation and the relationship between the ecological sciences and empire.<sup>9</sup> Of recent works in this field, William Beinart and Lotte Hughes' study, *Environment and Empire*, presents a masterly and compelling narrative of colonial attempts introduced to regulate and commodify nature through a thematic focus on different aspects of environmental history of the British Empire. If that work examined some important national and trans-national themes of imperial environmental historiography, this study provides a regional perspective of the interconnections between Australasia and India through the commodification and management of nature at one level and its limitations, as well as the intersections between health, conservation and aesthetics.<sup>10</sup> A regional perspective is particularly important because, with the exception of some work on forestry by Greg Barton, Brett Bennett and myself, historians have largely overlooked the environmental and health connections between Britain's colonies in South Asia and Australasia.<sup>11</sup> South Asian-Australasian connections, both in their magnitude and importance, reveal a hitherto ignored aspect of environmental exchange. At the same time, they raise important questions and add to existing scholarly debates on the relative role of European-to-colonial and colonial-to-colonial models in shaping environmental and health policy. Initial models of scientific transfer favoured the diffusion of scientific ideas from Europe to its colonies, with later ones acknowledging the different phases of colonial scientific development; the particular examples (in forestry science, sand-drift, aesthetics and health) examined in this book instead reveal the continuous linkages between, and beyond, colonies.<sup>12</sup>

As Zaheer Baber notes, India 'was never perceived to be a "colony" as Canada and Australia were'. The British never migrated to India as millions did to the Australasian colonies.<sup>13</sup> Yet, despite differences, as Beverly Kingston notes,

[a] vast network of imperial connections in government, administration, the army, the church, the law, education, and enterprise,

extended from India to the Australian colonies. Most families engaged on imperial business, whether officially or privately, knew someone in India.

These networks, she observes, reached from the nineteenth century into the early-twentieth century, and resulted from India's 'position on [*sic*] the crossroads of the world'.<sup>14</sup> Few environmental historians have been attuned to these connections. For those environmental historians who look beyond the nation state, imperial environmental historiography largely follows the old divisions between extractive and settler colonies, yet, the colonies of Australasia, it should be recalled, were also largely extractive, primary producers, as they remain to this day.

Characterised in particular by studies of its pre-colonial, colonial and post-colonial environmental histories, scholars of India have only recently begun to situate Indian environmental history in relation to Europe, occasionally South Asia and only gradually other colonial regions.<sup>15</sup> Despite Libby Robin and Tom Griffiths' observation that Australians and New Zealanders have tended to keep their backs turned to the Tasman Sea and to foster relations with other areas rather than with each other,<sup>16</sup> several major studies pursue Australasian environmental history comparisons. Thomas R. Dunlap's pioneering study, *Nature and the English Diaspora: Environment and History in the United States, Canada, Australia, and New Zealand*, explored the settlement by the 'English Diaspora' of the 'neo-Europes' of North America and Australasia, rather awkwardly at times fitting New Zealand and Australia into broader North American patterns. His employment of the term 'neo-Europes' itself drew upon Alfred Crosby's innovative work on European imperialism, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900*. For Crosby, the plants, animals and pathogens Europeans brought to 'neo-Europes' such as Australia, New Zealand, the Americas and South Africa ushered in an ecological revolution, facilitating imperialism as much as, if not more than, imperialists' military might and technical know-how. More recently, Don Garden's *Australia, New Zealand, and the Pacific: An Environmental History* has firmly situated Australasia in the wider Pacific region, while Tim Flannery's earlier *The Future Eaters: An Ecological History of the Australasian Lands and People* took a much longer-term view of the region's pre-human and human environmental history.<sup>17</sup> This book examines for the first time the parallel and intertwined histories of colonial South Asia and Australasia, in turn contributing to the field of comparative and trans-national environmental history.

One dominant theme of imperial environmental history is the expansion of the colonial state, its increasing hegemony over nature and ensuing environmental destruction. This vision of the environmentally destructive colonial state juggernaut is not without substance, but it is an example of a particularly strong declensionist narrative common to imperial environmental history, as John M. MacKenzie has observed.<sup>18</sup> This particular narrative, Simon Schama has explained, relates a story 'of land taken, exploited, 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'.<sup>19</sup> For instance, some scholarship maintains that colonialism unleashed one series of environmental disasters after another.<sup>20</sup> The popularity of this declensionist narrative among imperial environmental historians upholds Ranajit Guha's observation of the dominance of what he terms 'the triumphalist and progressivist moments of imperialism' evident in imperial historiography. 'Can we', he asks, 'afford to leave anxiety out of the story of empire?'<sup>21</sup> By acknowledging the environmental, political and social limitations to colonial power as well as the nuances and anxieties at the heart of imperial environmental history, this book at once responds to Guha's still largely unheeded challenge and questions the dominant interpretation of environmental history as a strongly declensionist narrative. Where it goes beyond existing studies of environmental anxiety and conservation – most notably Richard Grove's elegant study of deforestation on tropical islands – is in arguing that, far from Grove's assertion of anxiety presenting a radical critique of colonialism, anxiety actually impelled efforts towards the more efficient exploitation of resources, particularly in India, and to a lesser extent, Australasia.<sup>22</sup> This book argues that conservation represented a different – albeit complementary – form of colonial development, one in which, its proponents argued, the teeming colonial populations and smiling pastures on the lowlands would be protected from droughts and soil erosion, flooding and timber famine, sand-drift and disease through wise scientific management of resources, at the same time as otherwise agriculturally useless areas would be developed.

If one particular theme in the writing of imperial environmental history is the preponderance of a narrative of environmental apocalypse, another has been the relatively poor understanding some scholars have shown of the influence of Christianity in the shaping of environmental beliefs and actions.<sup>23</sup> Environmental historians generally have presented religion either in overly simplistic terms, as an environmentally destructive ideology, or ignored it altogether.<sup>24</sup> As a pervasive cultural force,

Christianity framed many settler environmental anxieties and responses, instilling belief in the natural productivity of all environments, sanctifying the improvement and thus restoration of unproductive environments through cultivation, and justifying, through legal systems and 'waste-lands' legislation, the moral right of settlers to take lands 'unused' by non-Europeans. As Richard Drayton has argued, 'Christian assumptions about man's place in nature played a central role in the making of Imperial Britain well into the nineteenth century.' Agriculture 'as a way of using nature sanctified by the religious and economic assumptions of the West', he notes, proved 'crucial to the culture of British expansion'.<sup>25</sup> For nineteenth-century Europeans, then, science promised to meet God's injunction to subdue and make the earth plentiful, but maintaining that productivity also created anxieties.

When imperial environments failed to respond in ways Europeans anticipated, refused to meet normative expectations of natural productivity or deteriorated when intended improvements actually produced the opposite effects, significant anxiety resulted. This book examines five principal, and interrelated, concerns in colonial Australia, New Zealand and India. The first theme, explored in Chapters 2, 3 and 4, centres on colonial health. Health anxiety reflected the pervasive nineteenth-century belief in the environmental origins of disease and the potentially deadly impact of new environments – and particularly tropical climates – on European health. Settlers feared both the effects of unknown and unproven environments and the impact of human-created changes, such as water and air pollution or unsanitary and overcrowded urban dwellings. The second, aesthetic anxiety (Chapters 2 and 3), denotes fears about the visual and health impacts of changed environments in urban and rural areas. Settlements, some colonists believed, required parks and urban planting both to combat the unintentional environmental and health impacts of development and to improve perceived unhealthy areas such as swamps and other ill-drained land. The third relates to forest anxieties (Chapters 4–6). Climatic anxiety refers to the popular scientific belief that tree cutting imperilled agriculture by diminishing rainfall and increasing temperatures, while hydrological anxiety signifies scientific concerns about deforestation accelerating soil erosion and flooding. Finally, desertification (Chapter 7) refers to the swamping of fertile fields by spreading sands. The next sections of the present chapter examine the origins of environmental anxiety, its impacts on Australasia and India, as well as how, in relation to changing local environments and particular political and economic situations, anxieties were exchanged and helped to justify the expansion of state bureaucracies.

## **Origins of environmental anxiety**

In the eighteenth and nineteenth centuries, humans, especially in Europe and China, began to change environments on a scale never before experienced.<sup>26</sup> Agricultural improvement and empire-making from the late-eighteenth century helped to radically change Britain's fortunes. Agricultural improvement swept many poor from the land, forcing them to the cities or to migrate further afield. By the nineteenth century, empire provided Britain with a ready market for its manufactured goods and access to India's cheap labour and vast resources. Increasing agricultural production, coupled with readily available supplies of coal ushered in the fossil-fuel age, allowing Britain a brief comparative advantage over other areas by making it cheaper to produce food and manufactured products than countries reliant on animal and human labour.<sup>27</sup> Fossil fuels enabled the nineteenth century's industrial revolution and propelled Britain and later other countries (in Europe and North America, as well as Japan) to a brief greatness, reversing a centuries-long trend of Asian domination of manufacturing, principally by India and China.

In Britain, steam technology provided both the basis of industrial expansion and a source of employment to many. Sucking in workers from the surrounding countryside, it set in motion a vast drama of internal (urbanisation) and external (overseas) migration, creating new forms of social organisation, living conditions and lifestyles.<sup>28</sup> To those at the time, environmental, social and political change appeared as remorseless as the never-tiring arms of a steam engine's flywheel. Although Britain exported some of its environmental problems to the colonies, progress still exacted an awfully high social, environmental and political price at home.<sup>29</sup> Blighted landscapes of slag and spoils, cuttings and holes, exposed the bones of Britain's landscape. That great symbol of Victorian progress – the railway – improved communications and facilitated travel, but 'manipulated the landscape on a grand scale'. Pollution blackened Britain's skies and soured its waters. With justification, its industrial revolution coined the term 'slum'.<sup>30</sup> Overcrowded tenements concentrated together poverty and filth, bringing disease and death,<sup>31</sup> as infrastructure failed to cope with the teeming masses surging into the cities.

## **Responding to environmental anxiety: Protest, romanticism and migration**

Across early-nineteenth-century Britain, rural and urban protesters targeted the de-humanising process of mechanisation and challenged

the abysmal conditions endured by factory workers.<sup>32</sup> The upper echelons of society were also strongly affected. Artists and novelists searched out traces of pre-industrial Britain, some giving to the hard life of the labourer or weaver a rosy patina it had never had in real life.<sup>33</sup> Even those English industrialists who benefited most from the new order quietly retreated to the countryside to live, removed from the environmental and social tumult to which they had contributed.<sup>34</sup>

Environmental anxiety reflected growing disquiet in the high environmental and social price exacted for increased comfort and goods. According to many historians, new forms of living fostered new sensibilities. Apiarists anguished that, in collecting honey, they killed the bees.<sup>35</sup> In England (1824) and France (1850), societies emerged to uphold animals' rights; others followed in the British Empire and elsewhere.<sup>36</sup> Particularly sensitive souls even fretted that trees suffered pain when cut down.<sup>37</sup> Study of nature and natural history societies flourished.<sup>38</sup> In this time of bewildering change and amid the tumult of new emotions, romanticism emerged as a major late-eighteenth- and early-nineteenth-century cultural reaction to industrial and modern living. Romantic sensibility took different forms. Followers consistently opposed industrialisation and its social and environmental results, often harking back to a fictitious 'golden' pre-industrial age of solid community ties and rural society.<sup>39</sup> 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.<sup>40</sup>

New modes of living created new diseases and magnified the effects of others. Self-doubt, nervous disorders, stress, status and money concerns assailed the confidence of an expanding bourgeois society while from the late-nineteenth-century Europeans worried about racial degeneration and the appearance of an apparently effete urban male population (Chapter 2). As well, by this date, they attempted to prevent unwanted non-European migrants.<sup>41</sup> What applied individually also applied to the state. By the late nineteenth century, alongside Social Darwinism's

brash confidence in European imperialism were also deep-seated fears about the deleterious health and environmental impacts of colonisation. Britons might be the Chosen People, yet history taught that civilisations, like people, grew up, reached maturity and died. Just when, wondered many Britons, would the sun be setting on the British Empire?<sup>42</sup>

Such sentiment, coupled with concern at the power of humanity to destroy nature, provided considerable counterweight – and yet also momentum – to the dominant ethos of progress. Most migrants and travellers to Australasia and South Asia believed in human and economic progress but thought it could be achieved, not through industry, but through farming. For many of them the basis of their new societies would be agriculture. They left their homes precisely to escape the trying industrial, social and environmental problems of industrial Europe. For a time, settlers believed they had succeeded, only to discover that they had not. What is more, imperialism itself generated significant new anxieties, notably about the insidiously undermining effects of colonial environments on European morals and constitutions, the impact of environmental change on economic production, political economy and health. Concerns also emerged in some quarters about the effects of European colonisation on indigenous peoples and environments.<sup>43</sup>

Over the course of the nineteenth century an astonishing 20 million Britons left the British Isles, fetching up principally in North America (13 million) but also spreading to most other corners of the world.<sup>44</sup> Only a proportion of the total number leaving Britain reached Australasia and India, but it still meant significant numbers of people found themselves living outside their places of birth. Exploration, unrest at home and simple lack of opportunity released the floodgates to European settlement of Australasia in the nineteenth century. Until the middle of that century, most migrants went to Australasia as either convicts (to all the Australian colonies except South Australia, a process lasting until 1856) or as free and assisted migrants (the New Zealand Company alone sent almost 10,000 settlers). Gold-seekers from Victoria, where its rush began in 1851, and numbering among them significant numbers of Chinese, followed the gold discoveries to New Zealand. The most significant input of settlers to Australasia (Figure 1.1) dates from the 1840s, and commenced with planned and assisted migration, but the real immigration explosion took place from the 1860s. From 1861 to 1900, net migration brought 134,000 settlers into Western Australia; 256,000 into Queensland; 331,000 into New South Wales (NSW); and 223,000 into New Zealand. Census figures reveal 3.8 million Europeans living in Australia in 1901 and 800,000 in New Zealand, along with several

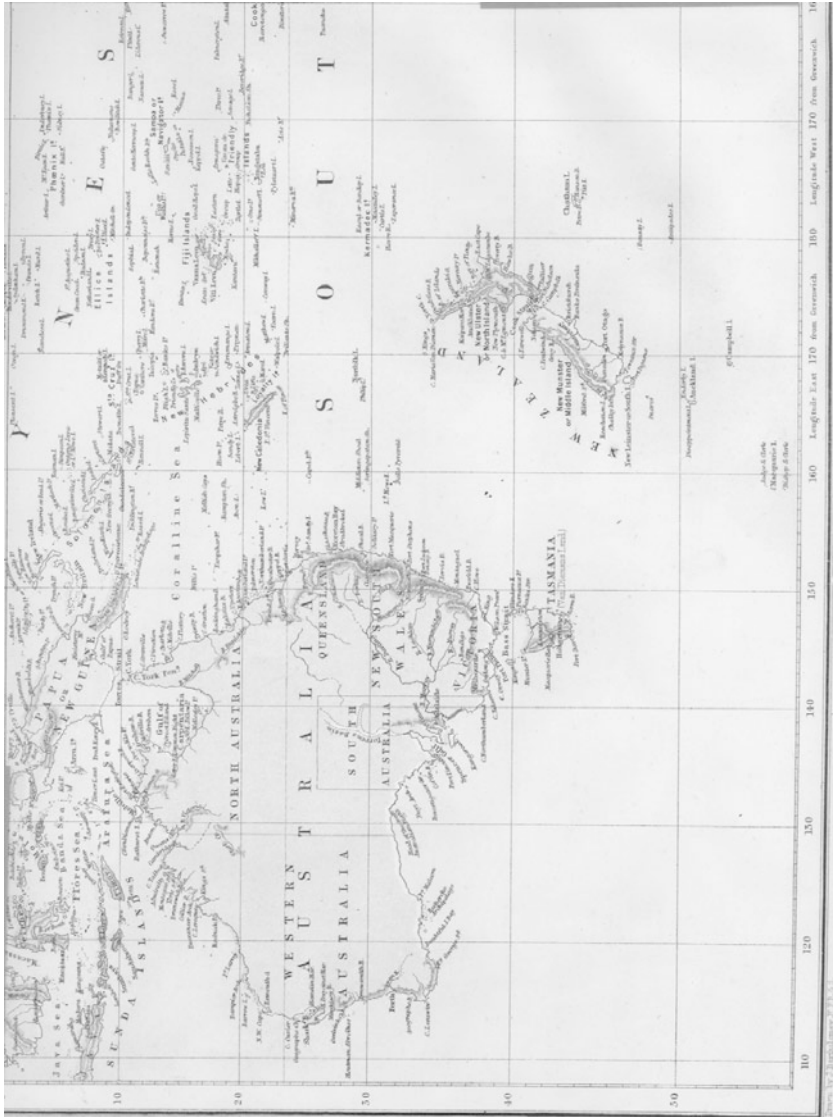


Figure 1.1 'Oceania and the Pacific Ocean', J. Bartholomew, *Black's General Atlas of the World* (Edinburgh: A. and C. Black, circa 1860), no page



tens of thousands of other groups including, respectively, Australian Aboriginals and Maori and Chinese.<sup>45</sup> Thousands of people were constantly on the move. A massive influx of Australian gold-seekers travelled to New Zealand in the 1860s, including thousands from Australia to the West Coast Gold rush of 1865–1867. That reversed in the long-depression of the 1890s as people sought opportunities in Australia. By the early-twentieth century, Australasian society was one of the most urbanised in the world.<sup>46</sup>

### **Colonial environmental change and anxiety**

Australasian settlers forged new lives and made homes by consciously rejecting mechanisation and industrialisation. Despite the reality of urbanisation and industrialisation by the late-nineteenth century, they continued to extol Arcadian images celebrating farming and rural life, images that contributed to growing settler nationalism by the century's end.<sup>47</sup> Australasian governments sought to make available as quickly as possible as much land as possible for settlement. From 1860 to 1900, almost all Australian colonial land legislators believed that most of Australia could be commercially used.<sup>48</sup> Until the 1860s closer settlement occurred in coastal areas, with the pastoral frontier developing inland. This changed after the 1860s through an emphasis on the yeoman ideal of small family-owned, freehold farms: a similar pattern was evident in New Zealand.<sup>49</sup> Although demonstrating a reluctance to intervene in society, a commitment to laissez-faire policies still required the colonial state to make available land for settlement, regulate markets and banking, develop infrastructure, and, as often as not, suppress local indigenous populations. Thus, limited settler bureaucracies developed, principally in the so-called field sciences, and principally to fuel settlers' land hunger through land survey and sale.<sup>50</sup> The history of that migration was written across the landscape of Australasia. Pastoralism initially dominated the eastern parts of New Zealand, and the coastal fringes of Australia, giving way to wheat growing (such as in South Australia and on the South Island's east coast) and, later still, dairying from the late nineteenth century (notably, for instance, New Zealand's North Island and sub-tropical coastal Queensland and NSW). From the 1890s, many Australasian colonies sought to parcel out some of the larger estates into smaller farms, and the use by government of science to boost agricultural production and improve health became increasingly acceptable under the tenets of state socialism.<sup>51</sup> In India, the British, assuming the mantle of rule from the Mughals, also pushed agricultural improvement, but mainly relied on adapting indigenous systems and

using Indian labour. As tax farmers, they sought to maximise profits, though not always successfully. Over the nineteenth century, the role of the state also increased. Indian cotton manufacturing was replaced with plantation agriculture and cash crop production encouraged through investments in irrigation, transportation and plant improvements.<sup>52</sup>

Throughout the period discussed – from the early 1800s to the early 1920s – the role of the state also grew in Australasia, in part, as a consequence of increased communication networks and cultural changes which helped to foster settler nationalisms. In New Zealand, provincial government (1852–76) gave way to a centralised government and, in 1907, the country received Dominion status. In Australia, by contrast, the colonial system that persisted until federation in 1901 brought the colonies together as states within a federalist system. Democratically elected governments also emerged in Australasia over this period. Unlike Australasia, however, Indian governments had more power to act arbitrarily – without having to take the needs (and voting) of settlers into consideration – and, under the influence of the doctrine of utilitarianism from the 1850s developed a far more interventionist model of government. I explore more of the implications of these differences below.

While agricultural improvement drove imperial expansion in India and Australasia, it also carried expectations about environments which, if not met, generated anxiety. Colonisation, reliant upon successfully marshalling resources and increasing productivity, sometimes drove unrealistic environmental expectations and led to the introduction of agricultural practices unsuited to particular environments.<sup>53</sup> Since for most Europeans a productive environment figured as the norm and since cultivation signified Christianity, its absence indicated landscapes lying in a state of sin, nature in desperate need of improvement. For William Marshall, an evangelical missionary in New Zealand, ‘any place ... left desolate by man ... becomes ... a waste ... no longer a well watered garden, but a wild and weary wilderness’, a wilderness that serves as a reminder of man’s sin and ‘to that grand catastrophe of which all the prophets witness, when earth’s Creator ... cursed and quitted it’.<sup>54</sup> Encountering unproductive land led to anxiety and improvement.

Activities such as irrigation, tree planting and forest conservation promised to ‘restore’ fertility to previously desolate regions by returning them to their pre-Fall state and thereby meet biblical aims of using land wisely (Chapters 2 to 7).<sup>55</sup> Illustrating such a view on the Punjab plains, the Marquis of Dalhousie (1812–60), Governor General of India (1848–56), despaired of the absence of ‘foliage which is its natural

arraignment', determining to plant trees to improve climate and provide fuel to villagers.<sup>56</sup> For forester Berthold Ribbentrop, 'Nature's unaided efforts' proves 'that the withdrawal of man's active interference would, under favourable circumstances, be sufficient in time to re-clothe the now denuded areas with forest vegetation'.<sup>57</sup> In many arid parts of Australasia, such as South Australia and Central Otago, settlers entertained similar hopes. Tree planting, they fervently hoped, would bring wholesale climatic change. Deserts would bloom. Economies would boom. And settlers would become rich. In 1869, John Gillies claimed tree planting in Central Otago would encourage rainfall and 'convert that district into the garden of Otago'.<sup>58</sup> The idea of a naturally productive environment extended to ideas of health. Settlers believed that unwholesome areas, such as swamps, as well as zones of illness created by humans, should be made productive and healthy. Notions of beauty and health thus coalesced; settler aesthetic conventions valued beautiful *and* healthy areas (Chapters 2 and 3).

Large-scale environmental change also released a set of often unintended environmental consequences that threatened colonial development and, with it, the whole colonial project, a problem seemingly accentuated on tropical islands, as Richard Grove has contended. For Grove, the smallness of tropical islands magnified the effects of environmental change, invoking in European minds images of an Eden despoiled.<sup>59</sup> This is what almost happened on Mauritius in the mid-nineteenth century, Grove argues. Plantation agriculture led to deforestation and soil erosion (and perceived climate change) that threatened to undermine the economy. Only through tree planting and the conservation of existing forests, so proponents of conservation argued, was the productive (and economic) capacity of the island restored.<sup>60</sup> With a process of Indianisation gathering pace in the early-twentieth century, British rule in India came to rest upon its shaky presentation as a civilising agent and an improver of both Indian agricultural productivity and morality.<sup>61</sup> Sustained agricultural failure, conservation supporters stressed, threatened to bring economic decline and cause unrest. Although a region the size of the Indian subcontinent could still sustain serious losses of people and environments, it could not do so indefinitely.

In Australasia and South Asia existing populations had already made major modifications to environments, in some cases (in Australia and India) over tens of thousands of years, but the rapidity and extent of change accelerated with colonisation.<sup>62</sup> Empire established resource extraction frontiers in one place to service the demands of another.<sup>63</sup> Rabbit infestations, for instance, became a curse in many parts of

Australasia from the 1860s, competing with stock and causing soil erosion. Secondary introductions from the 1880s (designed to get rid of the now-unwanted introductions) made heavy and largely unanticipated depredations on local birdlife and animals. Weeds, other animal pests and unwanted microorganisms also wreaked havoc on local ecologies and economies.<sup>64</sup> In India, canal re-building and re-commissioning from the 1850s created massive problems of salinisation and also facilitating the spread of malaria. Crop failures – and the shift to cash, rather than food, crops which the British encouraged – led to devastating famines, followed by disease and death.<sup>65</sup> Deforestation accelerated with colonisation and increased anxieties in some quarters, particularly among educated men and women. In Australia between 1871 and 1880, for instance, railways grew about 1288 km, leading to the estimated loss of over 12,100 acres (4900 ha) of forest. Destruction increased rapidly over the nineteenth century, climbing to almost 48,000 acres (19,400 ha) in the period from 1881 to 1890 and to over 90,000 acres (36,500 ha) in the last decade of the nineteenth century.<sup>66</sup> Overseas railway building also impacted on Australian forest supplies, with Australian hardwoods meeting demand for railway sleepers from New Zealand, South Africa, Great Britain and even India. Deforestation soared in New Zealand over the nineteenth century, indicating the rapid development of its lowlands in particular (Figure 1.2) and their re-making with introduced grasslands. As forest historian Michael Roche notes: ‘In 1900 forest covered approximately 25 per cent of the country, a reduction from about a half in 1840, and perhaps 80 per cent when Polynesians first arrived’ (Figures 1.3, 1.4).<sup>67</sup> In India, colonisation also increased deforestation rates, adding to existing pre-European timber losses. In the colonial period, a complex of factors including expanding agriculture, fuel needs, increased population pressure on resources, while from the mid-nineteenth century internal migration and railway building accounted for increased deforestation. Indeed, in the fledgling forest bureaucracies which developed, particular concerns revolved around supplying timber needs for anticipated railway development designed to improve communications, one of the problems identified with the violence of 1857. It was estimated, for instance, that 200 tons of timber was required for every 1.6 km of railway.<sup>68</sup>

### **Indian models**

Environmental anxieties tied together different parts of the British Empire and elsewhere, enhancing the authority of certain bureaucracies,



Figure 1.2 'Inglewood from Recreation Ground', Taranaki, New Zealand, circa 1876 or 1878. Reproduced with the permission of the collection of Puke Ariki, New Plymouth, PHO2007-046

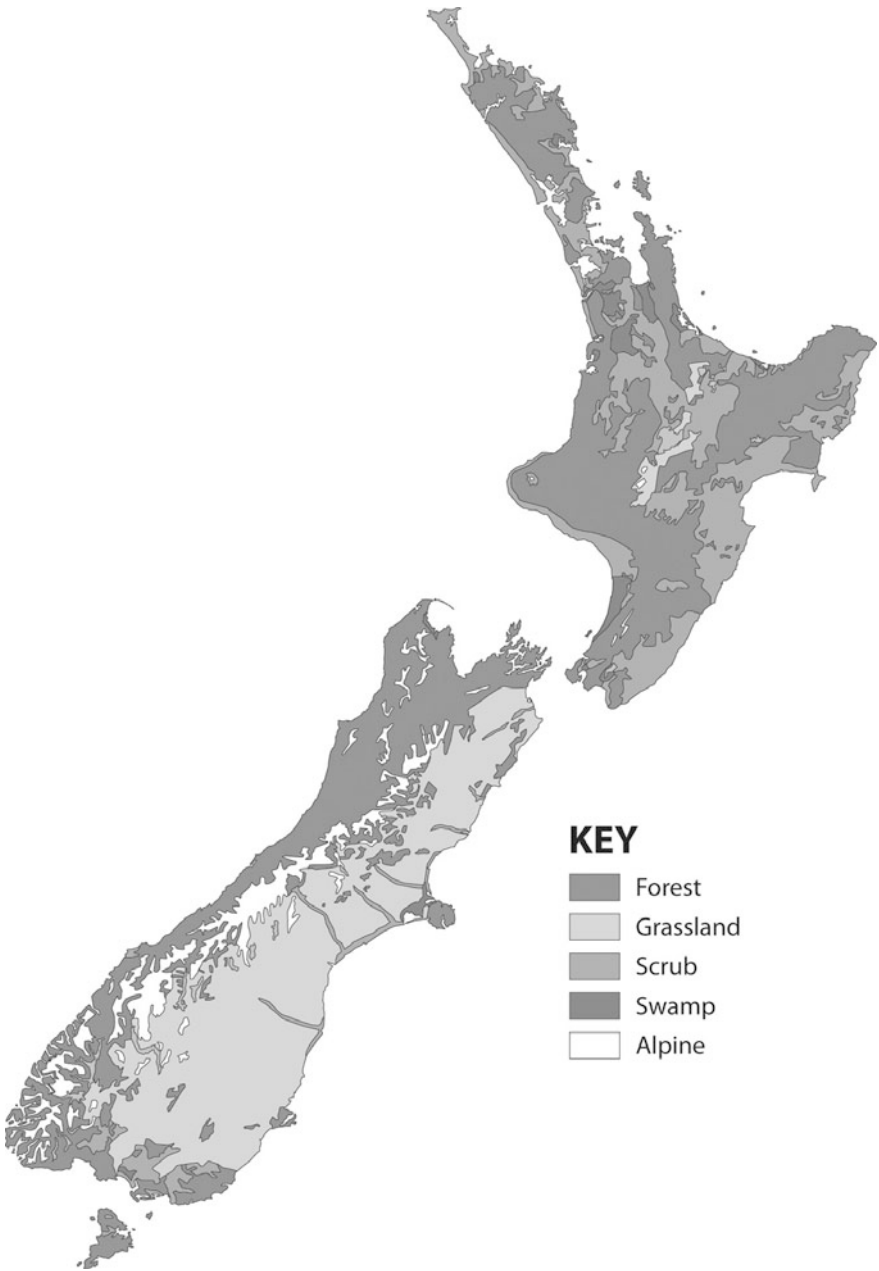


Figure 1.3 New Zealand Vegetation and Land Use, 1840. Map based on: Kenneth B. Cumberland, 'A Century's Change: Natural to Cultural Vegetation in New Zealand', *Geographical Review*, 31, 4 (October, 1941): no page

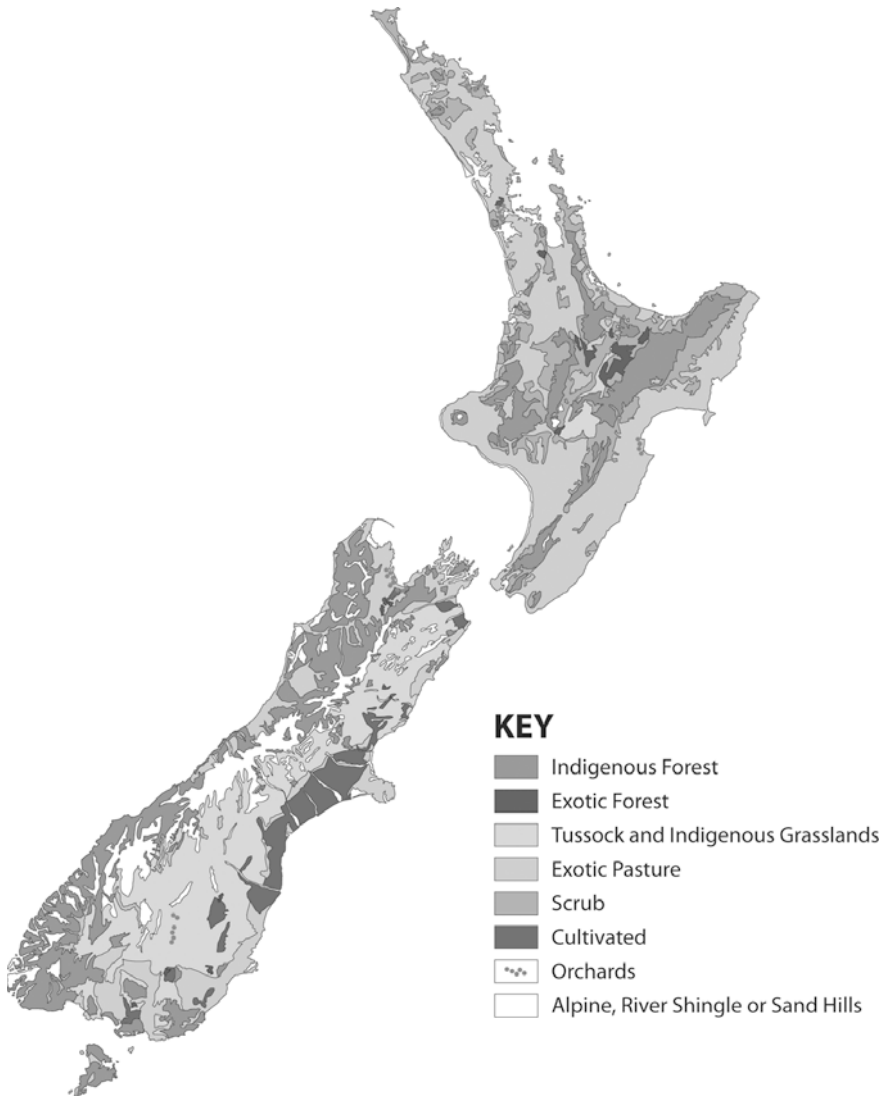


Figure 1.4 New Zealand Vegetation and Land Use, 1940. Map based on: Kenneth B. Cumberland, 'A Century's Change: Natural to Cultural Vegetation in New Zealand', *Geographical Review*, 31, 4 (October, 1941): no page

especially health officials and foresters, who stressed the necessity of greater government involvement in environmental and health management. The success of their demands, in turn, reflected a colony's particular local, political, environmental and cultural circumstances. As Zaheer Baber notes, 'British India proved to be a good testing

ground for a number of experiments in the application of science and technology by the colonial state.' In the mid-nineteenth century, India possessed 'one of the largest state-sponsored scientific research and development activities undertaken in modern times'.<sup>69</sup> Since its early victories over Bengal and Madras in the eighteenth century, the EIC (the English East India Company) had come to rely increasingly on accurate information – and bureaucracies to provide that information – to facilitate its shift from a trading role to an imperial power (Figures 1.5, 1.6, 1.7).<sup>70</sup> Under the EIC, surveying and the natural sciences became effective 'instruments of social, political and economic progress'.<sup>71</sup> They provided vital information about the resources of the new colony and were instrumental in military planning. Military expansion reinforced the need for an EIC medical bureaucracy to keep European and Indian troops fighting fit and to investigate and control new disease regimes while botanical knowledge supplied important information about potentially valuable local plants. Botanical gardens themselves furthered colonialism through acclimatising and improving crop varieties, thereby increasing agricultural production and state revenue. A developing bureaucracy, coupled with research and development located at botanical gardens, emerged in the late-eighteenth century. Although these imperial bureaucracies were certainly limited and rather more ad hoc than their somewhat grandiose names suggested, compared to other colonial possessions they were nevertheless significantly more advanced.<sup>72</sup>

Following a period of *laissez-faire* policies, justification for state activity increased with the popularity of utilitarianism from the mid-nineteenth century. The Marquis of Dalhousie, an ardent follower of utilitarian philosopher Jeremy Bentham (1748–1832), pushed for the development of railways and telegraphic and postal systems as a means of civilising Asians. In 1854, he established the Public Works Department to increase agricultural production. Ambitious programmes to revive canals and irrigation works resulted in an informal engineering college at Roorkee (later, the Thomason Civil Engineering College).<sup>73</sup> Direct British control after 1858, following the uprising of the previous year, extended state intervention undertaken under Company rule. During the British Raj, the Indian civil service grew massively as did its military presence. Private irrigation schemes, attempted between 1858 and 1864, failed so the state took control, never again relinquishing their governance to private concerns. State railway development forged ahead from the 1860s and in response to persistent famines, government created a department of agriculture in 1871.<sup>74</sup>



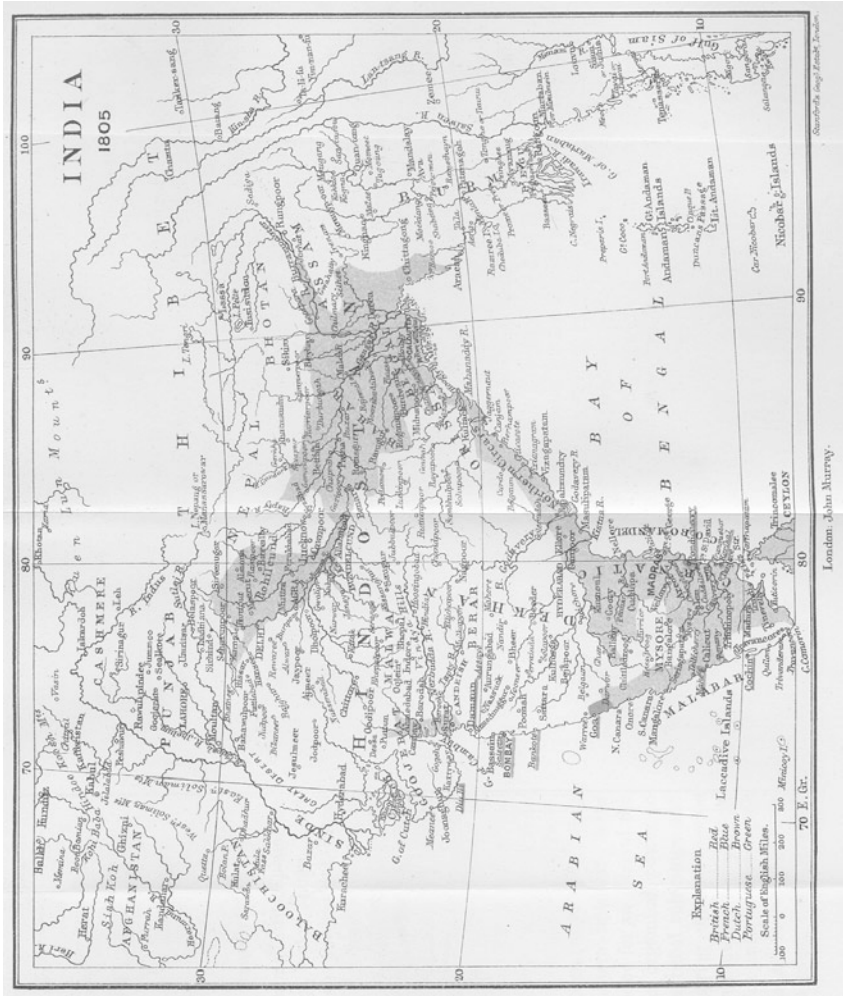


Figure 1.5 'India, 1805', Sir Alfred Lyall, *The Rise and Expansion of British Dominion in India* (London: John Murray, 1919), no page

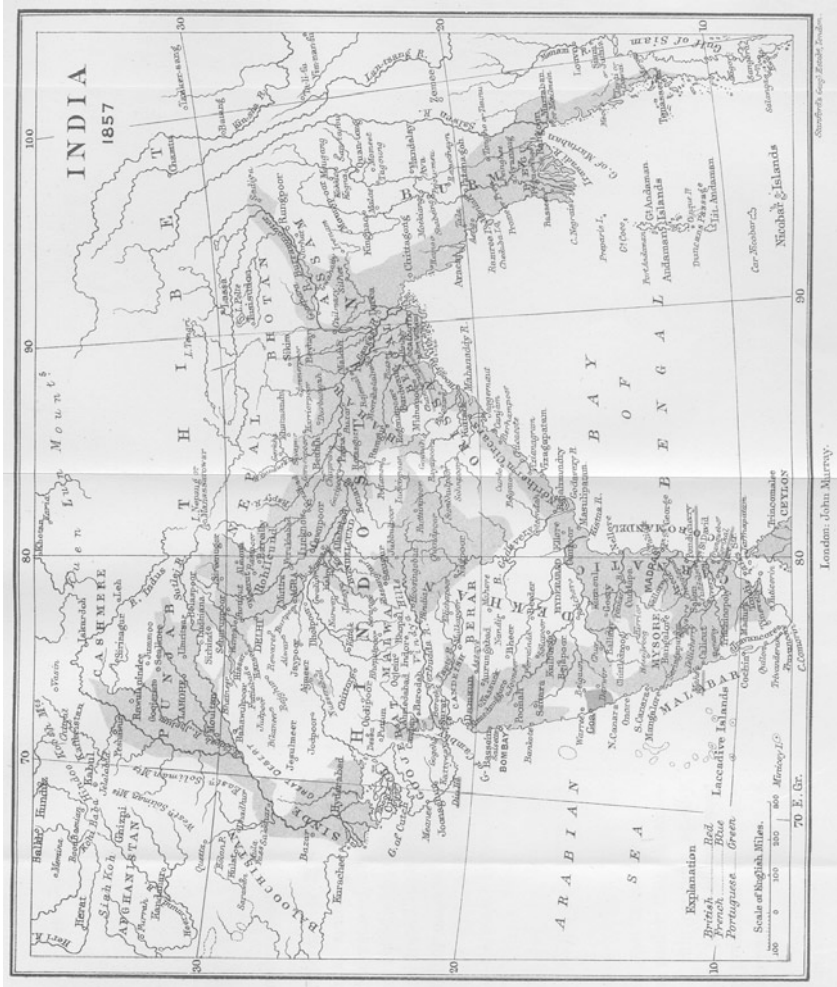


Figure 1.6 'India, 1857', Sir Alfred Lyall, *The Rise and Expansion of British Dominion in India* (London: John Murray, 1919), no page



Figure 1.7 'British India, early twentieth century', Sir Alfred Lyall, *The Rise and Expansion of British Dominion in India* (London: John Murray, 1919), no page

By the beginning of the twentieth century, 'the British administration included men whose years of experience on the subcontinent had led them to acquire views of science and its social functions far different from those of their contemporaries in Whitehall and Burlington House.'<sup>75</sup> This included, as Russell Dionne and Roy MacLeod note, enthusiasm for natural history and geology and their pursuit by the state.<sup>76</sup> Environmental anxieties played a key role in many of these developments. For instance, supporters of forest conservation, initially drawn from professionals in the medical service and later relying upon German-trained scientists and models, deployed highly alarmist and messianic language to emphasise the 'civilisation-threatening consequences of deforestation'. They did so deliberately, to further the bureaucratic interests which they represented. Advocates argued that, unless protected, deforestation would choke colonial development, bringing drought through lessened rainfall, washing away soils or deluging fields.<sup>77</sup> The benefits of conservation to the state were stressed. Forest conservation, proponents argued, made best use of land unsuited to agriculture – thus furthering the aim of improvement by bringing into production marginal areas – and protected farming. In spatial terms, with the exception of tea growing, it largely led to the conservation and working of highlands forests and to the use of the lowlands for agriculture. In common with the times, doctors and naturalists trained in Scotland and northern Europe and Germany might attend to medical concerns but also provide expertise in the so-called field sciences described above.

Forest administrators from India acted as 'centers of calculation', compiling and exchanging information and testing models and techniques of forest management and environmental control from many parts of the world, including Australasia, India, Europe and North America.<sup>78</sup> Their influence was extended in part because of the exchange of knowledge between different colonies facilitated through letter writing and reading. Exchanges of information enabled individuals to form 'empires of their own, both connected to and separate from the political intentions of ruling governments.'<sup>79</sup> In other ways, it came to bear through the considerable numbers of European imperial soldiers, civil servants and opportunists who made their way from India to Australia and, from the mid-nineteenth century, to New Zealand (established as a colony in 1840).<sup>80</sup> Several wealthier retirees were active in New Zealand colonial politics and lobbied for Indian models in the 1870s, while many Australasian colonies, land officials and scientists upheld the Indian model because the latter offered the only imperial model of forest conservation available. Indeed, developing fears of the pathological

qualities of the Indian climate for Europeans gathered pace over the nineteenth century and impacted on Australasia. As the acclimatisation of European people to India was now no longer seen as possible, it placed added pressure on finding places suitable for permanent European settlement. As a result, comparisons of Australasian and Indian healthiness abounded, as did schemes encouraging Europeans from India to migrate to Australasia, thereby further entrenching the sinews between the regions.

### **Expressing anxiety: Individuals and groups**

As a result in part of their education, certain individuals and groups advocated environmental anxieties, the impacts of which varied by time and place. Members of colonial scientific societies, bureaucracies and visiting men of science articulated early environmental concerns. Natural history societies, often associated with colonial museums, provided the structures and personnel for the examination of environmental processes and problems. Concerns and discussions of environmental change appeared in colonial scientific journals and newspapers, later extending to discussions in colonial parliaments and other published works.<sup>81</sup> The nature of the anxiety in many senses dictated its mode of articulation. Scientific ideas were generally articulated by males, not females, a reflection of perceived differences in the sexes and their restricted educational opportunities, but artistic notions could be put forward by both men and women. An individual or a group's credibility rested on the accuracy of predicting and mitigating the impact of environmental change but also on claims to knowledge that reflected educational attainment, expertise and social standing. Over the nineteenth century, society gradually became more specialised. Professional organisations developed, making claims to knowledge based on the abilities of its practitioners. They also established journals, certification to control membership and ensure standards, clear career pathways and distinctions between reliable and unreliable forms of knowledge to enhance their authority.<sup>82</sup> But professionalisation varied by region and over time, and did not necessarily occur in a neat, linear fashion. Even in India, widely lauded for its forest bureaucracy, professionalisation, while ahead of Australasia, emerged gradually.<sup>83</sup>

In Australasia, for instance, only really in the twentieth century, for instance, did its forest bureaucracies evince more of the professionalism evident in the Indian forestry service in the previous century.<sup>84</sup> By the late-nineteenth century, Australasian colonial governments supported

bigger bureaucracies, as science became an increasingly accepted form to manage resources and people. Increasing disciplinary divisions also marked out new bureaucracies. Medical expressions of climatic anxiety and involvement in forestry lessened throughout the nineteenth century due to pressing medical concerns and increasing specialisation. In India from the 1860s, professionally trained German foresters began to take over the articulation and responses to environmental anxieties previously undertaken by many Scottish-trained medics. This reflected, in part, doctors' increased opportunities to practice in their profession. Scientific specialisation also meant they no longer had the qualifications necessary to undertake forest management (Chapters 2–7). As R. Wright has demonstrated, from the 1870s, 'the conduct of environmental management in Victoria was increasingly to become a professional, scientific business'.<sup>85</sup> Despite centralisation and standardisation of bureaucracy, regional differences in management remained, owing in particular to the different terrain, forests and climate of regions.

For women, for example, contemporary societal norms directed them into the domestic sphere, seemingly away from many of the public scientific roles adopted by males. Outside the arena of amateur natural history and its writing for children, few if any women served as colonial scientists or as land administrators until the twentieth century. Women, as art historian Caroline Jordan notes, 'had the sanctioned roles of compassion, of links to nature, of sensibility to feeling and beauty'.<sup>86</sup> But in the nineteenth century, many women used these stereotypes to their advantage, to open up new opportunities for themselves. Justifying their actions as extensions of their 'natural' interest in art, women publicly expressed aesthetic anxiety about the ugliness of environmental change (Chapter 3). They expressed concern about the impact of certain climates on their health and that of their family. Gendered ideas about health also held that female bodies were particularly vulnerable to environmental change and offered a pertinent area of study for medical science (Chapter 2).

Biography is a particularly useful way to explore environmental anxiety and its responses. Chapters 3 and 4 examine in greater detail the impact of education on the articulation of environmental anxieties by, respectively, Scottish- and German-trained scientists. Biography is useful in revealing the complexity of colonial views and the connections between different people and places, but also, as David Lambert and Alan Lester observe, 'how ideas, practices and identities developed *trans-imperially* as they moved from one imperial site to another'.<sup>87</sup>

In articulating concerns about the aesthetic appearance of towns and the ugliness of deforestation, individuals like Alfred Sharpe derived their authority from their status as an artist. Many middle- and upper-class women also qualified to declaim on aesthetic matters and received an artistic education because contemporary society believed women were 'naturally' inclined to such pursuits (Chapter 3). Medical doctors' concerns about the health of places and environments too reflected sounder medical training and growing public confidence in medicine (Chapter 2). Authority also changed over time. In expressing anxiety about deforestation and in promoting scientific forestry, credibility in India rested with medical doctors in the early-to-mid-nineteenth century and German-trained foresters later in that century due to their specialised scientific and practical knowledge (Chapters 4 to 5).

Responses to environmental anxieties also echoed the enthusiasms of particular individuals and political cultures. In relatively small colonial societies, individuals may have had a greater impact on environmental decision-making than in larger societies.<sup>88</sup> The New Zealand politician Julius Vogel (1835–99) twice (in 1874 and 1885) introduced conservation schemes to prevent timber famine, climate change and flooding, and twice witnessed the parliament revoke his legislation. Compared to other Australian colonies, South Australia's relatively developed forestry programme from the 1870s owed much to the efforts of one man, Friedrich Krichauff (1824–1904) (Chapter 5).

Finding the appropriate terminology to reflect the heterogeneity of imperialism – the people, ideas and processes involved – across Australasia and South Asia is challenging. Even the term 'colonialism' can connote different types of engagement and ideological commitments on the part of the historian. Settler colonialism clearly differed in its social and political characteristics from India. Whereas white rule in India tended to be more absolute and government intervention in society more widely accepted especially after the 1850s, in the settler colonies laissez-faire attitudes reigned longer. In the late-nineteenth century, democratic government emerged in many settler colonies and with it, gradual acceptance of state involvement in society. Where India's populace were mostly poor peasants, the white settlers of Australasia enjoyed greater economic prosperity in contrast also to its native peoples. Where many Europeans came to India to serve in an official capacity, in the settler colonies most came to settle.<sup>89</sup> While giving due regard to these important differences, for the sake of simplicity I use terms such as settler, colonial and colonist interchangeably, as well as colonised and coloniser, with the recognition of the complexity and diversity behind such labels.

*Empire and Environmental Anxiety* for the most part examines the concerns of colonisers rather than colonised. This reflects in part the difficulty of accessing non-English-language sources and the sheer heterogeneity of non-European groups and their experiences in Empire. Even the terms coloniser and colonised used in this book are only useful shorthand provided the differential and changing power relations within non-European societies are kept in mind.<sup>90</sup> New Zealand Maori, Aboriginal Australians and Indians appear in the book through the eyes of colonists and occasionally in their own words too. While asymmetrical, the impacts of colonisation affected different non-European groups in contrasting ways, with some groups using it to their advantage. In India, the British took over the structures and bureaucracies of the Mughal Empire in the eighteenth century. The wheels of the empire were oiled by an educated local staff and kept in motion by non-European workers – Indians, Chinese and others. Bengalis later played a vital role as civil servants in the British Raj, but their literacy and connections also laid the foundation for a thriving resistance to imperial authority later in the nineteenth century.<sup>91</sup> Indians staffed the lower bureaucracies of the Indian Forest Service (IFS) in the nineteenth century. For instance, in Burma, foresters employed the Karen to find, fell and remove timber.<sup>92</sup> Foresters met stiff resistance to the encroachment of forest laws and commodification from various hill tribes and other groups who engaged in incendiarism, non-violence and other forms of protest. And even among tribal groups affected by forest laws, significantly different experiences of colonisation resulted.<sup>93</sup> As the work of Ramachandra Guha and Madhav Gadgil show, in the Rajmahal hills (north-eastern India), the Santhals adapted better to policies of sedentarisation than the Paharias, because the former were acquainted with settled cultivation while the latter, who practised slash-and-burn agriculture, were not.<sup>94</sup>

The outcomes of forest policies also cut unevenly across New Zealand society, severely affecting Maori, whose access to lands and resources was removed or often severely restricted by forest reservation additional to the main causes of land loss: sale and confiscation.<sup>95</sup> As a correspondent to the Maori-language newspaper *Te Wananga* noted in 1874, some Maori feared that forestland in their hands would be lost to pay for the newly proposed state forests department.<sup>96</sup> Others, such as Ngati Tuwharetoa leader Te Heuheu Tukino IV, it is suggested, made use of preservation legislation to gift land to the Crown so that it might not, at least, fall into settler hands.<sup>97</sup> Given their remarkably high literacy rates and ability to operate successfully in both their own



and European worlds, Maori resorted to written and formal means of protest. Organised military campaigns (The New Zealand Wars), passive resistance and organised political movements also fought the encroachments of the colonial government while many Maori also engaged at various levels with aspects of European science and ideas, for instance training as doctors or serving as bureaucrats to improve their people's welfare (Chapter 2).<sup>98</sup>

Colonialism also severely affected Australian Aboriginals through disease, landlessness, war and institutional racism.<sup>99</sup> Colonial experiences of imperialism and environmental change, then, differed according to age, location, caste, background, education, religion and gender and for Europeans were also moderated by class. As Elliott Campbell declares, understanding 'the heterogeneity of Britain is vital before studying the heterogeneity of its white settler colonies'.<sup>100</sup> This rings true both for that multi-national state, the United Kingdom, and for the plea intellectual historian John Pocock made to historians over 30 years ago of the need to recognise the plurality of British history.<sup>101</sup> The background of Europeans before they arrived in the colonies is thus an important consideration when examining their environmental views, as is the differential experience of imperialism among colonised peoples.

### **Local environments, politics and professions**

Environmental anxiety and its responses reflected the nexus between culture and nature, experienced at the local level. 'Local conditions', as historian of science David Livingstone has observed, 'pose local problems needing local solutions.'<sup>102</sup> As Eric Pawson and Stephen Dovers note, for island landmasses such as New Zealand and Australia, national-scale enquiry 'may indeed be useful'.<sup>103</sup> Colonial governments sometimes exchanged anxieties, as New Zealand and South Australia did over tree-planting legislation in the 1870s, but at other times they resulted from the advice of visiting experts or from local scientists adapting ideas from one place to another, above and beyond national boundaries. These examples uphold Livingstone's assertion that 'As ideas circulate, they undergo translation and transformation' in response to particular circumstances.<sup>104</sup>

It made environmental sense, for instance, to introduce tree-planting legislation into the provinces of Otago and Canterbury and the colony of South Australia because of their scarcity of forests exacerbated by colonial development. Even when such legislation was introduced nationally in New Zealand, for obvious reasons settlers in heavily

forested areas did not make use of the act. In the Punjab, 'the almost total absence of forest trees and cover of forest trees and of bushes', noted an official in 1851, makes 'the whole territory one continuous stretch of unrelieved plain' and invited tree-planting legislation.<sup>105</sup> In other ways, rugged topography and geographical diversity prevented both the extraction of timber and the introduction of uniform forest management models. New Zealand's steep mountainsides thwarted successful attempts to remove and bring some timber to markets. Those and extremely heavy rainfall left large areas of the southwestern South Island untouched by timber cutters.<sup>106</sup> Inaccessible mangrove forests, difficulties of access and sheer ecological diversity, not to mention tigers, restricted forest management in southwest Bengal in the Sundarabans.<sup>107</sup> Forest policies in Burma, rather than those from elsewhere in India, were deemed by overseas experts as appropriate and useful models for colonial Victoria. Even then, Burma's forest model required adaptation to local circumstances (Chapter 6). For some individuals, slower growing rates in New Zealand's South Island warranted the following of what they identified as German models of forest conservation and the introduction of fast-growing exotics (Chapter 5). The behaviour of existing and changed environments impacted strongly upon environmental anxieties and the effectiveness of responses to them, as did existing political, geographical and economic conditions.

While hierarchies of political organisation ordered space across India and the Australasian colonies and levels of administration ranged from the municipal and provincial to the colonial and national, issues and measures came to a head at the local level. When shifting sands swept over fields and settlement, attempts to deal with the problem through raising taxes stumbled because of the low rating bases of affected areas (Chapter 7). Ignited by fears of an impending timber famine consequent upon mining, forest reservation took place in parts of colonial Victoria in the early 1860s to supply pit props and fuel for the industry.<sup>108</sup> Similar fears over gold-mining and scarce timber resources gripped colonial Otago in the 1860s, leading to attempts to plant trees and reserve forest.<sup>109</sup> Political responses to problems differed greatly within and across Australasia and India and help to explain why certain policies favouring state scientific bureaucracies stuttered in Australasia but went ahead in India.<sup>110</sup>

The sheer diversity of environments within empire posed particular problems to administration, and required different environmental management. Europeans tried, in vain, to define India as tropical.<sup>111</sup>

As the British Association for the Advancement of Science's Report of 1851 into the impact of tropical deforestation observed,

British India is so extensive an empire, so diversified in soil and climate, as well as in natural and agricultural products, that it is impossible to predict anything respecting it generally; that which is descriptive of one part is not necessarily applicable to another. Thus some parts are covered with primeval forests ... while other parts are not only bare of trees, but even of vegetation of any kind, as the deserts which run parallel with the Indus, and stretch more or less into the interior of India.<sup>112</sup>

With desert to the northwest, the mountainous Himalaya range to the north and tropical regions to the south, India's vegetation and climate are heavily influenced by these geographical features as well as by underlying geology and the effects of the monsoon. Monsoon sweeps across India in late May or June from the Bay of Bengal and the Arabian Sea, retreating in September or October and bringing in turn a different monsoon cycle from the northeast. Precipitation rates vary accordingly. As well as the Himalaya, the Western Ghats run for almost 1600 km along western India. To the east lie the Eastern Ghats, and between both mountain ranges is the high Deccan plateau. To the north of the Deccan plateau are two mountain ranges which help to form the Deccan plateau into a triangle. Tropical forests (containing teak [*Tectona grandis*] and other commercially valuable trees) occur principally to the west and east, where there is less rainfall, of the Western Ghats as well as in the northeast of India (Figure 1.8). The latter includes a variety of moist deciduous monsoon forests, semi-evergreen and evergreen rain forests, swamps and grasslands. In the north, stretching from east to west, are the northern plains of India, dominated by the Indian deltaic systems. Often of very low relief (less than 300m in height), the river system contains agriculturally fertile soil in the north-east and sterile sands of the Thar Desert, to the west of northern India.<sup>113</sup>

Although Australia is known for 'the red-brown aridity of the outback', its northern reaches also experience the effects of India's monsoon, resulting in lush tropical rainforest and mangrove forest.<sup>114</sup> Climatically, Australia, New Zealand and India are also affected by the El Niño Southern Oscillation (ENSO),<sup>115</sup> a phenomenon resulting from complex changes in the currents and air pressure in the Pacific Ocean. Although ENSO is only one contributor to climatic variability, it has a significant worldwide impact.<sup>116</sup> At different times and places, it causes drought and

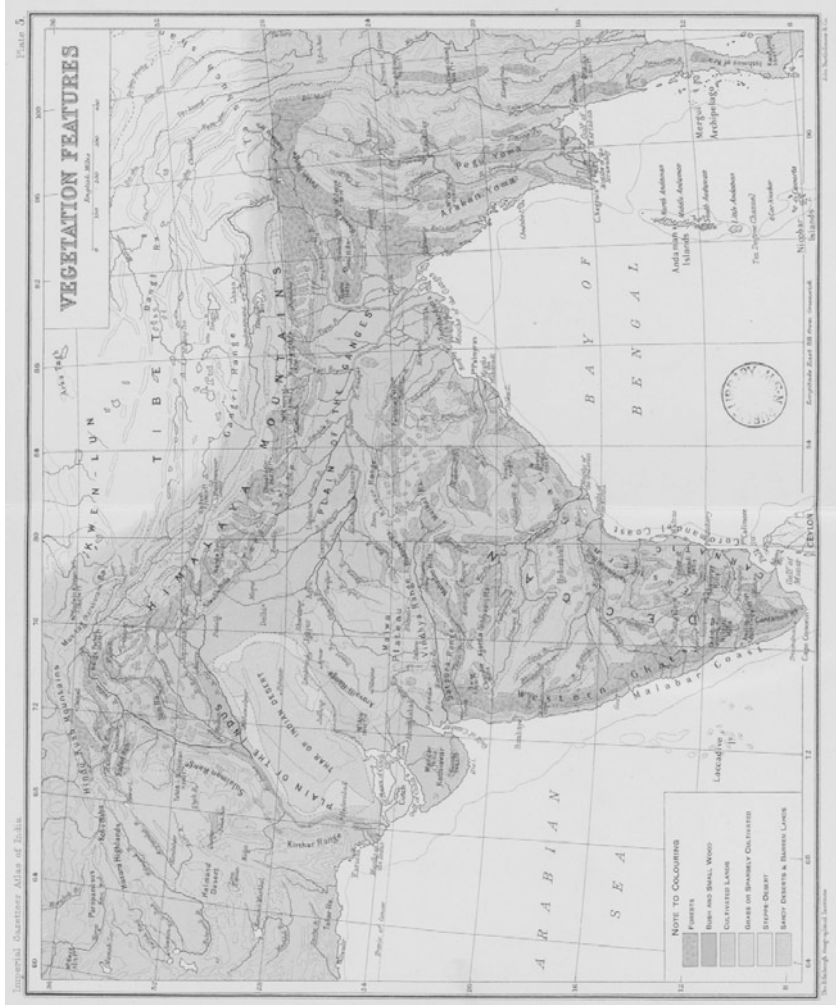


Figure 1.8 'Vegetation Features', *Imperial Gazetteer of India*, Volume 26 (Oxford: Clarendon Press, 1909), plate 5

flooding across Australasia and South Asia and, as Richard Grove and others suggest, heightened concern about the impact of deforestation on hydrology, rainfall and flooding (Figures 1.9, 1.10).<sup>117</sup>

Although sharing a similar Gondwanaland heritage, Australia is geologically older than New Zealand. Its soils are ancient and consequently poorer; and it suffers from greater temperature extremes. Semi-arid and arid regions comprise some 70 per cent of Australia's surface area and represent a diversity of environments characterised by a uniformly low rainfall.<sup>118</sup> Water is in great dearth in many areas and this has a major impact on forest distribution. Most of Australia's trees are hardwoods and most grow on the northern, eastern and southwestern littoral in areas of greater than 500mm of rainfall per annum. Dense forest gives way to open forest the further inland one travels due to decreasing rainfall.

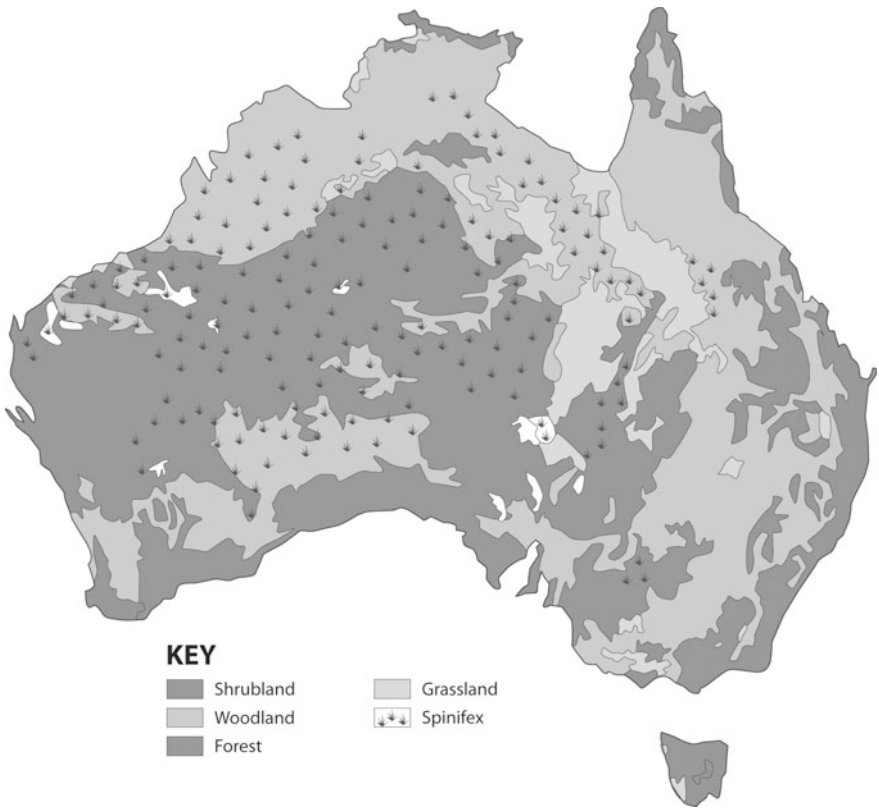
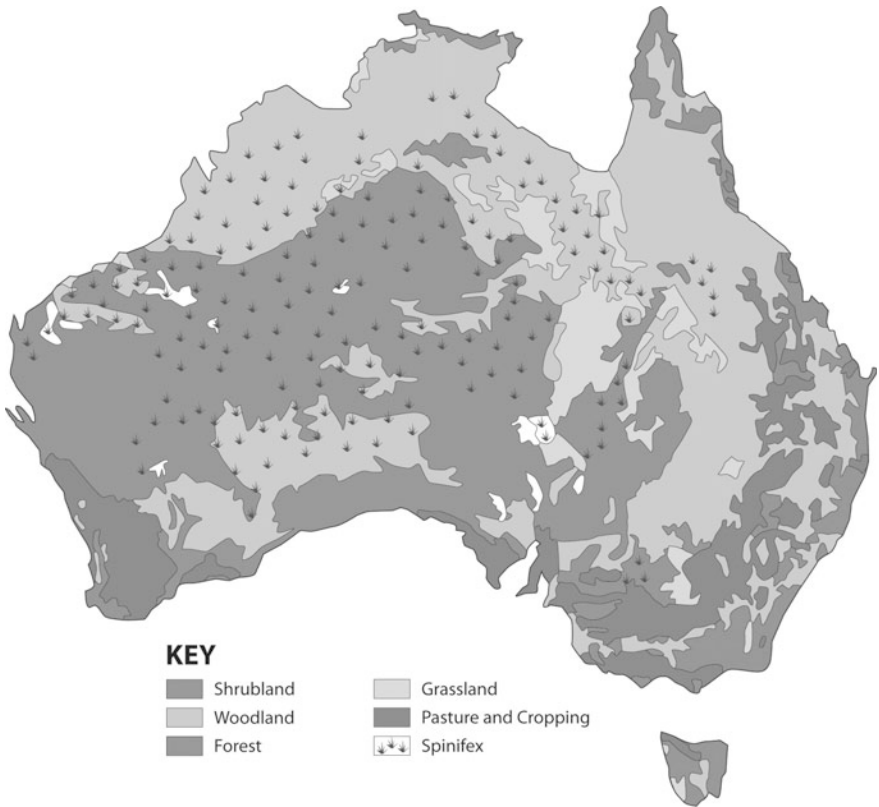


Figure 1.9 Australian Vegetation and Land Use, 1788. Map based on: Ann Young, *Environmental Change in Australia Since 1788* (South Melbourne: Oxford University Press, 2000), plate c



*Figure 1.10* Australian Vegetation and Land Use, 2000. Map based on: Ann Young, *Environmental Change in Australia Since 1788* (South Melbourne: Oxford University Press, 2000), plate c

In these dry areas, amidst the grassy and open scrub, drought-resistant eucalyptus grow.<sup>119</sup> Australia’s dryness, in particular, created anxieties among settlers unused to working in such a climate.

By contrast, New Zealand is mostly well watered, its soils – although themselves not as rich as settlers first imagined – are much newer, and it is a geologically active country prone to earthquakes. Considering these great environmental differences (though, of course, he had no knowledge of Gondwanaland), imperial traveller Charles Dilke (1843–1911) compared the environments of India, Australia and New Zealand and their impact on colonial development. New Zealand’s climate, he observed, ‘is damp and windy’, its land

covered in most parts with a tangled jungle of tree-ferns, creepers, and parasitic plants; water never fails, and, though winter is unknown,

the summer heat is never great; the islands are always green. Australia has for the most part flat, yellow, sunburnt shores; the soil may be rich, the country good for wheat and sheep, but to the eye it is an arid plain; the winters are pleasant, but in the hot weather the thermometer rises higher than it does in India, and dust storms and hot winds sweep the land from end to end.<sup>120</sup>

Geologically, New Zealand is a long, thin island chain, broken down its spine in the South Island by a mountain chain. The predominant westerly trade winds produce heavy rain on its west coast and sometimes rainfall deficiency on its east. While in the south it is temperate, subject to snow on its higher country in winter, in the far north it is sub-tropical. On its eastern coasts, particularly in the South Island, fire removed much of the vegetation before European arrival and, under Maori management, a rich mosaic of horticulture and hunting developed. With colonisation the grassland areas of its east coast became popular for the development of pastoralism, as Australian settlers moved across to take advantage of the availability of land in New Zealand. Along with the remaking of grasslands, settlers also drained swamps and cut down trees, sometimes very wastefully. Indeed, for decades the sound of axes and the smell of burning signalled settlement. Depredations on the forests accelerated trends already in evidence among Maori, resulting in the deforesting of Northland's famous kauri (*Agathis australis*) and the removal of forest on areas such as Otago Peninsula in the south. In the late-nineteenth century, attention shifted to the development of the North Island dairy industry. In complete contrast to Australia, most of New Zealand's forests are softwoods.

Important physical characteristics of the different parts of Australasia and South Asia meant, first, that environments differed greatly from those of Europe, requiring the introduction of different systems of environmental management. Second, since many of these imperial environments were so different from Europe, they often responded in unanticipated ways to changes, leading in some cases to environmental anxieties. Those environments which looked the same as Europe, such as parts of New Zealand, proved to be particularly perplexing as settlers expected them to behave as they did in Europe. Third, in seeking solutions to environmental anxieties, empire drew together geographically similar areas facing similar problems.

## Conclusion

In the process of coming into contact with previously unknown or little-known environments, imperialism unearthed similar anxieties to

Europe and generated new ones as settlers found that environments did not necessarily respond in ways they anticipated. Environmental anxiety tied together different parts of the British Empire and beyond, but particular political, economic, social and environmental situations modified concerns and responses. India's greater level of state resource management, thanks to the influence of utilitarianism, meant that for much of the nineteenth century those arguing for increased forest bureaucracies in the settler colonies of Australasia looked to Indian as well as others' forestry as a model for their own. Scottish-trained doctors and German and continental scientists likewise had lesser impact on conservation in Australasia than India because *laissez-faire* ideology pervaded governance longer in the settler colonies than in India. The present chapter has also argued for the need to consider the complexity of imperial environmental history, not least its enmeshing of ideas about health, conservation, landscape and science and the dynamic regional exchanges of ideas and policies between South Asia and Australasia in which these took place. Imperial environmental history, it shows, represents neither a story of despotic environmental destruction nor one of enlightened conservation, but instead a complex and fascinating fusion of competing and at times contradictory tendencies modified by the particularities of place, people and environment. The next chapter examines fears about the impact of environments on health and the intellectual interconnections between European notions of aesthetics, health and productivity.



# 2

## Imperial Health Anxieties

[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.<sup>1</sup>

Arthur S. Thomson, 1854

Fever is the great scourge and calamity of India, for natives as well as Europeans.<sup>2</sup>

Dietrich Brandis, 1883

As these quotes demonstrate, the pervasiveness of nineteenth-century European belief in the power of environments to affect health meant that discerning and mitigating its adverse effects took on particular importance in empire. Contemporaries held that imperialism displaced European bodies, and sometimes even minds, by subjecting them to unknown environmental influences, the effects of which could have immediate and far-reaching impacts. Tropical climates sapped the fighting powers of British soldiers or prevented administrators from efficiently overseeing empire while by the early-twentieth century, the spectre of white degeneration in the settler colonies and in India haunted policymakers, leading to increased government intervention in society to alleviate its ill effects. To colonists, indeed, the very security of the British Empire seemed to hinge on the interaction of people and environments. Fears of tropical climates prevented permanent European migration to India and, at different times, to parts of tropical Australia, but made India's higher altitudes attractive, along with migration to temperate parts of Australasia. Europeans encountered existing unhealthy environments, but could also, through pollution, create equally dangerous places. As well as facilitating the migration of people

from India to Australasia, anxieties about the environmental impacts on health stimulated detailed environmental health surveys, anti-pollution legislation, urban tree planting, and the introduction of plants such as eucalyptus, which were believed to improve the health of a particular locality. By the late nineteenth century – with the rise of microbial science – anxiety shifted from environments as sources of disease to fears of humans as its carriers. Although tropical environments and tropical peoples became pathologised, and despite settlers no longer regarding environment as a cause of illness, the efficacy of environment as a palliative remained.<sup>3</sup>

This chapter provides a thematic and chronological discussion of changing health anxieties across India and Australasia. Through its demonstration of the centrality of environments in generating health anxieties, it examines how European experience across empire reinforced existing fears of certain kinds of environments, such as of swamps and densely populated urban areas, as well as generating new ones. Responses to these anxieties, I demonstrate, knitted together different local landscapes, people and places in the British Empire, affecting migration, local and national government policy, environmental modification, and the exchange of people and plants. I first discuss the chapter's historiographical contributions. Next, I introduce European ideas of health and the influence of imperialism on these, before examining, in turn, how growing fears of tropical climates in India led to the expansion of government sanitation schemes and health bureaucracies, migration and the introduction of eucalyptus from Australia into India, and urban planning and park making. I then consider health anxieties in temperate parts of Australasia and highland India, delineating the measures designed to improve their healthiness through tree planting, swamp drainage and anti-pollution legislation. Finally, I analyse the growing spectre of white degeneracy among the settler colonies, the growth of attitudes equating people of the tropics – and lower classes – as carriers of disease, and the on-going importance of environmental cures as a palliative in health care. Throughout, the present chapter demonstrates the importance of local-level experiences of environments and environmental change on health.

### **The historiography of health and empire**

In examining European experiences of the environmental impacts on imperial health, this chapter draws from a rich scholarship on medical and health history, but it also adds to it in several new ways. First, few

scholars have examined how health concerns in settler and extractive colonies actually fostered relationships between these areas. Medical historians have followed the broader trend in the profession to demarcate their study into the so-called white settler lands (such as Australia and New Zealand) and the extractive colonies of India, Africa and elsewhere. Accordingly, medical histories largely have a particular national, local-level or regional focus, with the regional focus generally centring around either the white settler lands or the extractive colonies, seldom both.<sup>4</sup> It is often overlooked that the very boundaries – boundaries resting on perceived differences of environments and particularly climates – between settler and extractive colonies fostered connections in and of themselves. This book therefore highlights the significant exchanges of ideas, people and policies between India and Australasia that took place precisely because the policies enacted in one place could have empire-wide impacts. Second, a particular focus of study has been the impact of climate on European health.<sup>5</sup> While acknowledging its significance, this book also examines European belief about the influence of vegetation on climate and health, a hitherto largely unstudied topic. Evidence in New Zealand, Australia and India also suggests that attitudes towards vegetation were far more important, and complex, than the few authors who have written on this topic have implied.<sup>6</sup> Colonial debate about the salubrity of particular trees questions the interpretations of historians such as Kenneth Thompson, who maintained that belief in the unhealthiness of trees in late-eighteenth century United States changed to valuing their health-giving aspects by the next century.<sup>7</sup> Third, by paying particular attention to local environments, this chapter demonstrates that, as well as those in the tropics, colonists in the temperate settler colonies also expressed significant anxiety about the effects of unknown environments and environmental changes on their own health, a point frequently overlooked in studies of imperial health where the focus has been largely on the environmentally based fears of tropical colonies. Anxieties about the impacts of local rural environments in temperate Australasia lessened in the nineteenth century, but were replaced by grave concerns about the impact of polluted, ugly and insanitary urban environments on colonial morals and gender.<sup>8</sup> They uphold the interpretation that in the nineteenth century ‘The epidemiological costs of territorial expansion’, as Alan Bewell has observed, ‘were an intrinsic part of colonial discourse, whether on moral, economical or medical grounds’.<sup>9</sup> Environment emerges as a powerful factor in explaining illness, but of course European medical science recognised the transmission of

disease from person to person as well as the social impacts of ill health. The risk of placing so much weight on environment and biology as explanations for the spread of European empires, as authors such as Alfred Crosby and others have done, is to present colonisation as a *fait accompli*, as an almost-inevitable process whose actors confidently and swiftly overcame a passive nature and native populace.<sup>10</sup> Rather than falling into the trap of environmental determinism, this study notes the importance of environmental factors as they intersected with political, social and religious beliefs. Fourth, examination of local-level health anxieties can reveal the hitherto overlooked personal and ecological connections drawn between different places in South Asia and Australasia, fostering in some cases the acclimatisation of plants from one geographically similar region to another, in this case, the introduction of eucalyptus from Australia to New Zealand and India. Fifth, this chapter reveals that European belief in the original productivity and healthiness of all environments led them to believe their environmental transformations to improve these areas were acts of restoration. Finally, it demonstrates that settlers regarded healthiness, productiveness and certain landscape preferences as both inter-related and as the natural state of nature.

### **Health, empire and tropical climates**

Nineteenth-century Europeans held a plurality of medical ideas. Certain diseases were communicable; others arose from the interaction of environments and constitutions; still others from the interaction of environments and people. There was no clear-cut division, as historians once thought, between contagionists and anti-contagionists.<sup>11</sup> To contemporaries, susceptibility to disease often reflected the response of an individual's constitution to environmental influences. Temperature, wind, humidity and heat, rotting vegetation, proximity to swamps, sunshine and smell all impacted on health.<sup>12</sup> Europeans also acknowledged the unhealthiness of urban areas over rural ones. Their fears of the environmental influence on health reflected the renewed popularity of humoral theories in the nineteenth century. Concerns also emerged thanks to more refined ways of measuring air and the development of medical geography.<sup>13</sup> Until the late nineteenth century – at least in medical circles – the connections between environment and disease rested on the idea of miasma. Popularly referring to miasma as 'a quality of particular environments', settlers debated whether it caused or indicated illness. Most agreed that extremes of heat, strong winds and

soaking moisture upset constitutions and generated fevers like malaria and typhoid, dysentery, diphtheria and yellow fever. Diseases, they also recognised, had a seasonal aspect. Trincomalee's (present day Sri Lanka) 'feverish season', observed one writer to the *Indian Forester* in 1882, spanned December to January and resulted from the 'dry cool air of that season checking skin action in the malarious subject'.<sup>14</sup> Earlier, on New Zealand's broad Hauraki Plains in the 1830s, James Preece (1801–70), Church Missionary Society Catechist, believed that '[t]he vapour which arises' from a nearby swamp 'during the whole of the summer' had caused the death of three children.<sup>15</sup> Unable to identify the unseen enemy of disease, settlers focussed their attention on identifying its purported sources. Sight and scent helped colonists to distinguish healthy from diseased areas. Settlers avoided or drained perceived sources of miasma such as low-lying ground, swamps and standing water. They learnt to be suspicious of fogs, bad smells and rotting vegetation. And they sought to escape – if at least temporarily – the enervating effects of tropical climates and extremes of temperature.<sup>16</sup>

As noted, imperialism placed European bodies in unfamiliar situations, subjecting them to the influences of unknown environmental agents and new diseases. Mark Harrison argues that Europeans had long acknowledged the problem of mortality and morbidity in India and other tropical climates, but believed that through changes in lifestyle and diet, they could successfully acclimatise to its climate. Harrison detects increasing pessimism about the success of European acclimatisation in tropical lands in the 1830s. High morbidity and mortality suffered by British and Indian troops during the First Burma War (1824–6), among other factors, he argues, drove home to the British the notion that certain races could only thrive in certain climates. Thereafter, Europeans increasingly held that fighting in a climate different to their own hampered Indian troops as much as themselves.<sup>17</sup> Later experiences solidified attitudes. Epidemic disease severely inhibited the effectiveness of British troops during the events of 1857. Suggestions even circulated that Indian knowledge of white vulnerability to tropical climates had partially encouraged the revolution.<sup>18</sup> The English politician Sir Henry Rawlinson (1810–95) outlined official thinking about post-1857 India. Observing that 'under the privations of a severe climate', soldiers 'became almost disorganized', he recommended the deployment of Indian troops only to 'colonies, where the climate was similar to that of India'. Temperate areas were deemed too dangerous to troops born in a tropical climate.<sup>19</sup> Rawlinson's views reflected growing belief in the nineteenth century that cultural differences, previously viewed

as malleable, were actually static, biologically based criteria. To many thinkers, biology now determined racial characteristics.<sup>20</sup> As David Arnold notes, Europeans came to view all of India as tropically dangerous. Over time, as germ theory heightened anxieties of Indians as reservoirs of disease, they pathologised people living in tropical climates.<sup>21</sup>

What were the impacts on Europeans living in tropical climates? Settlers believed that a tropical climate caused racial deterioration and severely constrained their ability to labour. To them, heat and moisture formed a deadly combination, accelerating the decomposition of vegetable and animal matter and rendering it immensely dangerous for Europeans inhabiting humid forested and swampy areas. Jungles – disordered and plentiful, vibrant and colourful – seemed to threaten not only the very foundations of civilisation but also the health of any inhabitant unfortunate enough to live there.<sup>22</sup> Surgeon Major General R. W. Meadows highlighted this ambiguity, describing Trincomalee as ‘the White Man’s Grave’, ‘a beautiful place, like flowers on one[']s coffin’.<sup>23</sup> As Sir James Stirling (1791–1865, the first Governor of Western Australia, 1828–38) explained, when heat combined with moisture as in India, ‘unwholesome exhalations are produced’, chief among them malaria.<sup>24</sup> Malaria, as an author in the *Indian Forester* elucidated, ‘ruins a race, sapping its stamina and destroying its power of work. There is no acclimatization to the effects of malaria either in the individual or the race’.<sup>25</sup>

Although opinion later changed (see below), Australia’s tropical north, as in tropical India, initially appeared to limit settlement. Disease ran through the military personnel posted to tropical Fort Dundas, established in 1824, on Melville Island in northern Australia, resulting in its rapid closure.<sup>26</sup> Europeans expressed anxiety that white bodies degenerated, becoming lazy and diseased after residence in the tropical north. As the imperial traveller Charles Dilke elucidated in the late 1860s, ‘The Queenslanders have not yet solved the problem of the settlement of a tropical country by Englishmen, and of its cultivation by English hands.’ This racial experiment, he believed, had wide implications not just for Empire but also for European settlement everywhere. ‘The future’, he declared, ‘not of Queensland merely, but of Mexico, of Ceylon, of every tropical country, of our race, of free government itself, are all at stake’.<sup>27</sup> Others acknowledged the problem of the tropical north, but identified southeast Queensland as sub-tropical, and hence more suitable to white bodies.<sup>28</sup> Among colonists, women seemed particularly vulnerable to the vagaries of tropical climates, reflecting belief in the susceptibility of female constitutions to environmental change.

Tropical north Queensland's climate, for instance, appeared to intensify diseases in women and adversely accelerate the growth of children; settlers in Australia's tropical north were accordingly advised to send their wives and children to the temperate southeast.<sup>29</sup> Similar attitudes existed in India, though like Australia, increasing confidence is evident thanks to the introduction of sanitary measures later in the century.<sup>30</sup>

The long-standing European recognition that health depended on the interaction of environments and people, climates and constitutions, led to large-scale investigation of newly encountered environments through medical topography as well as monitoring by settlers of any changes to their own bodies in response to environmental influences. Far from simply fearing the effects of India, Australian settlers also expressed considerable health anxiety about the impact of tropical Australia. How, then, could Europeans rule tropical climates, given these environmental constraints?

### **Responses to vulnerability in India: Movement and improvement**

The perceived inability of Europeans to successfully adapt to climates different from their own threatened to loosen the imperial grip on tropical colonies. In consequence, Europeans turned to non-white labourers to work West Indian plantations, introduced Pacific Island and Chinese workers into northern Australia from the 1860s, and relied on Indian troops and labour in the sub-continent.<sup>31</sup> In military terms, perceptions of India's unhealthy climate troubled imperial policymakers. The uprising of 1857 drove home to the British the vulnerability of both their rule and soldiers in particular. The concerns expressed in the House of Commons in 1863 by Mr Coningham typified those of many and illustrate the significance of health anxiety to imperial policy. Coningham requested that remedial measures be immediately taken to check troop mortality in India, which sat at 'sixty head per thousand'.<sup>32</sup> A contributor to the *Indian Forester* believed that although the mortality of European soldiers in India had 'considerably decreased[,] ... invaliding has increased in almost exact proportion', so 'the total loss to the Service is very little less than when our soldiers died in India'.<sup>33</sup> The issues identified by the correspondent remained a great problem for imperial policymakers. Even if death rates fell, disease still debilitated British forces, a problem accentuated by the post-1857 British military policy, which aimed to increase the ratio of European to Indian troops to 3:1.<sup>34</sup>

Feelings of vulnerability – but also possible preventative measures – came from commissions and acts passed after 1857. Medical topographers also compiled statistics of mortality and morbidity, investigated sanitary measures and disease outbreaks and recommended health improvements and healthier building designs.<sup>35</sup> As a result, a series of public health reforms principally aimed at improving troops' health, rather than the population at large, slowly came into force. Mortality rates among both Indian and British troops correspondingly fell 'significantly, if unevenly, from the early 1880s'.<sup>36</sup> Better military clothing, nutrition and barrack design, as well as improved sanitation and the provision of clean drinking water lessened mortality rates, though it should also be remembered that devastating famines and outbreaks of disease (especially cholera and plague) still broke out. The need to keep troops and imperial administrators healthy also reinforced the importance of the Indian Medical Service (IMS). The IMS was responsible for maintaining the health of the Indian Army while the Army Medical Department kept troops of the British Army healthy. Health anxieties thus led to the expansion of medical bureaucracies, legislation and sanitation as well as environmental modification and the seasonal migration of government officials and troops to hill stations.<sup>37</sup>

Located in the Himalayan foothills and on other mountain ranges, hill stations offered cool and temperate climates thought to better suit European constitutions.<sup>38</sup> They provided relief from the enervating heat of the plains, refuges in which Europeans could labour, relax and recover. Health considerations figured relatively early in their establishment. Many were initially established by the military, which acquired them for defence needs. Simla (now, Shimla), which in 1864 became the designated summer capital of the viceroy, accepted its first European invalids as early as 1824. In 1820, John Sullivan formed the colony of Ootacamund (now Udhagamandalam), employing European-trained gardeners to improve the site and its healthiness as well as grow food. The military sanatorium opened in 1827. Darjeeling developed in the 1830s after the EIC lost its monopoly on tea in 1833, and erected its first dwellings for invalided soldiers in the 1840s. Rajasthan emerged as a summer residence of the Agent to the Governor General in the 1840s.<sup>39</sup> By the end of the nineteenth century, military and government officials were spending considerable periods of time in hill stations. The Madras Government, for instance, went to Ootacamund for six months; the Bengal Government spent three months in Darjeeling, while the Imperial Government travelled over 2000 km from Calcutta to officiate from Simla. In 1884, the permanent military headquarters of the Madras Army



also joined its Government in Ootacamund.<sup>40</sup> Responding to the seasonal fluctuations of climate and to its corresponding problems of ill health, tens of thousands of Europeans, their Indian staff, retainers and others, migrated semi-permanently to India's higher altitudes.

Despite some critics balking at the cost of seasonal removal, others accepted its strategic necessity. Acknowledging the impossibility of brainwork in such a 'singularly hot, unhealthy, and out of the way' city as Calcutta, Dilke wrote that Simla's climate was central to 'the retention of our Indian empire'.<sup>41</sup> Like others, Dilke admitted the unhealthy effects of tropical climates on European minds, an anxiety common to India, northern Australia, and other tropical regions. A high-altitude retreat in the tropics promised to stave off mental disintegration and to lessen the likelihood of 'Punjab head' or 'brain fog' clouding imperial decision-making.<sup>42</sup> The healthiness of these areas also rested on their resemblance to Europe, and specifically England, as well as the degree to which the mountain scenes corresponded to picturesque traditions of landscape appreciation. Romanticism, both in its literary and artistic, scientific and philosophical forms, was exceedingly popular in India, and many men and women eagerly kept written records and sketches of their travels, while men of science used the tropes of romanticism to describe the environments around them (see Chapter 3).<sup>43</sup>

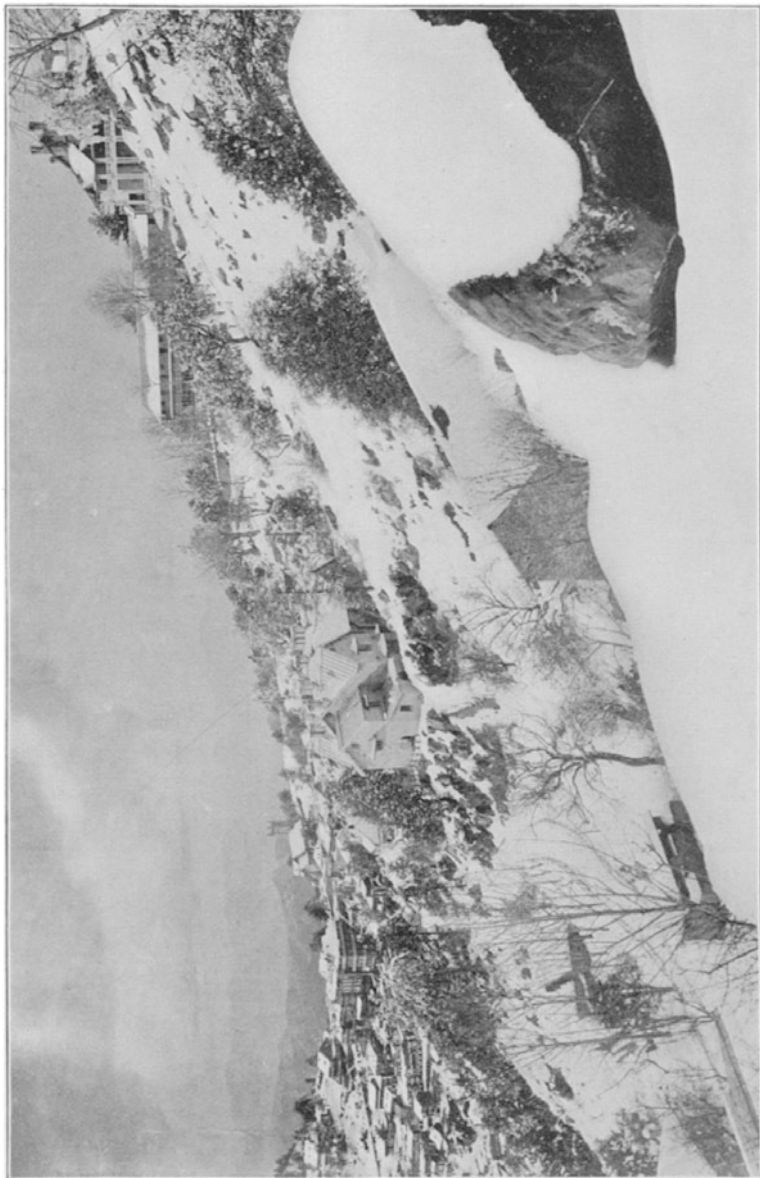
These sentiments are apparent in the account by Elizabeth Muter of her arrival at the hill station of Murree, on the foothills of the Western Himalayas.

Seldom have I felt happier than when borne up this hill to the picturesque [hill] station of Murree. I regarded the scene as one regards a prize he has toiled hard to gain. Gurgling streams came sparkling down the slopes, and murmured along with a sound sweeter than music to my ear. Imagination carried me back to the days of my childhood; and in fancy I was again in an English dell, with the trickling water rolling over the mossy stones. I could not resist the inclination to walk where the towering mountain gave me shade, or the branches of the forest broke the rays of the sun.<sup>44</sup>

Muter speculated on sanatoria's impact on 'the heat-exhausted resident of the cantonment below'. 'After the monotonous wards of an [*sic*] hospital, with its walled enclosure, without a flower – after the interminable flat, with its endless crops and villages', she imagined the 'indescribable relief' an invalid would feel on seeing 'the vast mountain, and their [*sic*] wild and tangled vegetation'.<sup>45</sup>

Descriptions like these, coupled with images from the period, reinforced the importance of the perceived connection between health, aesthetics, productivity and labour (explored in Chapter 3) as well as the extent to which the appearance of hill stations and their immediate surrounds inspired minds wearied by the dreary and enervating plains. As picturesque refuges, hill stations promoted recovery and freed European males from the sapping tropics by enabling them to labour. Surveying the Anamalai Hills (Coimbatore) in 1858, Dr Macpherson thought them perfect for a sanatorium. A 'bracing' climate combined with deep soils and rich pasture, abundant streams and a resemblance to Ceylon's flora, suggested its suitability for health and coffee cultivation.<sup>46</sup> Hill stations may also have initially appealed because they shored up the badly shaken European belief that rural areas were healthier than urban ones. India confounded European experiences of health because of its almost equally high death rates in both rural and urban areas, owing particularly to cholera and plague.<sup>47</sup> (In Europe, the countryside was widely acknowledged to be healthier than the towns.) The real estate values of India's hill stations cleaved to aesthetic and health considerations. Thanks to its picturesque situation and perceived healthiness, the highest social ranks at Ootacamund occupied the highest ground.<sup>48</sup> As well, Europeans nodded to the rural tradition, and its perceived salubrity, through the hill stations' mimicry of Tudor or Georgian architecture. But far from 'summer stations' providing examples of 'imperial confidence', as Queeny Pradhan maintains, I believe they actually illustrated imperial anxiety, embodying British officials and military pushed to the margins of the country, forced to rule from afar because of a perceived pathological climate.<sup>49</sup>

Diseases associated with the plains also appeared at hill stations. Their very attraction as places beyond urban centres and away from the filth and squalor of local habitations threatened to be their downfall. Human habitation brought increasing health problems. The barracks on Gundamuck Hill, Mount Abu (Rajasthan), were eventually moved for health reasons.<sup>50</sup> Drainage for health reasons took place in Simla, while in 1877 cholera struck Ootacamund.<sup>51</sup> At Murree (Figure 2.1), Muter's initial enthusiasm deserted her after cholera swept through the troops following a prolonged spell of uninterrupted rain. Describing the situation and underlining the vulnerability felt in such places, Muter 'felt as if a net had been thrown over the station, and that noxious and deadly gases had been let loose in the atmosphere'. 'The most horrid feeling', she observed, 'was that of stagnation.' This desultory experience, she continued, meant she 'lost faith ... in the restorative power of the



MURREE, A HILL STATION IN THE PUNJAB, IN WINTER  
Murree from above Telegraph Office

Figure 2.1 'Murree, A Hill Station in the Punjab, in winter'

climate of Murree', conjecturing that 'the seeds of disease were sown' during the Punjab war, and acknowledged that some hill stations were healthier than others.<sup>52</sup> At Bulwara in the mid-1870s, surgeon Major General Meadows' health failed, owing to 'anxiety about the men dying of cholera and' the hopelessness of treatment. '[M]en', he bemoaned, 'seemed simply to get colder and colder going out [i.e., dying] without the usual cholera symptoms'.<sup>53</sup>

While acknowledging that hill stations were healthier than the surrounding plains, Europeans accepted that even their local conditions could deteriorate and threaten health. The civil station of 'Mysore, Chikmagalur', noted one observer, 'from its elevation and situation, enjoys the most temperate climate; yet it has the worst reputation for fever' because it stands 'in the midst of paddy flats'.<sup>54</sup> Drainage and tree planting were popular means of improving a locality's healthiness, as they were also in Australasia (see below). They offered a practical response to health concerns, as well as tacit recognition that, while it was difficult if not impossible to change certain regional climatic conditions, humans could at least effect improvements to local environmental conditions and thus to the health of local inhabitants. Garden making and tree planting bettered health. As Ray Desmond notes, the attempt in hill stations 'to evoke in a domestic landscape the ambience of [British] spas and seaside resorts' relied strongly on gardens 'providing places in which members of polite society could perambulate and socialise'. Ootacamund's garden took shape in 1821 with the planting of European trees and vegetables, and grew significantly thereafter under the supervision of a professional gardener. The new Viceregal Lodge in Simla boasted elaborate flowerbeds, stone terraces, a rose pergola and lawns. Beyond the hill stations, Bombay had Victoria Gardens (established 1861), while botanical gardens such as Calcutta's, ostensibly founded for scientific purposes, also formed important sites of health, sport and recreation.<sup>55</sup>

The plants growing in and around such gardens were also believed to improve health, with some trees removing miasma from the air and helping to drain swampy land. Rotting vegetation and dense, tangled jungle, as well as very young or old plants, could, however, generate miasma and endanger health.<sup>56</sup> In tropical India, as Dietrich Brandis (1824–1907), India's first Inspector General of Forests, observed in 1876, 'effectual clearances seem to make a place less feverish and more [*sic*] healthy'. He cited the example of Akyab which, before the conversion of 'waste land and jungle ... into paddy fields', had proved 'notoriously unhealthy, and at certain seasons almost fatal to Europeans' living

there. The resulting deforestation, he noted, 'had a marked and most beneficial effect upon the salubrity of the place'. Different climates and local environments, however, required different approaches. By contrast to Akyab, 'it seems to be acknowledged', Brandis observed, 'that, in the open country in the plains of North India, stations are improved and become more healthy [*sic*] by the planting of trees'.<sup>57</sup> Asked to comment on whether *kumri* (shifting cultivation) encouraged malaria, Scottish-trained surgeon and forest conservator Hugh Cleghorn (1820–95) declared that clearings were an 'unmixed good', but that 'the dense thorny scrub which succeeds a deserted Kumari [*sic*] is decidedly more injurious to health than lofty forest open below, and harbours destructive animals'.<sup>58</sup> In assessing landscape change and its impact on health, settlers had to examine the botany of local areas, as well as the age of trees. Brandis found that 'the plantation of Changa Manga in the Lahore District has been extremely feverish since the sissoo [*Dalbergia sissoo*] has grown up into a forest'. He reasoned that planting should favour 'those species which grow most rapidly' to thus minimise the period of young growth and unhealthiness. This suggestion reflected belief that, in addition to older plants, young plants produced miasma through their green shoots.<sup>59</sup> Subtle readings of vegetation also appeared in Australasia (see below).

Fears about the effects of unknown and altered environments on health in tropical India and Australasia led to imperial officials and military retreating from fever-laden swamps and jungles. Hill stations helped a white race to rule India, yet even here local environmental problems, coupled with fears of the spread of disease from Indians and of the effects of unintended environmental changes, rendered Europeans vulnerable. Given the climatic similarity of hill stations to settler colonies, officials introduced plants from around the empire and beyond. Among them, officials held particularly high hopes for the ability of eucalyptus to redeem fever-laden lands.

### The Australian eucalyptus in India

Tree planting assumed importance around India's hill stations, replacing denuded local species, providing fuel, stabilising soil and climate, and maintaining health. Notwithstanding the speedy realisation of its climatic limits, the quick-growing eucalyptus proved remarkably popular. The first specimens in India may have been planted by Tipu Sultan (r. 1782–99), 'The Tiger of Mysore', in the 1790s for ornamental purposes,<sup>60</sup> possibly as part of a wider programme of tree planting.<sup>61</sup>

Many experiments with different species on higher and lower slopes took place from the 1830s.

Popularised by Victoria's German-born scientist Ferdinand von Mueller (1825–96) – 'Baron Blue Gum' to his supporters – word of its properties spread throughout the world, peaking in the 1870s.<sup>62</sup> According to the Baron, eucalyptus could successfully combat malaria in southern Europe, render habitable uninhabitable areas in California and even redeem North Africa's vast wastes of malaria-stricken land. It also could be rubbed on the body, taken internally, even sniffed.<sup>63</sup> As one correspondent in the *Indian Forester* enthused, eucalyptus would 'improve the health and add to the wealth of the country'.<sup>64</sup> The blue gum (*Eucalyptus globulus*), explained forestry writer J. L. Laird, absorbed moisture from the atmosphere, while its healthful emanations possibly even neutralised or destroyed the deadly but unseen miasmas. Its scent, he claimed, 'is of recognized utility in hygiene, and has even been found useful in cases of intermittent fever' while its leaves acted 'as an astringent tonic, and its essential oil as a stimulant'.<sup>65</sup> Despite significant misgivings about the 'exaggeration' of certain of its health qualities, as a drainer of miasmatic marshes, explained forestry writer J. E. O'Connor, the eucalyptus genus was second to none, 'absorbing daily ten times its own weight of water from the soil' and favouring its planting for timber in climatically suitable regions.<sup>66</sup> Another author in the *Indian Forester*, however, regretted its ineffectiveness below 5000 feet (1524 m) – 'just when it begins to be of use in destroying malaria' – but held firmly to its anti-malarial properties. 'Trees', he observed, 'are one of the few aesthetic pleasures in a country where so much jars on the senses', but may yet, he warned, 'conceal decay'. Nodding to the ambiguity of vegetation, the author observed that

[a]s we shake with ague, the doctor nods his head, and thinks that there may be too many trees about the house. Let us plant, but plant with knowledge, and let us banish swamps and all uncleanness from our midst. Let the man who would be practical turn to the published accounts of Eucalyptus planting, and the effect of these trees in arresting malaria.<sup>67</sup>

The eucalyptus' appearance, and its similarity to other healthful species such as St John's Wort, further recommended its planting,<sup>68</sup> and demonstrates the perceived nexus between aesthetic appearance and healthiness, a connection further examined in Chapter 3.

Several medical doctors also advocated tree planting. In the late 1850s, Dr J. Maitland suggested that 'a moderate quantity of vegetation' could provide fuel wood and help purify the atmosphere of Wellington (on the Nilgiris) by modifying extremes of climate and thereby making it 'more suitable as a sanitarium [*sic*] for invalids'.<sup>69</sup> Others advocated the clearance of rank vegetation and the planting of (unspecified) trees for health reasons. Lord Mark Kerr observed that by such measures, along with drainage and the introduction of gardening and fresh water, he had cured his troops of 'Delhi sore', the growth of 'boils, sores and unsightly fungus-looking growths on' soldiers' limbs and hands.<sup>70</sup> Around the 1870s, the Sanitary Commissioner of Madras attempted to introduce eucalyptus but without success.<sup>71</sup>

Eucalyptus appealed not simply because of their perceived healthiness, but also because they provided fuel in areas where trees were becoming scarce. Cleghorn, for instance, favoured allowing some sections of forest land on the Nilgiris to be cut out and replaced with Australian species<sup>72</sup> while similar hopes for eucalyptus were held for areas such as the North West Himalayas.<sup>73</sup> In many hill stations, as Cleghorn observed, the demands for timber were greater than on the plains owing to the cooler temperatures and increasing population.<sup>74</sup> By the late 1850s, some 10,000 Australian trees were growing near Ootacamund, with many of the early plantings undertaken by military personnel or officials.<sup>75</sup> Cleghorn also anticipated that jarrah (*Eucalyptus marginata*) would eventually replace indigenous production.<sup>76</sup> It seemed Cleghorn's optimism was well founded. Viewing parts of the South Indian uplands in 1882, Brandis noted that their planting has 'altered the appearance of the country'. '[L]arge trees, chiefly *Eucalyptus globulus*, *Acacia melanoxylon* and *Acacia dealbata*', he recorded, surround the hill stations of Wellington, Ootacamund and Coonoor (all in the Nilgiris).<sup>77</sup> In 1883, Ootacamund was 'almost surrounded by a forest of these trees', while on the Nilgiris eucalyptus grew four times as fast as teak.<sup>78</sup> Experiments in Mysore and Coorg (now, Kodagu) established that swamp stringy bark (*Eucalyptus robusta*) grew successfully in areas with good loam and plentiful water supplies nearby.<sup>79</sup> Plantations of Australian species also provided fuel for Wellington barracks.<sup>80</sup> In 1873, some 16,000 various eucalyptus were growing in Ranikhet (Uttarakhand).<sup>81</sup>

Although Australian species grew successfully in some places, planters quickly recognised their climatic limitations. O'Connor described the ranges of some species in Madras: *Eucalyptus globulus* grew best between 6000 and 7000 feet (1828–2134 m); red gum (*Eucalyptus rostrata*) between 5000 and 6000 feet (1524 and 1828 m); (*Eucalyptus marginata*), 4500

and 6000 feet (1372–1828 m). O'Connor concluded that only in the Nilgiris and Ranikhet did the *Eucalyptus globulus* succeed.<sup>82</sup> Brandis later added that the species seemed to survive only in those areas of a similar temperature to Melbourne. The eucalyptus genus, he noted, grew only above 5000–6000 feet (1524–1828m) in the Punjab and above 7000 feet (2134m) in Kumaun, Uttarakhand.<sup>83</sup> Given its climatic limitations, Brandis recommended introducing species onto the North Indian plains from tropical Queensland, *Eucalyptus rostrata* and red mahogany (*Eucalyptus resinifera*), since both areas had a similar temperature range.<sup>84</sup> Many others were tried but most eucalyptus seemed confined to higher altitudes in India, although an overall picture of the results is hard to obtain owing to the paucity of records and the difficulty of accurately identifying particular species.<sup>85</sup> Climate restricted its growth, but local conditions such as poor soils, limited or no water and fungus also influenced the success of acclimatisation.<sup>86</sup>

Despite limitations, the work of well-known Australian-based authors and writers on eucalyptus such as Mueller and his friend, Richard Schomburgk, received widespread attention in the *Indian Forester*. Translated (French) works such as J. L. Laird's enthusiastic plug for *Eucalyptus globulus* and its health-giving qualities also appeared.<sup>87</sup> Occasionally, too, private planters from Australia living in India experimented with Australian species, as did public figures.<sup>88</sup> The Governor of Madras Presidency, Sir William Thomas Denison (1804–71), a former Governor-General of Australia, for instance, enthusiastically promoted the species' health-giving properties.<sup>89</sup> Networks of exchange between South Asia and Australasia meant that seeds were received in India from Sydney Botanical Garden as well as Melbourne sources.<sup>90</sup> Further, the *Indian Forester* carried regular summaries of Australian state forestry reports. Such connections demonstrate that health anxiety stimulated the exchange of information and seeds not simply between parts of Australia and India, but also between France and India. As with anxiety about desertification (Chapter 7), in this case France and French forestry literature demonstrated the successful acclimatisation of eucalyptus outside Australia and provided evidence that similar introductions might also succeed in India.<sup>91</sup>

Introduction of eucalyptus for health reasons also mirrored the acclimatisation of other commercially valuable species into India's hill country, such as tea, coffee and cinchona. As Brandis observed, to a degree, the Nilgiris' gradual deforestation 'is counter-balanced by the plantations of Australian Eucalyptus and Acacias as well as of Tea and Cinchona at the higher, and of Coffee at the lower, elevations'.<sup>92</sup> Cinchona shared many



of the qualities (and problems) of eucalyptus, not least in its perceived healthfulness. The cinchona bark which was taken from South America, improved and experimented upon at Royal Botanical Gardens, Kew and finally introduced into India in the early 1860s was upheld by medical and imperial authorities as an anti-malarial agent. Unfortunately, however, it appears the British introduced the wrong species, and it failed to bring about the great hoped-for health benefits.<sup>93</sup>

Were such unhealthy areas on the plains and, later, in the hill-stations a result of natural or human causes? Some writers lambasted both Indian and British agricultural practices for creating pestilence. One correspondent to the *Indian Forester* criticised Indian cultivators' 'popular ignorance, indifference, and the accumulated prejudices of centuries' for spreading disease through poor water drainage. But he rounded on the British even more. Despite longstanding knowledge of such effects, he charged that British authorities had knowingly perpetuated the 'same calamitous monotony' of irrigation leading to disease. 'Is not the spirit and tendency of rural improvement', he asked sarcastically, 'to make artificial swamps, to saturate the sub-soil with moisture and vegetable débris, to produce plenty, and to develop disease?' The writer advocated following 'the preventive principles of the French' through carrying out experiments with eucalyptus throughout India, believing that the genus would be able to improve productivity, especially in 'the water-saturated soils of Bengal and elsewhere'.<sup>94</sup> Captain Hall, an engineer, also pointed to similar problems of pooling created through inadequately draining soil and argued for the need to plant trees and improve drainage to enhance health and productivity.<sup>95</sup> These authors described the problem of disease that followed the British re-commissioning and building of canals. Pooling and inadequate drainage led to increases in malaria, and to other problems such as salinisation and decreasing agricultural productivity.<sup>96</sup> The first author's emphasis on irrigation and increasing productivity as progressive, not regressive, activities provides another illustration of the unintended consequences of environmental change in undercutting health. As this author noted, 'profit, health, and climate are so intimately connected' that it made sense for the government to improve them all, intimating in effect that the forest department should promote hygiene and profit.<sup>97</sup> This author's concerns about the impact of unintended environmental consequences such as these threatened, as Chapter 1 argued, to undermine the very legitimacy of British rule, a legitimacy founded upon its portrayal as a civilising agent and improver of both Indian agricultural productivity and morality.<sup>98</sup>

Anxieties about the health impacts of local environments in India led to the large-scale introduction of thousands of Australian trees, a demonstration of how environmental anxieties in one area could lead to botanical and information exchanges with another. As the next section demonstrates, broader exchanges between these regions based on health anxieties about India also led to the migration of large numbers of ex-British troops and officials to Australasia who, in turn, would introduce environmental anxieties and responses from India into their new homes (Chapter 6).

### **Recovering health: Migration**

If Europeans in India made for the hills and improved them with plants from the empire and beyond, some migrated further afield. Before the Suez Canal opened, many British ships docked at the Cape Colony, South Africa, a common stopping place between India and Britain. From the middle of the nineteenth century, it earned a reputation as a place of retreat for convalescing Britons attracted to its hot, but dry, climate.<sup>99</sup> Former British officials and military from India also retired to Britain, but not always happily. On the voyage back to Britain from India, Mrs Muter witnessed many such individuals ‘debilitated by the [Indian] climate, whose constitution could not be renewed’ and who ‘sank by degrees and died, some victims to their own intemperance’. Muter and her husband followed their doctor’s advice for ‘a total change of scene ... as well as of climate’, removing themselves temporarily to Europe during winter.<sup>100</sup> Migration for health reflected belief that imbalances in constitutions could be righted through exposure to the correct climate and long sea voyages.<sup>101</sup> Not all, however, extolled the restorative properties of a northern climate.

Describing Britain’s climate as ‘hostile’, in 1885 imperial administrator Sir Frederick Napier Broome (1842–96) suggested to the Viceroy of India that British troops be sent from India to enjoy Western Australia’s ‘kindly climate’.<sup>102</sup> Broome was then Governor of Western Australia, but had been a settler in New Zealand (1857–68) and then Lieutenant-Governor of Mauritius (in the early 1880s) before its climate endangered his wife’s health and forced them to leave, imperial experiences which no doubt influenced his offer to Indian authorities.<sup>103</sup> Broome’s suggestions were not taken up, but they added to a long list of similar proposals that demonstrate how health anxiety connected different places in the British Empire. In 1859, Sir James Stirling, Western Australia’s first governor, published a small pamphlet extolling that colony’s atmosphere.

It possessed 'a sea-climate, fresh and invigorating; temperate in point of heat; equable in point of temperature; free from sudden chills', with the hottest season also the one of the 'greatest draught'. Temporary migration, he observed, would enable troops to escape India's 'highly uncongenial' atmosphere. Being only 14 days' voyage from India, troops in Western Australia could be recalled 'instantaneously' should any need arise. The voyage from India through 'the healthy breezes of the South-East Trades', he added, also promoted health. Acknowledging that 'many thousands of valuable lives' would be saved through their 'timely removal' to hill stations, Stirling also believed 'that the climate of the Hills is only Preservative and not Curative in its effects on Indian maladies'.<sup>104</sup>

Other colonies clamoured to present themselves as sanatoriums for Europeans escaping the Indian climate.<sup>105</sup> This constitutes an important – and hitherto largely unacknowledged – aspect of migration studies in the nineteenth century.<sup>106</sup> In the struggle for settlers, rivals exaggerated their own colony's healthfulness and quality of available land and mercilessly exposed rivals' shortcomings. New Zealand claimed its climate was like Britain's, only better, but Wellington's earthquakes earned that colony a reputation as the 'shaky isles'. Emphasis on the climatic salubrity of Western Australia also meant rebuking claims its summers were too hot. '[A]lthough the thermometer may sometimes range as high as 100 degrees [Fahrenheit] in the shade', countered Stirling, 'the extreme dryness of [Western Australia's] ... atmosphere prevents that heat from being injurious to health', and did not preclude Europeans from following 'agricultural avocations'.<sup>107</sup> Authors confidently predicted that Europeans would acclimatise as successfully, and as swiftly, as had their flourishing plants at the expense of local species.<sup>108</sup> Whatever their actual accuracy, such arguments demonstrate the importance of health anxiety in influencing the migration of Europeans from one part of the Empire to another.

Among those promoting New Zealand's settlement were military surgeons such as Arthur S. Thomson (c.1817–60) and K. R. Prendergast. Both surveyed New Zealand's climate and landscape in imperial terms. Questions of health and migration had long interested Thomson, whose doctoral thesis from Edinburgh University examined the global influence of climate on health. Postings to India and Afghanistan gave him an opportunity to experience first hand and research the effects of tropical climates on the well being of British troops.<sup>109</sup> Comparing death rates among soldiers in Bengal, Britain, Mauritius, Madras and the West Indies, Thomson discerned that prolonged stay in the tropics produced

sickness among whites, and moral degeneration among European children.<sup>110</sup> Races, he concluded, could not acclimatise to dissimilar climates.

Stationed in New Zealand from the late 1840s with the 58th Regiment, Thomson marvelled at the low troop mortality, which he attributed to New Zealand's healthful climate.<sup>111</sup> Comparing death and disease rates among British soldiers stationed in the North Island with those abroad, Thomson discovered additional health benefits. The North Island's climate, he observed, 'checked the occurrence of ague in several men who had contracted the disease in England', and offered particular benefits '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'. In making these assessments, Thomson drew from his 'own personal experience, and that of one or two others who have suffered from the exhaustion of an Indian life'.<sup>112</sup> Further statistical research reinforced his interpretations, as did monitoring the health of New Zealand's pensioners.<sup>113</sup> As he explained, 'All of them are old soldiers' who had served 'in widely different parts of the globe', from Canada, Ceylon and Corfu, to the East and West Indies, Mauritius, Scinde, Cabul [*sic*] and Africa. Each had 'been invalided from the army on account of disease or length of service'. Due to New Zealand's 'invigorating' climate, he explained, there are now 'many healthy men among them, who were rendered unfit for the army ... [by] every disease which tropical, frigid, and temperate climates can produce'. Like Muter and Stirling, Thomson held that tropical climates produced disease because of the extremes of heat and moisture, while he also believed that southern European climates were unhealthy because of their intense winter cold and oppressive summer heat.<sup>114</sup> In New Zealand, typhus and common fevers developed among Auckland's civilians, Thomson noted, not because of a poor climate, but because they lived 'in low, badly drained, and badly ventilated houses'.<sup>115</sup> Similarly, he attributed Maori population decline to the inability of tropical races to acclimatise to temperate climates, with poor diet, housing and low birth rates cited as supplementary factors.<sup>116</sup> Anxiety about the health impacts of the environments of India, the West Indies and elsewhere thus led Thomson to evaluate New Zealand's climate in imperial terms.

Others made similar comparisons. 'The sickly Nabob, the childless wife, and the attenuated object of consumption', enthused a correspondent to *The New Zealand Journal* in 1842, 'may be restored to the blessings of health and enjoyment' in New Zealand's salubrious climate

and hot springs. These factors, the writer predicted, 'will undoubtedly make it the resort of invalids from India, and officers of the East India Company's service'.<sup>117</sup> In 1844, German naturalist and medical doctor Ernst Dieffenbach (1811–55) predicted the same.<sup>118</sup> India's loss could, indeed, be New Zealand's – and the Empire's – gain. An 1854 editorial of the *Lyttleton Times* hoped that the Canterbury Settlement would attract many of the highly educated and wealthy officers of the EIC and, as a prelude, their children.<sup>119</sup> Probably stimulated by the Indian uprising of 1857, in August 1858 the Provincial Government of Taranaki requested from the Secretary of State for War that New Zealand be established as a sanatorium 'for the benefit of Invalids from the Indian Army'.<sup>120</sup> The same idea resurfaced in 1868, with suggestions by New Zealand parliamentarian T. Macfarlane.<sup>121</sup>

In 1858 the government offered former soldiers stationed in New Zealand a land grant. Several who took up that offer had served in the subcontinent.<sup>122</sup> Ex-EIC troops and officers settled in Taranaki. Some may have belonged to a contingent of EIC artillerymen and sailors who had fought in the early years of the New Zealand Land Wars from the mid-1850s.<sup>123</sup> And, as Thomson noted, many New Zealand pensioners had served throughout the British Empire. Biographies provide details of wealthier migrants from India. Canterbury politician, runholder and former judge in India, Sir John Cracroft Wilson (1808–81) and Sir J. L. C. Richardson (1810–78), formerly of the EIC military but latterly Otago politician and Superintendent, both migrated from India to New Zealand for health reasons.<sup>124</sup> Both also wrote works specifically aimed at encouraging the migration of other ex-EIC employees to migrate to New Zealand.<sup>125</sup> Despite Canterbury's unusually hot and windy summer, Muter contrasted New Zealand's healthy climate with her first impressions of India.<sup>126</sup> Others also encountered ex-Indian civil servants on their travels. Travelling between Bluff and Dunedin in March 1860, Dr Andrew Sinclair (1794–1861), a New Zealand official (Chapter 4), encountered Mr Chapman, 'a tall, thin, broken down man in constitution from the Indian military service, who snivelled in his speech from hare lip and was now endeavouring to patch up and make the best of his shattered constitution in a mild climate'.<sup>127</sup> Certain places in New Zealand such as Nelson (South Island) also became known as 'the resort of men of means who have come from India, and other warmer climates, to settle down with the idea of doing nothing but enjoying themselves', as Edward Payton (1859–1944) noted in 1888.<sup>128</sup> Many of these migrants may have been attracted to New Zealand through reviews appearing in Indian publications or through family connections with

those already settled in the colony.<sup>129</sup> The Australian colonies also attracted significant numbers of ex-EIC migrants thanks to promotional work undertaken by the likes of Stirling, Broome and others.<sup>130</sup> Anxieties about the impact of environments on health thus facilitated exchanges of plants as well as people from India to Australasia.

### **Health anxieties in temperate Australasia, 1800s–1860s**

New Zealand and parts of Australia gained a reputation for their salubrity and suitability to the British constitution. Such praise, though, masked lingering anxieties about the impact of local environments on health. In 1869, for instance, Hokitika's Surgeon Superintendent identified an outbreak of yellow fever, a disease often associated with tropical environments, on the South Island's West Coast.<sup>131</sup> Its cause, he explained, was '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'.<sup>132</sup> His discussion emphasised the perceived nexus between tropical environments (swamps, moisture and bush), human action (draining and cultivation) and health, views also illustrating the importance settlers placed upon the appearance of a place as an indicator of its healthiness.

Over its first 50 years of European settlement, as Warwick Anderson has shown, settlers in Australia's southeast expressed considerable anxiety about its environmental suitability to European constitutions. Europeans fretted that their bodies 'seemed out of balance with the new climate' and feared their children would diverge from the European ancestral type.<sup>133</sup> The *Edinburgh Review* of 1828 identified worrying characteristics. The white Australian race, it noted alarmingly, 'shoots up, tall and pale, exactly as' do American emigrants. And it suffered from 'speedy decay of the teeth', the result of 'some climatizing process, not yet understood'.<sup>134</sup> This contrasted with the earlier opinion of men like traveller John Turnbull. In 1805, Turnbull discerned no 'defect' in Antipodean children, merely that they were 'invariably of one complexion, fair and with white hair' and possessed 'black and very brilliant eyes' and a 'quick and volatile' disposition.<sup>135</sup> Still, as late as the 1860s, Dilke could identify the by-then common condition ascribed to European-born children in Australia: that boys were 'cornstalks' exhibiting 'plenty of activity and health, but ... wanting in power and weight' while girls were 'slight and thin; delicate, without being sickly'.<sup>136</sup> Colonial doctors also discovered new 'diseases' caused by social and environmental conditions that

differed from Europe. Nostalgia, ophthalmia, gold fever, bush-mania and colonial fever assailed settler health in colonial Australia. Dr D. J. Thomas identified 'colonial fever' in the 1840s. Of summer onset, he explained, the disease caused appetite loss, general weakness and dejection, followed by fever and vomiting, and a long convalescence. Dr Thomas blamed rank vegetation and decomposition for ill health and believed increasing cultivation would bring salubrity,<sup>137</sup> views emphasising the perceived connection between productive and healthy environments.

By the mid-nineteenth century, as Warwick Anderson notes, many anxieties about the southeast had ebbed, except for those about its heat and hot winds. Confidence abounded thanks to an increasingly settled lifestyle, belief that drainage and cultivation had improved the climate, recognition of the need for proper clothing, and acknowledgement that both unhealthy areas and times existed when it was prudent to stay indoors. Doctors also adapted treatments to the new environment, favouring stimulants, such as cod liver oil or quinine, rather than depletives. Although the gold rush of 1851, which swelled Melbourne's population from about 20,000 in 1851 to over 140,000 by 1861, overcame some fears about inland Victoria's oven-like heat, settlers continued to comment on its effects.<sup>138</sup> Urbanisation, as explored below, also created new concerns about the unhealthiness of people crowded together in unsanitary dwellings. In the goldfields, declared the author William Howitt (1792–1879), Europeans laboured 'under an almost Indian sun' and suffered 'the most frightful effects of cramps and rheumatism, of fever and dysentery'.<sup>139</sup> Organising his ship to New Zealand, in 1854 Sir John Cracroft Wilson complained that 'I never suffered in India so much as I suffered from the persecution of the mosquito wretches', discomfort worsened by Melbourne's 'excessive' heat.<sup>140</sup> Nor was heat confined to Victoria. In 1840s NSW, Louisa Anne Meredith (1812–95) complained of Bathurst's 'oven-like atmosphere, the temperature of which is frequently increased tenfold by a "hot wind," when it seems as if a fiery blast from a huge furnace pervaded all space around, rushing into the house through every opening with the force of a hurricane'.<sup>141</sup>

A solution to Australia's excessive summer heat came from India. In 1885, the *West Australian* reported that Mount Macedon, near the colonial capital of Melbourne, 'is a capital resort for the hot weather', and was under negotiation for purchase as a summer residence for the Governor of Victoria.<sup>142</sup> A year before, the Governor, Henry Loch, rented the Macedon property, Rosenheim, as a summer retreat, so it was with some justification, then, that the pastoralist and gold commissioner Thomas Alexander Browne, better known as the novelist Rolf Boldrewood

(1826–1915), described Macedon as ‘the Simla of Victoria’.<sup>143</sup> As garden historian Paul Fox notes, ‘Macedon, with its deodars, Himalayan spruce, Assam tea, Rhododendron Dalhousie, and Indian ducks on the State Nursery Lake had been re-created in the image of an Indian hill station.’ This impression was further enhanced by the mock-Tudor construction of its new two-storied Governor’s residence which closely resembled the Commander-in-Chief’s recently constructed Simla abode.<sup>144</sup> Indeed, imperial landscapes of health had become so intertwined that, visiting Darjeeling in 1890, Indianophile, irrigator and politician Alfred Deakin (1856–1919) noted in his diary: ‘cleared patches of garden and dry grass like Macedon – gardens on steep slopes and crests of hills’.<sup>145</sup> As Andrea Inglis shows, mountain resorts in Australia developed in response to the extremes of heat on Australia’s plains. The Blue Mountains, north of Sydney (NSW), catered to upper- and middle-class needs, combining relaxing walks with cooler summer temperatures, and provided luxury accommodation set amid pleasingly picturesque scenery. South Australians could likewise migrate to the Adelaide Hills; Queenslanders to Toowomba. The beach, too, remained a favoured source of health (see below).<sup>146</sup>

The environments of temperate Australasia, then, generated considerable anxieties about their impact on European health and particularly on the growth of the next generation. Would children born in colonies differ from the ancestral type, asked many doctors and officials? While these anxieties abated as a result of environmental change and improvements, such as drainage and cultivation, other fears remained, demonstrating the significance of health anxiety in parts of the temperate Australasia. As in India, heat and decomposition – as well as any environment resembling India’s – elicited particular concern. Demonstrating the interconnections developed by health anxieties the idea of Indian hill stations and the exchange of Indian plants inspired solutions to Australian seasonal heat. As I explore below, particular concerns also developed around the impact of human social and environmental change in urban areas.

### **Australasian urban anxieties, 1860–1880s**

Increasing migration and urbanisation – particularly from the 1870s – brought many of the old world serpents of industrial Europe to the settler colonies. European experiences made settlers acutely aware of the problems associated with urbanisation, and anxiety emerged within a few decades of organised settlement that Australasia’s urban centres



would soon face the problems as Europe unless careful controls were instituted.<sup>147</sup> In 1879, Dr A. K. Newman (1849–1924) created a stir by predicting the degeneration of Europeans in New Zealand. New Zealand's climate, allied with other environmental factors, he charged, was causing '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.<sup>148</sup> Trenchant criticism of his use of unreliable statistics followed. In response, Newman withdrew his paper, only to argue three years later that New Zealand was the healthiest country in the world!<sup>149</sup> Other scientific papers of that period, however, revealed the dangerous state of New Zealand's settlements. W. D. Campbell's 1876 research, for instance, demonstrated the 'fearful loss of life that might be prevented by proper sanitary measures'. England's 68 largest towns, he outlined, had an annual death rate per thousand in 1873 of 3.6 while that of New Zealand's seven largest towns in 1875 was 8.63. Even more 'startling', he continued, was that the death rate of New Zealand's seven largest towns (25.91 per 1000) was much greater than England's rural death rate (18.4 per 1000).<sup>150</sup> This comparison challenged favourable impressions, and much propaganda, of New Zealand as far healthier than Britain. Indeed, as the physician Leger Erson observed in 1889, despite transitions 'taking place from the hamlet to the village; the village to the town, and from the town to the city' not a thought is 'being given [in New Zealand] as to the disastrous effects attendant upon an increasing population, when associated with the steady accumulation of insanitary [*sic*] surroundings'.<sup>151</sup> Studies of many Australian cities also revealed high rates of death and disease, especially from the 1870s. Insufficient drainage and sewerage created major health concerns in Sydney, as it did in most other Australian colonial cities.<sup>152</sup> While also blaming the poor habits of the working classes, settlers believed that environmental conditions explained ill health. Towns, they thought, harboured higher concentrations of putrefying vegetable and animal matter than the countryside. Such dangerous concentrations of miasma removed important elements from the air, particularly ozone.<sup>153</sup> As 'the great natural disinfectant or purifier of the atmosphere', ozone was particularly valued, as encountering 'decaying organic matter gases it tends to combine with and quietly burn up the bad-smelling gases which are evolved'.<sup>154</sup>

An 1867 commission in the South Island town of Nelson typified colonial responses to ill health in urban Australasia. The Commission concluded that illness arose through pollution, over-flowing and soaking

cesspools, dusty streets and naturally swampy land. It highlighted the 'so[-]called "preventative diseases,"' those caused 'by decaying vegetable and animal matters, and the gases they give off polluting air and water'.<sup>155</sup> Recommended sanitary improvements included the removal of dangerous vegetation, especially 'all long growth of shrubs, flax, raupo, bushes, tussock, or other rank vegetation ... so as to lay the mud open to sun and air, and prevent it from being a source of damp exhalation'.<sup>156</sup> Penalties for pollution had also been tried. Legislation introduced in 1863, for instance, levied a penalty of £50 on anyone fouling or corrupting the waterways near the town, a measure typical of other such local-level legislation enacted at this time, but not always successfully.<sup>157</sup>

As human environmental changes could improve health, so could natural, therapeutic landscapes. Colonists tried to live in or regularly visit perceived ozone-producing locations such as the coast and highlands. Wind action over waves, settlers believed, produced ozone and enhanced health while highland areas – ideally with spas – also had high concentrations of ozone.<sup>158</sup> But even these areas, like Indian hill stations, could be made healthier through careful planting. Plants, it was thought, 'throw off ozone largely on exposure to the sun's rays' and are a 'powerful ... atmospheric purifier'.<sup>159</sup> As with India's hill stations, because settlers could only physically identify the conditions that promoted healthiness, they sought, as one contemporary put it, to bring 'the town nearer the country in appearance and healthiness' through activities like tree planting and park-making.<sup>160</sup> Eucalypts from Australia proved as popular in New Zealand as they were in India and had the added bonus of being more easily acclimatised into the colony. Eucalypts reached New Zealand through official, but principally private channels. A vigorous plant trade connected Australia's eastern coast with New Zealand: many New Zealand settlers ordered plants from Australian nurseries.<sup>161</sup> Mueller regularly corresponded with many scientists and institutions in New Zealand. In the 1860s, for instance, he made available large quantities of eucalyptus seed to the Otago Provincial Government.<sup>162</sup> In 1880, nurseryman J. B. Armstrong urged the introduction into New Zealand towns for health reasons of carbon-absorbing plants, especially the Blue Gum, 'the most active absorber of carbon known'.<sup>163</sup> Indeed, the impact of gums was widely recognised in the colony. Writing in the late nineteenth century, Canterbury settler John Dixon Marmaduke appealed that settlers who 'remember Chch [*sic*] before gum trees & artesian water were so general will [also] remember the great susceptibility of the whole district to fever'.<sup>164</sup> Trees, observed a correspondent to a northern

New Zealand newspaper, operate 'as a sponge'. Each 'sucks up all this unwholesome saturation, distils it, and exhales a part of it, purified, into the atmosphere'. Thus, he enthusiastically continued, 'the more good, wholesome trees there are about a homestead the better, provided they do not shut out the sun too much'. He recommended 'gum trees' as well as 'weeping willows or other ornamental trees'.<sup>165</sup>

Attractive and aromatic flowers could help to 'redeem' areas from the deadly grip of miasma.<sup>166</sup> Alongside city parks and tree planting, sanitation and drainage, and organised sports and exercise, they formed just some of the weapons available in the fight for public health.<sup>167</sup> Tree planting and parks, planners believed, would counter the artificiality and poor health of cities.<sup>168</sup> Sydney's Botanic Garden dates from 1816, while even before organised European colonisation began in the late 1830s, the New Zealand Company laid out public parks and green spaces in its town plans, as had also Adelaide's planners. They acted as lungs for the growing cities as well as places in which to exercise. Most new settlements had land set aside either for a public park or domain, while urban gardens, aside from their value as food producers, grew beneficial ozone-producing plants.<sup>169</sup> Park making, planting and their health-giving properties improved naturally unhealthy areas or remedied human-induced problems. '[A]n adequate open space or lung for the well-being of future inhabitants should be dedicated for public use', declared a New Zealand journalist in 1884, and forms an important part of the country's 'rational and social progress'.<sup>170</sup> By this time, the city beautiful movement had captured civic attention and activated city improvers across Australasia. Interest in the garden city and city planning developed in the next decade.<sup>171</sup> (Urban tree planting and park making are explored in more detail in the next chapter.)

If rural tree planting drained unhealthy areas,<sup>172</sup> in towns trees provided valuable storehouses of water, which would 'help to regulate the water supply, produce a more sustained feeding of springs' and lower the risk of flooding and land slips.<sup>173</sup> Many Australasian cities reserved timber for the purposes of regulating and maintaining the purity of town water supplies.<sup>174</sup> But, as in India, vegetation in Australasia could be an ambiguous indicator of health. Old vegetation elicited fears of decomposition and poison associated with the production of miasma. Older plants 'lose their carbon-absorbing properties when old and decaying', noted New Zealand nurseryman J. B. Armstrong, 'and consequently all town trees should be removed as soon as they show signs of decay'.<sup>175</sup> Younger trees, because of their greater carbon absorbing power, were recommended, but if too young or located in too great

a profusion could also present health risks. Thomas and Kilgour, two Australian doctors, believed that cultivation decreased disease because in-between states – neither wilderness, nor cultivation – endangered health.<sup>176</sup> Likewise Peter Wilson, New Plymouth's Colonial Surgeon, identified green timber along with a poorly chosen site as the cause of a typhoid outbreak in 1847 (later modified in 1860 to typhus fever).<sup>177</sup> According to him, the outbreak originated 'from the moist rotting, or dry decaying of the timbers of dwellings ... strengthened in the degree of its poisoning influence by the oozing of indoor soil emanations also'.<sup>178</sup>

Environmental transformation of particular localities – coupled with growing emphasis on the unsanitary habits of the working classes and certain races – could elicit anxiety by making healthy areas unhealthy, even in the temperate parts of Australasia. As in India's hill stations, settlers believed that modification of behaviour and environment (such as through park making and tree planting, sanitation and increased personal hygiene) could help to return such areas to their former state of healthiness. By the late nineteenth century as the following section explores, Australasian health anxiety about white degeneration strengthened the nexus between medical science and nationalism at the same time as medical opinion increasingly upheld diseased bodies, rather than diseased environments, as a cause of ill health. Also, the newly emerging discipline of tropical medicine promised to make northern Australia safe for white settlement.

### **Late-nineteenth-century health shifts**

Towards the end of the nineteenth century, miasma, as an explanation for disease, lost popularity in medical circles.<sup>179</sup> Although environment remained as a potent palliative, doctors favoured microbial over miasmatic theories. Microbial theories acknowledged humans rather than environments as sources of disease.<sup>180</sup> New ideas generated vigorous debates, marking out differences between recent and older generations of medical graduates, as well as signifying the rise of different centres of medical power. In Australia, medical authority came to rest with urban medical professionals.<sup>181</sup> Colonial government and power also became associated with the provision and certification of medical care, though it must be remembered that policies still reflected the particularity of local conditions (environment, economics and politics). In many respects, too, especially in Australia, national medical governance remained notional given the complexity of federal and state politics.<sup>182</sup> The Bubonic Plague

Prevention Act (1900) hastened the establishment of the New Zealand Department of Public Health in 1900 (from 1909, the Department of Public Health).<sup>183</sup> In 1921, Australia, prompted by the impact of the influenza epidemic, established a Federal Health Department, although states still held considerable power.<sup>184</sup> In India from the 1880s, medical policy devolved to municipal authorities, while sanitary officers gained increasing power, although again it was a series of crises – in this case the plague outbreaks of the 1890s – which prompted increased public health measures and signalled greater confidence in the powers of sanitary science to prevent disease. The Government of India Act (1919) devolved responsibility for health to elected Indian representatives in the various provinces, but did not grant provinces responsibility for their own budgets (this was only granted in 1937), which further stymied state public health measures. For the most part, until the last few years of British rule, public health remained concerned largely with the health of imperial troops and officials.<sup>185</sup> A series of medical crises across Australasia and India prompted the strengthening nexus between public health and state power under which public health became a legitimate state concern.<sup>186</sup> They also revealed changing ideas about disease transmission and the way local experiences of disease shaped health and led to increasingly state-directed public health responses.

Across the Empire, emphasis on microbes as agents of disease increased anxiety about interactions with diseased groups, building on already prejudicial attitudes towards non-whites. Europeans associated certain peoples with the pathologies of certain climates. With devastating outbreaks of plague striking in waves from 1896, Britons increasingly sought to further distance themselves from Indians. Although quarantine measures aiming to prevent the movement of plague through the country came up against vehement local opposition and fears among colonial officials of inciting rebellion, plague stimulated a more interventionist form of government through public health measures.<sup>187</sup> Even before such disease outbreaks, military authorities had encouraged segregation between Europeans and Indians. Some of the measures included the erection of sanitary cordons around villages and localities, and restrictions on European soldiers entering Indian areas.<sup>188</sup>

Racial anxieties about diseased Asian bodies bringing plague and other illnesses into Australasia also expressed prevailing settler racial prejudices and fears of Asian labour undercutting European wages and health. In Queensland, it led to legislation such as The Pacific Island Labourer's Act 1901, which prevented further Melanesian migration and facilitated their mass deportation from 1906 to 1907.<sup>189</sup> Quarantine

measures followed. During the smallpox epidemic of 1881, for instance, Victoria quarantined ships from China while NSW sought to prevent all vessels with Chinese on board from entering. Health anxiety, nationalism and racism combined as quarantine, Alan Mayne argues, functioned as 'an instrument of immigration restriction'.<sup>190</sup> This was reinforced by Australia's Health Department, which amalgamated some public health functions with quarantine.<sup>191</sup> New Zealand's anti-Chinese immigration policies, enacted from the 1880s, functioned in much the same ways, feeding on fears that Chinese were inherently diseased, morally corrupting, undercut white workers' wages, and thus needed to be kept out. Racial and health anxieties, expressed through medical ideas and legislation, figured strongly in strengthening the settler nationalisms of Australia and New Zealand. By shoring up the borders against diseased non-whites, quarantine promised to protect Australian whiteness and New Zealand's nominally brown-whiteness – Maori were treated as honorary Europeans in some senses, perhaps because they were believed to be facing extinction.<sup>192</sup>

The expulsion of Pacific Island labour from Queensland signalled increased confidence in the ability of white Australians to work in the tropics. Despite some lingering doubts, increased certainty resulted from the survival of white pioneers, who thereby demonstrated that whites could work in tropical Australia, the introduction of quarantine and more detailed investigations into tropical micro-organisms, particularly the discovery that certain mosquitoes acted as vectors for malaria. Guided by the advice of the newly emerging discipline of tropical medicine, an institute for which was set up in tropical Townsville, sensible diet and living thus promised to make tropical Queensland habitable for Europeans.<sup>193</sup> Indeed, by the late nineteenth century attitudes towards the region were changing, sparked also by growing nationalism which called for the blank spaces of Australia to be filled up with white settlers.<sup>194</sup> Brisbane and Western Australia, observed a writer to the *Indian Forester*, instanced evidence 'of successful colonization in a hot but non-malarious climate'.<sup>195</sup> In 1886, health propagandist James Bonwick (1817–1906) acknowledged that, while '[a]cclimatisation may be hardly possible in the miasmatic jungles of India', 'already healthy generations of English origin have appeared in the pure atmosphere of Australian forests'.<sup>196</sup> In India, however, fears of tropical climates and tropical diseases remained firmly entrenched. Even the development of the likes of the Calcutta School of Tropical Medicine in 1921 demonstrated the limitations of tropical medicine in India. This underfunded institute was not even located in areas where malaria was a problem!<sup>197</sup>

While acknowledging the specificity of tropical medical diseases, the newly founded discipline of tropical medicine acknowledged that tropical pathological organisms caused disease.

Meanwhile, new anxieties of a different sort also began to haunt urban colonial Australasian society and some of India's community in the late nineteenth century. Popular epithets such as 'Smelbourne' (Melbourne) or 'Mudedin' (Dunedin) expressed the impact of increasing urbanisation and its associated health problems. By 1901, around half a million people lived in both Melbourne (41% of the Victoria's population) and Sydney (36% of NSW's population), while in 1896 41% of New Zealanders lived in urban areas, with urban dwellers overtaking rural by 1916.<sup>198</sup> Fears of slums dominated newspaper headlines in 1880s Sydney after investigation into the cause of a smallpox outbreak while Brisbane had no proper sewerage and drainage until the 1890s, a common situation across Australasia.<sup>199</sup> Aside from anxiety about particular diseases, major concerns arose about the perceived degeneration of urban Australians and New Zealanders – males in particular. Urban lifestyles appeared to be rendering the white Australasian male effeminate. To contemporaries, signs of decadence abounded. Birth rates were plummeting while those in Asian nations were swelling menacingly.<sup>200</sup> Canterbury College Professor John Macmillan Brown (1846–1935) drew reader's attention to 'the appearance of slums and vice' in New Zealand, and to the 'decadence' of the white race whose 'fountains of population and talent' were 'drying up'.<sup>201</sup> Preparation for war merely underlined the global problem of 'degeneration'. Of New Zealand's First World War conscripts (1916–18), only 34 per cent were passed entirely fit to kill others.<sup>202</sup> Australia fared similarly badly.<sup>203</sup> Fears of white deterioration should also be set alongside dying race narratives for Aboriginal Australians and Maori, in the case of the latter fears also expressed by many indigenous doctors and leaders.<sup>204</sup> In late-nineteenth-century India, Bengal's Hindus feared they were deteriorating in the face of malaria while Muslim families were growing. To many British, the seeming susceptibility of Bengalis to malaria heightened perceptions of that race's effeminacy.<sup>205</sup>

Late-nineteenth-century health anxiety also encouraged the growth of state involvement in health, particularly in infant welfare in white settler colonies. Embracing germ theory, medical experts of the various Australasian public health departments continued to look to nature as an inspiration and a source of healthiness. In 1902, medical doctor R. H. Makgill (1870–1946) claimed that 'Nature has framed certain sanitary laws more reaching than any by-laws [of which] the most exemplary

local body ever conceived'. He advocated elimination of the unfit, the removal of sanitary waste onto fields, the dissemination of knowledge about the microbe and use of the sanitary powers of sunlight and fresh air.<sup>206</sup> For Makgill, the discovery of the microbe did not diminish the role of environment in causing and explaining patterns of disease but rather modified it to one providing both therapeutic benefits and a model which 'modern' science could draw upon to fight ill-health.<sup>207</sup> In the early decades of the twentieth century, anxieties about declining birth rates and even physical deterioration sparked the establishment of children's and adults' organisations and government programmes that aimed to improve healthiness through environmental therapeutics.<sup>208</sup> Thus, despite the gradual acceptance of germ theory, environmental cures and the importance of local environments such as those located in dry, highland areas for tuberculosis sufferers, retained their importance in medical care.<sup>209</sup> In Australia, as Anderson has observed, 'Environmental sanitation remained a focus of the colonial medical profession, even if its strategies and goals, in becoming microbiological, had changed.'<sup>210</sup>

## Conclusion

Over the course of the nineteenth century and into the next, Europeans expressed markedly less confidence that they could acclimatise to climates dissimilar to their own. Either through residence in hill stations or through migration to temperate climates, Europeans in tropical India sought temporary and permanent relief from its perceived unhealthy climate. They also attempted to improve the healthiness of hill stations through tree planting and urban design, activities which, alongside migration, connected the extractive colony of India with the settler colonies of Australasia. Europeans in India introduced Australian eucalyptus for fuel and health reasons, and, upon retirement, settled in parts of temperate Australasia, deemed to better suit the European condition. Yet, despite perceptions of the healthiness of Australasia's temperate zones, fears initially emerged about the likely effects of unknown environments on European constitutions. Could the heat of Australia and local climatic conditions be changing the European type and even be causing it to deteriorate, doctors and laypeople alike asked. Though concerns lingered about the healthiness of certain localities, swamp drainage, tree planting and other improvements assuaged many health anxieties and provided settlers with the confidence that their new homes were healthy and habitable. The spectre of white degeneracy, however, haunted doctors at the same time as many increasingly feared Maori and



Aboriginal Australians would die out or, in the case of Asian peoples, provide a reservoir of disease. By the late nineteenth century, human-caused problems had made colonial cities dangerous places to inhabit. Their relative insalubrities, coupled with changes to patterns of work and leisure, threatened to dry up the fountains of the white population and render the male weak and effeminate. In response, governments turned to newly discovered microbial explanations to heighten their involvement in public health and to promote policies that excluded perceived diseased people, such as Asians, from polluting white society, although exceptions to such policies were made in New Zealand for Maori who were categorised in the same group as white settlers.<sup>211</sup> In India, plague accelerated racial separation between Europeans and Indians, as well as between different caste and religious groups, solidifying perceptions that Indians harboured disease. Meanwhile, in Australia's tropical north, infused by nationalism, governments praised the tools of tropical medicine to enhance settlement there while settlers themselves re-categorised southern Queensland as safe for European settlement, in part on the basis of the survival of older European residents. By contrast, fears of tropical debilitation persisted in India as the perceived pathology of the tropical environment was written onto Indian people. The next chapter explores the interconnections of health, environment and aesthetic anxieties in rural and urban Australasia through a case study of a settler artist and poet.

# 3

## Colonial Aesthetic Anxieties

I wonder what John Ruskin would say could he walk  
out and see the ravages of the Auckland Goths?<sup>1</sup>

Alfred Sharpe, 1877

As the previous chapter demonstrated, anxieties about unhealthy environments impelled the transformation of many places in India and Australasia. Park making and tree planting, drainage and anti-pollution legislation attempted to 'redeem' unhealthy and fever-laden landscapes. Environmental transformation took place because settlers regarded the healthiness and productiveness of certain landscapes as both inter-related and normal. When settlers altered environments or when they encountered ones that did not conform to aesthetic preferences, anxieties arose, sometimes stimulating conservation and environmental modification to make places healthier and more aesthetically pleasing.

This chapter explores in detail the environmental anxieties of the eccentric artist, poet and park designer, Alfred Sharpe (1836–1908), whose art works were popular and well known. Sharpe's views on environment and conservation open fascinating windows into settler culture in this period, demonstrating that environmental changes and interaction with previously unknown environments prompted a series of aesthetic anxieties and responses. Sharpe articulated imperial-wide aesthetic anxieties, spending around 20 to 30 years each in northern England, northern New Zealand and eastern Australia. These experiences are particularly useful for environmental historians wishing to study the development of colonial aesthetic views and the interplay of local and international influences in shaping settler responses to the widespread environmental transformations taking place around them. As Sharpe lived in predominantly urban environments, his environmental anxieties provide a

welcome counterpoint to the mainly rural focus of much environmental history. Such a focus helps, in turn, to re-evaluate existing interpretations of urban conservation and its relationship to aesthetic influences. Sharpe's biography reveals the complexity of settler environmental engagement and the role of religious sensibilities and local environmental experiences in shaping aesthetic anxieties. It also demonstrates the extent to which 'ideas, practices and identities developed *trans-imperially* as they moved from one imperial site to another'. David Lambert and Alan Lester have described the process whereby settlers moved through empire and took ideas from one place to another as 'imperial careering'.<sup>2</sup> This chapter begins with a discussion of colonial aesthetic preferences and then explores Sharpe's developing Australasian aesthetic anxieties in light of both his experiences of large-scale environmental change and interaction with environments new to him.

## Romanticism

Nineteenth-century aesthetic views cannot be understood without romanticism. This complex cultural and intellectual movement firmly held nineteenth-century Europeans and colonialists in its grip, peaking in the 1830s and 1840s just as significant numbers of Europeans were travelling to India, Australia and New Zealand. Romantics embraced wonder at the power and majesty of the natural world, celebrated the unique and the bizarre, and passionately reacted, or so they argued, to the cool reason and cold calculation of the Enlightenment.<sup>3</sup> More a mood than a coherent movement, romanticism influenced fashions, art, writing and intellectual life – even the way Europeans viewed non-Europeans.<sup>4</sup> But it was also Janus-faced. On one hand, in Australasia and India colonists actively searched for landscapes that conformed to romantic conventions, sometimes expressing environmental anxieties about places threatened with destruction and occasionally even conserving them. On the other, romanticism could impel the alteration of environments – even by artists – to make landscapes conform more closely to aesthetic ideals. Complicating this mix was the urge to improve that constantly kept colonials – and colonised people – striving to turn land to productive use, and to change the very landscapes that they admired.<sup>5</sup>

Despite several fine studies of romanticism and empire, when it comes to studies of the interconnections between romanticism, aesthetics and conservation, environmental history generally has not been well served.<sup>6</sup> As environmental historian David Arnold argues for India between 1800

and 1856, despite the centrality of romanticism to colonialism and science, historians of the Indian sub-continent have largely neglected this field.<sup>7</sup> Many environmental historians of Australasia have also downplayed the importance of aesthetics in shaping conservation and in moderating environmental behaviour. Aesthetic attitudes are viewed as unimportant when set in the wider scheme of environmental despoliation. As Don Garden notes, for instance, Australasian settlers who expressed concern 'about such matters as the loss of indigenous species ... were in a tiny minority – and generally they were like voices crying in the wilderness. The colonial project – to master, develop, and prosper – overwhelmed the faint cry of such sentiments'.<sup>8</sup> Alternatively, environmental historians accord conservation and aesthetics an importance *only* from the late nineteenth century, when across many of the settler lands, nationalism and urbanisation, the influence of new sciences such as ecology and environmental degradation itself caused many to see in their country's nature a source of proud nationalism that deserved protection. National parks and scenic reserves resulted.<sup>9</sup> While these factors did undoubtedly lead to aesthetically inspired conservation, several scholars of Australasian environmental history have established an inaccurate temporal division between appreciation (and conservation) characteristic of the late nineteenth century, and environmental change (and non-appreciation) associated with earlier periods. Alfred Sharpe demonstrates that environmental change *accompanied* appreciation of certain environments and that environmental views were more complex than many scholars believe. Settler landscape change, for instance, did not invariably signal dislike of the colonial environments, as some have inaccurately assumed. To historical geographer Alan Grey, New Zealand's 'alien[,] ... dark and seemingly forbidding bush gave further impetus to its clearing in favour of something more familiar – grassy hills'<sup>10</sup> while Paul Shepard has posited that colonists' view of native flora as barren and unproductive justified its removal.<sup>11</sup> Ploughed land, well-established homesteads, and fenced paddocks undoubtedly represented settler ideals in both Australasia and India, but it would be wrong to think that colonists did not appreciate the landscape of their new homes or the native species growing there. In New Zealand, native species were incorporated into European gardens and aesthetics just as Maori themselves incorporated introduced species into theirs. At the Mission Station of Waimate North (northern New Zealand) for instance, in 1843 Rev William Cotton established a native garden, planting nikau palms (*Rhopalostylis sapida*), tree ferns, ti-tree (*Cordyline australis*) and creating an environment apparently much to the liking of his pet kiwi.<sup>12</sup>

In India, too, under the influence of romanticism, individual painters incorporated into their paintings aspects of the culture, history and landscape of India, although with specific and differing narratives over time.<sup>13</sup> Even if European garden making in India reflected the shift of emphasis of appreciation of Indian culture under Orientalism to attempts to re-create 'English' gardens, the popularity of many Indian species remained undimmed.<sup>14</sup>

Another important historiographical point is borne out through an analysis of Sharpe's aesthetic anxieties. Most scholarship on Australasian and Indian conservation pays overwhelming attention to rural environments. Virtually no attention, for instance, is given to the connections between the making of urban parks and rural forest conservation.<sup>15</sup> And where scholars have examined urban conservation groups or urban beautification, most focus on the very late nineteenth century or early-twentieth century. The assumption is often that either no urban conservation took place earlier or, what did, was not worthwhile.<sup>16</sup> In this context, Sharpe demonstrates, first, the interconnections between urban and rural conservation aesthetics in Australasia; second, the centrality of aesthetic conceptions in informing debates over urban land use and its management; third, the articulation of individual aesthetic anxieties and the formation of issues-based urban conservation groups and their use of newspapers to fight unwanted environmental change; and, fourth, that historians must push urban conservation to a much earlier date than previously thought.

If romanticism significantly infused settler culture, it was anything but a neutral ideology. Many scholars point to its culturally specific aesthetic forms that effectively overwrote existing indigenous views. This is an important point to bear in mind, but to dismiss its influence outright, as Don Garden does, or to present its influence in relatively simplistic and monolithic terms, as authors such as Giselle Byrnes and Paul Carter have for New Zealand and Australia respectively, is to do great disservice to understandings of the past.<sup>17</sup> Romanticism operated in different ways in different places and periods, inspiring a far more complex series of aesthetic responses than such authors recognise. David Arnold has argued that in India, as opposed to in Europe, romanticism inspired the British to seek out landscapes that conformed to pre-conditioned aesthetic views, leading them to change those which did not meet such culturally constructed images. Romanticism, he notes, was also 'an integral part of the colonial scientific enterprise' and of the colonial imagination, exploitation and experience of India – an idea I explore more detail in Chapter 5.<sup>18</sup> As noted in Chapter 2, ideas

of health and aesthetics coalesced in the establishment of hill stations in India and tropical Australia and in the search for romantic scenery. Their climates and topography reminded colonials of alpine Europe while, in India, they offered a welcome balm to the enervating plains, perceived as ugly and disease-ridden, and totally unsuitable for permanent European settlement.

Sharpe never visited India. Therefore the focus of this chapter is on local environments in Australasia and England that inspired his aesthetic. Despite this, the connection between aesthetics and health, as well as the local dimensions of landscape appreciation, were also evident in India. As noted in the previous chapter, Elizabeth Muter, for instance, praised the appearance of the hill station of Murree for its resemblance to Europe. As David Arnold has demonstrated, romanticism helped the explorer and scientists Joseph Hooker (1817–1911) to frame his experience of the Himalayas as a bio-geographically similar region to New Zealand, Tasmania and even Antarctica, all three places he had visited in the late 1830s and early 1840s on a scientific expedition. As Hooker noted on 19 May 1848: ‘In the humid and equable climate of the latter [Himalayas], botanical orders which only reached la[titude] 300 or 400 in the northern hemisphere, reached Tasmania and New Zealand and even Cape Horn in 550 S[outh].’<sup>19</sup>

Indeed, the hill station of Darjeeling strongly reminded Hooker of the Scottish seaside town of Helensburgh but also evoked the excitement of a new botanical region and his view that it represented a model of improvement analogous to settlements in New Zealand and Australia.<sup>20</sup> The sights ‘of salt water looking people with faded bonnets and thick shoes’ scurrying to church and the sounds of chiming church bells formed an important part of the aesthetic, as did

the insects humming through the windows, and the irresistible attraction I feel to look out on the open valleys with huge mountains all around, the clouds chasing one another across the forest, and sunbeams dancing on the heavy masses of mist that keeps floating along some thousand feet above us. The wind sighs the same sigh through the leaves that it used through the Limes at Row and these rustle in the same note. I see ripe blackberries too and small children gathering them, but don’t see the Gare Loch and its boats; or smell the sea-weeds, no nor the tansy and peppermint, nor peat smoke of the new washed matches and red cloaks— and above all, the Rev. Mr Winchester ... [I] cannot keep my mind off the new trees and new weeds that grow up to the very doorstep.<sup>21</sup>

Others, for example, the surveyor and engineer J. T. Thomson (1821–84), who settled in New Zealand after extensive experience in the Straits Settlement and in Singapore, commonly used romantically coded language to describe these areas as well as to draw comparisons between them.<sup>22</sup>

For Sharpe, the landscape around Auckland proved relatively easy to assimilate into European aesthetics, but that around Newcastle (NSW) did not. When landscapes threatened with change conformed to European aesthetic notions, Sharpe often championed their protection; but for those that did not, he encouraged their modification through aesthetic alteration or even destruction. Like other artists painting in Australia such as John Glover (1767–1849), Eugene von Guérard (1811–1901) and Louis Buvelot (1814–88), Sharpe attempted to fit local environments into European picturesque conventions. The picturesque accorded significance to the composition of a picture, particularly to the use of framing trees, distinct plains and pastoral settings.<sup>23</sup> It enjoyed great popularity among eighteenth- and nineteenth-century Europeans. Eagerly sketching plants and seeking out picturesque scenery in new imperial settings helped well-educated settlers make sense of and order their environments, creating both a sense of home and connections to different landscapes, as already noted. While the picturesque might be used by colonial surveyors, as Giselle Byrnes describes, to set out plans for future settlement, it also fulfilled far less hegemonic imperatives, helping settlers to express a range of emotional responses. Through her painting and travelling in the British Empire and beyond, Victorian botanical painter Marianne North (1830–90), as William Beinart and Lotte Hughes note, ‘tried to conquer nothing but her own inadequacy’.<sup>24</sup> Like explorer and naturalist Alexander von Humboldt (1769–1859) or writer, artist and amateur scientist Johann Wolfgang von Goethe (1749–1832) who both employed images for scientific and artistic appreciation, A. R. Wallace’s (1823–1913) used vibrant images, in his case of the tropics of southeast Asia, displaying at once his love of the region, concern at extinction, respect for indigenous rights and scientific utility.<sup>25</sup>

These examples significantly complicate one-dimensional portrayals of European landscape depictions such as also found in the study by Mary Louise Pratt of imperial travel accounts. Nevertheless, the picturesque aesthetic reflected particular gender and class ideals. The gentler, feminine picturesque contrasted with the rugged and masculines sublime.<sup>26</sup> Although essayists like William Gilpin (1724–1804) and Uvedale Price (1747–1829) bickered about their specifics, generally, authors set the

sublime's ruggedness and negligence, its darkness and gloom against the picturesque's roughness and irregularity, animation and variety.<sup>27</sup> As art historian Caroline Jordan notes, 'the picturesque mapped the limits of feminine power within colonialism'. It reflected the perceived role of women as compassionate creatures, linked to nature, capable of feeling, sensibility and possessing a 'natural' understanding of beauty, senses, as she notes, 'marginal, fanciful and impractical in the world of colonial masculine affairs'.<sup>28</sup> In colonial Australasia women also took on an active role in landscape change and, while many struggled to find the picturesque, some used this aesthetic to criticise destruction. Louisa Anne Meredith, for instance, lambasted settlers for the ugliness of deforestation in NSW:

The system of 'clearing' here, by the total destruction of every native tree and shrub, gives a most bare, raw, and ugly appearance to a new place. In England we plant groves and woods, and think our country residences unfinished and incomplete without them; but here the exact contrary is the case, and unless a settler can see an expanse of bare, naked, unvaried, shadeless, dry, dusty and spread all around him, he fancies his dwelling 'wild and uncivilized'.<sup>29</sup>

As Jordan notes, Meredith did not oppose development, merely *tasteless* development. In employing the picturesque to articulate such aesthetic anxieties she, like male artists Sharpe, Glover or von Guérard, demonstrated her cultivation as a member of the middle-classes. Only those educated in how to view and depict landscape, only those apart from its daily workings, could claim any authority on appreciating and judging its appearance.<sup>30</sup> An artistic education – backed up for Meredith and other females by gendered understandings of their role in society – gave her and the likes of Sharpe the cultural authority to comment on matters pertaining to taste and to comment on the impacts of environmental change on the appearance of landscapes, just as much as a scientific education for Scottish- or German-trained foresters gave them the cultural authority to comment on scientific processes (Chapters 4 and 5).<sup>31</sup>

### **Sharpe's early life and migration**

How did Sharpe gain the cultural authority to pass judgement on aesthetic issues? Despite his father's death, Alfred Sharpe enjoyed a relatively privileged, middle-class upbringing in Birkenhead, England. At that time,



Birkenhead was a green and peaceful haven compared with the sprawling and bustling port-city of Liverpool just across the Mersey.<sup>32</sup> In his childhood, Sharpe's father William, a successful merchant, most probably inspired his son's interest in art through his own collecting habits.<sup>33</sup> This passion intensified after Sharpe's attendance at the Birkenhead School of Art, leading to his enthusiasm for the Pre-Raphaelites whose artistic style would later influence his.<sup>34</sup> Established in 1848 by a group of young, idealistic artists interested in early Italian art, The Pre-Raphaelite Brotherhood (recognised at its foundation simply by the enigmatic initials, 'PRB') sought to shake up the art world. Although its aims and writings differed almost from the outset, realism or naturalism, including the use of bright colours and an attention to minute detail, characterised early Pre-Raphaelite art.<sup>35</sup> Success brought the Pre-Raphaelites regular exhibition space in Liverpool's galleries, exposure giving young Sharpe excellent access to, and a solid grounding in, the group's aims and objectives.<sup>36</sup>

In 1859, for reasons still unknown, Sharpe migrated to New Zealand. Settling in rough and ready rural northern New Zealand, Sharpe took up farming and part-time undertaking, soon adding an 'e' to his surname, most probably to distinguish himself from the numerous 'Sharps'.<sup>37</sup> In 1866, Sharpe moved to Auckland, then a struggling colonial port city straining under the effects of the Land Wars of the mid-1860s. In Auckland, Sharpe married, setting himself up as a draughtsman and later describing himself as a professional artist, a clear indication of his aspirations.<sup>38</sup> Toiling to earn a living and beset by financial hardship, Sharpe's life in Auckland and subsequently Newcastle reflected the difficulties facing professional artists in smaller colonial societies where a market for colonial art barely existed. Sharpe, nevertheless, persisted, successfully earning a reputation as a gifted watercolourist. A prodigious outpouring of (often anonymous) writing accompanied his artwork.

In the 1870s, Sharpe began to submit letters, poetry and drawings to northern New Zealand newspapers. Most appeared under a variety of pseudonyms that he continued to employ throughout his life. While characterised by eccentricity dashed with liberal doses of vitriol, his letters reveal a keen eye for detail and a sharp intellect. In these, Sharpe declaimed on a variety of issues. Lawyers, lovers and land sharks, judges, deforesters and acclimatisers as well as vandals, suffragettes and others, all felt his poisoned pen. A favourite *nom-de-plume* was Asmodeus, a lame devil in Jewish demonology, which, as his biographer Roger Blackley notes, probably appealed to Sharpe because of his apparent deafness later in life.<sup>39</sup>

Despite his use of pseudonyms, Sharpe's distinctive style and subject matter, as well as his strident and condemnatory tone, identify his authorship relatively easily. His aliases disappeared from Auckland's newspapers when he left the region, reappearing in Newcastle soon after his arrival there in 1887. Together with his art, Sharpe's writing forms an invaluable archive of environmental anxieties of this period. Written and visual works provide an especially valuable means of interrogating the close connection between artwork and literary output, especially valuable since relatively few colonial artists described their intentions in depicting a particular scene or person.<sup>40</sup> Sharpe did so, usually in a work's title or in contemporary newspaper commentaries.

### Sharpe and Ruskin's 'great entail'

As a romantic, Sharpe closely followed the ideas of John Ruskin (1819–1900), the immensely influential art critic and social commentator who vehemently criticised the alienating and destructive effects of industrialisation.<sup>41</sup> Regarding nature as revelatory of God's magnificence – at least for the first half of his life until he fell out with organised religion – Ruskin delighted in all natural phenomena, especially clouds and mountains.<sup>42</sup> Celebrating the natural world and rural life, Ruskin vilified everything that he believed threatened them. His view of environmental destruction as a fundamental breach of God's covenant, reflected Ruskin's belief that God granted humanity dominion over the natural world in return for its stewardship.<sup>43</sup> Emphasising the broken bond between God and humanity, Ruskin contrasted 'pure' with defiled nature. Indeed, he frequently drew sharp distinctions between Arcadian scenery and its destruction, on one occasion describing the pollution of a once clear, swift-flowing river.<sup>44</sup> By contrasting scenes in this way, Ruskin drew on nostalgia, which induced a longing for a lost time or place.<sup>45</sup>

Sharpe followed Ruskin's precepts closely but unlike the latter, who only criticised the destruction of nature, Sharpe offered solutions and, at times, a more optimistic view of human nature and its capacity to improve upon nature, and create even more beautiful areas than already existed. Sharpe, like Ruskin, wanted to ensure the 'transmission of cultural property' to later generations.<sup>46</sup> As Ruskin wrote 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.<sup>47</sup>

Sharpe's religious beliefs strengthened both a desire to preserve aspects of the natural environment for future generations and his belief that the present generation merely held it in trust for the following. Discussing the need to preserve the extinct volcano of Mount Eden, in Auckland, Sharpe expressed aesthetic anxiety about its neglect, speculating on 'what John Ruskin would say could he walk out and see the ravages of the Auckland Goths?' '[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'. 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 even be set aside as an educational farm. 'The day will yet come', he wrote prophetically, 'when the future inhabitants of this city will bless us for its preservation'.<sup>48</sup> Later in May 1877, Sharpe emotionally wrote that '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.' He declared: 'God help the nation which has no reverence for the sublime and beautiful, its better nature has gone out of it.'<sup>49</sup> For Sharpe, the preservation of natural beauty required people to steward the natural heritage God granted to them, a duty they also owed to their children and succeeding generations. Sharpe appreciated wild nature in such a way that people could enhance its beauty. While essentially a romantic vision it also focused on the betterment of the human condition through the preservation of natural areas, which, in turn, he believed would benefit society.

### **Environmental anxiety and nostalgia**

Nostalgia and environmental anxiety underpinned Sharpe's view of the role of the artist. As one of the earliest writers on watercolour techniques in New Zealand, Sharpe wholeheartedly echoed Ruskin's recommendations. Ruskin keenly supported the endeavours of the PRB and, in his five-volume *Modern Painters* advocated a strongly naturalistic style of painting. Cleaving to the 'necessity, as well as the dignity, of an earnest, faithful, loving study of nature as she is',<sup>50</sup> he also urged artists to 'break free from both the conventions on everyday seeing and those of artistic representation'.<sup>51</sup> Ruskin himself belonged to natural history societies and collected fossils, a particularly popular Victorian pastime.<sup>52</sup>

In 'Hints for Landscape Students in Water Colour', Sharpe advocated a novel approach for artists in New Zealand, one strongly reminiscent of Ruskin's ideas. Sharpe claimed that since 'New Zealand is special and unique ... it is altogether inexcusable [for artists] to take liberties with it on pretence of improvement.' Instead, they should, 'strive to reproduce Nature here as she is, ere her originality disappears before the combined effects of advancing civilisation and imported vermin and vegetation'.<sup>53</sup> As Ruskin urged European artists to strive towards a faithful representation of nature, so Sharpe pressed New Zealand artists to adapt European painting traditions to the colonial environment. Echoing Ruskin, Sharpe implored colonial artists to reproduce 'nature here as she is'. Inspired as much by anxiety at the loss of particular environments he prized, Sharpe's call to adapt European aesthetic conventions to local conditions, supports Nicholas Thomas' interpretation that colonial artists sought national emblems in locally distinctive nature or indigenous culture.<sup>54</sup> His views also reinforce the importance of local environments in shaping settler identity and in adapting environmental anxieties. Commenting on the former, historian Rollo Arnold notes that New Zealand settler identity of the 1880s and 1890s was complex. Provincial attachments, along with a 'continuing affection for the distant homeland, remained stronger than the various other competing frames of reference such as federation, nationalism, and even Pacific federation'. Settler identity across Australasia was complex and was commonly articulated through, and shaped by, experiences of local environments.<sup>55</sup>

Painfully aware of environmental changes underway in New Zealand, Sharpe lashed settlers for importing 'vermin and vegetation' that polluted the originality of the New Zealand bush. Given the rapid pace of environmental change, Sharpe believed artists should waste no time in pursuing the 'main object' of the newly formed New Zealand Art Students' Association:

[T]o 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.<sup>56</sup>

Environmental anxiety occasioned in Sharpe a sense of the loss of purity of the New Zealand bush, sentiment that appeared in several of



Figure 3.1 Alfred Sharpe, *Burial place of Hone Heke, Bay of Islands*, 1883

his artworks. *Burial Place of Hone Heke, Bay of Islands* (1883) (Figure 3.1) presents a ghostly Maori figure clad in traditional *pueru* (cape), possibly even the famous Nga Puhi tribal leader himself, passing over the historical site of the grave of Hone Heke (?–1850). The foreground presents

a cleared area which, as Sharpe later explained, 'had been exterminated by cattle'.<sup>57</sup> In it, foxgloves (*Digitalis*) and European grasses flourish.<sup>58</sup> Sharpe likely painted these European plants deliberately, to illustrate the environmental changes already underway and to emphasise the ephemeral nature of the scene. Moving now to the figure, its turned-away face has double significance. Almost melting into the forest, its portrayal suggests an affinity between native forest and native person, a connection commonly made by Australasian settlers and artists at the time.<sup>59</sup> As art historian Nicholas Thomas notes, many artists of this period sombrely represented indigenous people, to demonstrate their transitory tenure on land and sometimes to symbolise their imminent disappearance.<sup>60</sup> Sharpe's figure thus turns away literally and metaphorically from both European plants and European viewers, suggesting that native people and plants were fading into the distance in the painting just as they were perceived to be in real life. Most likely, the largely European audience that viewed *Burial Place of Hone Heke, Bay of Islands* would have understood this message quite clearly.<sup>61</sup>

Sharpe employed other compositional techniques to articulate environmental anxiety. In *A Golden Eve, Waiheke Island* [Hauraki Gulf] (1885), two Maori survey a deforested scene. Stumps of kauri lie scattered in the gully and contrast with the trees growing in profusion on the valley sides. The cause of deforestation is unknown, both to the viewer and, perhaps, to the Maori – the outstretched hand of one could be a gesture of lament and wonder as to its cause. Like the depiction of Maori in *Burial Place of Hone Heke*, those portrayed in *A Golden Eve* are a benign, passive presence in marked contrast to other works such as Sharpe's watercolour *Among the Kauri, Castle Rock, Coromandel* (1884), which depicts two European timber cutters about to take an actively destructive role in environmental transformation.

Similar environmental anxieties over the fate of native nature, though not native people, are evident in Sharpe's Australian works. Sharpe's painting *The last dying remnant of the grand ti tree forests, between Adamstown and the Glebe* (1901, Figure 3.2) laments the heedless destruction of an area which, as he writes on the painting, 'should have been preserved and reserved as a fine park when the Government appropriated our 3000 acre reserve'.<sup>62</sup> Image reinforces the message of the title. Sharpe depicts an environment undergoing transition. Tree stumps litter the foreground. Introduced cattle scramble through now opened-up land. The clump of bush in the middle ground and the misty forest in the background, right, indicate a once dark, extensive and dense forest only recently reduced in size. Cattle symbolise the introduction of European stock,



Figure 3.2 Alfred Sharpe, *The last dying remnant of the grand ti tree forests, between Adamstown and the Glebe, 1901*

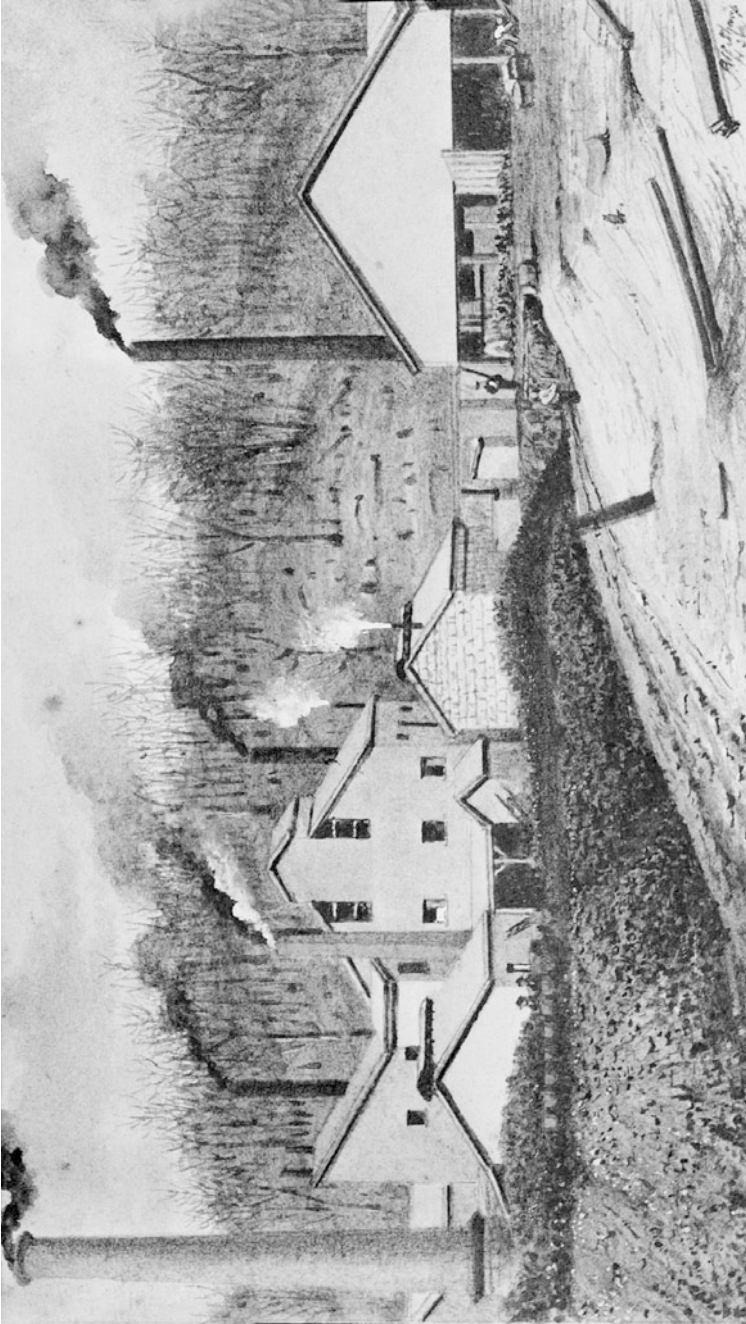
a major motive for Australasian deforestation, as forest was cleared for pasture and stock grazing.<sup>63</sup> In the right of the middle ground is perhaps evidence of what the hewn wood became: fence posts and timber for housing. The neat, regular and organised open spaces of the gardens of these colonial houses in the middle-foreground (right) and the house and garden (on the top left), also demonstrate the coming of European farming practices. In other hands – and without the benefit of Sharpe’s written record – bush clearance like this could easily be interpreted as a celebration of the taming and civilising of wild woods through the establishment of settler farms.

A remarkably graphic illustration of Sharpe’s aesthetic anxiety is an illuminated address prepared for the departing manager of the Sulphide Corporation smelting works at Cockle Creek, Newcastle. *Near View of Smelting Works, with Several Men at Work, 1902* (Figure 3.3) is arguably Sharpe’s most devastating critique of environmental destruction. It portrays an utterly despoiled landscape closely comparing with photographs taken two years after Sharpe painted the illuminated address (Figure 3.4). Scattered like upright corpses across a blasted landscape, dead, skeletal trees are consumed by the toxic fumes pouring out of the factory. A contemporary’s letter expresses the scene, as well as the contempt that many of the factory owners had towards the frightening environmental consequences of aluminium production. In 1896, H. L. Gibbs, a supporter of the project, told 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.<sup>64</sup>

What would have made the destruction so deplorable to Sharpe were his religious beliefs, which accorded forests high aesthetic value as places ‘Where man’s foot hath seldom trod’, and ‘as natural cathedrals created by God’.<sup>65</sup> Sharpe’s concern for destruction of what he regarded as untouched nature reflected the value romantics placed on the natural world as a sanctuary from the perceived artificiality and corruption of urban living. This sentiment is particularly strident in Sharpe’s poem, ‘Earth is Fair’ (1888), which acknowledges that ‘man, His creation, hath dimmed’ the ‘bright tone’ of the natural world created by God.<sup>66</sup> As noted, Ruskin employed similar arguments, contrasting the pure and wonderful aspects of nature with the polluting and de-humanising features of modern living.

Central to Sharpe’s aesthetic anxiety was a determination ‘to give a vividly truthful and exact representation’ of scenes. Writing of the *Burial Place of Hone Heke*, he noted that ‘I flatter myself that they were as close reproductions of the scenes as is possible on paper’.<sup>67</sup> Roger Blackley





*Figure 3.3 Near view of smelting works, with several men at work, 1902*



*Figure 3.4 Ralph Snowball, Sulphide works at Cockle Creek, 28 March 1903*

notes, concern for accurately rendering nature is a key characteristic of Sharpe's artistic style.<sup>68</sup> The importance of such 'close reproductions' to his environmental protest is evident in his description of *Entrance to Cadman's Creek, Coromandel* (1880). In a later newspaper description of this image, Sharpe drew attention to the burnt off bush he depicted, highlighted where new life was springing up, described the effects of flooding on the landscape and labelled each New Zealand plant in the scene.<sup>69</sup> To achieve this accuracy, Sharpe followed the maxim of Ruskin who urged artists to study nature and to join natural history societies.<sup>70</sup> Sharpe belonged to the Field Naturalists' Club, which undertook botanical excursions in the Auckland area.

### Coming to terms with the Australian environment

By moving from Auckland to Newcastle in 1887, Sharpe came into contact with a different kind of environment, one that could not be fitted as easily into European aesthetic concepts as parts of northern New Zealand. In contrast to New Zealand, many mid-nineteenth-century European colonists found Australia's bush and animals unusual and ugly, even inexplicable. Trees losing their bark, not their leaves, perplexed some colonists, as did the topsy-turvy nature of the seasons and the seemingly inexplicable creatures that lived there.<sup>71</sup> Its nature posed aesthetic quandaries to some nineteenth-century European artists in Australia. How could they depict something so different, *so very* Antipodean, using existing aesthetic conventions developed in Europe? As naturalist and artist William Swainson (1789–1855) confessed to his son in 1851 while travelling north of Sydney:

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-withered, sickly looking stunted trees, almost defying the artist to make anything tolerable of such subjects.<sup>72</sup>

Sharpe overcame these issues by fitting parts of the Australian landscape into the same picturesque convention that he used in northern New Zealand. In 1890, for instance, he republished, 'Hints for Landscape Artists in Water Colour', but gave it an Australian bent, usually by substituting references to New Zealand with those of Australia or Australasia.<sup>73</sup> Where the New Zealand and Australian versions differ most markedly, however, is in the final section of the Australian version. This Sharpe

totally rewrote. In the Australian version, Sharpe discussed the character of the Australian bush, including naturalism and geology, the means of painting trees and some admired painters. To a certain extent, this work challenged some earlier settlers' dismissal of the bush by rhapsodising over its qualities. 'Comparatively few among you', he wrote, 'have seen the real glory and grandeur of the Australian bush'. Particularly beautiful, he noted, were the 'secluded mountain gorges' supporting a variety of different species.<sup>74</sup> Yet his aesthetic only went so far. Like most artists, Sharpe only painted on the coastal littoral; only later did European artists in any great numbers appreciate or venture into the interior and discover its 'red centre'.<sup>75</sup>

Since Sharpe appreciated variety in both scenery and plants, he disliked the 'open gum forests around' Newcastle, finding them 'unutterably wearisome in their unchanging monotony'.<sup>76</sup> This attitude probably invoked him, in 1895, to recommend using 'the illimitable quantities of timber at our doors', either for paving Newcastle's streets or for exporting overseas.<sup>77</sup> Sharpe advocated the use and destruction of eucalyptus timber probably because these trees could not be aestheticised into his European artistic conventions quite as easily as New Zealand's. Sharpe's views bear out Caroline Jordan's observation of the ambiguity of the picturesque. It could be used, as Sharpe did, to criticise environmental destruction but just as easily justify the destruction of areas that did not correspond to certain aesthetics.<sup>78</sup> In India, the picturesque frame also had deeply ambiguous overtones. Early European artists in India often portrayed detailed aspects of Indian life in accordance with the sympathetic portrayal of cultural life in the sub-continent consequent upon Orientalism. Later views accorded more closely with representations of imperial vistas. Sanitised views of Indian life and landscapes appeared, reflecting the British distancing from Indian life evident through fears of its filth and disease (see Chapter 2).<sup>79</sup>

That ambiguity extended to the activities of some Australasian artists. Art historian Tim Bonyhady has highlighted the relatively common practice among artists, including Eugene von Guérard, to have trees cut down to improve a painting's prospect or to create a vista in the middle-ground, creating scenes which corresponded to the picturesque.<sup>80</sup> To gain access to Australasian 'landscapes that had never before been painted', Sharpe explained that he had 'accompanied timber workers' to remote areas of bush.<sup>81</sup> Unlike other painters, however, there is no evidence to suggest that he cut down trees to improve painterly aesthetics, although ironically, his ability to accompany the timber cutters accounts for

the very immediacy, empherality and nostalgic power of many of his watercolours.

### **Painterly techniques and urban beautification**

If Sharpe's aesthetic environmental anxieties stimulated calls to preserve some Australasian forests in rural areas, then they also promoted the same for the urban environments of Auckland and Newcastle. In 1879, for instance, he described 'Beautiful' Auckland as

Thy city of the sea.  
Thy terraced slopes rise swelling from the wavelets  
That murmur unto thee.<sup>82</sup>

Along with many other settlers (see, Chapter 2), Sharpe believed that parks and plants would improve city life. As with his writing on rural areas, he recommended the reservation of existing aesthetically pleasing areas, but also believed that humanity could create pleasant areas through tree planting and that they could improve sites through adherence to artistically informed garden designs. Sharpe, as noted, enjoyed contrasts of light and darkness produced by the form of plants and the colour of their foliage experienced in different seasons and times of day. In addition, he appreciated textured leaves and trunks and, crucially, the rarity and age of trees. For Sharpe, the older and rarer the plant, the better. This vision of beauty championed the planting of many Eurasian and American species alongside New Zealand and Australian ones, as well as the protection of unique European and New Zealand trees and the acclimatisation of New Zealand species into Newcastle. It also acknowledged his debt to Ruskin, through Sharpe's criticism of the destruction of anything he considered beautiful.<sup>83</sup>

Sharpe believed that public gardens and judicious plantings could further improve already pleasant urban areas. Garden-making and ornamental planting, as already noted in Chapter 2, took place in India's hill stations to improve their healthiness and appearance. With a hardening of racial attitudes towards Indians and the move away from Orientalism over the nineteenth century, many British developed gardens which promoted the growth of English trees, plants and garden designs, though they sometimes incorporated and adapted elements such as the Bengal colonial bungalow as well as existing ruins and views.<sup>84</sup> Garden design and tree planting also formed a crucial element in the making of New Delhi under Edwin Lutyens (1869–1944). From the late-nineteenth century,

in fact, British officials had made sporadic attempts to re-forest, in particular, the southern and northern portions of the Delhi Ridge surrounding that city. They wanted to improve the aesthetic appearance of the barren hills, increase rainfall, diminish erosion and improve health. Under Lutyens, that vision progressed further. Urban tree planting defines New Delhi. Vegetation offset the formally laid-out imperial buildings and served as the city's 'green lung', while the design incorporated views of old ruins and former centres of power.<sup>85</sup>

Gardens provided places in which to exercise, to enjoy nature and offered important health benefits. To this end, Sharpe submitted a number of designs for public gardens in both Auckland and Newcastle, although only in the latter were they implemented. These designs promoted both 'wild' and more overtly controlled nature. In 1880, for instance, Sharpe urged the Auckland Domain Board, with whom he had previously clashed, 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'. He implored the Board to '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'.<sup>86</sup> His recommendations followed European garden preferences for laying out scenery that appeared wild and romantic.<sup>87</sup> He also followed the lead of some English landscape protection societies and individuals, who sought to have special areas of wild forest and common ground preserved in cities. To these groups, gardens had a regenerative effect on individuals worn down by the artificiality of city life.<sup>88</sup>

The manner in which romanticism shaped European park making in the nineteenth century differed by region. In many parts of Germany, for instance, romanticism promoted a fierce desire to celebrate the goodness and purity of an imagined 'German' culture and its homeland through the preservation of historical sites and areas of nature.<sup>89</sup> In Australia in 1884, the Kalizoc Society attempted to preserve what it considered beautiful and healthy around Melbourne, Victoria,<sup>90</sup> while early in the 1860s in the New Zealand city of Dunedin access to parks became an issue of settler rights.<sup>91</sup> And, as already noted in this and the previous chapter, urban re-development occurred in many parts of India, most famously perhaps in New Delhi, often accompanied by a desire to incorporate romanticised Indian ruins in the view. In the development of such societies, divisions often developed between nature protection and urban improvement.<sup>92</sup> Sharpe, however, 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 other 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, setting native and introduced species in European-style gardens. In Melbourne's Botanic Garden, for instance, Guilfoyle fashioned a remarkable ensemble of sub-tropical plants within a more traditional aesthetic.<sup>93</sup>

Sharpe's promotion of urban conservation and improvement complicates present understandings about early New Zealand urban conservation. For Paul Star and Lynne Lochhead, urban preservation societies – the first of which emerged in 1888 – marked the beginning of urban conservation in that colony.<sup>94</sup> Sharpe's endorsement of protection for both introduced and indigenous plants in the 1870s, however, predates the formation of these groups while his views of the importance of both indigenous and introduced nature complicate the interpretations of historians who see conservation as springing largely from interest in indigenous nature.<sup>95</sup> The example of Sharpe, together with the urban reforms discussed in Chapter 2, present a more nuanced picture of colonial environmental views.

As well as promoting 'wild' nature, Sharpe delighted in the pleasure garden. 'The walks are to a pleasure ground', he declared of Albert Park (Auckland) in 1880, 'what the foundation is to a house'. 'All planting', he stressed, 'must be done in unison with these' guidelines 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, and give adequate provision for seating. He recommended the planting of conifers along with 'many of our New Zealand trees, which from their size, beauty, and variety of form, and rich verdure ... are unrivalled'. He favoured deciduous trees for aesthetic and practical reasons since

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.<sup>96</sup>

Sharpe believed that the park would satisfy 'the lover of flowers' while also providing a place 'where the invalid can breathe a little fresh air, mingled with the perfume of the surrounding flowers'.<sup>97</sup> Sharpe's no-longer-surviving design closely followed artistic principles. He sought winding walks and varied plantings to open out views over Auckland's

Waitemata Harbour; he stressed the importance of different hues and textures of foliage for their pleasing aesthetic effects; and he believed that parks offered health benefits. Such aesthetic appreciation mirrors Sharpe's famous watercolours, which illuminate their creator's delight in the detail of nature and in capturing the play of light through branches. Like his paintings, too, Sharpe's aesthetic garden vision eschewed what he called 'villainously regular and mathematically equidistant planting'.<sup>98</sup>

Sharpe's designs followed the principles of Humphrey Repton (1752–1818) in upholding the importance of prospect, and in promulgating the axiom that art should prevail over nature.<sup>99</sup> Repton's influence probably reached Sharpe through one of Repton's best-known followers, Sir Joseph Paxton (1803–65). The phenomenally multitalented Paxton designed Birkenhead Park, England, which Sharpe visited and appreciated as a youth. Created by Paxton from 125 acres of low-lying swampy land, Birkenhead Park inspired other park-makers, including Frederick Law Olmsted (1822–1903), designer of New York's Central Park. Birkenhead Park incorporated dark glens, great varieties of plants, trees set in meadows, ornamental buildings and archery grounds all inter-crossed by winding paths.<sup>100</sup> It was an aesthetic that also appealed to Sharpe's contemporaries in Australia.<sup>101</sup>

### **Designing parks: Newcastle**

Sharpe brought the same landscape aesthetics from England and New Zealand to Newcastle. Shortly after moving there in 1887, he enjoyed considerable success in local design competitions, ending up designing or re-designing all of the major parks in the Newcastle area. Although, sadly, the original designs have been lost, it is still possible to reconstruct them from contemporary descriptions and photographs.

In August 1890, Sharpe won the Newcastle City Council tender for improving the 38-acre Hill Reserve (then also known as Upper Reserve, but now called King Edward Park).<sup>102</sup> In the 1890s, Hill Reserve bustled with activity as many of Newcastle's sports teams competed on its grounds, its popularity no doubt enhanced by proximity to the beach and fine views over the Pacific Ocean.<sup>103</sup> A description of Sharpe's successful design appeared in the *Newcastle Morning Herald* in 1890. His 'very simple' plan, noted the report, continued existing paths and created new ones. One 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' before finishing in a broad sweep 'round the other side of the



valley' and joining 'the main path at the cliffs'. A third path formed 'a promenade overlooking the entire park', affording the walker 'fine ocean views'. 'Every part of the reserve that will give the slightest shelter is utilised for tree planting'. Three dams, each 10 feet high (3 m), formed three ponds. Each would 'be stocked with fish, and planted with choice waterlillies', and ringed by 'thickly planted ... 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 and the 'wild' garden. The top of the reserve contained an 'upper lawn ... levelled and turfed'. Near the gully, a romantic dell emerged. Densely planted trees overhung the path. Sharpe's love of the pohutukawa (*Metrosideros excelsa*) was evident, with some 800 trees of this species planted through the reserve.<sup>104</sup> These plantings, coupled with winding paths, demonstrate Sharpe's debt to Paxton and Repton, and illustrate the application of his English and New Zealand aesthetic to Newcastle. While period photographs of Hill Reserve do not do justice to Sharpe's designs, they nevertheless demonstrate the winding paths and formal layout of the upper section of the reserve that adhere to Sharpe's design principles (Figure 3.5). (In the photographs, the ground appears bare because the trees are young.<sup>105</sup>)

### Aesthetic campaigns

Sharpe's campaigns to improve urban areas also involved stinging attacks on those whom he regarded as polluting the environment and destroying art. Following Ruskin's criticism of the destruction of things of beauty, Sharpe, in 1876, for instance, attacked on aesthetic grounds 'the substitution of karaka trees [*Corynocarpus laevigatus*] for the fine old oaks [*Quercus*] so wantonly destroyed in [Auckland's] Government House 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.

Oak trees harboured strong memories. '[E]ndeared to us by old associations as reminiscences of old England', he observed, they have 'taken 25 years to grow ... are unique in the colony and irreplaceable in our generation, while karakas ... can be seen by groves any day, in many



Figure 3.5 King Edward Park (formerly Hill Reserve)

parts of the country'.<sup>106</sup> Sharpe valued trees because of their appearance and rarity and because they symbolised past memories. As Simon Schama and others have shown, Europeans imbued trees – and particularly oaks – with strong symbolism.<sup>107</sup> Sharpe wanted the particular oak grove at Government House preserved because of its uniqueness and because it evoked thoughts of home.

Another campaign in which Sharpe became embroiled makes even clearer the inspiration of Ruskin for his environmental anxieties. In 1884, Sharpe highlighted the 'arboricultural controversy' over trees along Hobson Street, Auckland, lashing 'The arboricides [*sic*]' for claiming 'that the trees are a nuisance and obstruct business'. Sharpe supported 'the oppositionists [*sic*]', who saw them as 'things of beauty, and joys forever'.<sup>108</sup> Sharpe also drew attention to rumours that 'the fine old poplars' at St Paul's Church would be destroyed, imploring city authorities 'to spare those two trees, which are the finest and the oldest in the province'.<sup>109</sup> Nearly six months later, Albin Martin (1812/1813–88), a fellow artist and, ironically, one of Sharpe's most trenchant critics, chimed in about the fate of those trees.<sup>110</sup> Martin protested against their destruction, as they 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.

Explaining their historical importance and significance to Christian and English history, Martin ended with a swipe at the 'ignorance and bad taste' of those who had felled the poplars.<sup>111</sup> Martin's words pricked Sharpe into action; Sharpe called their removal 'an act of unmitigated vandalism'.<sup>112</sup>

Campaigns like these highlight the extent to which battles were being fought over the appearance and management of city environments long before the establishment of formal urban protection societies in Australasia. They also highlight the centrality of artists and artistic conceptions to the formulation and articulation of anxieties over land use in parts of urban Australasia. And they demonstrate the complexity of Sharpe's attitudes towards introduced and native nature. His criteria for the preservation of one or the other relied on a complex aesthetic matrix made up of the appearance, age and provenance of a species rather than whether the species was native or introduced, as would be understood in contemporary Australia and New Zealand. Sharpe's

ideas reinforce the importance of local and international factors in shaping both aesthetic environmental anxieties and settler nationalism. Essentially local in vision, although sometimes national in appeal and international in inspiration (as demonstrated below by his appeal for New Zealand to follow the example of Yellowstone, the world's first national park), Sharpe only campaigned for the conservation of those localities in New Zealand and Australia that he knew. In 1886, for instance, Sharpe wrote imploringly to the *Observer and the Free Lance* of the need to protect kauri trees from the 'short-sighted greed of landed proprietors' on the Waitakere Ranges near Auckland.

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.<sup>113</sup>

Sharpe changed his occasionally New Zealand nationalist appeal in Australia. As noted, he re-published 'Hints for Landscape Artists in Water Colour' and gave it an Australian or Australasian bent by substituting references to New Zealand with those of Australia or Australasia.<sup>114</sup> His 1901 watercolour, *The last dying remnant of the grand ti tree forests, between Adamstown and the Glebe*, was described as an area 'which should have been preserved and reserved as a fine park when the Government appropriated our 3000 acre reserve'.<sup>115</sup>

## Conclusion

Interpreting deforestation around Auckland and later Newcastle through the lens of romanticism and specifically the ideas of Ruskin, Sharpe's views demonstrate the importance of existing and changed local environments in generating aesthetic anxieties. They reinforce the close connections colonists made between aesthetics, health and conservation and, not least, demonstrate the need for environmental historians to study urban environments alongside rural ones. Urban environmental

history, when examined alongside processes of rural landscape change, can provide a richer understanding of conservation history. After all at one level, the idea of national parks extended the idea of the garden as a reserved area bounded by clearly defined geographical limits. Historians of Australasian urban protection also need to take into account the sophisticated aesthetic anxieties of settlers like Alfred Sharpe. Sharpe reveals that urban beautification and design, resting on normative assumptions of the innately 'natural' healthiness, beauty and productivity of particular environments, took place much earlier and on a more complex scale than hitherto acknowledged. Sharpe's views reveal the complex aesthetic criteria – rather than any necessarily simplistic division between native and non-native – guiding settler decisions about urban and rural environmental transformation and conservation. His anxieties also illustrate how certain environmental ideas of imperial careerists changed while others remained consistent as they moved from one region to another. The next two chapters will examine environmental anxieties expressed by two different groups of scientists and will explore their role in the development of institutionalised responses to deforestation in Australasia and India.

# 4

## Scottish-trained Doctors Environmental Anxieties and Imperial Development, 1780s–1870s

[F]rom ... Edinburgh University there have been sent forth men who have occupied most distinguished positions in the botanical world.<sup>1</sup>

J. H. Balfour, 1869

This chapter examines the environmental anxieties Scottish-trained doctors<sup>2</sup> expressed about the impacts of deforestation on colonial development in India and Australasia as well as the influence of locality in modifying the bureaucratic responses which developed. Assessing whether the Indian experience was mirrored in colonial New Zealand and Victoria, this chapter argues that less acceptance of government intervention in society in the settler colonies as well as differential experiences of deforestation meant that Scottish-educated doctors did not have the same impact in Victoria and New Zealand as they did in India. The prior existence of the IMS provided a ready-made source of environmental experts who, from the late-eighteenth century, identified the impacts of deforestation and, from the 1840s, contributed to the development of India's fledgling forest bureaucracy. The Scottish-educated doctors' differential influence is best attributed to their sound scientific education and numerical preponderance, together with the particular forms of government in India, rather than to any ethnic inclination towards conservation (which Richard Grove and others have contended). This chapter also argues that conservation also must be understood as an attempt to further colonial development. Forest reservation and management was designed to protect agriculture from droughts, soil erosion and flooding and, not least, to meet the increasing demands for timber by a burgeoning colonial economy. Furthermore, foresters presented the development of plantations in agriculturally useless areas as an efficient use of otherwise 'waste' areas.

## Historiography

Scottish-trained scientists were the backbone of empire, staffing bureaucracies in medical sciences, engineering, surveying, botany and forest conservation, and leading the charge for the more efficient exploitation of nature.<sup>3</sup> Richard Grove has argued that, from the eighteenth century, doctors educated at Scottish universities helped to kick-start forest conservation and natural history in India.<sup>4</sup> For Grove, Scottish-trained doctors 'were especially receptive to a mode of thinking which related the multiple factors of deforestation, water supply, famine, climate and disease in a clear and connected fashion'.<sup>5</sup> Expressing a series of environmental anxieties, ranging from deforestation-induced rainfall decline and temperature increase to soil erosion and a timber famine, these doctors urged the EIC to prevent deforestation and mitigate the effects of famines. In doing so, Grove has charged, they laid the foundation for state forest management and a forest bureaucracy – the IFS.<sup>6</sup>

This chapter revises some of Richard Grove's general arguments about the role of Scottish-educated doctors in colonial India. As well, it tests them in relation to two areas he did not examine, the colonies of New Zealand and Victoria. First, extending Richard Drayton and Ravi Rajan's work,<sup>7</sup> this chapter argues that Scottish-educated doctors played a prominent role in colonial development, of which forest conservation must be understood as part. This finding challenges Richard Grove's interpretation that forest conservation represented a radical critique of colonisation. Instead, I demonstrate that forest conservation was a quest for efficient resource management, one imbued by both moral and economic arguments. Second, this chapter extends Grove's analysis of Scottish doctors working in India to consider the roles played by those working in New Zealand and Victoria. Examination of these two Australasian colonies applies Grove's general hypothesis to colonies beyond his area of study (India), an approach that points to the importance of locality in the modification of experiences of similar groups across empire. In addition to modifying Grove's emphasis on education and questioning any ethnic Scottish tendencies towards conservation, a focus on Victoria and New Zealand illustrates the importance of local factors in accounting for the different experience of Scottish-trained doctors in empire. Their numerical dominance over English graduates until the 1880s, the importance of local environmental experience, the timing of settlement and scientific specialisation and, in particular, political culture all contributed to the differential impact of Scottish-educated doctors across Victoria and New Zealand. As outlined in

Chapter 1, a stronger bureaucracy developed in India. Many members of this bureaucracy, as Roy MacLeod notes, ‘took up science as an avocation’ and, supported by the utilitarianism taught at Haileybury College, encouraged the application of state science to address India’s problems.<sup>8</sup> As a consequence, Scottish-educated doctors built upon already existing political justifications of the state management of resources to extend this to forestry. By contrast, in New Zealand, although several prominent Scottish-educated doctors articulated environmental anxieties, their calls did not lead to long-term bureaucratic solutions through the establishment of a forestry department. Victoria was different again. There, no evidence emerges of Scottish-trained medics articulating environmental anxiety.

### **Medical training and environment**

For much of the nineteenth century, as explored in Chapter 2, doctors believed in the power of environment to generate disease. Even by the late nineteenth century with the increasing popularity of germ theory, medical practitioners continued to rely upon environment as a palliative. Nineteenth-century medical education impressed on students the connection between environment and health. Botanical study provided crucial information about medically useful plants (*materia medica*). Botanical gardens developed to extend knowledge of plants and to provide medicinally valuable plants.<sup>9</sup> Although most doctors received some training in *materia medica*, and perhaps, too, natural history, Edinburgh’s medical curriculum was especially thorough in this respect. It required students to spend three months of their training studying both natural history and botany.<sup>10</sup> After 1833, Edinburgh University made natural history compulsory for medical students taking the degree of MD (physician).<sup>11</sup> In their natural history studies, medical students received instruction at the Royal Botanic Garden Edinburgh (initially called the Physical Garden), established in 1670.<sup>12</sup> Balfour, Professor of Medicine and Botany at Edinburgh and Regius Keeper of the Royal Botanic Garden Edinburgh, explained its significance. ‘In all stages of its existence’, he wrote, the Royal Botanic Garden ‘has been associated with the Chair of Botany, and the University course of lectures has been conducted more or less completely within its precincts’.<sup>13</sup> As well as relying on specimens and drawings from the Museum, the garden provided a venue for botanical demonstrations and a site for daily lectures in its 300-seat lecture theatre. Every Saturday, students left their classroom to go on a botanical excursion, as well as, occasionally, on longer trips of two to



three days' duration. At the conclusion of the teaching session, an 8- to 10-day excursion took students into the countryside, where they received instruction in the basics of plant preservation and processing, and 'of making observations on the geographical distribution of plants and the soils and localities [in which] they grow'. Anatomical and physiological research also took place in a room specially 'fitted up for the purpose in the Botanic Garden'.<sup>14</sup>

A succession of prominent medical graduates from Edinburgh and Glasgow universities furthered the teaching of natural history or pursued botanical studies in the Empire. As Grove notes, professors John Hope (1725–86; Regius Chair of Botany, Edinburgh University) and William Hooker (1785–1865; Professor of Botany, Glasgow University, and later Director at Kew Gardens) both 'advocated rigorous field observation, holistic approaches to nature and tree-planting programmes' to their medical students.<sup>15</sup> Hope, Grove points out, 'popularized the Linnaean school of botany among his students'.<sup>16</sup> Hope's perspective reflected the liberal borrowing of medical classifications of disease from those developed for botany by Carl Linnaeus (1707–78) in plant classification.<sup>17</sup> Institutional connections, either through the maintenance of contacts with former classmates or those established through having attended the same university, meant that Scottish-trained medics continued to exchange ideas and plants, theories and even complaints, despite having dispersed to different parts of the Empire. Joseph Hooker (1817–1911), for instance, corresponded with Edinburgh graduate James Hector (1834–1907), in New Zealand, for over 30 years, complaining to Hooker about the 'boshy Botany' presented by another fellow Edinburgh graduate, William Lauder Lindsay (1829–81).<sup>18</sup> Joseph Hooker also encouraged natural history among many of his fellow graduates through his role as Director of the Royal Botanical Gardens, Kew (see below).<sup>19</sup>

In addition to the networks established at university, the thoroughness of Scotland's university medical training – and that provided by continental European institutions in science (Chapter 5) – contrasted with the situation in England. Until the later decades of the nineteenth century, most English institutions lagged significantly behind Scotland's education-system. In place of Scotland's rigorous and prescriptive scientific education, English universities offered students a general, rather than a strict, scientific grounding. An English education commonly emphasised language mastery and classical learning. Cambridge medical students, for instance, could decide how and what knowledge to acquire. In the early-nineteenth century, this prepared them well for serving the upper classes but not to meet imperial needs for scientifically

trained men. Those who attended Scottish and Irish medical schools perceived English graduates as wealthier. Also – most crucially – the numbers of English graduates remained small until the 1860s.<sup>20</sup> My argument here is not that English-trained doctors contributed little to natural history. As the work of John Pearn, Sujit Sivasundaram, myself and John Stenhouse and others reveals, throughout colonial India, Australia and New Zealand natural history was immensely popular, with many English parson naturalists as well as doctors contributing significantly to its development.<sup>21</sup> Rather, I suggest that when it came to providing the specific scientific skills demanded in the far-flung British Empire in the mid-to-late-nineteenth century, administrators favoured Scottish-educated doctors and those trained in German-speaking lands and northern Europe (Chapter 5) over English graduates. These graduates three possessed a more thoroughgoing and practical education than many of their English-trained scientific counterparts and readily obtained positions in India, New Zealand and Victoria for most of the nineteenth century.

Indeed, the staggering number of Scottish-educated graduates matriculating each year added significantly to existing pressures on limited and poorly paying private medical practices in Scotland. In the period from 1846 to 1855, for instance, the universities of Oxford and Cambridge respectively matriculated 17 and 61 graduates of medicine, the University of London 241. By contrast, in that same period 594 (all MDs) graduated from Edinburgh University alone.<sup>22</sup> An indication of the numbers of Scottish-trained doctors in Empire can be gleaned through those working in imperial medical administration and medical registers. As Mark Harrison's research on the IMS reveals, in the period of 1839–60, 53.3 per cent of that service's medical recruits came from Scottish medical schools, teaching hospitals or universities. Edinburgh University graduates dominated, accounting for 38.6% of that total. By contrast, not quite one third (31.2%) of IMS recruits came from English education institutions. Although in the period from 1860 to 1880 the intake of IMS medical recruits trained in Scotland dropped to less than a third, Edinburgh graduates still monopolised the senior positions in the IMS. Between 1897 and 1914, 27% came from Scottish institutions, but by this time their prominence had been overtaken by doctors educated in England, who in this later period constituted 53.6% of all IMS doctors.<sup>23</sup> In New Zealand in 1871, medical practitioners trained in England (49%) actually outnumbered those who had received their medical education in Scotland (38%). As in India, the pattern changed over the course of the late-nineteenth and early twentieth centuries.

By 1922, New Zealand-trained doctors dominated that country's medical profession (46%), with both Scotland (27%) and England (20%) falling behind.<sup>24</sup> In Victoria between 1850 and 1901, Scottish graduates monopolised the medical profession among those with degrees from British institutions. Scottish graduates accounted for 645 (representing 85%) as opposed to 68 English degrees (9%) of the 755 doctors registered before 1901. Among licenciates, fellows and members, those from Scottish institutions (46%, from a total of 1415) marginally outnumbered those from England (39%, from a total of 1188). These figures are indicative only. They do not, for instance, reflect those who held two or more qualifications from different institutions. A sample between 1876 and 1880 revealed that 18.5% of registered doctors in Melbourne held qualifications from different institutions, with the most common combination comprising either a Scottish and an English licence or a Scottish degree and an English licence.<sup>25</sup> The figures also do not reveal change over time, with the growth of the Medical School at Melbourne University providing increasing numbers of graduates from the late-nineteenth century.<sup>26</sup>

Social and political factors also stimulated the migration of medical graduates from Scotland. Limited job opportunities, coupled with the appalling social and environmental problems associated with industrialisation, accounted for general migration, including that of medical doctors. More specifically, despite the 1858 Medical Act in principle providing opportunities for Scottish medical graduates to practice south of the border, in reality the many Scots who lacked the social networks and capital of English-trained doctors faced institutional and ethnic prejudice to successfully earning a living in England. This, combined with the uncertain income provided by Scotland's notoriously low medical fees, prompted the migration of many Scottish-educated doctors.<sup>27</sup>

## **Empire, medicine and natural history**

Empire, especially in India, opened up many employment opportunities for medical graduates beyond the practise of medicine itself. As the nineteenth century lengthened, the benefits science offered for the exploitation of colonial environments became more widely recognised. Imperial medical bureaucracies and those in allied sciences grew accordingly. This was especially true of the IMS over the course of the nineteenth century. Its staff increased both in numbers and in their professional qualifications.<sup>28</sup>

In India and New Zealand, Scottish-trained doctors were some of the earliest to express environmental anxiety about the effects of deforestation. Through learning from the mistakes made at other times and places, they believed that state scientific management of forest resources would help to develop colonial nature and ensure continued economic development. In India, Richard Grove and others have extensively discussed the role of Scottish-educated doctors in forest conservation. Here, I use selected biographies<sup>29</sup> to demonstrate that far from the radical critics of conservation Grove presented, these Indian medical foresters' aim of scientifically managed forests represented another version of colonial development, albeit one also premised on the principles of state-directed resource use and the prevention of the unwanted consequences of environmental change: flooding, soil erosion, and climate-change. Environmental anxiety gave their arguments urgency, with science helping also to legitimate their claims to knowledge and authority. Of those articulating such concerns, Grove has identified a group of early medical conservationists in India, all active roughly before 1860. This included William Roxburgh (1751–1815; surgeon, Edinburgh), Alexander Gibson (1800–67; surgeon, Edinburgh), Hugh Falconer (1808–65; MD, Edinburgh), Edward Balfour (1813–89; surgeon, Edinburgh) and Hugh Cleghorn (1820–95; MD, Edinburgh).

Mixing utilitarian concerns with near messianic arguments about the likely impacts of uncontrolled deforestation on climate, timber supply, soil erosion and flooding, these colonial doctors as well as others hoped to persuade the EIC to reserve forests. Initial forest conservation – achieved both by indigenous rulers and, later, by Company officials – took place in the late eighteenth and early nineteenth centuries amidst concerns, in particular, about the need to secure adequate supplies of timber spars for Royal Naval vessels. Following the loss of Britain's American colonies, coupled with the outbreak of the Napoleonic Wars and a blockade of the Baltic between 1805 and 1822, teak assumed especial importance. The British initially obtained it from the Malabar Coast and, later, from Bengal and Burma, but by the 1840s Scottish-trained doctors and others were reporting on the likelihood of a major timber famine unless government initiated forest management. The likelihood of a timber famine arose, in part, because from the 1820s until the 1850s the EIC relaxed its management of natural resources. Sir Thomas Monro (1761–1827), Governor of Madras, for instance, lifted conservation restrictions, believing instead that market forces could provide for Royal Naval wants.<sup>30</sup> In addition, the British emphasis on

agricultural expansion was placing corresponding pressure on forests. In northern India, for instance, in the Ganga-Jamna Doab, Michael Mann has demonstrated that the expansion of cultivation and the extension of the raising of cash crops had a devastating impact on forests and land more generally. Deforestation resulted in salinisation, the expansion of malaria (sunshine on water storage tanks provided the ideal breeding conditions for mosquito vectors for malaria), greater temperature extremes, soil erosion and timber scarcity.<sup>31</sup> After the mid nineteenth century, railway building expanded under Lord Dalhousie and his successors, placing great pressure upon timber resources, just as the demand for teak for shipbuilding lessened. For instance, by 1860 over 2400 km of railway lines were laid down, equating, as Michael Williams has estimated, to around 2538 ha of cleared forests. A decade later a further 11,300 km of track was laid (equating to about 11,546 ha of cleared forests). By 1900, British India had over 64,600 km of railway tracks, consuming some 52,811 ha of forested land.<sup>32</sup> In addition, India's population increased from 236.5 million in 1850 to 284.9 million in 1900, and 305.4 million by 1920.<sup>33</sup> This not only led to agricultural expansion, encouraged under British rule, but also increased demands for fuel wood, and timber for building as well as other uses.<sup>34</sup> In 1866, for instance, Clement Markham estimated that some 24,281 ha of forest had been cleared in the Western Ghats for tea, coffee and cinchona plantations, resulting in a drier climate and increased soil erosion.<sup>35</sup>

Untrammelled exploitation attracted the ire of many Scottish-trained medics, who began to express environmental anxieties about its effects from the late 1700s, most notably through the work of William Roxburgh on the connection between climate and famine.<sup>36</sup> In doing so, they sought to place forests under systematic management and to ensure a controlled supply of timber that would, they argued, guarantee the state a profit, maintain future timber supplies for railway building, construction and fuel wood, while also protecting its precious agricultural systems from soil erosion, drought and flooding as well as providing a source of famine relief.<sup>37</sup> In expressing these concerns, they were particularly aware of the localised nature of deforestation, furnishing detailed reports on this. These reports referenced some of the latest ideas and examples from continental forestry to support arguments that forestry management made sound economic and environmental sense. The work of Hugh Cleghorn, Alexander Gibson and Hugh Falconer, in Madras/northern India, Bombay and Burma respectively demonstrates the use of local studies supported by the latest continental forest theories.

During his five-year medical education at Edinburgh University, Indian-born Cleghorn developed an interest in botany. Coming back to India in 1841 as a member of the IMS, his interests in economic botany blossomed under the advice of Joseph Hooker, and he was regularly sought out to provide advice on matters pertaining to the natural sciences.<sup>38</sup> Returning to Britain on sick leave, he served as a key member of the body commissioned to report on the timber needs of India. In the report for the British Association for the Advancement of Science (BAAS), Cleghorn and others adopted a carrot and stick approach, pointing out the dangers inherent in unchecked deforestation and highlighting the benefits of scientific management both for ensuring the future supply of timber and for generating revenue. Thanks to his expertise, in 1852 Cleghorn accepted the position of Professor of Botany and Materia Medica at the EIC's Madras Medical College.<sup>39</sup> In his BAAS report, published in 1852, Cleghorn commented on the importance of locality, noting that because in India the 'circumstances of particular districts vary so much in regard to indigenous supply and local demand ... it appears to me impossible to lay down rules which admit of general application'. To support this contention, Cleghorn observed that while wood for fuel still abounded in Malabar and Canara, the jungles of the east coast were 'generally small and stunted', excepting the mangrove forests and Orissa's more luxuriant vegetation.<sup>40</sup>

In 1855, Cleghorn headed Madras' first forest department, energetically surveying the province's forest resources and management needs. His forest reports in that decade reflected concerns about future timber supply and upheld his vision of the centrality of forest management to Indian development. Cleghorn acknowledged the great demands placed upon forests: for railways and firewood, and their use by military (navy and army) and shifting agriculturists.<sup>41</sup> Building railways, Cleghorn warned, 'causes an immense demand for timber, and ... entirely changes the features of the districts through which they pass'.<sup>42</sup> Although aware of these wider changes, Cleghorn's views also cleaved to the practicalities of balancing reservation with local needs. For instance, although viewing shifting agriculture as 'wasteful', Cleghorn recognised its necessity 'to the ailment [*sic*] of certain classes of people'. Thus, rather than a blanket ban, he advocated that it 'should be *greatly limited*'.<sup>43</sup> In areas in which reservation would be impracticable owing to steadily increasing migration, Cleghorn advocated tree planting.<sup>44</sup> On other occasions, he supported the rights of *ryots* to collect fuel wood for their own purposes but not for sale.<sup>45</sup> Climatic and hydrological anxieties also impelled preservation and tree planting. Acknowledging his belief that 'the vast

clearings which have taken place have had a share in producing the irregularity of the monsoon' in Coimbatore, he advocated the importance of giving 'every facility for the cultivation of coffee' but recognised the desirability of limiting 'the clearings of those situations where this peculiar shrub can be grown with advantage'. Cleghorn favoured restricting the extent of clearing for coffee cultivation to 'the extreme range within which coffee planted on a large scale is found to thrive', between 760 m and 1372 m.<sup>46</sup>

In the early 1860s, the Government deputed Cleghorn to investigate the forest resources of northern India, specifically in the Punjab (annexed in 1849) and the Western Himalayas. Overall, Cleghorn discerned extensive deforestation resulting from railway building and 'advancing civilization'. Again, economic considerations underlay the survey. Cleghorn received instructions to describe the forests of those areas, locate 'where the most valuable timber is found' as well as 'enumerate all economic plants' and review existing district rules and legislation in light of the plan to introduce forest conservancy.<sup>47</sup> Except for Hazara, Kangra and Hoshiarpur, Cleghorn found forests in relatively short supply in the Punjab. Even in Hazara, with the exception of Kaghan, he noted, deodar was 'becoming scarce'. Cleghorn also highlighted the so-called Hazara Forest Rules, which relied on the conservancy of local chiefs to control timber felling. Local chiefs, in turn, reported to *thannadars* (police officers) and thence to the Deputy Commissioner. The Hazara Rules allowed villagers with forest rights to cut timber sufficient only for their own uses as well as restricting the cutting of timber by zamindars and the use of fires. They also required local populations without forest access rights to request permission in writing to cut trees.<sup>48</sup> Elsewhere, Cleghorn noted the scarcity of timber, particularly near railways and along rivers, where the timber would have been easily worked out. And, as with Madras, he identified the great demands placed upon timber resources near hill stations such as Murree, in the Himalayas (Chapter 2). On upper slopes of the western Himalayas, where Murree is located, he identified the growth of deodar, *Pinus excelsa*, *Abies smithiana*, three species of oak and chil (*Pinus longifolia*). However, on its lower slopes he found much of the larger timber growing near the station had been removed. Finally, Cleghorn identified likely timber shortfalls in Lahore for projected railway building, and established that existing nearby supplies would likely only last for one-and-a-half more years.<sup>49</sup>

In Bombay, as Richard Grove and others have demonstrated, another Scottish-trained surgeon, Alexander Gibson, had taken a leading role

in the establishment, in 1847, of the Bombay Forest Department, for which he served as Conservator until 1860. In the 1840s he, and others, had highlighted problems of deforestation on the Deccan plateau and in the Eastern Ghats, causing rivers to silt up.<sup>50</sup> In 1841, for instance, Gibson drew attention to the alarming loss of teak on the hills around Bombay.<sup>51</sup> According to Richard Grove, Gibson stressed the problems of climatic decline occasioned with forest destruction as a means of increasing pressure on the Bombay Government to reserve forests.<sup>52</sup> Published in *Transactions of the Bombay Medical and Physical Society*, his 'Report on Deforestation in South Conkan', based on a survey of the area, pointed out the dangers of deforestation not only for erosion and flooding, but also for regional climate change.<sup>53</sup> This, as well as his constant lobbying, led to the establishment of forest conservancy.<sup>54</sup>

Other medical naturalists were also active in reporting on the resources of the provinces of Tenasserim, acquired during the First Burma War (1824–26). In a pattern also evident in India, in 1829 government opened up the forests to exploitation, resulting in a booming trade in Tenasserim's teak forests.<sup>55</sup> Hugh Falconer's 1852 *Report on the Teak Forests of the Tenasserim Provinces* provided a thoroughgoing and up-to-date overview of forest resources. It built on earlier work undertaken by Nathaniel Wallich in 1827 and continued with a series of reports by military officials seconded to oversee forestry resources. Journeying along the main river systems of the region, beginning with the forests on the Weinyo and Zimmé rivers, he reported on timber resources. Although inferior to Malabar teak, Falconer highlighted the forests of the Upper Mittigate as 'the finest forest upon the Attaran rivers'. But he also warned that the forests along the Weinyo and Zimmé rivers 'are in rapid progress of exhaustion'.<sup>56</sup> Indeed: 'So general and indiscriminate have been the felling upon the' two rivers 'that but for the timber' of the reserved forests of Thengan-nyee-Nyoung and Upper Mittigate, 'it would now be a matter of record only, that Teak of large size has ever been produced on the Attaran'.<sup>57</sup> The nearer one went towards the capital of Moulmein, the site of a thriving shipbuilding trade, the scarcer grew the timber.

Falconer also pointed to the particular local distribution and growth patterns of teak. In Tenasserim, he observed, the teak forests 'are not ... extensive tracts covered by a single species of tree', but rather 'composed of many species, of which Teak is by no means the most common or prevailing form' unlike other timber such as sissou or sal. Falconer estimated that teak 'rarely exceeds 1 in 10 of the surrounding trees' while its distribution is uneven and not continuous, being found in belts or



patches particularly along the uplands of the great rivers or along flat areas of the river banks.<sup>58</sup> He also outlined problems with its natural regeneration, but believed that plantations could ultimately succeed in meeting demand.<sup>59</sup> The annexation of Pegu in 1852 as a result of the Second Anglo Burma War, and reports by medico John McClelland (1805–75) recommending state reservation to prevent further forest loss in this province, contributed to the declaration that, through right of conquest, the state would take over the royal prerogative on the control of teak and teak forests.<sup>60</sup>

Cumulatively, the observation of local deforestation by Falconer, Cleghorn and others, and the growing influence of utilitarianism in government, paved the way for increasing provincial and later centralised state acceptance of forest conservation in India. Their lobbying led, as several authors have observed, to what early forestry historian E. P. Stebbing (1860–1960) described as ‘the Charter of the Indian Forests’ promulgated by Lord Dalhousie. Following Pegu’s annexation and concerned at future timber supplies for railway development, Dalhousie stated that government should regard forests as state property that required state control, in effect laying the basis for the first India-wide conservation in the 1860s.<sup>61</sup> By the 1870s, the lead given to forest conservation by this group was increasingly taken over by a coterie of German-trained scientific foresters, accompanied by military officers, who attempted to professionalise the discipline, a process explored in greater detail in the next two chapters. Indeed, as Stebbing recorded, the period overseen by the Scottish-doctors represented a ‘transitory phase’ before greater professionalisation took place under German forest officers.<sup>62</sup> Their concerns also clearly demonstrate, contra Grove, that for Scottish-educated doctors forest management represented a form of imperial development.

## **New Zealand and Victoria**

What, then, of the Scottish-trained doctors who came to New Zealand and Victoria? Did they raise concerns similar to their colleagues in India, and likewise drive the shift to state forest management? Based on Grove’s thesis, one would expect this to be so. Yet the picture is more complex. Rather than expressing environmental anxiety, Scottish-educated doctors in New Zealand, and certainly Victoria, more commonly investigated the natural history of their new homes. In New Zealand, Scottish-trained doctors expressed environmental anxieties in the 1860s, much later than in India, a reflection perhaps of perceptions

of the colonies' inexhaustible forestry resources, later development to India and, in particular, its different political situation. In Victoria, by contrast, Scottish-educated doctors appear to have played no role in forest conservation.

David Monro (later Sir, 1813–77), a well-known member of the famous Scottish medical family and the son of Alexander Monro, Professor of Anatomy at the University of Edinburgh, exemplifies the trend in New Zealand for Scottish-trained medics to examine the colony's natural history. An MD graduate of Edinburgh University in 1835, David Monro barely practised medicine in New Zealand and instead became a parliamentarian. He occupied his spare time with botany rather than forest conservation, his interest in botany originating in study at Edinburgh with Professor Robert Graham, while his fascination with *materia medica* owed much to the influence of another staff member at Edinburgh, Sir Robert Christison, Lecturer in Materia Medica, Dietetics and Pharmacy.<sup>63</sup> Soon after his arrival in the South Island town of Nelson in 1842, Monro spent time 'in the field', as well as keeping up his wider interests in gardening and tree planting.<sup>64</sup> Monro's paper in the first issue of the *Transactions and Proceedings of the New Zealand Institute (TPNZI)* overviewed the botany of the Nelson and Marlborough provinces, discussing deforestation, but making no plea for its prevention, other than noting the 'melancholy' sight 'of dead trees' that 'were formerly masses of cool foliage' and the distribution of forests in the region.<sup>65</sup> As a colonial botanist, Monro corresponded with Kew Gardens, sending plants to Sir William Hooker and, in turn, having plants named in his honour by Hooker's son, Joseph. Despite these connections with individuals concerned at the effects of colonial deforestation, Monro did not articulate environmental anxieties about timber scarcity.<sup>66</sup>

Instead, in these early years of Crown Colony Government (before 1856), New Zealand's colonial administration often relied upon the services of doctors whose medical training equipped them for broader scientific and administrative endeavour.<sup>67</sup> Andrew Sinclair, a doctor and able administrator, enthusiastically pursued botany but not, significantly, forest conservation, despite some evidence of the local impacts of timber removal in northern New Zealand (Chapter 5). Sinclair studied medicine and surgery at the University of Glasgow as well as at both Paris and Edinburgh universities, qualifying as a licentiate in 1818. Joining the Royal Navy in 1822 as an assistant surgeon, Sinclair travelled widely, collecting zoological and botanical specimens for the British Museum and the Royal Botanic Gardens, Kew. Having botanised

in the Bay of Islands in 1841 with Joseph Hooker and William Colenso (1811–99, missionary, printer and botanist), Sinclair returned to New Zealand in December 1843 at the insistence of Governor Robert FitzRoy (1805–65), serving as New Zealand's Colonial Secretary (1844–56). In that time, Sinclair collected botanical specimens for Kew Gardens and corresponded on scientific matters with Richard Owen (1804–92), Charles Darwin and Thomas Huxley (1825–95).<sup>68</sup> It appears that in early colonial New Zealand Grove's model did not apply. Even a Scottish-educated British Army medic, A. S. Thomson, who came to New Zealand after service in India and Afghanistan and who might be expected to express environmental concerns, did not conform to Grove's model. Thomson's interests instead lay in the impact of climate on comparative mortality and morbidity and racial development (Chapter 2).

A similar pattern emerges in colonial Victoria. As Diana Dyson has noted, 'graduates of Scottish institutions made the largest contribution to Victoria's medical profession and to the pool of graduates in the general community'. They figured strongly, she continues, 'in the development of the scientific and cultural institutions of the colony',<sup>69</sup> yet few, if any it seems, played a role in forest conservation. John Pearn's work on Victoria further complicates Grove's argument by demonstrating that Scottish-educated doctors contributed to colonial development through natural history rather than to forest conservation. Two biographies of prominent Victorian medicos bear this out. Edinburgh-educated David Wilkie (1815–85), who graduated with an MD in 1836, for instance, played a significant role in fostering both Victoria's medical profession and the exploration of its natural history. In the latter role, he contributed significantly to the discovery of species new to European science.<sup>70</sup> Another Edinburgh-educated doctor, Daniel Curdie (1810–84), undertook botanical investigation as well as serving as a member of the Government Expedition sent to observe an eclipse in northern Australia.<sup>71</sup> It is difficult to explain why Victoria's Scottish-trained doctors, despite their prominence in the medical and wider colonial community, expressed no environmental anxieties. The possibility that medical men were consumed by the demands of their medical practice in colonial Victoria can be discounted. In the 1880s, contemporaries identified the oversupply of doctors as limiting graduates' opportunities.<sup>72</sup> Several Scottish-trained doctors were also prominent pastoralists. As Stephen Legg is finding, Scottish-trained gardeners dominated tree planting activities, but whether this was prompted by their owner's medical education or otherwise, is difficult to ascertain.<sup>73</sup>

More detailed statistical and biographical research is necessary, it seems, to examine why no Scottish-trained doctor expressed environmental anxiety in Victoria.

One reason may well have been the later timing of forest clearance in that state. Although across Australasia settlement resulted in deforestation, its timing and extent took place unevenly (Figure 4.1).<sup>74</sup> Depredations on Victoria's forests increased just as the influence of Scottish-educated doctors in India and elsewhere waned, with their role in furthering forestry management increasingly falling to continental-trained foresters (Chapter 5). As outlined in Chapter 1, Australia's forests grew densest along the coast, becoming sparser further inland with declining rainfall until eventually thinning out altogether. In environmental terms, forests in Victoria were relatively plentiful, certainly compared to South Australia. Settlement in Victoria also commenced later than NSW or South Australia, dating in effect from the 1830s with squatters moving into Victoria from Tasmania. Over half of Victoria's land area carried forests of various densities, ranging from thicker forest at the coast to mixed woodlands further inland. In the more mountainous regions of



*Figure 4.1* 'Opua Road', near Opunake, looking up towards Mount Taranaki, ca 1900, Feaver Collection

Victoria, alpine and mountain ash predominated, while on the plains a variety of species of gums grew, from stringy bark and red gum, to blue and peppermint gums (Figures 1.9 and 1.10). Although deforestation increased rapidly over the latter decades of the nineteenth century, notwithstanding the depredations on the gold fields, there was still the perception in many quarters until the 1860s that forestland was in plentiful supply in Victoria.<sup>75</sup>

Meanwhile, in contrast with Victoria, deforestation in parts of New Zealand began creating some environmental anxiety. Most notably, the exhaustion of kauri forests in New Zealand's far north attracted the criticism of visiting scientists from as early as the 1850s (see Chapter 5). On its eastern coasts, pre-European deforestation had turned New Zealand's forests to open grasslands. On those grassland plains, particularly in the provinces of Otago and Canterbury, timber was in relatively short supply. The solution was, as in India, to create forest reserves and to license cutting.<sup>76</sup> Contrasting with the relative paucity of forests in these eastern areas, western areas of the South Island and much of the North Island still lay in forests, adding perhaps to perceptions in the popular imagination of the inexhaustibility of timber supplies.<sup>77</sup> These local factors relating to forest distribution had an important part to play in influencing provincial responses to deforestation and timber scarcity, as I explore below.

### **New Zealand's developing anxiety: 1860–1870s**

One of the only Scottish-educated doctors to visit Australasia and South Asia who expressed environmental anxieties was Joseph Hooker. Expeditions of HMS *Erebus* and *Terror* (from 1839 to 1843) to the southern ocean and, later, one to the Himalayas (from 1847 to 1851) helped to cement Hooker's position as a leading light in imperial and British botany, one confirmed when he took over the directorship of Kew Gardens from his father in 1865. As well as producing an astonishing number of works on the systematic botany of many parts of the Empire, Hooker articulated anxiety about the environmental impact of imperial development. Inspired by romanticism, and particularly by the work of Alexander von Humboldt (Chapter 5), Hooker raised concerns about deforestation in eastern and northwestern India causing climatic change, although unusually among his peers he attributed such changes, in part, to natural conditions rather than human causes.<sup>78</sup> Although elsewhere expressing uncertainty about the forests-climate link, in 1868 he feared that Mauritius, like New Zealand and the Western Cape, would exhibit

rainfall decline with deforestation. Underlining the importance of local political factors in influencing the success of bureaucratic solutions, Hooker speculated that solutions might not be readily forthcoming because 'our arbitrary Indian measures would not suit a Colony'.<sup>79</sup> Here, Hooker referred to the greater powers of decision-makers in India than Australasia. Unlike the settler colonies where *laissez-faire* attitudes towards forestry reigned, officials in India were not beholden to public sentiment when making their rulings and, moreover, had greater powers to intervene in resource management thanks to the influence of utilitarianism.

In New Zealand, a few Scottish-trained doctors argued for conservation. They did this much later than in India, possibly because of perceptions of the overall inexhaustibility of New Zealand's forests. *Laissez-faire* policies, as well as provincial mistrust of centralisation, however, restricted the effectiveness of their calls. The careers of two Edinburgh-trained doctors, Lindsay and Hector, illustrate the connections between natural history investigation, medical education, conservation and development. In 1862, Lindsay argued that the 'natural sciences' were 'a distinct *power*' and occupied 'a distinct *place in* [Otago's] *colonization*'.<sup>80</sup> '[T]he systematic, economical, and complete development of her [Otago's] resources', he declared, 'can be effectually accomplished only by the aid of scientific observations and deductions'.<sup>81</sup> Lindsay believed Otago should establish a museum of useful collections of plants and animals and a university with strengths in natural history.<sup>82</sup> Lindsay's statement of scientific imperialism bears out Richard Drayton's eloquent thesis that achieving 'nature's government' over colonies and their resources furthered imperial expansion, the development of state-directed imperial science, and scientific research.<sup>83</sup>

Edinburgh-raised, Lindsay graduated MD in 1852, gaining the prestigious Gold Medal from the Royal Society of Edinburgh for his thesis on lichen.<sup>84</sup> Despite offers of at least one overseas position in botany, Lindsay took up a post at the Murray Royal Asylum, Perth (Scotland), quickly assuming its superintendence.<sup>85</sup> As a student 'most successful' in botany and 'fond' of natural history,<sup>86</sup> Lindsay devoted all of his available leisure time at the Murray Royal – as well as what must have been considerable periods of work time – to pursue his primary love, natural history, particularly of lichens. Myriad other subjects also attracted his interest, including scientific education, geology, women's education, and mental health reform. Lindsay's decision to use medical pursuits as a way of financing his botanical and geological interests was not unusual at the time. As John Pearn notes, in the colonial context, 'the trained

scientific minds of the medical men were invaluable in interpreting and recording the new topographical, geological, botanical and zoological information that was literally on all sides'.<sup>87</sup>

In July 1861, Lindsay left on a short botanical tour. Granted sick leave from the Murray Royal, Lindsay spent three-and-a-half months in Otago, New Zealand, returning to Scotland in 1862.<sup>88</sup> Although brief, Lindsay's time in Otago laid the foundation for many publications. According to historian Warwick Brunton, Lindsay published some 55 papers on New Zealand subjects out of a total oeuvre of around 277 works.<sup>89</sup> This voluminous output reflected the energy he expended on examining the botany and geology of the Dunedin area. Lindsay travelled extensively northwards and southwards from Dunedin but, owing to labour shortages brought on by its gold rush, did not visit Central Otago.<sup>90</sup> Stressing the utility of natural science to colonisation, Lindsay advocated practical measures designed to protect the forest resources of Otago and New Zealand. In 1862, he responded to local concerns about diminishing timber supplies in Otago, by advocating the establishment of an Otago '*Conservator of Forests*' and '*Board of Woods and Forests*'.<sup>91</sup> Unlike many western or southern parts of the South Island, Otago (and Canterbury) as noted, did not have vast forest resources. Those near settlements like Dunedin, or in the vicinity of the gold fields of Central Otago (which had little forest resources at the time of settlement), were rapidly worked out.<sup>92</sup> In 1868, Lindsay returned to the topic in two publications. In *Contributions to New Zealand Botany* he advocated that

[e]vidence 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.<sup>93</sup>

'On the Conservation of Forests in New Zealand' also appeared in 1868. In the first article on state forestry in New Zealand, Lindsay attacked 'colonial governments and colonists' for their 'blind indifference to, or ignorance of, the importance of' forest preservation and the '*systematic cultivation of new forests*'. Recognising both natural and artificial causes, Lindsay charged settlers with 'reckless and improvident, or illegal and culpable timber-felling'. He also rounded on Maori for their role in

deforestation, an early example of a European writer acknowledging Maori agency in landscape alteration. Systematic forest conservation, Lindsay stressed, could also turn to a handsome profit. A New Zealand 'Board of Forests', he hoped, could oversee 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 also become a necessity because 'the present forests are doomed, in great measure at least, to ultimate decay and disappearance'.<sup>94</sup> Lindsay's views followed the popular, but by no means universal, idea that New Zealand plants and animals inevitably succumbed to superior European species.<sup>95</sup> Acclimatising exotics also reflected practicalities. Australian, Eurasian and American trees grew faster than New Zealand species, an important practical consideration for foresters.<sup>96</sup> Tellingly, Lindsay's suggestions for forestry did not generate much interest at either a provincial or national level, his proposed forestry board and its functions in effect pre-empting government policy by three decades. Only in 1896, with the creation of a Forestry Branch, were forest policies implemented on the permanent, nationwide scale envisaged by Lindsay and then only because of a climate more conducive to government-led resource development (see Chapter 6 for more details).<sup>97</sup> In Lindsay's time, neither the political will, nor the funds, existed to underwrite his enthusiastic suggestions.

For Lindsay, forestry exemplified exactly the same imperative operating in his other scientific works. It demonstrated, as he noted in the *Place and Power* (1862), that 'Geology, Botany, and other allied sciences will pay in a young colony, both in a sense of saving and creating revenue'.<sup>98</sup> As discussed, Richard Grove has suggested that forest conservation led by Scottish-trained doctors represented a radical critique of colonial development, yet, as Lindsay and the other practitioners highlighted here demonstrate, contemporaries viewed forest conservation as essential to sustained economic growth, and in India to providing famine relief. Despite a growing sense of the usefulness of science in the Australasian colonies, it primarily extended to the so-called field sciences, including especially the surveying of land and resources, rather than to forest conservation.<sup>99</sup>

In Otago, the discovery of gold reinforced to its fledgling Provincial Government, the potential benefits of the systematic exploitation of natural resources through the employment of scientifically trained men. To this end, in 1861, the Otago Provincial Government established the Geological Survey of Otago. Its first director, James Hector, an Edinburgh contemporary of Lindsay, went on to fill many of the



scientific roles that Lindsay had so ambitiously suggested possibly with himself in mind. As director of the Geological Survey of Otago, Hector helped to accelerate that province's development, overseeing several major geological surveys. But, with eyes on greater things, he moved to the colonial capital, Wellington, to assume the directorship of the Colonial Museum. Swiftly climbing the ladder of New Zealand science, by the last third of the nineteenth century Hector was its most influential practitioner, playing a major role in the dissemination and professionalisation of science, and in the promotion of state-directed scientific development.<sup>100</sup>

In Wellington, Hector's many roles included serving as Director of the Botanical Gardens (Wellington) and overseeing its acclimatisation garden.<sup>101</sup> Hector also pushed for the establishment of the New Zealand Institute (the forerunner of the Royal Society of New Zealand) and edited its annually produced journal, the TPNZI. This journal effectively served as New Zealand's scientific mouthpiece and became an early forum for the scientific community's environmental anxieties (Chapters 5–7).<sup>102</sup> As well as his interests in geology, botany and science, Hector investigated forest resources and expressed anxiety about climatic change and soil erosion. With emphasis placed on railway development and immigration by the Colonial Treasurer, Julius Vogel, concerns emerged of a likely timber famine. Hector emphasised these when, at the 1870 Committee on Colonial Industries, he lambasted colonial authorities for permitting the wholesale and wasteful destruction of forests. Rather than clear felling, he felt selective thinning of forests worked best.<sup>103</sup> Reaching similar conclusions to Lindsay and the Indian medicos, Hector pointed out the devastation and waste of deforestation, probably with the loss of Northland's kauri forests in mind (Chapter 5). 'Large tracts of land in the north of Auckland which naturally possess great capabilities for agriculture', he argued, 'have been rendered absolutely worthless for centuries to come'. Their agricultural potential had diminished, he charged, because newly fired and recently opened bush does 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'.<sup>104</sup>

A few years earlier, Hector had listened to a paper read on behalf of Dr Wjeikof before the Wellington Philosophical Institute, an instance of the growing importance of New Zealand's scientific societies in expressing environmental concerns. Wjeikof's argument that deforestation had increased flooding and drought in Russia drew Hector's support, leading Hector to observe that 'the effects on the climate

produced by the clearing of forests can be observed in this country [New Zealand] without the complications due to distant influences which affect continental climates'.<sup>105</sup> On a more practical level, the New Zealand Government commissioned Hector to undertake surveys of the colony's forestry resources.<sup>106</sup> Later estimates put forward by Hector revealed considerable rates of deforestation consequent upon colonisation. Along with information provided for each of the provinces, Hector, for instance, estimated that forest in Auckland Province had fallen from 24 per cent in 1830 to 7 per cent of the total land area by 1873. Others, such as Otago and Canterbury, revealing the probable impact of private planting and state-encouragement of afforestation, fell less steeply, but had much less forest to start with (see Chapter 6). Canterbury's estimated forest cover fell from 3.5 per cent in 1830 to 2 per cent in 1873, Otago's from 14 per cent to 11.8 per cent over the same period.<sup>107</sup>

Like Lindsay, then, Hector expressed concern about the impact of settlement on New Zealand's forested landscape and its effects on flooding, soil erosion and climate change. And like Lindsay, he promoted the application of scientific ideas to forest management, deploying environmental anxieties as means of supporting more scientific and thus more efficient utilisation of New Zealand's resources. If local evidence of forest problems spurred concerns among Scottish-trained doctors in India and to a lesser extent New Zealand, the relative importance of a favourable political climate impacted strongly on the effectiveness with which doctors could implement their suggestions. As Joseph Hooker had predicted, the *laissez-faire* emphasis in the settler colonies limited state responses to environmental anxieties.

Despite this, favourable political climates – however brief – could emerge in the Australasian colonies (see South Australia in Chapter 5). For instance, in New Zealand Vogel's experiment in state-directed development came to embrace forest conservation, a development which Hector contributed to through his earlier surveys and expertise. In the 1870s, conservation formed an important plank in Vogel's ambitious scheme to kick-start the New Zealand economy. Borrowing heavily, Vogel used money for assisted migration and to develop the nation's railway infrastructure, the latter scheme, of course, requiring vast amounts of timber. Forest conservation also fitted with Vogel's broader principles of economic development. Almost half of the house spoke during the initial debate on a Forests bill introduced by Vogel in 1874.<sup>108</sup> Most supporters of provincial interests vehemently opposed it, not so much because of opposition to the principle of conservation but rather because the bill promised to increase central government

control at the expense of provincial power. Provincial politicians, who were responsible for such matters as health, immigration, law enforcement and the disposal of wastelands, resented the intrusion of central government into their affairs, with particular opposition focused on Vogel's initial debt-for-land scheme. Vogel planned reserving not more than three per cent of the land area of each province for forest growth in return for writing off the one per cent sinking fund provinces paid to the government for railway construction. According to Vogel's model, the revenue earned from forestry would be used to discharge the colony's debt.<sup>109</sup>

Although historians of the Forests Act, such as Graeme Wynn, correctly emphasise that state intervention stood as an affront to the provincial and laissez-faire policies of the day, 22 of the 34 members who spoke during the Bill supported the principles of conservation.<sup>110</sup> Even if they did not favour the establishment of a forestry department, at least they agreed in principle of the need for governmental intervention, whether central or provincial, to protect threatened forests. As many pointed out, though, the surfeit of forest in the North Island contrasted with the east coast of the South Island's dearth.<sup>111</sup> Cleaving to provincial interests, then, Vogel's Act established a new state forests department, supported by a £10,000 budget.<sup>112</sup> Into the 1870s and 1880s, proponents of conservation no longer looked to models and expertise provided to them by Scottish-trained doctors. As I demonstrate in subsequent chapters, Vogel's relatively short-lived forests department relied heavily on Indian models (Chapter 6) as well as the input of continental forestry ideas (Chapter 5).

## **Conclusion**

In India, and to a lesser extent New Zealand, Scottish-educated doctors held a variety of positions in provincial and colonial scientific bureaucracies in the British Empire and beyond. From the eighteenth century, they began to articulate a series of environmental anxieties in India about the direction of development, arguments that gathered pace in the nineteenth century and contributed to the rise in utilitarianism and shift to government intervention in the 1850s. Numerically dominant in the IMS until after the mid-nineteenth century, as scientific advisors, Scottish-trained doctors often staffed and led the newly emerging forest departments in India, developments that resulted in nearly India-wide state forestry in the mid-1860s. By the 1870s, with increasing numbers of German-trained foresters and scientists arriving and with more openings

in the expanding government medical services, Scottish-trained medics' role in forest conservation declined. This was accentuated by increasing professionalism – exhibited by the sending of officers for a period of forest training on the continent, the establishment of a national pay scale and a professional journal – that drew boundaries between those trained in forestry and those who were not. By the late nineteenth century, too, medical specialisation, an increase in non-Scottish-trained doctors and a series of disease outbreaks kept all doctors, Scottish-trained ones included, busy pursuing medical interests. In contrast, the different levels of acceptance of government action in settler societies limited the environmental anxieties of New Zealand's Scottish-trained doctors, while in Victoria no Scottish-trained medicos appear to have articulated environmental anxieties.

Environmental anxieties among Scottish-educated doctors were neither as vocal nor as widespread in New Zealand as they were in India, while in colonial Victoria they were seemingly non-existent. In both Victoria and New Zealand, Scottish-trained doctors pursued natural history as a means of colonial development while of the two colonies only in New Zealand did this group express environmental concerns. These colonies' later development, combined with perceptions of the relatively inexhaustible supply of their timber, meant that environmental anxieties were not as patent as in India. Moreover, the emphasis on *laissez-faire* government further restricted the effectiveness of Scottish-trained doctors in developing state responses to environmental anxiety in New Zealand. Neither Victoria nor New Zealand ever had an equivalent to the IMS to provide practitioners with state positions and from which a lobby for state forest bureaucracy could emerge. By the 1880s, when environmental anxieties gathered pace in Australasia, greater opportunities for doctors to practise in their own fields, combined with specialisation, and the rise of other models (notably from India), further lessened the opportunity for Scottish-trained doctors to express environmental anxieties. The next chapter examines in greater detail the development of state forestry in India and Australasia in relation to the influence of German scientists and German models of state forestry.<sup>113</sup>

# 5

## German Science and Imperial Forestry, 1840s–1900s

My experience of all these Germans is ... that they must be kept in their place. Their good education & general knowledge rapidly gets them good scientific posts to begin with – this demoralizes them, & after a few years they resent everything, & try to override everyone.<sup>1</sup>

J. D. Hooker, 1879

Good God! Are these [German] authors such Oracles that we must translate every syllable and render letter for letter, lest we lose a drop of their saliva, or a whiff of their flatulence?<sup>2</sup>

Hooker, 1854

This chapter examines the environmental anxieties and bureaucratic responses initiated in Australasia and South Asia by German-trained scientists, whose prominence and qualifications J. D. Hooker had mocked. In India, German-trained scientists effectively developed the foundation of state forest conservation laid by Scottish-trained doctors, moving it onto a far more professional footing. Their strong educational background and particular experiences and training gave German-educated scientists a system, and a science, to translate these earlier anxieties into practical policies and bureaucratic solutions, moderated by the particular political and environmental circumstances of colonies.<sup>3</sup> Thanks to greater acceptance of state intervention, German scientists developed the IFS into a widely admired bureaucracy, whereas laissez-faire attitudes restricted their impact on state forest management in Australasia. In both regions, however, environmental anxieties proved

crucial in fostering a sense of alarm and in establishing the professionalism of foresters.

This chapter first examines the particular educational, social and political factors that characterised German education and which meant they approached environmental problems in much the same manner across the Empire. A shared and strong scientific training, it shows, led to their prominence throughout the British Empire. Next, the chapter investigates in greater detail the relationship between education, environmental anxiety and bureaucratic expansion as well as the particular geographical circumstances and political systems that gave rise to local differences of forest administration and conservation across India and Australasia. It argues that, in the development of a scientific cadre of professional foresters, environmental anxiety served useful ideological needs, especially given the conflict between advocates of forestry and agriculture (such as between the IFS and the Revenue Department in India), a resolution which worked in forestry's favour in India more than in Australasia. As this chapter shows, Indian environmental anxieties and forestry models continually responded to German and French forestry ideas, geared to local needs, at the same time as increasing local evidence of environmental problems emerged. In discussing the role of German-, and to a lesser extent, continental-trained scientists in articulating and developing the profession of forestry through environmental anxieties, I deliberately use the term 'German-trained scientists', rather than 'German science', in recognition that local circumstances dictated the adaptation, rather than wholesale importation, of German methods.

This chapter provides an important comparative dimension to historiography on the development of forestry, by stressing the importance of local environmental and political factors in moderating the similar anxieties of German-trained scientists in different places. It also supports the work of Ravi Rajan by providing a series of detailed case-studies illustrating the on-going importance of continental forestry traditions in areas not examined in detail by Rajan. As well, it demonstrates the variety of forest policies within India's seemingly national forestry legislation, a point often forgotten, and which further underlines the need to understand local-level exchanges of environmental anxieties and responses.<sup>4</sup>

### **German education**

In examining the success of German-trained scientists in the British Empire, it is illustrative to closely interrogate Hooker's comments

quoted at the beginning of the chapter. As Hooker hinted, the key to understanding the German<sup>5</sup> university system and indeed its social system, especially from the second half of the nineteenth century, was *Wissenschaft*. Put simply, rather than meaning science in any narrow sense, *Wissenschaft* referred to the application of professionalised and ‘scientized’ behaviour to the pursuit of knowledge.<sup>6</sup> Through the ideals of *Wissenschaft*, universities in the German-speaking lands became ‘indispensable certifying agents for membership in the *Bildungsbürgertum*, the intellectual, professional, and administrative bourgeois elite that predated and then developed parallel to a large commercial middle-class’.<sup>7</sup> In lieu of political freedom, authorities instead expected the growing middle-classes to pursue intellectual goals in return for employment in the expanding state bureaucracies.<sup>8</sup> While the policy of minimising dissent through offering intellectual rather than political freedom did not prove wholly successful, the spread of the ideals of *Wissenschaft* did. Desire for moral and intellectual improvement – or ‘cultivation’ – found widespread popular expression in the German term *Bildung* and in the desire for this by large sections of society.<sup>9</sup>

By the mid-nineteenth century, scientific professionalisation was gathering momentum in the German lands thanks to the strength of regional universities. Growth, however, belied the crisis many had earlier faced under alternating periods of political reaction and reform.<sup>10</sup> And it belied a broader tension between practical and theoretical education. Scholars have discerned that practical and applied sciences took hold in the German lands from the late-eighteenth century as states introduced aspects of the newly discovered ‘sciences of government’ (*Kameralwissenschaften* or the cameral sciences) to a wide variety of areas, from administration, surveying and tax collection to agriculture, forestry, and even the mapping of disease. University education – indeed, so too the ideals of *Bildung* – also drew a line between moral and intellectual self-cultivation and practical and utilitarian needs.<sup>11</sup> Though tensions between practical and theoretical education would remain, a working solution, largely instituted by the mid-nineteenth century, registered a compromise between the ideals of education and the specific technical expertise required by the German states. The solution involved extensive borrowing from French models of technical education, as pursued through the *Écoles Polytechniques* – military academies established by the state to provide it with engineers, surveyors and other practical services. From 1819 to 1866, German states founded several of these institutes of technology (*technische Hochschulen*). This formed part of the evolving German education system, which catered to different state

requirements. By the mid-nineteenth century, students could choose between *Oberrealschulen* (higher vocational schools, allowing pupils entry to *technische Hochschulen*), *Gymnasien* (grammar schools, teaching Latin and Greek, from which pupils advanced to university) and *Realgymnasien* (something of a compromise between the two previous options, where students learnt modern languages, and from which they could enter certified professional studies).<sup>12</sup> Despite such divisions, as Lewis Pyenson and Susan Sheets-Pyenson note, ‘the battery of examinations instituted to certify young men as customs agents, mine inspectors, and *Gymnasium* teachers went far beyond the practical knowledge necessary for the jobs’.<sup>13</sup>

One of the most significant educational reforms in terms of the British Empire that took place in the German lands involved the establishment of *Forstwissenschaft* (forestry science). This discipline appeared, in part, in response to the devastation of the Seven Years’ War (1756–63) and the resulting realisation of major timber shortfalls.<sup>14</sup> As a solution, administrators in the different states and principalities of the ‘German’ lands turned to the principles of *Kameralwissenschaften*, applying scientific methods to forest management. By the early 1800s, *Forstwissenschaft* demanded the application of systematic mathematical modelling and surveying to the sustainable harvesting and growth of forests.<sup>15</sup> Buttressed by an impressive array of technical treatises and a battery of examinations, in response to local needs, several forest academies promulgated and developed the discipline, in turn furthering its professionalisation. While forest conservancy expressed regional differences in forests and approaches, most British writers referred to ‘German’, rather than acknowledge forestry’s regional diversity across the German-speaking lands.<sup>16</sup> Forestry education developed rapidly in the nineteenth century, becoming part of the wider educational reforms instituted by states. In the 1820s, a handful of forest institutions were attached to universities: in 1821, for instance, the Forestry College at Eberswalde became part of the University of Berlin.<sup>17</sup> Others emerged around this period, commonly as royal academies.<sup>18</sup> Forestry science as a profession also developed in the Austro-Hungarian Empire, motivated by long-standing problems of deforestation and flooding on its higher lands. Later still, it spread to other parts of northern Europe and France.<sup>19</sup>

If the German-speaking regions as well as those of northern Europe and France exhibited a sophisticated understanding of forest systems supported by a professional cadre of foresters, across the English Channel a strong tradition of forestry simply did not exist. What eventually developed from the late-nineteenth century, owed much to continental and



Indian models. Even Scottish plantation forestry appeared relatively unscientific and unsophisticated when set against continental systems of forest management. German forestry provided a model in the 1820s for France and later, for India, Australasia (via India and France), and finally England and Scotland (through the British Empire and continental forestry).<sup>20</sup> German models, themselves reflective of regional differences, were adapted to local imperial needs. German forestry methods in India, New Zealand and Australia required considerable adaptation to manage hitherto unknown forest types growing at different speeds and in different climates and terrain.<sup>21</sup> However, as Dietrich Brandis, India's first Inspector-General of Forests, argued, while the 'Climate and the species of trees are different in India' from Europe, 'the principles upon which systematic forestry is based, are the same in all countries'. They rest, he declared, 'upon the results which long experience has furnished in those countries of Europe where scientific forestry is oldest and best understood'.<sup>22</sup>

Based on a complex system of mathematical equations and detailed surveying techniques, the principles of German scientific forestry as eventually applied to India appeared to eschew sentiment and diversity for profit and conformity. Yet this was actually far from the case. German forestry under the principles of the cameral sciences developed a strong moral element. Foresters argued that systematic management represented responsible government, an argument that gained particular ground in India through utilitarianism. But it also went further than that. German romantic sciences emphasised the perceived harmony between nature and the self, the individual and the organic.<sup>23</sup> Early expression of this view appeared in the work of geographer Alexander von Humboldt. A true polymath, Humboldt viewed aesthetics and science as complementary ways of comprehending nature. Nature, Humboldt believed, comprised an organised whole fully deserving of investigation in its totality.<sup>24</sup> Fired by such views, Humboldt expressed considerable anxieties about human environmental impacts. His widely read *Personal Narrative of a Journey to the Equinoctial Regions of the New Continent*, recounting its author's adventures in South America, argued that deforestation diminished rainfall and dried-up streams, reducing the size of Venezuela's Lake Valencia.<sup>25</sup> Others (see below) – German and non-German alike – supported their environmental anxieties in the British Empire with reference to Humboldt's works, while Humboldt himself even inspired a few to undertake imperial scientific exploration.<sup>26</sup>

Plant geography, itself pioneered by Humboldt, is an example of the influence of German romanticism on scientific study, which later

contributed to the development of ecology. In the early-nineteenth century, plant geographers valued the accurate research of complex interactions between different phenomena, an approach that made many trained in this tradition acutely aware of environmental change and its consequences.<sup>27</sup> A measure of their importance is that German-trained botanists were keenly sought after in Britain and its empire in the nineteenth century because of the relatively underdeveloped state of the natural sciences at institutions such as Cambridge and Oxford. Indeed, Oxford and Cambridge relied on German models for the gradual reform of their scientific curricula.<sup>28</sup>

Aside from demand and a strong practical training, especially in forestry and the plant sciences, local factors influenced the decision of German-trained scientists to work in the British Empire. Political and religious repression in the German lands, particularly in the 1820s to the 1840s, drove many well-educated scientists from their *Heimat* (homeland). Economic downturn and shrinking opportunities in German bureaucracies, coupled with an inability to gain permanent university positions, further stimulated migration.<sup>29</sup> Less tangible motives also played a role. In common with many other Europeans (see Chapter 2), Australia's perceived salubrity attracted several German migrants, perhaps most famously Ferdinand von Mueller.

### **Indian forestry and forestry debates**

German scientists played a central role in consolidating, and then expanding, state forestry in India. Drawing from their own training and experiences, they provided a forestry management template, staffed a significant part of the IFS, and oversaw the expansion of state forestry on a national scale (though still with particular local differences). Their influence also led to increasing professionalisation.<sup>30</sup> Historian Ulrike Kirchberger has observed that until recently, historians of empire have largely overlooked the importance of German foresters, a lacuna, she contends, reflecting the relatively seamless assimilation of Germans into structures of British imperialism.<sup>31</sup> Although the hardly flattering comment quoted at the beginning of this chapter by J. D. Hooker suggests that assimilation may not have been as seamless as Kirchberger believes, German foresters undoubtedly played a crucial role in professionalisation, supported by their articulation of environmental anxiety in India. Kirchberger estimates that about a dozen German foresters attained high-ranking positions in the IFS, along while many others served in lower-ranking forestry positions. As well, German-trained scientists

found employment in the EIC and later Raj bureaucracies as botanists or scientists in addition to maintaining a lively correspondence among themselves. A measure of the importance of German graduates to the IFS is that its first three permanently appointed Inspectors-General all came from German forestry or other scientific backgrounds: Dietrich Brandis (1864–81); Wilhelm Schlich (1881–4); Berthold Ribbentrop (1889–1900).<sup>32</sup>

Generally speaking, German foresters became influential in India from the 1860s. Their guidance played a crucial role in professionalising the IFS. They expanded its bureaucracy, increased its legitimacy by raising the standards of forestry education, established a professional journal, and not least, set the running of the IFS on firmly scientific lines. While many military served as forest officers throughout this period and after, a reminder that professionalisation took place gradually, German foresters nevertheless guided the expansion of its bureaucracy. They oversaw the development of a forestry school at Dehra Dun (northern India) in the late 1870s for the instruction of non-commissioned officers. By 1899, it had trained some 343 Forest Rangers as well as issued 105 certificates for those taking forest courses in the vernacular. From the late 1860s until the opening of the Royal Indian Engineering College at Cooper's Hill (in England) in 1884, officers received their forestry education in Germany (until 1875) and France (from 1866).<sup>33</sup> By 1884, some 79 officers of the IFS had been trained on the continent.<sup>34</sup> Cooper's Hill, opened in 1884, offered a 26-month course in forestry (later extended in duration), including a four-month placement for students. The German forester (and later Inspector-General) Wilhelm Schlich served as its first Professor and when Cooper's Hill closed in 1905, both he and forestry education relocated to Oxford University. By 1897/1898, Cooper's Hill had trained 104 forest officers.<sup>35</sup> Aside from a thorough and professional training, the establishment of a forestry journal helped to solidify a professional identity for forestry. Earlier, Schlich served as the founding editor of the *Indian Forester*. This journal provided a forum for discussion of forestry matters, proselytised the forestry message and made a marked contribution to the formation of a profession.<sup>36</sup>

The impact on forestry in the nineteenth century of the succession of German leaders was profound. Later foresters, for instance, acknowledged its first Inspector-General, Dietrich Brandis, as the founder of modern Indian forestry, an individual presented as dragging forestry from the early years of the medico-foresters into the professional era.<sup>37</sup> Whatever the hyperbole or motivations for such praise, Brandis undoubtedly had a profound impact on the IFS. He and his successors expanded the

forest bureaucracy and attempted to re-organise it on a national basis. They also sought to consolidate previously disparate and localised forest legislation, though not always successfully. Under these reform-minded, German scientists, the forest bureaucracy expanded greatly. In 1869, for instance, there were 57 forest officers; by 1885 that had almost doubled to 107; and, by 1899, the latter figure had nearly doubled again, to 213, out of the IFS' overall staff of 10,508.<sup>38</sup> The overall area of conserved forests also expanded (Table 5.1). Brandis' dynamism and vision made much of this early work possible.

Brandis studied natural science at Göttingen, Bonn and Copenhagen, completed a Ph.D. in botany in 1848 and began work at Bonn University in 1849.<sup>39</sup> Appointed by Lord Dalhousie as Superintendent of the Pegu teak forests in 1856, Brandis distinguished himself by successfully resisting the attempts of timber cutters to undermine conservation. With the territorial expansion into Lower Burma, Brandis enforced the British declaration that all teak forest was state property. That experience of forest management had a lasting impact on Brandis. He would later disclaim the 'lesson' taught by Burma's experience, that public forests should not be entrusted to private firms.<sup>40</sup>

Brandis' arguments for forest protection emphasised the need to prevent an impending timber famine and associated hydrological and local climatic changes. He also stressed the revenue managed forestry could provide the state. In a series of articles published in the 1880s, Brandis outlined his forestry programme. He emphasised forestry's primary aim of ensuring future timber,<sup>41</sup> but also pointed out the hydrological impacts of forestry. '[T]here is no doubt', he declared, 'that on hills clothed with forest the soil is protected, that less soil is washed away, and that less sand and silt are carried down by the rivers'. While careful to stress that not all floods could be stopped by conservation, he pointed out that 'the beneficial effect' of forests 'is chiefly felt when the ground is hilly; and it probably is greatest in a tropical or subtropical climate, where the rain comes down in torrents and evaporation is very rapid'.<sup>42</sup> Particular colonial circumstances contributed to environmental problems, he noted. In support of his contention of the importance of forest preservation for hydrological reasons, for instance, Brandis cited the local example of Ajmer, in Rajputana. Deforestation after 1850, he argued, led to sudden floods, siltation and soil erosion, problems exacerbated by drought. With reduced forest cover, Brandis pointed out, cattle fodder declined along with stock numbers, exacerbating the plight of the population during famine.<sup>43</sup>

Table 5.1 'Forest and land area of India, 1899'

Province	Balance under Government of India (Square miles)	Total Area cultivated	Forests under control of the Forest Department			No returns available	Proportion or Reserves to area under the Govt of India
			Reserved	Protected	Unclassed	Total	
Bengal	38652	80973	5880	3460	4034	13374	58801
North-West Province, Oudh	106149	57580	3851	94	43	3988	44581
Punjab	110786	41909	2283	3011	2139	7433	61444
Burma Lower	83557	10358	7373			7373	65826
Burma Upper	77210	6447	7333			7333	63430
Central Provinces	86451	30272	19206		292	19498	36681
Assam	41380	5284	3590		15683	19273	16823
Coorg	1582	378	238	649		887	317
Ajmer	2646	766	139		10	149	1731
Berar	17707	11499	4175			1475	2033
Madras	141259	46819	13775		5478	19253	75187
Bombay	123048	58326	13281	1631		14912	49810
TOTAL	944923	350611	81124	8845		117648	8.58

Source: Adapted from B. Ribbentrop, *Forestry in British India* (Calcutta: Government Printing, India, 1900), 122.

On the forests-climate question, Brandis regarded local-scale climatic influences as likely. Acknowledging the theory's widespread popularity, he pointed out that, first and foremost, 'the climate of each district depends upon its geographical position, its elevation, the configuration of the ground, and upon cosmic causes which are independent of local circumstances'. Only 'in their immediate vicinity', he concluded, could forests influence climate.<sup>44</sup> To investigate that connection further, Brandis initiated a series of experiments. Noting the complexity of 'relations between forest and rainfall' in India and the influence of climate on forest distribution, he also instanced recent 'facts', which 'point to the conclusion that the conservation of forest in several localities has resulted in the increase of the mean annual rainfall'.<sup>45</sup>

In emphasising such environmental problems, Brandis, realising the imprimatur of authority that science granted, took especial care to apply rigorous scientific methods to forestry. For instance, in arguing that forests influenced water supply, Brandis noted that: 'Unless these matters are proved by precise experiment, steady progress in forest conservancy, to the extent demanded by the interests of the country, can hardly be expected. The objection can always be raised, that forest conservancy has been carried too far, and that its indirect advantages are imaginary.'<sup>46</sup> Later foresters, such as Inspector-General Ribbentrop, would also draw from German research into the impact of forests on hydrology and climate (see Chapter 6). One of the singular acts of Brandis' period in control culminated in 1878, with the passing of the Indian Forest Act. This act attempted to extend state forestry by more clearly defining the scope of forest rights and access as well as the status of reserved and protected forests. It also sought to remove local variations in the Indian Forest Act of 1865, which had created the first national forest department.<sup>47</sup> The forest acts of Burma and Madras diverged from the 1865 Act, while as Ribbentrop noted, they also 'differ often district by district and thereby place not only the Forest Administration, but the surrounding population, in a maze of bewilderment'.<sup>48</sup> Reserved status denoted forests near to towns, which could be sustainably managed. In these, foresters mostly removed local rights, either by extinguishing existing private property or by providing compensation for lands lost. Protected Forests were areas where rights to forests were recorded. Finally, the act allowed for the establishment of village forests, granting villagers access to resources.

Attempts at centralisation and the expansion of bureaucracy, as several authors have written, belied the on-going importance of locality in accounting for differences across forest conservancies and in

circumscribing colonial rule and forest legislation.<sup>49</sup> K. Sivaramakrishnan, for instance, provides a wonderfully detailed case-study of colonial southwest Bengal to demonstrate the manner in which ecology and geography, in-fighting between District Officers and Forest Officers and resistance from local populations, thwarted the efforts of the IFS to enact forestry working plans and extend their authority.<sup>50</sup> Subaltern scholars, in particular, have also demonstrated the ability of local peoples to resist the encroachment of forestry legislation, particularly after the more invasive 1878 Act.<sup>51</sup> Despite the efforts of its directors, professionalisation took place gradually. As Brett Bennett observes, India's foresters 'struggled to create a coherent system of forestry' and, according to Benjamin Weil, only succeeded from the 1920s in realising Brandis' vision of a more uniformly technocratic and bureaucratic IFS.<sup>52</sup> A closer examination of the 1878 legislation bears out these observations regarding professionalisation and reveals the extent to which the Act represented a step towards a more uniform legislation rather than the fulfilment of such a goal. It certainly was not a hegemonic piece of legislation, as claimed by some scholars.<sup>53</sup> Remarking on such regional developments before the 1878 legislation, Berthold Ribbentrop later observed in his overview of *Forestry in British India*, that although 'the [British] state had inherited extensive proprietary rights in the forests of India from the rulers by whom the territories were ceded, the actual status of the property and its extent were uncertain'. The complex political and environmental landscape of India challenged attempts at national forestry management.<sup>54</sup>

The notionally national 1878 Act did not, for instance, apply to Madras, Burma, Ajmer, Beluchistan, Coorg, Berar, and the Hazara District (in the Punjab), its impacts varying because of differences in land tenure systems. The Madras Government felt unable to enact its provisions because existing village rights meant it could not declare reserves, as could other governments. In Coorg, by contrast, the government claimed ownership of the wastelands because it 'inherited the rights of the Raja' upon its annexation in 1834. Likewise, as noted, in 1853 the state declared its ownership of all teak forests in Lower Burma. In Bombay, all uncultivated land was claimed by the state, while in both the Central Provinces and Bengal the state recognised private and public ownership of forests.<sup>55</sup> Different forest management systems, moreover, operated across British India, even as forestry legislation became more co-ordinated. In the North-West Provinces, for instance, the District Forest Officer was subordinate to the Collector, with officers sending accounts and administrative records to the Conservator of Forests. All other official material was sent to the Collector, who then forwarded it

to the Conservator. Administrators extended this system, in operation since 1880 in the North-West Provinces, to Burma from 1880 and Assam from 1882. Similar variations existed in other Indian provinces. Indeed, by the late-nineteenth century, local variations in control remained. All provincial conservators of forests answered to local government control, except for 'Madras, where the Board of Revenue intervenes; and of Berar, Coorg [*sic*] and Ajmer, where the business is carried on through the Commissioners'.<sup>56</sup>

Local environmental and settlement differences, in terms of the trees growing there, their growth rates and the topography, climate and rainfall in which they were found, further impacted on forest policy. The Punjab and Central Provinces, for example, containing much land unfit for permanent cultivation, included within their bounds both desert and forest.<sup>57</sup> As noted in the previous chapter, the *taungya* system developed uniquely in Burma, while the Land Revenue Settlement recognised state forests under the Hazara Forest Rules (see Chapter 4). In environmental terms, too, the IFS had to manage a variety of forest types, growing at different rates in different climates across varied topography. Larger bioregions in India encompass the evergreen forests located on much of its west coast in areas of relatively high rainfall, and kept moist by the southwest monsoon. In Central India, from the southern Himalayas in the Punjab almost to the far south, deciduous forests dominate. Alpine flora varies in its geographical distribution and extent. It is found in the higher altitude regions such as in parts of Afghanistan, Burma, Beluchistan and the Himalayas whereas low rainfall restricts the geographical extent and size of the flora of Rajputana and Punjab. Only small trees and bushes grow in the Thar Desert. Along coastal Bengal, mangroves dominate. In the Western Himalayas, vegetation decreases towards the interior with diminishing rainfall. On its wetter, outer ranges, sal (*Shorea robusta*) grows up to 3000 feet (1214 m). Higher still, from 4000 to 10000 feet (1619 to 4047 m) in height, dependent on latitude, conifers dominate. Temperate vegetation grows in the 4000 to 6000 feet (1619 to 2428 m) zone, giving way to deodar and blue pine (*Pinus wallichiana*) from between 6000 and 8000 feet (2428 to 3237 m). Higher still, at from 8000 to 11000 feet (3237 to 4452 m), Himalayan spruce (*Picea smithiana*), oak (*Quercus* spp.) and West Himalayan fir (*Abies pindrow*) dominate. Above 12,000 feet (4856 m), birch (*Betula bhojpattra*) and rhododendrons grow. Forest management in India – so very different from Europe – thus required particularly detailed knowledge of local environments. The reproduction of pine and mixed oak forests, as Ribbentrop observed, was much better understood than of species such



as deodar. Deodar regeneration required careful observation because only certain trees bear male flowers, a particularly difficult requirement for foresters given the height and density of the forest canopy. Areas with few forests and scarce rainfall, as in parts of the Deccan, required considerably longer growth periods to regenerate species, unlike, for example, the areas of higher rainfall in the teak forests of Burma. Even then, the re-planting of teak only enjoyed success where such species were already well represented; otherwise, bamboo and other vegetation unwanted by foresters grew up.<sup>58</sup>

Local environmental problems, coupled with local political systems, accounted for the different nature of environmental anxieties and responses in India. These persisted into the twentieth century. In Madras, with over five million acres (2.02 million ha) of land irrigated by wells, tanks or rivers, forest protection assumed importance in maintaining the regular supply of water. As Ribbentrop observed in 1900: 'In the same way as the hurtful effect of deforestation on soil and drainage is chiefly felt when the ground is hilly and in a degree proportionate to its steepness, the beneficial effect of the action of forests in this respect is greatest under similar circumstances.'<sup>59</sup> Deforestation on the Deccan plateau, for instance, caused the Godavari and Krishna rivers to silt up, while near Simla from the 1870s, it led to soil erosion and left hillsides barren and subject to freshets (flash-floods). In articulating their concerns, foresters took especial care to emphasise the protection forests afforded agriculture. In Kanara, 'the once moist and cool valleys of the Sirsi and Siddapur ranges', noted Ribbentrop, 'gardens were deserted soon after the hillsides had been cleared of forest growth', leading to the abandonment of spice plantations.<sup>60</sup> By using local examples, foresters buttressed their authority by stressing the redemptive potential of tree planting, drawing on experience both of the impacts of deforestation in British times and historically. Early accounts of India such as by Fa Xian, a Buddhist scripture pilgrim and monk who visited south Asia between 399 and 414 CE, as well as archaeological evidence illustrating the existence of once-thriving villages in now-arid areas, contributed evidence for Ribbentrop's argument that India's climate had historically been wetter and less prone to present temperature extremes owing to the greater extent of forests. Forestry thus promised to restore areas to their naturally fertile state.<sup>61</sup>

From the 1860s, German foresters and scientists, then, significantly contributed to the professionalisation and expansion of state forestry in India, effectively building upon the earlier efforts of Scottish-trained medical foresters by enacting bureaucratic responses drawn from their own experiences and training in Germany. Although certainly not as

hegemonic or as linear a process as some historians have made out, forest professionalisation gradually took hold in the IFS at the same time as the extent of lands in state forestry increased. In upholding the need for state management, German foresters gathered detailed local evidence of historical and contemporary climatic and hydrological impacts of deforestation and set these alongside models from elsewhere. They applied the general principles of overseas scientific forest management to the particular needs of India's vastly different environments and polities. Anxieties and responses emphasising the role of forests as sources of revenue resulted in part from attempts by the newly professionalising foresters to assert their independence from competing interests such as those of agriculture. In this, forestry's moral dimension or its guardianship role, through its protection of climatic and hydrological decline as well as of timber supply, represented a fundamental aspect of the profession and its newly emerging culture. As Vasant Saberwal has observed in an influential article on this topic, in the twentieth century 'the continued opposition by the Revenue Department simply drove the Forest Department to a greater and greater use of an alarmist, and from the Forest Department's perspective, politically valuable rhetoric' – a theme I also take up in more detail in the next chapter.<sup>62</sup>

The use of interlocking environmental anxieties by foresters was clearly aimed at firming up support for their programme and its professional culture, with foresters shackling the future of agriculture to the fortunes of forestry. This finding also contributes to an important debate centred on whether or not the so-called moral element of forestry dropped off the agenda of the IFS with the increasing commodification of forest resources evident in the latter part of the nineteenth century. The evidence of this chapter – and others in the book – supports the recent research of Greg Barton and Brett Bennett, who have challenged the interpretation that later Indian forest conservation focussed solely on commercial gain to the detriment of its earlier 'moral' emphasis on famine relief and flood protection.<sup>63</sup> Famine relief and forestry protection works to prevent perceived climatic deterioration, soil erosion and flooding continued in this period. From the mid-nineteenth century, forest commodification and professionalism increased *at the same time as* climatic and soil erosion anxieties became more strident (note, also, Chapters 6 and 7). This chapter's finding also complicates Richard Grove's argument that forestry represented a radical critique of colonialism, by demonstrating that forestry supported the development of wastelands at the same time as it also regulated timber supply and protected agricultural interests. The next section explores the impact of German-trained

scientists in Australasia, revealing a different pattern of forest conservation as a result of local environmental and political cultures preventing the successful translation of environmental anxieties into state policies on the scale undertaken in India.

## **Australasia**

Set against the extensive areas controlled by the IFS, Australasian forest conservation appears limited and small-scale until towards the end of the nineteenth century. The need to please voters meant that Australasian colonial governments supported the overwhelming interests of the majority of settlers who wanted access to agricultural or pastoral land, needs sharpened by the flood of migrants in this period. In contrast, Indian authorities had more power to act in support of such interests as forestry, a situation many of them commented upon (Chapter 6). The relative importance of different forms of governance – and different levels of acceptance of government action – seems to have strongly shaped the role played by German-educated scientists in Australasia as much as it did for Scottish-trained doctors (Chapter 4).

The quickening pace of railway development in Australasia from the 1870s demanded hardwoods for sleepers, binding together economies and environments in different parts of the world. In Australia between 1871 and 1880, for instance, the length of railways grew about 1288 km, leading to the estimated loss of over 12,100 acres (4900 ha) of forest. Destruction accelerated rapidly over the nineteenth century, climbing to almost 48,000 (19400 ha) in the period 1881–90 and to over 90,000 (36,500 ha) acres in the last decade of the nineteenth century.<sup>64</sup> Overseas railway building impacted on Australian forest supplies. As noted in Chapter 1, exports of Australian hardwoods met demand for railway sleepers from New Zealand, South Africa, Great Britain and even India from the late-nineteenth century. Settlement also placed great demands on wood, through its removal for agricultural pursuits, construction and firewood. By the late 1880s, for instance, Melbourne's population of almost half a million required from between 350,000 and 450,000 tons of firewood per year, most of which was transported by its developing rail network, which itself placed further demands on wood. The several hundreds of kms of railway lines in Victoria in the late 1860s increased rapidly to over a thousand by 1880.<sup>65</sup>

Despite large-scale political indifference, in New Zealand and, to a lesser extent, Australasia's eastern colonies, a growing lobby began to emerge for the protection of forests to prevent the very environmental

disasters befalling other areas of the world. In New Zealand and the eastern Australian colonies, as in India, supporters urged highlands forest reservation, a policy removing forest conservation from direct competition with settler agriculture. In pressing for forest conservation in Australasia, German-trained scientists articulated environmental anxieties, attempting to spread the 'gospel' of scientific forestry among a largely indifferent populace. In Victoria and South Australia, the contribution of German-trained scientists to the articulation of environmental anxieties remained strong from the 1860s to 1880s, thanks principally to the influence of two important figures, but only really in South Australia did an effective forest bureaucracy briefly develop. In New Zealand, the German link appeared stronger in the 1840s and 1850s, through the extended visits of two German-speaking scientists, one of whose works appeared in parliamentary bills and forestry papers of the 1870s alongside other material on German forestry. After a hiatus, the German influence re-appeared alongside an American one in the 1890s and 1900s, principally through the impact of environmental anxieties inspired by ecological ideas.<sup>66</sup> These upheld the importance of individuals in expressing environmental anxiety and in establishing state responses to it.

Different reasons accounted for the migration of German-trained scientists to Australia and New Zealand. Fired by scientific curiosity, many wanted to undertake research in exciting areas new to European science. Some, like those employed by the Godeffroys trading company of Hamburg and engaged on behalf of botanical collectors, came as scientific sojourners to parts of Australia and New Zealand. Others, like the wealthy Austrian-born Carl von Hügel (1795–1870), travelling independently, sought both adventure and new botanical species.<sup>67</sup> Economic downturn and political repression influenced migration to Australasia, as it had to India. New economic opportunities also stimulated settlement. In the 1850s, for instance, many Europeans flocked to the goldfields of Victoria, later moving on to the Otago goldfields that opened up in the early 1860s.<sup>68</sup>

Historian of science Rod Home believes that, in Australia, the German nineteenth-century contribution to science 'was out of all proportion to' the German population.<sup>69</sup> Germans served in a variety of scientific capacities in Australasia, as geologists, mining engineers, explorers, botanists and in other technical positions.<sup>70</sup> One of the most influential of these, the botanist Ferdinand von Mueller, came to Australia in 1847. With a doctorate in pharmacy from the University of Kiel on the local flora of Schleswig, Mueller directed Victoria's botanical gardens, served

as the Colonial Botanist and became a leading proponent of the eucalyptus, arboriculture and forest conservation (Chapter 2).<sup>71</sup> Like most others articulating those concerns, Mueller regarded forest conservation as a necessity to ensure continued colonial expansion.

In Victoria, Mueller<sup>72</sup> provided a firm and unwavering scientific voice for forestry protection, one largely unsuccessful in implementing effective forest management. Employing highly alarmist language, he drew attention to the devastating consequences of unfettered forest usage in Australia. In 1867, for instance, Mueller and five others drew up the *Advisability of Establishing State Forests*, a report using environmental anxieties to justify their recommendations. It, however, gained little traction. In 1871, Mueller returned to that subject, presenting an impassioned plea for forest conservation for the reasons of its maintenance of climate, rainfall, timber supply, hydrology, health, and economy. ‘Let us then take timely warning’, he observed

let us remember that denuded earth parts with its warmth by radiation, and is intensely heated by insolation [*sic*]; that thus in woodless countries the extremes of climate are brought about in rendering the winter-cold far more intense and boisterous, and the summer heat far more burning and oppressive. Let us remember why the absence or destruction of forests involves periodic floods and droughts, with all the great disasters inseparable there from.<sup>73</sup>

Continuing in this impassioned tone, he asked rhetorically: ‘Shall we follow then the example of those improvident populations, who, by clearing of forests, diminished most unduly the annual fall of rain, or prevented its retention’? In outlining the advantages of forestry, Mueller noted that his main object was ‘to show in what manner a well-organised and yet inexpensive system of forest administration might check the indiscriminate destruction of the woods, without, perhaps, lessening the rate of the present yield’.<sup>74</sup> As well as displaying remarkably wide reading, Mueller’s arguments reflected his German scientific education. This included, in particular, articulating the connection between health, aesthetics and forest conservation, links reminiscent of von Humboldt’s.<sup>75</sup> Outlining Humboldt’s ideas, Mueller wrote that

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.<sup>76</sup>

Mueller did not introduce German forestry methods directly into Victoria, but insisted on adapting them to meet the specific requirements of that colony's different climates, species, population and labour. Australia, he observed, 'must follow an independent path ... because the systems of forest management adopted with so much advantage in Germany, France and Scandinavia, are here applicable only to a very limited extent'.<sup>77</sup> These considerations informed his criticism of Clement Hodgkinson (1818–93), Victoria's Assistant Commissioner of Crown Lands and Survey from 1861 to 1874.<sup>78</sup> A proponent of forest conservation in Victoria, Hodgkinson favoured developing plantations following the tree planting systems of Prussia and Europe (rare recognition of the importance of the regional diversity of German forestry techniques). Mueller totally disagreed with Hodgkinson's approach, pointing out that "the systems of forest culture" used in "Germany, France and Scandinavia are only to a small extent applicable here, where quite different circumstances prevail in reference to climate, population, labour, native trees, and trees eligible."<sup>79</sup> Recognising the heterogeneity of Australia's environments, in Victoria Mueller also pushed for the establishment of forest boards to meet particularly local needs. He also tirelessly advocated tree planting, distributing seeds throughout Victoria, the rest of Australia and the world, a reflection of his interest in acclimatisation and commitment to the idea that trees could significantly change climatic patterns and prevent soil erosion and disease (Chapters 2 and 6). Recognising his role as an environmental expert disseminating forestry ideas, Western Australia engaged him to survey its forest resources.<sup>80</sup>

Mueller also drew his arguments from beyond Germany. His 1871 lecture, for instance, drew from North American as well as German environmental anxieties and responses. Mueller's arguments initially contributed to the establishment of Local Forest Boards along the lines he envisaged and, later, to the 1876 Forest Act which consolidated the position of the Local Forest Boards and the Central Forest Board (established in 1874). Reservation commenced but in the early 1880s, the Victorian government revoked many reserves to encourage settlement. Late in that decade, parliament once again considered the need for forest conservation.<sup>81</sup> The exhaustive Royal Commission on Vegetable Products examined the need for forest conservation and called in Mueller as an expert. Still pushing for the establishment of Local Forest Boards, Mueller reiterated the arguments he had made over several years: that managed forests provided a

profit, regulated water flow and had the potential to significantly alter climates, for instance, by moderating the coolness of Victoria's higher ranges and by attracting rainfall. Mueller stressed that forestry made use of land unsuitable to agriculture and would make use of the otherwise 'little utilised' Australian Alps through tree planting. Moreover, he pointed out that Victoria's climatic diversity meant it could produce a variety of different timbers suitable to meet the colony's (and export) needs: while rich in hardwoods, Mueller believed that the planting of softwoods as well as reservation of all remaining forestland in Eastern Gippsland, which settlement was only just reaching, would meet local needs for generations to come.<sup>82</sup> As a result of the Commission, in 1888 a forestry department was established and George Perrin (1849–1900) appointed to head it, but, by and large, as Stephen Legg notes, 'Victorian forestry policy consisted largely of outdated, piecemeal regulations that proved ineffective in preventing forest destruction'.<sup>83</sup> Fascinatingly, too, a strong gold-mining lobby pressed government for more permanent forestry reserves and sustainable forestry practices to manage them, a result of which was the establishment of a more independent forestry service in the early-twentieth century. Between 1908 and 1912, over 1.8 million ha of forests were excised, although forestry overall gained 45,000 ha of forests.<sup>84</sup> Part of the reason for Mueller's limited effectiveness was political indifference, coupled with perceptions of the inexhaustibility of Victoria's timber supplies. Indeed, compared with the pre-European forest cover of other colonies such as South Australia (5.6 million ha), Victoria's forest resources were much more extensive, with estimates of its pre-European vegetation as high as 16 million ha.<sup>85</sup>

In South Australia, German-educated and continental-trained scientists were also expressing environmental anxieties, but with greater success than in Victoria. One was a parliamentarian and therefore better able to push for forestry's cause. Also the relatively scant forest resources of the colony placed a more obvious need to encourage forest growth. Richard Schomburgk (1811–91), botanist, viticulturist and Director of the Adelaide Botanic Garden, expressed a series of anxieties in works such as 'Influence of Forests on Climate'. Expanding well beyond the scope of this title, Schomburgk pointed out the signal importance of forests in preventing drought and flooding, regulating water flows, attracting rainfall and in providing for the wants of society. Turning first to historical records and then to more recent examples, Schomburgk stressed that Australia and India's 'savannah' was originally heavily timbered. For him, India, Mauritius and elsewhere provided cautionary tales of the foolhardiness of deforestation in affecting the climate and fertility of

the region. The 'desolation, the waste, and destruction of our forests have been so general that it now renders it imperatively necessary', he claimed, to prevent further deforestation and create plantations. Upping the moral ante, Schomburgk also stressed that tree planting could help to redress the destructive tendencies of humans, framing these actions as ones of stewardship.<sup>86</sup> 'Let us hope', he declared,

that the times are past for ever when the progress of civilization was equal to wasting and desolating the surrounding nature. One thing is certain – a broad strip of wasteland follows in the wake of culture, and noxious weeds like henbane, solanum, thistles, nettles, &c., serve to mark the footsteps of men. Before him, Nature in all her beauty; behind him, desolation and hopeless waste. Looking at this picture, we have no cause at all to be proud of being called the Lords of Creation; but let us hope that the future generations will be wiser than the past ones.<sup>87</sup>

For Schomburgk, the role of forestry extended beyond the provision of timber for economic development (although these were important considerations too). Schomburgk presented interlocking arguments – as individuals such as Mueller or Sharpe did – about the role of forests and other environments in human society. For him, the sound management of nature meant improving and stewarding environments. Hence Schomburgk criticised the unexpected and unwanted aspects of environmental change, including the release of weeds and the creation of 'useless' tracts of land. He also campaigned for years against pollution and drew attention to the problem of soil erosion resulting from deforestation and the removal of native pasture. Furthermore, he advocated the need for South Australia to diversify its economy. Over-reliance on wheat growing, he warned, tied South Australia overmuch to the fortunes of shifting market demand and climatic variability. Better, he stressed, to have a diversified economy than to rely on one crop. Diversification could see the production of olive and stone fruit, the growing of hops, rapeseed, medicinal plants, even New Zealand kumara, introduced to climatically suitable parts of the colony (damp gullies). Given South Australia's drought, Schomburgk, moreover, looked to climatically similar areas for suitable introductions. He advocated, for instance, the introduction into the plains of South Australia of the pigeon pea (*Cajanus indicus*) from India, owing to its ability to survive droughts, and relied on a series of overseas reports, such as from the State Board of Forestry, in San Francisco, California.<sup>88</sup>



Schomburgk's work responded in part to the influence of Humboldt, whom he met while in Germany. It also reflected the influence of Schomburgk's older brother, Robert (1804–65), the well-known scientist and explorer of British Guiana and South America.<sup>89</sup> Another tireless South Australian advocate of environmental anxiety and forest conservation throughout the 1870s and 1880s was a close friend of both Mueller and Schomburgk's, the Danish-born Friedrich Krichauff, whom Mueller described as 'an enlightened and energetic gentleman' who 'has exercised great influence upon the resources of South Australia'.<sup>90</sup> Enlightened and energetic Krichauff certainly was. He held a first-class honours degree in botany from Kiel and trained at the University of Berlin. As a parliamentarian he introduced, in 1875, the Forest Board Act that led first to the establishment of forest boards and, in 1878, to the appointment of a Forest Conservator, John Ednie Brown.<sup>91</sup> In stressing forestry's importance, Krichauff cited a variety of environmental anxieties while also upholding his interests in agriculture (serving as the chairman of the Central Agricultural Bureau from 1888 until its closure in 1902). A measure of his impact is that his death marked a significant decline in state forest reservation. I explore in more detail the influences, and origins, of South Australia's forest conservancy in Chapter 6.<sup>92</sup>

In eastern Australia, Mueller, Krichauff and Richard Schomburgk made use of colonial scientific societies and political systems to further their interests in conservation, by buttressing their arguments both with environmental anxieties drawn from different parts of the world and through the authority of their own scientific expertise. Their influence was tempered, however, by the political systems in which they had to operate and by the lack of a strong, independent tradition of state bureaucracy upon which to draw. Despite this, the relative scarcity of South Australia's forest resources contributed to the establishment of a forest bureaucracy and legislation thanks in part to Krichauff's parliamentary efforts.

### **New Zealand: 1840s–1900s**

Similar political factors stymied the attempts by German- and continental-trained scientists to establish forest conservation in New Zealand, even though these scientists expressed some of the earliest apprehensions about colonial environmental change. In 1843, for instance, Ernst Dieffenbach expressed considerable concern about settler deforestation, challenging prevailing belief and the propaganda of the NZC of

the fertility of New Zealand's soils, most of which, the NZC claimed, originated from flood-deposited alluvium. Soil fertility, explained Dieffenbach, functioned differently in New Zealand to Europe. In the former, it relied on trees enriching soil with accumulated organic matter, rather than the other way around as in Europe. This meant, he explained, that settler deforestation was foolhardy and within a short time would exhaust soil fertility.<sup>93</sup> Based on what environmental historian Vaughan Wood terms a geological approach, Dieffenbach's reading of New Zealand's soil was accurate: as settlers would discover to their detriment, deforestation destroyed the very source of the soil's fertility.<sup>94</sup>

Dieffenbach's upbringing and attitudes underline the importance of continental scientific education systems, but so too religious sensibility, in shaping his environmental concerns. Although Dieffenbach hailed from a strongly religious family (his father was Professor of Theology at the University of Giessen), he instead chose to study for a doctorate in medicine at Giessen. Views highly critical of the ruling authorities and his implication in a planned storming by students of the *Hauptwache* (Main Guard House) in Frankfurt forced him into exile. After a period in England, he arrived in New Zealand in 1839 as a naturalist for the NZC settlement at Port Nicholson (now Wellington).<sup>95</sup> Dieffenbach, like Schomburgk, had met Humboldt several times, with Humboldt's influence as readily apparent on Dieffenbach's scholarly output as it was on Schomburgk's. Like Humboldt, Dieffenbach examined the interaction between people, plants and animals in the so-called New World.<sup>96</sup> Chapters 1, 4 and 7 of the first volume of Dieffenbach's two-volume *Travels in New Zealand*, for instance, investigated human impact on the colony's environment in addition to criticising settler deforestation.

A later German-speaking naturalist, geologist and geographer who visited northern New Zealand presented similar arguments to Dieffenbach. Ferdinand von Hochstetter (1829–84) arrived in the young colony in 1859 as part of the Austrian scientific expedition circumnavigating the world in the frigate *Novara*.<sup>97</sup> With Hochstetter's interest in natural history, like Humboldt's, forged in youth, Hochstetter followed his father's enthusiasm for natural history and as a young man corresponded with many of the leading scientists of his day. Following theological and scientific training, Hochstetter completed a mineralogy Ph.D. at Tübingen University in 1852.<sup>98</sup> Arriving in New Zealand in 1859, he remained in the colony for ten months, initially at the request of the Auckland Provincial Government who commissioned Hochstetter to undertake a district

geological survey of coal resources as the rest of the expedition sailed home to Europe. Relying on detailed research and observations undertaken during extensive travels through the North Island and northern South Island, Hochstetter produced two important books – and numerous articles – on New Zealand’s geography and geology.<sup>99</sup>

In his geography of New Zealand, published in German in 1863 and translated into English in 1867, Hochstetter warned of the disastrous consequences of burning and cutting down kauri forests. Repeated burning of native vegetation, he warned, represented a ‘perverse’ approach to soil management. Instead of laying down clover seed and grass immediately after firing, Hochstetter explained, settlers in the Auckland area ‘burn again and again’. With this, ‘the winds carry off the ashes; the rain is gradually washing the humus away, and at last nothing remains but the naked clay-soil’.<sup>100</sup> Contrasting this method with ‘the correct one’ used by Maori, who sowed immediately after a burn, Hochstetter concluded that settlers’ actions represented ‘an abuse’ and resulted in ‘a sadly waste plain’.<sup>101</sup>

Nor was this Hochstetter’s only criticism. Tracts formerly ‘covered with dense Kauri forests, and where large masses of Kauri gum are dug from the earth’, he had earlier 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[s] 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.<sup>102</sup>

Wholesale deforestation horrified Hochstetter. Unless checked, Hochstetter believed it would make New Zealand a desert. Likening settler deforestation to the activities undertaken by ‘cannibal tribes as a stratagem to burn out the enemy’, Hochstetter’s analogy inverted the popular contrast between ‘barbarous’ native peoples and ‘civilised’ Europeans; the first supposedly reckless and barbaric, the second, rational and civilised.<sup>103</sup> Hochstetter challenged the commonly held European idea that forest represented an unproductive resource, land lying idle in a state of nature – environments commonly associated with savage and barbarous peoples.<sup>104</sup> Instead, forests were vitally

important to the welfare of agriculture and to the successful settlement of New Zealand.

While both Dieffenbach and Hochstetter spent relatively short periods of time in New Zealand, a measure of the scientific standing of the latter can be gauged by the appearance of his arguments in later conservation proposals. During New Zealand's first national parliamentary debates on forestry in 1868, both Thomas Potts and Charles O'Neill supported their arguments by quoting Hochstetter's passage in full. Likewise, during parliamentary debate of Premier Julius Vogel's Forests Bill of 1874, as well as in the forestry papers, Hochstetter's words again appeared in full.<sup>105</sup> Appropriately enough given the connections between Hochstetter and Humboldt, in the 1870s the latter's arguments concerning the dangers to climate from deforestation also appeared regularly.<sup>106</sup>

Reflecting their high standing, German forest methods appeared in New Zealand almost as *de rigueur* in discussion of conservation. Typical of such reports is one of 1874, a comprehensive survey of forestry in the German lands compiled by Captain (later Colonel) Inches Campbell Walker of the IFS for the New Zealand Government (see Chapter 6 for further details).<sup>107</sup> Another example comes from J. R. Hacket whose recommendations illustrate the wide belief that, while German forestry methods were sound, they required significant adaptation to New Zealand. Recognising the 'highest scientific attainments' of German forestry and detailing its management practices, Hacket's 1873 paper acknowledged that 'European treatment of the forest is however not entirely applicable to N. Z. [*sic*] bush'.<sup>108</sup> Unlike European forests, New Zealand's native trees, he pointed out, generally die if thinned and are particularly susceptible to fire damage. Nor, unlike Germany and France, did New Zealand legislation restrict the wandering of cattle, which impacted detrimentally on native forests. Several other differences also characterised German and New Zealand forests, including the faster growth and greater yield of New Zealand trees, and the loss of fewer New Zealand trees to hoar frosts and wind damage.<sup>109</sup>

German forest methods – like those from elsewhere in the world – thus required considerable adaptation to most localities.<sup>110</sup> The only example of direct application of German forest methods in New Zealand took place at the plantation of parliamentarian and historian Robert McNab (1864–1917), a keen advocate of both forestry science and catchment conservation for farmers. Along with North American forestry reports, McNab's bulging scrapbook included many reports on German

forestry science.<sup>111</sup> As McNab explained, he had adopted ‘the German method’ of tree-planting on the recommendations of the Imperial Royal Commission on Forestry and on the grounds that it was cheaper than English and Scottish alternatives.<sup>112</sup> McNab’s decision probably reflected the climate of inland southern New Zealand, whose distinct seasons and very cold winters would have more closely approximated to the growing rates and the climate of central Europe.

By the 1890s, New Zealand scientist Leonard Cockayne (1855–1934) was taking German and northern-European scientific influence in new directions through his support for the recent science of ecology (see also Chapter 6).<sup>113</sup> Cockayne’s German knowledge permitted him to access the ecological ideas of the Dane, Eugenius Warming (1841–1924), whose seminal ecological text, *Plantensamfund*, appeared in German in 1895, a decade or so before its translation into English. Cockayne applied ecological ideas, and those from the United States Department of Agriculture, to a variety of New Zealand’s environmental problems from the late-1890s, producing Government-sponsored surveys of the Chatham Islands (1901), Kapiti Island, Tongariro National Park, Waipoua Forest and Stewart Island (1907–1909) as well as an influential 1909 report on sand drift in New Zealand.<sup>114</sup> Cockayne yoked onto New Zealand’s developing nationalism, the holism of ecology. He employed this ecologically nationalist argument to express a variety of environmental anxieties and to urge state conservation of forests and the reclamation of sand wastes (Chapter 7).<sup>115</sup> A working knowledge of German therefore gave Cockayne a head-start over his non-German-speaking peers, allowing him to introduce these ideas into New Zealand well before Australia, whose conservation efforts relied upon ecological ideas much later than New Zealand’s.<sup>116</sup> Around the same time, the Dunedin-based scientist, G. M. Thomson (1848–1933), translated a number of articles from German for his *New Zealand Journal of Science*, and expressed environmental anxieties also shaped by ecology. Interestingly, it is likely that ecology influenced Cockayne and Thomson – as well as several others – either because they could access German ideas directly or through reading American forestry reports. Into the twentieth century, in light of ecology and the American forestry influences Australasian foresters increasingly criticised the scientific veracity of climatic arguments in favour of hydrological concerns (Chapter 6).<sup>117</sup>

The impact of German ideas and scientists in New Zealand differed from the colonies of eastern Australia and India. German scientists in New Zealand responded to particular local environmental problems evident in early colonial New Zealand, notably the rapid deforestation

of kauri and soil erosion, but could not develop institutional responses because they left the colony after a relatively short time. Even if they had, it is unlikely in the laissez-faire political climate that they would have succeeded. Aside from the general applicability of continental forestry models, the particular influence of the likes of Mueller in Victoria or the German foresters in India did not eventuate in New Zealand for much of the nineteenth century. German and continental influences had particular resonance in New Zealand through the efforts of Leonard Cockayne, who drew ecological principles into finely honed arguments about the importance of local New Zealand plant species, tapping into increasing settler identification with native plants.

## Conclusion

By dint of their particularly strong scientific, educational and bureaucratic experiences, German- and, to a lesser extent, continental-trained scientists expressed similar environmental anxieties across India, Australia and New Zealand. They acted as environmental experts, but state responses to their suggestions varied according to local environmental and political conditions. They enjoyed greatest success in India, where German-trained foresters did much to establish and professionalise the fledgling forest bureaucracies established by Scottish-educated doctors. In India, they instituted systematic forestry management drawn from their own particular educational and bureaucratic experiences, but adapted to the particular environmental and political requirements of different colonial situations. They also acted as 'centers of learning', as experts who advocated the principles of forest conservation. German bureaucratic and professional methods of forestry enjoyed less success in Australasia than in India because of the former's different political systems, emphasis upon agricultural development and relative antipathy to widespread state scientific bureaucracies. The professional and scientifically rigorous basis of German forestry management was, however, widely admired in Australasian and Indian forestry circles, even if its particular forestry methods were not copied wholesale. As commentators recognised, German forestry techniques were adapted to environmental conditions, species and working conditions different to those found across Australasia and India. In the twentieth century, along with American models using similar ideas, ecological ideas came to shape the shift towards hydrological concerns evident in Australasia and India. Ecology encouraged fears about soil erosion and flooding because it emphasised the inter-relationship of environmental change

and disturbance. More specifically, it encouraged forest protection by encouraging understandings of the uniqueness of plant communities and their significance, as well as of the impact of humans on such systems. This, and the exchange of forestry anxieties and models across India and the Australasian colonies, is the subject of the next chapter.

# 6

## South Asian and Australasian Forestry Anxieties and Exchanges, 1870s–1920s

[C]limates (like soils) may be made good or bad by human agency.<sup>1</sup>

F. S. Peppercorne, 1880

I should view with very great anxiety any clearing of the hills ... 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.<sup>2</sup>

Inches Campbell Walker, 1877

This chapter builds upon previous ones on the influence of particular groups to examine some of the direct exchanges of environmental anxieties and policies that shaped Australasian and South Asian conservation into the early-twentieth century. Advocates of forest conservation in Australasia drew upon the same centres of environmental knowledge (notably India by the 1870s, but also Germany and France and, by the early 1900s, the US) at the same time as they accumulated local knowledge of environmental processes and problems. This chapter reveals that they constructed similar arguments to justify forest protection, demonstrating that what Richard Grove identified as an ‘Edenic’ narrative of conservation on tropical islands also applied to Australasia.<sup>3</sup> An Edenic argument went something like this: Colonisation and the unfettered example of private interests, proponents of conservation argued, caused an Environmental Fall, resulting in deforestation and, with it, alternating cycles of drought and flooding that threatened agricultural production. Only state-directed scientific forest conservation and



forestation, they argued, could reverse the excesses of private interests and restore agricultural prosperity to areas ruined by deforestation. Through examination of the forests-climate idea in Australasia and India, this chapter also examines the changing relationship between environmental anxieties and scientific credibility.

Conservationists continued to locate forestry in highland areas unsuitable for agriculture, stressing that it made the most efficient use of otherwise 'useless' hill country and that it represented a complementary form of colonial development through the protection of lowland cultivation. For plantation agriculture, they emphasised the importance of leaving some areas in forest for climatic and hydrological reasons. Environmental anxieties about deforestation, therefore, rested on shared belief in colonial development and the natural fecundity of environments, even of those lands deforested centuries ago. Some believed tree planting could 'restore' unproductive landscapes, even in some cases bringing rain to arid areas and thereby assisting in the spread of civilisation and colonial development.

Tracking the changing emphasis of forestry anxieties, especially the decline in climatic concerns in the late-nineteenth century in Australasia, demonstrates the changing culture of scientific elites but also the importance of local differences in geography, politics and environment in shaping anxieties and in promoting forest conservation and forestry professionalisation. Whereas Australasian advocates moved away from climatic arguments, for a variety of reasons explored below, Indian supporters continued to emphasise their importance. Growing attempts to professionalise forestry through more refined scientific methods of managing forests took place slower and on a more limited scale in Australasia than India, due, principally, to the continued reluctance of state interference in society. Unlike India's foresters, who continued to uphold climatic arguments in part because of their bureaucratically stronger position, in Australasia reliance on historical examples and anecdote for climatic anxieties gradually gave way to seemingly more 'objective' studies. Following precedents from the US, both Australasian and Indian foresters stressed the hydrological impact of forests in reducing erosion and flooding.

### **Circuits of knowledge and cultures of science**

As previous chapters demonstrated, environmental anxieties seldom diffused neatly from one place to another. Scientific '[i]deas and instruments, texts and theories, individuals and inventions', as historian

of science David Livingstone observes, spread unevenly 'across the surface of the earth'.<sup>4</sup> Uptake depended on regional and local social, geographical and political circumstances, as well as on the role of individuals and journals in distributing information about the impact of deforestation. Similar anxieties and responses tied together legislation enacted in environmentally similar places if it promised to address similar environmental problems. Conceptualising such transfers of knowledge as a web usefully demonstrates the particularities of geography, politics and society that sustained such connections as well as the way they formed and re-formed over time.<sup>5</sup>

In Australasia, shared institutional experience and scientific education – particularly expertise from Scotland, Germany and India – helped to shape regional and local scientific cultures and sometimes even institutional values (Chapters 4 and 5). A small conservation lobby sometimes emerged in a colony's land administration, or parliament, but, more generally, around colonial scientific societies. Members of the colonial scientific societies presented themselves as disinterested scientific observers who had the best interests of the colony at heart, and offered a vocal and sometimes powerful lobby group for conservation. In doing so, they selected those environmental anxieties or solutions which best suited their needs, either based on the applicability of general scientific principles to local needs or because of environmentally similar, and therefore more directly relevant overseas examples.

The adoption and adaptation of overseas models took place at different levels, from national and regional to local-level and personal exchanges. Geographical factors such as dissimilar climates, growth-rates, forest types and distribution impacted on forestry management as much as did culture, economics and politics. General environmental anxieties and processes were thus employed selectively to fit local circumstances and needs. Journal articles and letters alerted individuals to potential environmental problems in different localities. Visiting forestry experts distributed environmental information – acting as 'centers of calculation' in Bruno Latour's term – through their lectures, publications and advice.<sup>6</sup> The Indian-Australasian and Australian-New Zealand webs examined in this chapter were just some of the many operating at the time.<sup>7</sup>

Webs also changed – breaking and reforming over time – such that in Australasia and India American models assumed more significance and pan-imperial considerations and nationalism also came to the fore. Indian-Australasian, as well as Australian-New Zealand, environmental anxieties appeared strongest in the 1870s–80s, as India offered the

most developed imperial example of colonial forest conservation then available. In Australasia, especially in the 1870s and 1880s, along with American and European examples, South Asian environmental despoliation fed colonial anxieties about the frightening effects of deforestation. Providing a successful model whose principles could be adapted to local Australasian circumstances, India's advanced programme of state forestry gave administrators the confidence to be able to solve existing and future problems. In the 1870s and 1880s, Australasian colonies leaned heavily on forestry experts, particularly from India, while late-nineteenth century New Zealand utilised forestry experts from Victoria. From the early 1900s, the US assumed importance in Australasia and India as a model for presenting and solving environmental anxieties. Coupled with local experiences of forest problems, in Australasia, US models signalled a shift away from climatic concerns towards those of the hydrological impact of deforestation. By the 1920s, although newly established national forestry institutions emerged in Australasia, reflective of both growing settler nationalism and a wider imperial forestry framework, the professionalisation of the discipline in Australasia still lagged behind India. Throughout, employment of categories such as 'Indian' forestry or 'South Australian' forestry is not meant to freeze-frame forest policy at one particular time and place. Neither is it meant to imply that policy from one region was transplanted unmodified into another. Over the nineteenth century, as previous chapters noted, the IFS increasingly developed its own culture, and professionalism, but it also continued to adapt the latest innovations in German and French forestry.<sup>8</sup>

### **India-New Zealand environmental anxieties and responses, 1870s**

As already outlined in previous chapters, amidst increasing rates of deforestation brought on by colonial development and, in particular, by railway construction, fuel, and building materials, anxieties grew about the large-scale impact of deforestation. They focussed on fears of an impending timber famine, in addition to hydrological and climatic anxieties. Forest conservation developed unevenly across Australasia. South Australia led the charge, and many other Australasian colonies had forest departments, but all were secondary to land development and consequently languished relatively behind other areas. Economic retrenchment led to the disestablishment of forestry departments in both the mid 1870s and 1880s in New Zealand, for instance.

With debate on state forest conservation gathering pace in 1870s New Zealand, several former civil servants from India such as Sir John Cracroft Wilson participated in provincial and national forest debates. Men like Wilson drew extensively on their direct experiences of South Asia to inform debate on New Zealand forestry. Personal testimonies supplemented reports that highlighted South Asian, and in particular Indian, forestry. Together with other models such as from France and the German-speaking lands, the South Asian model contributed significantly to the development of state forestry in New Zealand in the 1870s and 1880s. South Asian environmental anxieties and responses often appeared during debate on the 1874 New Zealand Forests Bill, championed by Vogel as a means to increase government revenue, secure future timber supplies and protect against climatic deterioration and soil erosion.<sup>9</sup> Wilson pledged his wholehearted support for the Bill. As an almost fanatical upholder of the provincial interests he represented,<sup>10</sup> Wilson settled permanently in New Zealand in 1859, having served as a magistrate and revenue collector for the EIC in Bengal, India (see Chapter 2).<sup>11</sup> This vast experience moulded his forest anxieties. Instancing his visit to Mauritius, Wilson praised its forestation for arresting earlier climatic deterioration.<sup>12</sup> As one of the first islands to have forest climatic reserves, Mauritius' deforestation and subsequent reforestation received regular mention among those concerned with resource management. To them, Mauritius presented an environmental lesson to New Zealand of the stupidity of deforestation and fuel to the conservationist lobby that could point to Mauritius' environmental redemption through reforestation.<sup>13</sup>

Mauritius appeared in the many and varied forestry papers tabled before New Zealand's Parliament during readings of the 1874 Forests Bill. The papers carried the Earl of Kimberley's warnings to the Governor of Ceylon, W. H. Gregory (Governor, 1872–7), that 'the experience of Mauritius and other countries has so clearly shown the evil effect upon climate resulting from' deforestation.<sup>14</sup> Other writers in New Zealand such as the surveyor and climatologist, F. S. Peppercorne, upheld Mauritius for the same reason, a link also extending to its one of its scientific Institutes.<sup>15</sup> In 1882, members of Wellington's Philosophical Institute attended a lecture on Mauritius that presented a devastating assessment of the impact of deforestation on the island's hydrology and climate. Following 'the wholesale destruction of the forests' and without any vegetation to retain the moisture of the previous rains, its author related how floods had ravaged the island, followed soon afterwards by 'a long drought'. Forest conservation, the paper noted, was bringing 'great improvement'

to the climate. W. T. L. Travers (1819–1903), a leading member of New Zealand’s scientific community and an expert on its environmental transformation, ‘pointed out that this [paper] bore immediately on the question of forest conservation in New Zealand’.<sup>16</sup>

Wilson’s advocacy for Mauritius, then, was not unusual. As well as drawing from Mauritius, Wilson instanced his own experience in 1843 as officer in charge of a district bounded by the Himalayas, when he unsuccessfully petitioned to stop the indiscriminate destruction of a belt of sal (*Shorea robusta*). Only later, when ‘great difficulty’ arose ‘in getting sal timber for gun carriages’, did the Lieutenant-Governor visit the district, whereupon Wilson ‘showed him how valuable the promontory alluded to would be hereafter’. A forestry department, he noted, was finally created and ‘the forests have been conserved ever since’.<sup>17</sup> India sparked much of Wilson’s interest in conservation, but he also brought ideas from other areas to New Zealand, so it is important to recognise the broader influences shaping his environmental views and his role as an environmental expert introducing into New Zealand a variety of forestry ideas.<sup>18</sup> Wilson also put his ideas into practice, purchasing seven acres of forestland on the Port Hills, above Lyttelton (Christchurch’s port), to prevent its destruction. A deliberately lit fire, however, destroyed a forest that ‘had gladdened my sight for six years’.<sup>19</sup>

Other examples of forestry in South Asia appeared in print in the 1870s and 1880s, ramming home the need for conservation in New Zealand. Ceylon furnished alarming examples of deforestation-caused drought and infertility, featuring in the *Appendices of the Journal of the House of Representatives* alongside other 1874 forestry papers collected from around the world. In one excerpt, John Douglas, Acting Colonial Secretary to the Government Agent, Central Province, Colombo, described deforestation as ‘an evil, 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’. New Zealand conservationists followed a similar argument to Douglas, presenting deforestation in comparably messianic terms as threatening New Zealand’s agricultural fertility and economic viability.<sup>20</sup>

## **An Indian forestry expert for New Zealand**

In 1873, the *Otago Witness*, a New Zealand provincial newspaper, called on the government to commission a report on forest conservation ‘by some intelligent and experienced member of the Indian Forest Staff’.<sup>21</sup> Two years later, parliament appointed Scottish-born forester, Captain

(later Colonel) Inches Campbell Walker (1841–1911), as the colony's first Conservator of Forests. Walker came from Madras Presidency where he served as its Deputy Conservator of Forests.<sup>22</sup> Most likely his recently completed survey of European forest practices had brought him to the attention of New Zealand authorities. A fortuitous meeting between Vogel and Walker's brother, coupled with the enthusiasm for forestry of Sir James Fergusson (1832–1907), would also have helped Walker's cause. A former Under-Secretary of India (1866), and New Zealand's Governor (14 June 1873–3 December 1874), Fergusson supported forestry and was instrumental in providing Vogel with details of suitable candidates for the position of conservator.<sup>23</sup>

As noted in the previous chapter, from the 1860s, India was fast developing a strong forestry model the envy of the British Empire and beyond thanks initially to the efforts of Scottish-trained and more latterly German-educated scientists. By the last quarter of the nineteenth century, it possessed one of the most advanced and powerful forestry services in the world, comparable only perhaps to German and French forestry from which it was derived. By 1900, for instance, the IFS controlled over eight per cent of India's total land area.<sup>24</sup> As well, the IFS had its own forest school in Dehra Dun for the training of all non-officers (established in 1878) and a cadre of well-educated forestry officials (Chapters 4 and 5). The efforts of Walker demonstrate the cross-influences at play in the development of forestry within empire, particularly the way continental and Indian forestry ideas needed to be adapted to meet the needs of local conditions in colonies such as New Zealand.

After compiling an exhaustive survey of the New Zealand's forests,<sup>25</sup> Walker presented his vision for scientifically managed forests in the colony's parliamentary papers (1877) and in its only scientific journal, the *Transactions and Proceedings of the New Zealand Institute* (1876 and 1877).<sup>26</sup> Mindful that the main thrust of settlement was development, Walker stressed the economic benefits of scientific state forestry to New Zealand.<sup>27</sup> Quoting the impassioned writings of various European and North American authors, he associated their regulation of climate and soils with the preservation of New Zealand's fertile and 'smiling fields'. After the model of Indian forestry, Walker recommended the establishment of climatic reserves in New Zealand to protect against rainfall decline and increasing floods and soil erosion. Deforesting high altitude areas, Walker warned, would mean bidding 'farewell to the smiling fields in the vallies [*sic*] below and abundant pasture on the lower slopes of the hills'. State forests, he noted, belonged in the uplands, because

deforesting mountainous areas like those of the Southern Alps for sheep or cattle runs offered nothing like the ‘gain’ that ‘is generally supposed’. Poor soils, moreover, once deforested, would probably be washed away, leaving nothing behind but ‘arid hill-sides’.<sup>28</sup> Having ‘little doubt that’ trees ameliorated the colony’s climate, especially on the South Island’s West Coast, New Zealand needed to afforest, declared Walker, especially in the relatively treeless inland South Island which lies in the rain shadow of the Southern Alps.<sup>29</sup> Overall, Walker presented a comprehensive, though in parts contradictory, discussion of the climatic aspects of conservation. Relying on his own observations, and scientific hearsay, alongside his principle concerns of timber famine and hydrological change, he upheld forests-rainfall theory – even to the extent of ignoring his own experiments in these areas – and pointed out that unless the government protected some forests, disastrous droughts and floods would follow.

Since a key plank of Walker’s arguments rested on the forests-rainfall theory, he took time to study the colony’s temperature records and deforestation rates and establish a relationship between the two. Despite both his intention and increased deforestation rates, records of New Zealand’s average rainfall between 1866 and 1875 actually revealed a slight rise in the rainfall mean.<sup>30</sup> Walker, however, dismissed the reliability of such figures owing to improvements in meteorological observations rendering the earlier figures unreliable.<sup>31</sup> Walker’s efforts to measure the effects of deforestation on climate reflected growing attempts in India to increase the legitimacy of state forestry through recourse to statistics. From the 1880s, the IFS only began to accept climatic theories thanks to seemingly reliable meteorological evidence. As with other climatic conservationists, however, intuition and observation ultimately informed his belief in the powers of forests to attract rain: in Australasia, these would ultimately lead to its dismissal in scientific circles later in the century.<sup>32</sup>

Economic pressure forced parliament to disestablish the fledgling forest service headed by Walker. Walker returned to India in 1877, but not before the reservation of over half a million acres (202,343 ha) of forest took place.<sup>33</sup> His influence as an environmental expert also continued. As a respected environmental expert, Walker introduced New Zealand authors to a wide variety of theoretical works on forestry, from those by Alexander von Humboldt to Dr Croumbie Brown (the Cape Colony botanist).<sup>34</sup> His authority strengthened the lobby for reintroducing conservation, with many later advocates directly quoting from Walker’s New Zealand reports.<sup>35</sup>

### Later Indian connections: 1880s

While reservation of forests continued under New Zealand's 1877 Land Act, in 1885 Vogel formed another forest department under the State Forests Act (1885). Its Director this time came from within New Zealand. It received several applicants from the IFS (six) and Ceylon (one).<sup>36</sup> One, H. Calthrap, explained he had spent just over three years in New Zealand after service in the Punjab Forest Department and as Forest Officer to one of the princely states.<sup>37</sup> Possibly some had applied upon the recommendation of Walker, by now back in Madras.<sup>38</sup> Other Indian foresters may have applied after reading articles on New Zealand forestry carried in the *Indian Forester*. New Zealand, one such article suggested, might provide 'a good opening ... for [Indian] Forest officers of training and experience' and possessed an ideal climate, 'exquisite scenery, and a society above the average'.<sup>39</sup>

Of foresters with Indian experience who applied, only one gained a position in New Zealand, W. Edgar Spooner, a former Superintendent of the Government Agri-Horticultural Gardens at Lahore.<sup>40</sup> Recognising Spooner's skills, New Zealand's Director of Forests (1885–7) noted that he 'seems well qualified to take charge of the experimental gardens and plantations at the School of Forestry'.<sup>41</sup> In 1887, Spooner assumed superintendence of the Kioreroa reserve (near Whangarei, eastern North Island).<sup>42</sup> He proved an energetic writer, publishing several articles in New Zealand on forestry and scientific agriculture drawn from his Indian experiences. In one, Spooner recommended that New Zealand follow Punjab's precedent in establishing a bureau of forests and agriculture, noting 'many plants now under cultivation in the Punjaub [*sic*] and the North-Western Provinces of India that might be advantageously introduced into this colony'.<sup>43</sup> Plant exchanges between India and New Zealand had already taken place, initiated by Wilson and others, but no evidence exists to suggest that Spooner initiated any in his role as Superintendent.<sup>44</sup>

New Zealand's second experiment in state forestry in the mid-1880s also elicited interest from the IFS. An anonymous IFS officer from Dehra Dun visited New Zealand to assess its new forestry service, writing a lengthy article on it for the *Indian Forester* of 1886.<sup>45</sup> Although describing the State Forests Act (1885) as 'pleasing', the officer attacked New Zealand forest practices and policy. New Zealand's kauri forests, he complained, 'have been worked on no principle whatever, but simply as mines, and the reckless waste and destruction which has thus been caused is simply appalling'. He also rounded on the lack of professionalism evident in



New Zealand. According to him, despite ‘all these well-meaning efforts to preserve their forests, the colonists have no one who really understands what forestry is, or how extensive forest areas should be managed’ The author pointed out that a miserly wage and the appointment of a biologist as ‘Conservator of Forests’, hardly augured well for the future of forestry in the colony.<sup>46</sup> And so it proved. Economic decline yet again precipitated the abolition of the department in the late 1880s. Desperate to kick-start the economy, the new Liberal Government (1891–1912) used legislation and loans to encourage closer land settlement. The push for development – particularly in the forested North Island – accelerated deforestation, heightening fears of an impending timber famine at the same time as a move took place to reserve other forests for scenic purposes. Removing forests from reserved status in the 1890s provoked strident criticism from the *Indian Forester*,<sup>47</sup> while evidence of frustration among the IFS over the relative backwardness of forestry in the colonies surfaced at the Select Committee on Forestry before the House of Commons. As India’s Inspector of Forests, Dr Schlich put it – perhaps with New Zealand in mind – while the IFS desired to serve ‘the colonies by allowing their educated forestry officials to visit them ... it had been found impossible to obtain adequate terms which would make it worth the while of these gentlemen to settle permanently in the colonies’.<sup>48</sup> In the twentieth century, other forestry models, some derived from India, but now also from North America and ecology came to shape New Zealand forestry anxieties as they did Australasia thanks to the empire forestry model (see below).<sup>49</sup>

### **Victoria and India, 1880s–1900s**

In the 1880s and 1890s in the Australian colony of Victoria, Indian models, and more particularly, Indian experts furnished terrifying examples of the impact of deforestation – in precipitating a timber famine, causing floods, increasing drought and altering temperatures. Indian foresters, as in New Zealand, provided expert advice to guide Victoria’s forestry, while at the end of the nineteenth century a shift towards hydrological concerns also took place due to the influence of American models. A subsidiary connection between the Australian colonies and New Zealand demonstrates that models, anxieties and, later, expertise were shared across Australasia at different times in the nineteenth century.

Environmental anxieties and state protection of forests varied among the Australian colonies. As the previous chapter noted, South

Australia led the way in forestry circles, relying on the energetic Friedrich Krichauff, who also selectively borrowed aspects of New Zealand legislation in the 1870s (see below). By contrast, forestry in Victoria, Western Australia, NSW, and Queensland remained relatively backward. Examining Victoria as a case study reveals both the obstacles to forest conservation existing in the colonies but also reliance on experts from India to provide guidance. In his detailed study of colonial Australian environmental management, historical geographer J. M. Powell notes that Indian forestry and foresters provided important models and expertise in colonial Australia, in general, and Victoria in particular.<sup>50</sup> 'The legacy of British India', notes fire historian Stephen Pyne, 'rippled throughout the British Empire'. By the twentieth century, German foresters with years of experience in India staffed teaching posts in Scotland and England, influenced policy through publications on contemporary forestry and by writing their own early history of forestry. Avatars, as Pyne observes, appeared throughout the empire and beyond.<sup>51</sup>

Reflecting the importance of influential politicians in shaping conservation after earlier suggestions, Sir Henry Loch (1827–1900), Victoria's immensely popular Governor General (1884–9), lobbied for an Indian expert to report on its forests.<sup>52</sup> Loch's suggestion followed decades of complaints by concerned state officials and scientists of wasteful timber practices, problems magnified by the massive demand (and consequent deforestation) of timber in Victoria's inland goldfields. Attempts to address deforestation included provision of Local Forest Boards in 1871, but with some exceptions, most failed.<sup>53</sup> On Loch's recommendations, Frederick A. D'Vincent, a Madras forester, arrived in Victoria in 1888, the same year in which parliament appointed a Victorian conservator of forests, George S. Perrin (who held the position until his death in 1900).<sup>54</sup> Vincent's bold and highly critical report censured both '[t]he entire absence of' forest conservation and the political interference that permitted it. 'The maintenance of a constant supply of timber and firewood', he pointed out, 'is of the greatest importance' in most countries but especially so in Australia because of its great reliance on timber for building, fencing, and mining. The existing forest department, presently under the Department of Lands and Survey,<sup>55</sup> he charged, is 'worse than useless'. '[I]t imparts a false feeling of security to people who cannot inquire into its workings.' The overall 'general indifference as to the future' resulted, Vincent explained, from the lobby of 'powerful' saw millers and splitters blocking forest conservation. The 'influence of the electors', he gloomily observed, 'gives one little hope' of the forests receiving adequate treatment 'until the forest question is made a national one

and removed from party politics'. In this situation, and despite citing the model of India and Prussia, Vincent realised that the Indian system of a qualified officer in charge of the department, would not work in Australia owing to 'the pressures to which the Ministers are constantly exposed under the system of popular Government'. In common with other Indian foresters, Vincent also stressed the state's duty to rise above private interests to scientifically oversee a public resource like forests. In an ironic statement of the validity of Vincent's criticism, his forest report was suppressed until the 1890s, owing to its trenchant criticism.<sup>56</sup>

In 1895, in the light of continuing deforestation, Victorian legislators again turned to an Indian expert to report on its forest estate and to recommend future policy. This time, Berthold Ribbentrop, former Inspector General of the IFS, examined Victorian forestry. Aware of Vincent's report, Ribbentrop censured the state for its 'neglect and waste ... as rampant as in the days when Mr Vincent framed his indictment against this management'.<sup>57</sup> Political interference, he charged, hindered conservation and unless the state remove forests from the 'whirlpool of party politics', he predicted that 'the reconstruction of the ruined forests will sooner or later become necessary at the cost of enormous sums'. Advocating that 'a certain proportion of a country must be maintained under forest cover in order to secure the permanency of national progress and prosperity', Ribbentrop echoed the concerns of many other Indian foresters:

The forests of a country must be looked upon as a capital left in trust for the whole community, and though it may be quite right to divert a superfluity of the capital into other and probably more profitable channels, a sufficiency of the original investment must be maintained, and of this the interest alone should be consumed.<sup>58</sup>

As with Wilson and Walker in 1870s New Zealand, Ribbentrop and Vincent in 1880s and 1890s Victoria urged increasing government intervention. Appealing to notions of public good, they argued that resources as valuable as forests could not be left to private interests. But their cries were not met by largely indifferent politicians. As these case studies demonstrate, without the advocacy of a powerful forestry lobby in parliament it proved difficult to gain traction on conservation in the settler colonies. Vogel's inconsistent impact in New Zealand illustrates this, as does South Australian state forestry, which suffered a setback with Krichauff's death.<sup>59</sup> In the settler colonies, the whims of party politics often proved more enduring in a climate, which favoured land

settlement over forest alienation. Nevertheless, the efforts of Vincent, Ribbentrop and the other conservation-minded scientists and politicians across the Australian colonies, gave scientific legitimacy to environmental anxieties and, at least, raised the profile of conservation.

As with other experts, Ribbentrop advocated following aspects of Indian forestry, but adapted to local needs. Ribbentrop, for instance, recommended Victoria follow IFS practice in setting up forest working plans, even proposing the deputation of an Indian forestry officer to Victoria to oversee them. Victoria's new legislation, he believed, should follow the Upper Burma Forest Regulations 'as a pattern for the general lines of a Forest Bill'. Burma's act, he explained, 'is the most practical of Indian forest laws ... the outcome of the experience gained during nearly 30 years of forest legislation in the different provinces of the Empire'. Ribbentrop also arranged for the IFS to make available seed for the plantations of the 'Victorian Forest Department'.<sup>60</sup> The Upper Burma Forest Regulations Ribbentrop referred to – recently instituted in 1887 following the cessation of the third Anglo-Burmese War – made provision for managing an underdeveloped and hitherto not-yet-surveyed area, and empowered the government to regulate teak extraction and the activities of private timber companies.<sup>61</sup>

What became of Ribbentrop's suggestions? They also lapsed, submerged in the whirlpool of party politics and economic problems besetting the colony. Twelve years later the gold-mining lobby successfully pressured the Victorian parliament to pass the Forests Act (1907), creating an independent State Forests Department under the aegis of a Minister of Forests. The Act gave it departmental independence and, addressing the perennial issue of granting forest leases, the sole power to issue leases. Despite stabilising the area of forests, war and the consequent demand for closer settlement (especially through soldier settlement schemes) continued to place great pressure on forestland and conservation.<sup>62</sup> By this stage, new developments and models had come to shape environmental anxieties and responses not only in Victoria but also in other former colonies (see below).

### **Australasian connections, 1870s–80s**

While India provided an important model, as well as experts, for Victoria and New Zealand, environmental anxieties were also exchanged among the various Australasian colonies at different points in the nineteenth and early-twentieth centuries, a reflection very much of the see-saw nature of forest conservation in that period. Officials exchanged

forestry reports, some even applying forestry legislation from one place to another while individual ‘imperial careerists’ also shuttled back and forth, with a few articulating environmental anxieties comparing one place with another.

Just as Alfred Sharpe (Chapter 3) provided a useful case study of imperial careerists shuffling from Britain to New Zealand to Australia, so too does Frederick S. Peppercorne of an individual applying hydrological and climatic anxieties to different parts of Australasia. Peppercorne worked as a surveyor and engineer in New Zealand’s North Island and on Australia’s east coast, publishing widely on human climatic modification. Articles and pamphlets appeared on forest-climate connections, irrigation works, transportation networks, geology and the interaction of water bodies and climate in New Zealand and Australia. Arriving in New Zealand in the early 1850s at the latest,<sup>63</sup> Peppercorne left for NSW in the early 1880s. In New Zealand, he published several articles on forest conservation. Taking a global perspective in the ‘Influence of Forests on Climate and Rainfall’ (1879), he believed that New Zealand and Australia were ‘in much the same position as’ India, with the effects of deforestation only beginning to bite. Europe and India’s experience, he noted, provided a lesson to all, praising the latter’s government which, responding to ‘the reckless destruction of the Indian forests’ and the ‘greater frequency ... of drought and famine’, had finally begun to conserve and plant trees.<sup>64</sup> Unless ‘immediate steps’ towards forest conservation took place in Australia, he argued, severer droughts would occur more frequently and of a longer duration ‘to the great detriment of ... pastoral and agricultural interests’ alike.<sup>65</sup> Two of Peppercorne’s works appeared in 1879, extending his environmental anxieties. The first surveyed world irrigation works. Acutely aware of water scarcity in much of Australia, it focussed on India (18 pages in all), ending with a discussion of the need for irrigation canals in Australia to aid settlement, increase revenue and reduce aridity. Irrigation canals, wrote Peppercorne, should be supplemented by extensive tree planting that would help ameliorate its dry climate.<sup>66</sup> His second publication of 1879 examined Indian-Australian climatic interconnections, stressing the necessity of irrigation canals to offset Australia’s arid climate.<sup>67</sup>

In Australia, Peppercorne tailored his environmental anxieties and responses to local needs. His ‘Rainfall and Water Conservation in New South Wales’ addressed the particular problems associated with that colony’s insufficient and uneven rainfall distribution. Acknowledging that local circumstances affected climate, he noted that if Australia were

mountainous, NSW's rainfall would be greater. Its western watershed provided insufficient rainfall for agriculture, he explained, while the problem in eastern NSW lay, not in the scarcity of rainfall, but in the unevenness of its distribution.<sup>68</sup> He connected many of the problems associated with rainfall to deforestation. Instancing Victoria's Yan Yean reservoir, he observed its flow had diminished owing to deforestation on its watershed. Congratulating South Australia for its more forward-thinking forest conservation policies, he upheld the example of government-led Indian irrigation schemes as ones NSW should follow. Although noting that Australia did not possess any large rivers such as existed in northern India, he nevertheless believed that much of its problems could be offset by such measures, in conjunction with forest conservation and tree planting.<sup>69</sup>

Peppercorne considered forests, climate, agriculture and environmental change comparatively through investigations into the weather phenomenon that is known today as ENSO.<sup>70</sup> To Peppercorne, Northern India's experience of irrigation and forestation suggested solutions to inland Australia's aridity. In this, Peppercorne was not unique. Indian irrigation, promoted by individuals such as Alfred Deakin (who also looked to America), provided a powerful model of Australian water conservancy.<sup>71</sup> Significantly, irrigation solutions in New Zealand did not feature in Peppercorne's arguments, probably because of perceptions that New Zealand was largely well watered and thus did not face the problems of water scarcity encountered in Australia.<sup>72</sup>

Other visitors approached Australasian environmental anxieties differently. The naturalist Robert von Lendenfeld (1858–1913), who spent several years in Australasia in the 1880s, commented on forest conservation. Dismissing entirely the forests-climate idea, Lendenfeld instead believed Australasia's geology generated very different environmental problems. While forest conservation was necessary in alpine Europe to hold 'the soil to the steep mountain sides' and thereby 'prevent avalanches and floods', Australia's gentler slopes, he argued, rendered this unnecessary. He believed that Australia's grassland would hold water and even improve rainfall. Hence, for Lendenfeld, clearing 'of useless scrub and timber' was 'most advantageous'. In contrast, because of New Zealand's largely mountainous topography, Lendenfeld stressed that 'the adoption of stringent measures [of forest protection] is urgently necessary'.<sup>73</sup> For Lendenfeld, local topography generated different environmental anxieties and responses. New Zealand's mountainous landscape required upland conservation to prevent deluges and soil erosion, while Australia's gentler slopes rendered this unnecessary.

## Australasian tree planting as environmental redemption

While supporters of forestry generally favoured the preservation of existing forests, in some areas this was not practicable either owing to deforestation or to the prior absence of forests. Consequently, in many treeless areas, forestation took place. Local and regional governments often took the lead in legislation, followed later by laws introduced by colonial or national governments. State-directed tree planting, however, paled in comparison to the efforts of private foresters throughout Australasia. The present focus on official forestation presents only an overview of wider planting efforts that does not include private afforestation.<sup>74</sup> As with standing forests, settlers planted trees for different reasons: to provide fuel and building materials; to increase rainfall or water retention; to help ‘redeem’ infertile areas and make cultivation possible. Normative assumptions about an originally fertile and well-watered land underpinned such hopes of returning nature to its productive state, echoing descriptions of the world before The Fall when, according to the bible, all of nature was fruitful. While certainly not all believed in the redemptive property of trees – with naysayers pointing out that vegetation depended on existing climatic and soil conditions – imbued by such ideas many overly optimistic forestation schemes nevertheless took place.

One of the most optimistic of those occurred in South Australia. To its new Conservator of Forests, John Ednie Brown (1848–99), appointed in 1878, the absence of trees explained Australia’s arid interior. Taking the forests-climate argument to extremes, Brown believed plantations could exert almost complete climatic control. Promoting the plantation of *Pinus insignis* and *Pinus radiata*, Brown was convinced they would render the droughty interior the garden of Australia.<sup>75</sup> To convince everyone of his grand scheme, Brown had to challenge two dominant and popular theories of the time: the first, that ploughing, not tree planting, attracted rainfall; second, that rainfall patterns placed ecological limitations on settlement. Many South Australian settlers of the 1870s believed that ploughing attracted rainfall, especially since experience appeared to lend their ideas credence. Settlers spreading northwards across sub-tropical South Australia found, to their delight, above average rainfall.<sup>76</sup> Heavy rainfall in late 1875 entirely washed away any lingering fears of drought, encouraging settlers to confidently fan out onto agriculturally marginal areas beyond Goyder’s Line. Demarcating land suitable for agriculture and pastoralism, Goyder’s Line was established by Surveyor-General Goyder in an attempt to

set ecological limits to settlement. Boosters in the rural press, as well as politicians, including even the Minister of Agriculture, ridiculed Goyder's idea and energetically promoted settlement.<sup>77</sup> The late 1870s witnessed drought's return to South Australia and upheld the sagacity of Goyder's recommendations. Under drought conditions, settlers' dreams, like most of their crops, withered and died.<sup>78</sup> A pattern of boosterism, climatic theory, settlement and disappointment followed in other Australian territories. Settlers pouring into other semi-arid areas employed both plough-rainfall and tree-planting theories to justify their actions, and drought stymied settlement in semi-arid parts of New South Wales, so it did in South Australia, twice.<sup>79</sup> Remarkably, even many leading scientific figures voiced their approval of such ideas. Mueller in Melbourne, for instance, encouraged tree planting to ameliorate the climate and bring rainfall to the Murray Valley.<sup>80</sup>

Despite his disdain for J. E. Brown's theories, Goyder promoted tree planting in South Australia for the prevention of timber shortages rather than rainfall increases. His anxieties about timber supply were eagerly seized upon by New Zealand's press in the 1870s and appeared in the forestry papers assembled for the 1874 New Zealand Forests Act.<sup>81</sup> Goyder also corresponded with New Zealand's first Conservator of Forests, posting Walker clippings on South Australian forestry practice, which Walker subsequently passed onto Vogel. Goyder apparently visited New Zealand's South Island, recommending to Walker in 1876 that New Zealand adopt a measure stipulated in the Lease of the Pasturage of the Bundaleer Forest Reserve that gave ownership of all trees on private land to the state.<sup>82</sup> In general, New Zealand and the other Australian colonies tended to favour South Australia as a model for forestry because of its more advanced programme of forestation and management. In 1885, for instance, a New Zealand parliamentarian advocated that its new forestry department should be modelled on South Australia's successful and self-financing one.<sup>83</sup> In 1889, the arguments of South Australian forester J. E. Brown were also used to support Arbor Day in New Zealand.<sup>84</sup>

South Australia's tree-planting legislation, in fact, originated in provincial New Zealand. In the 1870s, Friedrich Krichauff, the Danish-born botanist and South Australian parliamentarian, introduced into his state parliament several tree-planting and forest conservation bills.<sup>85</sup> Krichauff's bill of 1873, as historical geographer Stephen Legg notes, was 'closely modelled on New Zealand's' tree-planting encouragement acts of 1871 and 1872.<sup>86</sup> In December 1873, Krichauff observed that his Bill 'had adopted the bonus of £4 from the New Zealand' tree-planting legislation.<sup>87</sup> 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, paying particular attention to the Premier's discussion of the climatic effects of forestry.<sup>88</sup> Other examples reinforced New Zealand's influence on South Australian debates in the 1870s. In 1874, a South Australian parliamentarian asked whether South Australia's Forests Board 'would be similar to the Forest Board of New Zealand', whose chairman was paid. Krichauff replied that, 'upon the recommendation of His Excellency [the Governor] they could alienate certain lands, as under the New Zealand Bill.'<sup>89</sup> South Australia's early forestry legislation owed much to the example of New Zealand's, clearly demonstrating the cross-fertilisation of environmental anxieties, forestry ideas and legislation between these areas in that decade.

The tree-planting legislation upon which Krichauff's legislation drew developed out of provincial New Zealand concerns of an imbalance in the distribution of forests. It probably appealed to South Australian legislators because, compared to other colonies, South Australia had relatively modest forest resources, so had to 'devote much more attention to plantation work than ... [its] neighbouring colonies'.<sup>90</sup> New Zealand's problem, as a Canterbury politician explained, arose because there was too much forest in the North Island but far too little in the South.<sup>91</sup> Attempting to correct this imbalance, in 1858, the South Island province of Canterbury enacted a tree-planting act: in return for which, settlers received a free grant of land.<sup>92</sup> In 1872, The Forest Trees Planting Encouragement Act, modifying the earlier provincial legislation, passed with slight amendments in the national parliament.<sup>93</sup> Most parliamentarians accepted the need for such a measure, particularly in the relatively treeless provinces of Otago and Canterbury, where it enjoyed by far the greatest success.<sup>94</sup> The Act awarded planters of trees either a free grant of two acres for every acre of land planted in trees or a land order, redeemable later, not exceeding £4 in value.<sup>95</sup> This legislation enshrined the principles of tree planting for fuel, construction, climatic control and soil quality. As John Gillies explained, tree planting in dry Central Otago 'would convert that district into the garden of Otago' by bringing more rain to the region.<sup>96</sup> After the Act's introduction nationally, its provisions were eagerly taken up in relatively treeless areas such as parts of Canterbury, Otago and Hawke's Bay.<sup>97</sup>

Forestry advocates in the different Australian colonies upheld New Zealand most often in the 1870s because of its initially impressive forests department. In 1874, for instance, Mueller wrote to James Hector of his admiration for Vogel's Forest Bill, after an Otago friend had sent him a copy of Vogel's speech of 14 July 1874 on forest conservation.

'The whole [attempt by Vogel]', gushed von Mueller, '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'.<sup>98</sup> In 1876, a Victorian commentator praised New Zealand's advanced state of forestry, suggesting that Victoria also avail itself of the Indian forestry expert.<sup>99</sup> Overviews of early New Zealand measures appeared regularly in reports on Australian colonies' forests.<sup>100</sup>

By the 1890s, with New Zealand's forest area decreasing due to excision and pricked into action by concerns expressed by the 1895 Timber Conference, New Zealand's parliament employed Victoria's Conservator of Forests, George Perrin (1849–1900), clear indication that New Zealand forestry had fallen behind even Victoria's.<sup>101</sup> An exhaustive 56-page report followed. Witnessing at first hand 'the ruinous destruction by fire from one end of the colony to the other' during his national forests tour, Perrin 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' represented 'a crime against the nation', he charged. 'Nature is never slow to avenge herself', he warned. '[S]uch reckless disregard of her natural conditions', he pointed out, 'results in flooded farms and ruined settlers'. South Island colonists, Perrin continued, 'have indeed only to use their eyes, and they can see for themselves the evil effect of the system I condemn so vehemently'.<sup>102</sup> Through the efforts of Perrin and the Timber Conference, a Forests Branch, under the Department of Lands, was created in 1896 and largely undertook tree planting, but faced many of the same problems which beset colonial forest departments across the Tasman: located within and under agricultural or mining departments, forest conservation received only secondary attention.<sup>103</sup>

### **Empire forest conservation, climate debates and professional cadres**

With the growth of nationalism and, in 1901, Australian federation, the kinds of forest bureaucracies staffed by professionally trained foresters envisaged by the likes of Walker in New Zealand or Ribbentrop in Victoria, gradually emerged, particularly after World War I, which revealed to British planners the need to secure imperial wood supplies and which effectively marked the ascent of empire forestry.<sup>104</sup> In this period, from roughly 1900 to 1920, a succession of independent forest departments emerged across Australasia under the aegis of emerging

state socialism. With increasing professionalism, Australasian foresters by and large dropped the climate-forests link as a result of the increasing influence of American forestry models. In this period, as part of that wider process of professionalisation, educational establishments were established. Victoria created its own School of Forestry at Creswick in 1910, while the following year, South Australia's Adelaide University offered a Bachelor of Science in the subject. NSW also opened a forestry training school at Narara. Across the Tasman, Canterbury (1924–34) and Auckland (1925–30), both colleges of the federalist University of New Zealand, began to offer courses in forestry.<sup>105</sup>

As noted in the previous chapter, 'centers of calculation' in the training of forestry had earlier emerged in 1885 at Cooper's Hill at the Royal Engineering College; training transferred in 1905 to Oxford University. Other university courses soon opened elsewhere in Britain. They formed part of a growing imperial movement manifested most strongly in a series of Empire Forestry conferences, begun in 1920. The empire forestry movement aimed to co-ordinate research and training and to provide for an effective lobby group for the interests of foresters and forestry at both imperial and national levels. Holding regular conferences, publishing reports, and establishing the Empire Forestry Association and an Imperial Forestry Institute at Oxford University for post-graduate forestry training, it sought to increase the professionalism and influence of forestry. Its Standing Committee, as Ravi Rajan notes, even had the ear of the Colonial Office.<sup>106</sup> As Joe Powell perceptively notes, interwar American and empire forestry conservation programmes influenced each other through the cross-fertilisation of ideas and approaches to the state-directed management of resources while also responding to particular local circumstances.<sup>107</sup> Effectively, it reflected the reality that many other colonies and states were developing forestry models previously only evident in India, Germany and France.

Despite increasing professionalisation, locality remained crucial in understanding forest conservation. Australia, as Brett Bennett has observed in an important study of its forestry education post-federation,

did not fit perfectly within the empire forestry ideal espoused during the early nineteenth century: it lacked a national forestry policy, had no national forestry school and any esprit de corps that existed among foresters was more often regional than national or imperial in its allegiance. The condition of Australian forestry was a product of Australia's distinct geography and social and political history.

Foresters in South Australia and Victoria, in particular, he notes, did not support C. E. Lane Poole's newly-created Australian Forestry School (1926), which he formed on the back of his European and imperial forestry experience.<sup>108</sup> Meanwhile, Canterbury and Auckland colleges bickered among themselves about who should control forestry in the dominion. Organisation in Australasia thus remained largely ad hoc, with 'imperial oversight ... limited to advice and persuasion'.<sup>109</sup> In this tumult of competing local, national and imperial interests, forestry professionalism took place slowly, and even as late as 1928 Lane Poole could declare that only 15 fully trained foresters lived in Australia. It seemed that the ideals of university-educated foresters, note Michael Roche and John Dargavel, did not initially fit with Australian ideals of practical on-the-job experience.<sup>110</sup> In 1935, graduates of the Australian Forestry School formed the Institute of Foresters of Australia, open to only those with a forestry diploma or Bachelor of Science degree, and began publishing its own journal, *Australian Forestry*.<sup>111</sup> Similar developments took place in New Zealand. The New Zealand Institute of Forestry was founded in 1927 while *The New Zealand Journal of Forestry* first appeared in 1937.

### **Australasian and Indian climatic concerns and professionalism**

As well as gradually increasing acceptance of government intervention in Australasia, the articulation of particular kinds of environmental anxieties also played a role in increasing state forest bureaucracies. With the American influence supporting growing local evidence of soil erosion, foresters in both New Zealand and Australia deliberately dropped the climate-forests link because it undermined their claims to scientific legitimacy. Although in India increasing emphasis came to be placed from the 1920s on hydrological problems, largely based on US models and experience in northern India (see next chapter), the climate-forests idea did not wholly disappear.

The American shift, also apparent in many Australian colonies, appeared strongly in New Zealand's 1913 Royal Commission on Forestry. Its findings also reflected the growth of ecological and aesthetic arguments for conservation and indicate a clear movement away from climatic arguments in favour of hydrological anxieties. The Commission's report on climatic and scenic reserves, indigenous forests, forestation and forest management recommended extensive upland forest reservation for water and soil conservation purposes as well as for shelter.<sup>112</sup> The report

stressed the importance of forests to the farming economy, pointing out the dangers inherent in deforesting uplands. Deforestation would, it warned, 'be a constant source of danger to the farmlands on which the prosperity of the Dominion so greatly depends'.<sup>113</sup> With this in mind, it recommended reservation of the entire upper portion of 'the North Island dividing range'.<sup>114</sup> The Commission emphasised its utilitarian orientation, and the penchant for settlement then current, by advising the removal of some existing reserves either for settlement or forestry purposes, a total area comprising 68,698 acres (27,519 ha).<sup>115</sup> By this time, too, an increasingly urbanised, New Zealand-born European population was coming to view New Zealand's landscapes, birds and forests as symbols of new national sentiment. This, as well as the growth of tourism and the realisation of the great losses of forestland and extinction since colonisation began, led to the reservation of large areas of otherwise economically valueless areas for national parks and scenic reserves. By 1914, this had increased in extent to 2 million acres (809,371 ha), at the same time, as revocation of some forestland occurred in order to expedite settlement, 623,257 acres (252,223 ha) in all from 1890–1919.<sup>116</sup> The newly formed State Forest Service under its first Director, the Canadian Leon McIntosh Ellis (1920–8), greatly expanded the area of forestland either reserved (2 million acres [809,371 ha] or provisionally designated as state forests (5.5 million acres [2,225,771 million ha]), as well as significantly expanding plantation forestry.<sup>117</sup>

The New Zealand scientists who contributed to the 1913 Forestry Commission's recommendations referred closely to US forestry, a development also evident in the colony's publications, which increasingly carried the latest North American research on the forests-hydrology link. With this influence to the fore, forestry lobbyists in New Zealand gradually dropped the forests-climate link, realising that, in New Zealand's context and in light of US examples, it did not help their claims of scientific and professional legitimacy through which they hoped for a stronger state forest bureaucracy. In the US, engineers and meteorologists had challenged the scientific legitimacy of the forests-rainfall arguments put forward by foresters. In response, foresters abandoned the argument entirely because association with its scientifically unproven claims harmed their prospects of increased government support and because it proved impossible to obtain accurate scientific data either on forests-rainfall or forests-temperature connections. Instead, in the early-twentieth century, United States Forestry Service officials played up the woeful consequences of deforestation on flooding and soil erosion, deliberately embarking, as historian Ashley L. Schiff notes, 'on a crusade to convert

the country to conservation'.<sup>118</sup> What made such moves possible in the US was the growth of the progressive movement, which sanctioned a more active government role in society. Reflective of the increasingly international milieu in which forestry was operating, Gifford Pinchot, the Yale graduate who trained under Dietrich Brandis, was strongly influenced by the model of Indian and continental forest conservation while his department, in turn, came to figure more prominently in Australasian conservation efforts from the end of the nineteenth century.<sup>119</sup> The progressive model also began to resonate in Australasia because of the beginnings there of what William English Walling called agrarian state socialism, marked by policies of land redistribution, the beginnings of welfare provision and increasing government support for science.<sup>120</sup>

New Zealand's 1913 report also exemplified the move towards US models and the use of ecological arguments tailored to local needs to support the conservation of New Zealand's native flora and fauna. An article by Dr C. A. Cotton (1885–1970), lecturer of Geology at Victoria University College, Wellington, praised the now classic American work, 'Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin, 1911'. Locality continued to figure prominently in encouraging connections between different areas. Geographical similarity of that region to New Zealand, Cotton noted, rendered the American work 'of special value' to the Dominion as it contained 'a very careful study of the results of reckless clearing in a climate which appears to be very similar to ours'. The report, Cotton continued, reached two conclusions, first, that the loss of tree roots following deforestation causes slips, thereby eroding away surface soil and rendering the slopes absolutely barren. 'The second result is', he noted, 'very much more far-reaching: the soil exposed by reckless clearing is washed off, and when clearing has been 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'.<sup>121</sup> The report Cotton quoted resembled an earlier (1907) highly alarming tract full of insufficient data and hyperbole employed by the United States Forestry Service to present as conclusive the flooding-forest link.<sup>122</sup> Although using scientific language, Cotton still employed the same scare tactics as earlier conservationists.

The article contributed by Cotton to the Report, 'Remarks on Erosion of Slopes in New Zealand', discussed the geological and vegetative factors affecting erosion, emphasising that geology just as much as vegetation affected water flow.<sup>123</sup> The report referenced other international work,

including 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 Bernhard Fernow's *Economics of Forestry* (1902). Bowman's work highlighted the horrifying loss of soil occasioned by deforestation. In 50 years, he claimed, a single lumber merchant may destroy soils that took thousands of years to develop. Warming and Fernow, meanwhile, lectured on the importance of forests in maintaining soils and, in Fernow's case, of also protecting against flooding.<sup>124</sup> The Commission also sought advice from other scientific experts, such as Charles Andrew Chilton (1860–1929), holder of the Chair of Biology and Palaeontology (later Biology) at Canterbury College, and Leonard Cockayne. Although the Commission chose works (such as those by Fernow and Cotton) stressing the relationship between forests and flooding and showing the complexity of hydrological systems and the dangers of ascribing to forests an overriding influence on river flow, it still fell back on highly alarming language. Without forests, it warned, the colony's mountains and hills would 'be a constant source of danger to the farm lands on which the prosperity of the Dominion so greatly depends'.<sup>125</sup> New Zealand's conservationists, including respected scientists such as Leonard Cockayne, thus continued to rely on a language of hyperbole and alarm, using this as a deliberate stratagem to push their 'cause' – conservation for hydrological reasons. They also emphasised their scientific credibility by dismissing the climate-forest connection. Tellingly, for instance, Chilton, citing the lack of supporting scientific evidence, categorically stated that forests did not affect rainfall.<sup>126</sup>

He and others made these arguments for several reasons. First, excepting Cockayne, both Cotton and Chilton were scientifically educated professionals teaching science in the University of New Zealand. As an ecological pioneer, Cockayne also conducted scientifically informed experiments to determine the local-level impacts of wider processes of landscape change (Chapters 5 and 7). This, combined with Cotton and Chilton's background, would make all three suspicious of any theory that could not be easily scientifically proven. Second, their suspicions of climate ideas would have been reinforced through their reading of North American literature and the realisation that US foresters managed to expand their influence, in part through espousal of hydrological anxieties and by dropping climatic concerns. A variety of opinions had long existed on the relationship between forests and climate, it was simply now that in New Zealand the idea became discredited as New Zealand's aspiring professionals dismissed it outright. During debate

of Vogel's 1874 Bill, for instance, William Buckland, MHR for Franklin (south of Auckland), believed that forests only exercised local climatic influence.<sup>127</sup> In New Zealand, unlike in the US, where meteorologists led the charge against the forests-climate theory, New Zealand's meteorological service relied on non-scientifically trained staff, several of whom even upheld the local climatic influence of forests.<sup>128</sup> Third, it seems that, as noted at the time, geographical and climatic similarities between New Zealand and North America lent the latter forestry's reports a particular relevance to the dominion. It meant that North American findings and techniques required less adaptation to a New Zealand context than those of continental Europe or India.

As previous chapters demonstrated, in many of the Australian colonies – which, from 1901, became states in a federalist system – climatic arguments figured strongly as justification for the establishment of state forest management programmes. Influenced by American models as well as by growing evidence of inland deterioration (Chapter 7), most notably in the Western Lands District (western NSW), foresters in Australia also dropped climatic arguments. The infamous Federation Drought, lasting from the mid 1890s to around 1903, further focused attention on the need to maintain soil fertility, prevent erosion and ensure moisture conservation. Ironically, too, as in New Zealand, several colonial governments, such as South Australia's, also excised forest reserves 'as a cheap means of offering rural relief'.<sup>129</sup>

In India, the situation differed. Although American ideas on hydrology and soil erosion appeared more frequently in Indian debates, they did not necessarily signal a decline in the forests-rainfall theory.<sup>130</sup> Hydrological concerns increased because of soil erosion, gullying and flash-flooding experienced in much of northern India (see next chapter). The forests-climate argument, however, remained. Vasant Saberwal believes whereas over the twentieth century 'American forestry gradually gave way to a more quantified approach' to the question of the forests/climate/hydrological influence, Indian forestry remained 'largely rhetorical, and non-experimental'.<sup>131</sup> Debate on the veracity of the forests-climate question filled many pages of the *Indian Forester* in the nineteenth and twentieth centuries. B. H. Baden Powell and others trenchantly criticised the forests-climate link, but it gained powerful support from foresters like Dietrich Brandis (Chapter 4) and even meteorologists such as H. F. Blanford (1834–93).<sup>132</sup> Indeed, in 1908, an enquiry specifically set out to determine whether or not forests influenced rainfall, but it, as with the other 13 papers on the topic published between 1906 and 1913 in the *Indian Forester*, could reach no consensus.<sup>133</sup> In 1900,



Berthold Ribbentrop, for instance, held that while forest distribution depended primarily

upon its geographical position, its elevation, the configuration of the ground, and other cosmic causes which are independent of local circumstances, it can hardly be denied that the existence or non-existence of large well-wooded areas in a country naturally capable of growing forests affects its climate in a very marked degree.<sup>134</sup>

Citing evidence from ‘old residents’ in India who argued that rainfall decline followed deforestation, Ribbentrop also drew on the detailed scientific experiments of Ferdinand Ebermayer’s *Die Physikalischen Einwirkungen des Waldes auf Luft und Boden und seine klimatologische und hygienische Bedeutung* (The Physical Impacts of Forests on Air and Earth and their Climatological and Hygienic Dimensions). Ebermeyer, Professor of Chemical Agriculture, Earth Sciences and Pedology at the Royal Bavarian Central Forest Teaching Academy, conducted his experiments at the Forest Research Station, Bavaria, at different times of the year. Although hardly new – the work first appeared in 1873 – Ribbentrop argued that if Ebermayer’s conclusions revealed forests’ considerable temperature modification and rainfall increases in temperate Germany in summer, what greater impact must they have in India, ‘with such a fierce climate’?<sup>135</sup> There was also, as Bennett and Barton have noted, general resistance to American forestry methods among many IFS officers.<sup>136</sup> In the empire forestry movement, the veracity of forests-climate debates would remain a point of tension among foresters from different backgrounds.<sup>137</sup>

## Conclusion

Environmental anxieties about the effects of deforestation drew together South Asia and Australasia at different times in the nineteenth and twentieth centuries. In the 1870s and 1880s, South Asian examples and experts provided sources and solutions to New Zealand’s environmental problems, with an Indian forester leading New Zealand’s first forestry department. In Australia, Victoria also employed IFS foresters as experts in the 1880s and 1890s. They produced a series of damning reports on the inadequacies of forest conservation that reflected problems of having to protect forests through democratically elected state parliaments whose main aim was land settlement and not forest conservation. Anxieties also connected the various Australasian colonies. In the 1870s,

New Zealand and its treeless provinces provided a model of tree-planting legislation for South Australia. After the 1880s, Victoria, as well as New Zealand, looked to South Australia for the regulation of forests, when in both Victoria and New Zealand forest conservation took a step backwards with the decision to promote policies of closer settlement. By the late-nineteenth century and into the twentieth century, colonies like Victoria and New Zealand gradually drew on US models of environmental anxieties and responses. These emphasised the impact of deforestation on river flows as climatic anxieties fell from favour. Faced with criticism of the climate-forests connection, Australasian foresters disassociated themselves from scientifically unreliable theories and instead aligned themselves with hydrological concerns in the hope of gaining increasing bureaucratic power over forest control. In India, however, because of its relative strength vis-à-vis Australasian forest bureaucracies, the IFS continued to uphold climatic anxieties alongside hydrological concerns, the latter reinforced by its own on-going problems of erosion in northern India. In the twentieth century, despite attempts to co-ordinate forestry on a more imperial scale, the particularities of geography, politics and culture meant that environmental anxieties and responses continued to be articulated through local experience. Just as South Australia in the 1870s pursued tree-planting policies because of timber scarcity and because of a powerful parliamentary forestry lobby, so other areas such as provincial Otago and Canterbury made widespread use of forestation policies. Political and professional rivalry, coupled with the complexity of different local environments, prevented the Canberra-based Australian Forestry School from imposing its model of professionally trained foresters on Australia until the 1930s. New Zealand forestry, similarly, professionalised slowly in light of different local circumstances. Throughout, this chapter has underlined the interaction and changing nature of different anxieties and solutions in response to shifting political, environmental and social contexts. The next chapter examines anxieties about desertification and discusses its impact on the development of more professional state forest bureaucracies in Australasia.

# 7

## Thwarting Imperial Agricultural Development: The Spectre of Drifting Sands, 1800s–1920s

Ascending one of the sand ridges I saw a numberless succession of these terrific objects rising above each other to the east and west of me ... The scene was awfully fearful, dear Charlotte. A kind of dread came over me as I gazed upon it. It looked like the entrance to hell.<sup>1</sup>

Charles Sturt

Private owners ... would only be too glad ... if they could discover some cheap and easy method of converting the desert into a Garden of Eden.<sup>2</sup>

F. Codrington-Ball, 1894

Desert and spreading sands represented the antithesis of all that settlement promised. They were terrible, un-Christian, an evil to be remedied. Threatening not only settler economies, they also made a mockery of Christian injunctions to make land fertile, to turn land to productive use. Destroying productive land through deforestation, as previous chapters noted, impelled conservation and tree planting as well as the establishment of forest bureaucracies in some parts of South Asia and Australasia. Evidence that human activities were literally creating desert by encouraging sand drift elicited a similar language of fear. Officials and individuals viewed spreading sand as an ‘evil’ imperilling fertile plains and prosperity, but believed that environmental redemption could follow through well-organised reclamation. Acknowledging the role of humans in deforesting or overstocking coastal and inland areas, initiatives involved local measures – and occasionally legislation – undertaken by private individuals and local bodies. By the

twentieth century, fears of sand drift contributed to the extension of state bureaucratic, legal and scientific solutions (not invariably successful) to meet a range of environmental anxieties. While couched as a response to concerns about the loss of agricultural land, most successful sand drift reclamation actually took place in urban areas, which had a higher rating value. Sand drift challenged normative European assumptions about the productivity of all environments, helping in some cases to modify closer land settlement policies in Australasia. In seeking solutions, officials initially looked to the successful model of French reclamation, before increasingly drawing on other examples, which, by the second decade of the twentieth century, deployed ecological arguments couched in nationalistic terms. By this time, governments sought the advice of scientifically trained experts to define sand drift problems and solutions. This chapter largely concentrates on case studies of Australasian coastal and inland sand drift, principally in the colonies of New Zealand, Western Australia and NSW, with some discussion of inland sand drift and problems faced in northern India.

### **Causes of sand drift**

In 1872, the engineer C. D. Whitcombe emotively argued before the Wellington Philosophical Institute of the need for sand drift reclamation. The arguments he put forward captured the presentation of sand drift throughout Australasia and India. 'Everyone can see with their [*sic*] own eyes', declared Whitcombe, 'the rapidity with which ... land is drifting in this [Taranaki] province and elsewhere in the colony from fruitfulness to desolation'. Environmental neglect by settlers, charged Whitcombe, was turning the province popularly known as New Zealand's Garden of Eden into a wasteland. He predicted worse to come. Unless prevented, sand sweeping inland would create 'ever-increasing areas of desert land'. Sands, he observed, 'choke up the smaller streams' and form 'swamps and marshes along the line of their course'. Moreover, north-south and south-north tides, allied with rivers bringing 'loose virgin soil' downstream, he continued, would increase river bars and impede river navigation. France offered solutions. Its successful sand drift legislation, he noted, granted settlers free land on sand-affected property in return for tree planting and reclamation.<sup>3</sup> Unlike others who felt local authorities should deal with sand drift, Whitcombe regarded it as a national problem and therefore something the New Zealand government should attend to. Arguments about precisely who and which groups – whether local or central government or individuals – should address sand drift acted

as a lightning rod in debates throughout the nineteenth and twentieth centuries, and eventually contributed to increasing levels of central government intervention by the twentieth century. Less controversy attended the cause of drifting sand. Blame was squarely placed on settler deforestation, and in New Zealand, occasionally on Maori. Most Australian settlers did not attribute environmental change to Australian Aboriginals, a reflection perhaps of settlers' perception of that people's backwardness and consequent disbelief in their ability to cause large-scale environmental change. In British India, officials blamed both local people and colonisation itself for causing sand drift.

Contrary to many interpretations at the time, scientists have demonstrated extensive evidence of the environmental impacts of native peoples. In New Zealand, Polynesian deforestation and other environmental transformation, aside from causing extinctions and vegetation change, also likely affected coastal dunes.<sup>4</sup> In Australia, Aboriginal land use over thousands of years had, literally, crafted a mosaic of thousands of different cultural landscapes.<sup>5</sup> From the nineteenth century, however, colonisation accelerated the scope and pace of environmental change. Introduced into Australasia, European agriculture, grazing animals and deforestation appreciably increased disturbance, contributing to shifting sands and soil erosion in both coastal and inland areas.<sup>6</sup> Such erosion processes are complex, dependent on a host of factors from prevailing wind direction and (in the case of coastal areas) currents, to underlying geology, vegetation types, climate and moisture levels. Beach erosion occurs naturally, for example, especially during storms and its impacts vary. For instance, at Newcastle's Bar Beach-Merewether (NSW), discussed below, several days of easterly or north easterly winds can cause beach erosion at its northern end, but accretion at its southern point.<sup>7</sup> In the Mallee bioregion (defined by the dominance of multi-stem eucalyptus plants) located in northern South Australia and Victoria, and southwestern NSW, sandy soils and semi-aridity play a major role in wind-borne sand drift, processes accentuated through vegetation removal.<sup>8</sup> Sandy soils and aridity in India's dry lands, especially in the desert-tracts of the northwest, also present large-scale problems of wind erosion and sand movement. Lying in a rain shadow area, the Thar Desert of India's northwest covers an area of over 200,000 square kms.<sup>9</sup> Given the diversity of environments that can officially be counted as desert, this chapter focuses on European perceptions of sand drift, principally in coastal Australasia, but also in India and in the Western Districts of inland NSW. The survey presented in this chapter is not exhaustive in its discussion of the

regions affected by sand drift, but is one which, I hope, will stimulate further research and comparisons. A focus on Australasian coastal areas – as well as some representative inland examples – is deliberate. European settlement in New Zealand and Australia occurred along the coast, so an examination of certain sites over time provides valuable evidence of changing environmental perceptions and responses.<sup>10</sup> It also suggests that sand drift may have resulted from population impact and the mobile nature of dune material. Secondly, as a detailed picture of sand drift issues in India has proven difficult to obtain, observations are necessarily restricted to select examples, principally drawn from northern India.

The phase of Australasian settlement discussed in this chapter witnessed changing perceptions of, and policies towards, Australia's environment. As R. L. Heathcote observed in 1987, in the period from 1860 to 1900, most Australian colonial land legislators regarded it as entirely possible to be able to commercially use much of Australia and to make the desert bloom through tree planting, cultivation or irrigation works.<sup>11</sup> Until the 1860s, as historical geographer Joe Powell notes, intensive agricultural settlement occurred in coastal areas, with the pastoral frontier developing inland. This changed after the 1860s through an emphasis on the yeoman ideal of small family-owned, freehold farms. In New Zealand, pastoralism in the 1840s and 1850s also gave way to policies of more intensive settlement. By the early-twentieth century, soldier settlement schemes in both countries attempted to put more settlers on the land, often in agriculturally marginal areas, and consequently experienced high failure rates. At the same time, in some areas (such as the Mallee), government recognised that policies of closer settlement simply did not suit particular environments.<sup>12</sup> Indeed, successive failures of pastoralism and cultivation slowly eroded confidence in the ability of Europeans to develop the interior of much of Australia, leading to a dawning realisation that policies of closer land settlement using European agricultural methods might be unsuited to such different environments (see below and Chapter 6). In parts of inland New Zealand – especially its more drought-prone east – experience also served to challenge some aspects of European farming. In the main, however, the more reliable rainfall experienced over much of the country, coupled with the introduction of super phosphates much later, enabled European agricultural methods to continue.<sup>13</sup> In India, both the Company and British Raj sought to similarly raise agricultural productivity. Introduction of cash crops and agricultural intensification through the commissioning of new, as well as the reconstruction of old, irrigation canals and land acts

encouraging settlement, all promised increased revenue. While the area of productive land increased, generally it came at a high social, economic and environmental price. In the Western Punjab, for instance, scholars estimate that the area of productive land increased from 57 per cent of the total land area in 1850 to some 73 per cent by 1890, much of it taken from the desert fringes. With soaring deforestation rates, coupled with a change to cash crops rather than food crops, in times of drought, land degradation and major famine resulted.<sup>14</sup>

What stimulated such environmental transformation? Economic factors undoubtedly played a major role, but so too cultural ideas. Early explorers' accounts reflected the pervasive belief that sand dunes, like other agriculturally unproductive areas, were waste and required improvement. On the suggestion of Joseph Banks (1743–1820), James Cook (1728–79), for instance, named New Zealand's Northland coast the 'Desert Coast'. Cook confided to his journal that 'no Country upon Earth can looke more barren than the land about this Bay doth it is in general low except the mountain just mentioned and the Soil to all appearance[s] nothing but white sand thrown up in low irregular hills lying in narrow ridges parrallel [*sic*] with the Shore'.<sup>15</sup> Many other travellers in New Zealand, India and Australia expressed anxiety about the spread of sands. In 1830s Newcastle, NSW, sand overtook parts of the town, inundating fields and houses, with one visitor in 1851 describing how the town's 'streets had been filled up by a sand-storm, which left the houses just emerging from it'.<sup>16</sup> In 1833, Thomas Skinner commented upon his experiences of North India: 'Clouds of sand', he observed, 'drift about and enter our rooms at all quarters'. As sand poured into his cabin, he likened the wind to 'the breath of a volcano'. The effect was to give the whole area 'so withering an aspect – the earth so dry, the trees so blasted, and the people ... seem to have no life in them; all natural moisture locked up, they appear as if suddenly turned into stone'.<sup>17</sup>

What did settlers think caused such processes? Most ignored the possibility of non-human and indigenous environmental impacts, and blamed colonisation. In 1843, for instance, the German naturalist Ernst Dieffenbach identified deforestation as the cause of sand drift in Kaitaia, northern New Zealand. Forests, he explained, prevented 'the encroachment of sand', but their destruction 'has sealed the doom of this northern part of the island'. The 'overwhelming sand drift', he continued, 'is of a modern date'. Small oases of vegetation protruding 20 to 30 feet above the sand evidenced its rapid drift.<sup>18</sup> With the spread of colonisation and, with it, the intensification of land use, growing evidence emerged in Australasia and India about the problem of shifting sands.

### **Spreading anxieties in New Zealand: 1870s–80s**

Among New Zealand's men of science, anxiety about the spread of sand drift gathered pace in the 1870s. Imploring government action, C. D. Whitcombe sent his concerns – and details of French legislation – straight to the Legislative Council, New Zealand's upper house, but without success.<sup>19</sup> In 1873, two articles on sand drift appeared in the *TPNZI*. One reproduced a letter probably written by William Keene, Inspector of Mines, to the Government of NSW, detailing measures taken there to arrest the problem, early evidence of trans-Tasman sand drift anxiety.<sup>20</sup> Thomas Kirk read the other paper on the subject, making an impassioned plea for reclamation in which he conveyed the overwhelming sense of alarm and destruction felt at drifting sand. '[A]ll who have paid the slightest attention to the subject', noted Kirk, admit 'the magnitude of the evil'. Settlers and Maori, he observed, look on as 'helpless witnesses' to the 'evil'. The 'sand-wave', he declared, had already forced many Maori to abandon their cultivations.<sup>21</sup> Members of the Wellington Philosophical Institute, among whom Kirk numbered, read five of the six papers published in the *Transactions* on sand drift penned in this decade and early into the next, suggesting that the Institute became something of a centre for calculation for environmental anxieties. The reason is most likely because evidence of sand drift was readily apparent nearby to Wellington, as settlers were taking up increasing areas of land on the west coast north of the city. Other members, G. W. Williams and William Travers, also tied in sand drift to wider environmental problems. Williams, for instance, believed 'evil results' like climate change, flooding and sand drift all resulted from 'indiscriminate destruction of the forests', but hoped that planting might arrest 'the large sand-dunes'.<sup>22</sup> Travers presented sand drift as part of the many unwanted changes set in motion by settler environmental modification.<sup>23</sup> Widely read, Travers quoted from G. P. Marsh on Prussia's advancing sand drifts and referred to their rapid spread along France's west coast, an example he had also discussed two years before when debating Williams' paper.<sup>24</sup>

### **Newcastle and Perth: 1850s–80s**

Across the Tasman, sand drift was also threatening coastal settlements. Sand inundations in mid-nineteenth-century Newcastle buried properties, roads and cultivations, and featured as a regular part of the town's news. As early as the 1850s, the Director of Sydney's Botanic Garden



attempted to analyse and solve the problem. To combat the southeast winds bringing 'great quantities' of sand 'upon the adjoining houses and land', Charles Moore instructed Newcastle's Harbourmaster to fence the five to ten acre (three to four ha) drift and prohibit cattle from entering. With the surface smoothed and holes dug, the area was manured and brushwood planted. Despite Moore confidently reporting the growth of 'thick luxuriant vegetation, consisting of couch or doab grass, sea trailing joint grass, hottentot fig (*Mesembryanthemum*), Lucerne, tea tree (*Fabricia*), castor oil, exerotes [*sic*]', news of sand drift continued to fill the local papers, and sand, the local streets.<sup>25</sup>

In 1871, a Newcastle Borough Council committee attempted to rectify the problem, in vain introducing galvanised iron fences to check sand drift. By 1881, sand occupied an estimated 60 acres, in parts up to a depth of 30 feet (nine m).<sup>26</sup> Its financial cost hit hard. Average land prices in affected areas fell from between £300 and £400 to a mere £40.<sup>27</sup> The Newcastle Council poured £3000 into solving the problem, but with little success. At this point, NSW's parliament commissioned a special report from Newcastle's City Engineer, granting the Council a further £1000. A government commission, chaired by Charles Moore, who had earlier reported on the problem, tabled its report in 1883, recommending resumption of 94 acres (38 ha) of private land, at an estimated cost of £16,445 including re-vegetation.<sup>28</sup>

On Australia's western coast, residents of the coastal towns of Fremantle and Geraldton, Western Australia, were also facing similar problems. According to evidence presented to the Sand-Drift Commission of 1888, sand drift first appeared in Fremantle in the 1860s. Although for some 'natural causes' explained its emergence, most pointed to human activity.<sup>29</sup> The Commission ultimately attributed its spread to scrub clearance, exacerbated by grazing stock.<sup>30</sup> In 1868 residents of Geraldton, some 400 km north of Perth, put forward a motion to take to the colonial legislature requesting measures to arrest sand drift. Sand drifts, noted a resident, 'were threatening his own property, burying his neighbors' property, and would very soon stop the town and port altogether, unless it was at once overcome'. Reviewing the initial resolution requesting government help, Samuel Phillips (1819–1901), Legislative Council member, 'thought the words intolerable nuisance were not strong enough', advocating 'that much stronger language should be made use of'. He recommended 'the words "serious evil" would apply more strongly; [because] the cessation of the sand drift was of so serious importance that the strongest language possible should be used'. This recommendation was quickly adopted.<sup>31</sup> And, in 1872, the 'Geraldton Sand-hills

Planting Act' passed.<sup>32</sup> Like their New Zealand counterparts, urgency and fear underpinned the resolution, testifying to both the very real threat elicited by sand drift and to the importance of using emotive language to engage political action. Arresting the spread of sand was also justified by Christian injunctions. The Genesis Mandate supported reclamation. '[I]n the beginning', observed C. A. Manning, 'the Almighty had ordered man to conquer nature, and this nuisance of a sand drift it was the duty of man to conquer and overcome.'<sup>33</sup>

In seeking to conquer nature, Champion Bay's Secretary of the Reform Association, H. Gray, had earlier unsuccessfully lobbied the Colonial Secretary for the colony to provide men and horses to reclaim the drift.<sup>34</sup> 'The settlers of this district', Gray later complained, 'know well they are not to expect any popular assistance from the Perth Government, even of the most paltry [of] amount[s]'.<sup>35</sup> Eventually, following prolonged lobbying by Phillips, the Legislative Council granted £500 to assist local reclamation.<sup>36</sup> As settlers in the various other Australasian colonies would discover, the difficulty of addressing sand drift arose from an inability to adequately fund reclamation. Were private individuals, local bodies or state organisations accountable? Moreover, should private or public monies be used? Usually cash-strapped colonial governments were unwilling to oversee the full costs, but as evidenced from New Zealand, NSW and Western Australia, environmental anxiety helped to justify increasing government intervention in society. Australasian governments certainly feared interfering too greatly in the affairs of individuals and stymieing private enterprise, but those expressing environmental anxieties, as these examples demonstrate, continued to call for government action to secure the public good in a variety of environmental spheres, whether through reclamation of sand drift or reforestation, forest conservation or provision of public parks. Continued cries for government help, combined with an often-patent local inability to meet many of these environmental problems, slowly increased the role of government in society. Led by 'environmental' experts and sometimes employing members of newly-created bureaucracies, state legislative solutions using science to meet the problems of drifting sand emerged towards the end of the nineteenth century.

### **Indian sand drift and soil erosion**

Areas of inland and coastal India suffered from the effects of soil erosion and sand drift. As noted, British encouragement of land intensification through settlement policies emphasising cash crops over food crops and

the introduction of irrigation led to serious ecological problems in parts of north India. Michael Mann demonstrates that in the Yamuna-Ganga Doab (the region between the Yamuna and Ganges rivers, in the United Provinces), revenue and demographic pressures resulted in the loss of up to 70 per cent of the area's original forest cover from the early-to-mid-nineteenth century. Although clearance undertaken in the Upper Doab by the Mughals had reduced the area of forestland, that undertaken as a consequence of British policies, he notes, led to a host of ecological problems exacerbated by drought, population pressure and the growing of fewer food crops. Its impacts included increased wind erosion, higher temperatures, sub-soil drying, increased frosts and drifting sand.<sup>37</sup> Attempts to alleviate such problems through re-construction of irrigation canals expanded the cultivable area but also brought salinisation and water logging, the resulting *reh* lands proving remarkably difficult to reclaim.<sup>38</sup>

On the Punjab, as a report noted in 1862, there are few districts 'where pure siliceous sand is not found on the surface in great abundance'. In the Upper Provinces (also known as The United Provinces of Agra and Oudh; and from 1856 to 1902 as the North-Western Provinces and Oudh), noted the report, sand drift lies 'sometimes in hillocks several feet high, or as a thinner covering, and in many instances gives an entirely altered character to the alluvial land.' Exacerbating the problem were the few natural obstructions to sand.<sup>39</sup> As Lieut.-Col. G. B. Tremenhere commented (presumably for 1862 although no year is recorded) on north western India:

[I]n the Julundhur [*sic*], and in many parts of the Cis-Sutledge [*sic*] states ... long hillocks of pure sand resemble the sandy Dunes near a sea coast, or on the borders of a desert. From these the white and arid material is gradually spread by the action of high winds during the dry season, till at length surfaces of considerable extent become totally unfit for cultivation.

Tremenhere hoped that a local plant known as mudar (either *Calotropis gigantea* or *Calotropis procera*) would be able to arrest its spread.<sup>40</sup> Another author believed that '*sirkundah* grass, bushes, or any kind of vegetation' would save 'many an acre from utter sterility' and address the 'evil'.<sup>41</sup> Both held that science would be able to combat the problem, either through increasing efficiency in agricultural methods or through making available a small grant for experimentation with manures.<sup>42</sup> Tree-planting experiments also took place.<sup>43</sup>

In 1879, B. H. Baden-Powell, Conservator of Forests, Punjab, presented a comprehensive overview of the problem of *chos* (seasonal streams) bringing down sand from the Hoshiarpur Siwalik ranges onto the fertile plains below (Figure 7.1). Assessing ‘the magnitude of the evil’, he stressed the importance of both prevention and reclamation. In one area alone, he noted, sand already covered an estimated 35,000 acres (14,164 ha) and threatened many more acres of fertile land. Its cause was deforestation through fuel-wood demand by local people and vegetation disturbance by animals, a process that operated in a vicious cycle. ‘The more the invasion of sand spoils the land’, he noted, ‘the more there will be a tendency among the people to become less agricultural and more pastoral’. In other words, some British feared that continued environmental problems would undermine the civilising process already undertaken by government and represented by the extension of settled agricultural lands. Solutions included control of water discharge and reclamation under the authority of foresters combined with either declaration of a new act

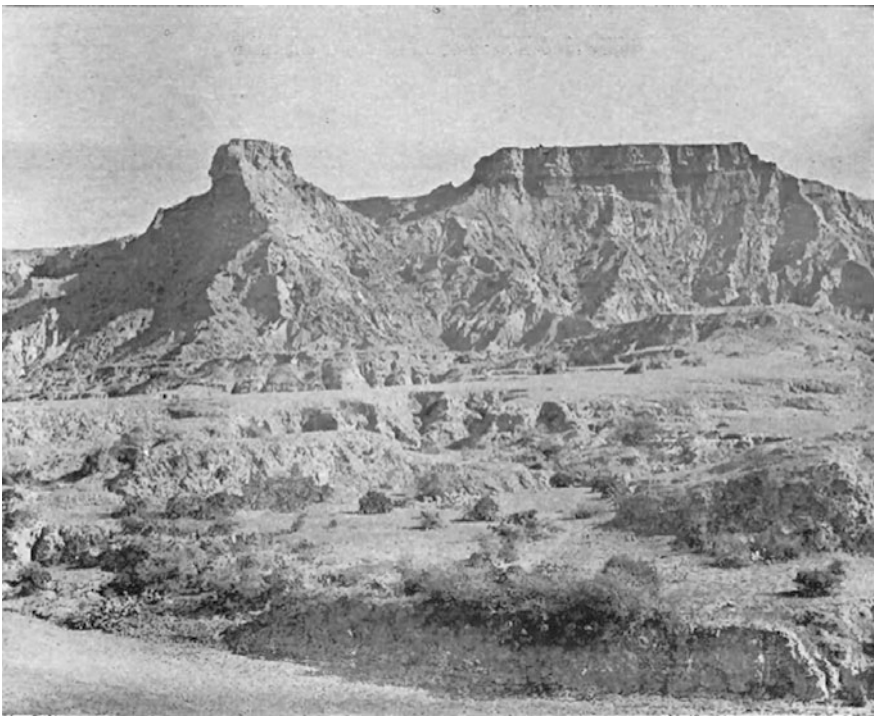


Figure 7.1 ‘Eroded country typical of the United Provinces and Punjab’

or Enforcement of the 'Rules for the Hill District of the Punjab, 1855', both of which would restrict local access rights to resources.<sup>44</sup> As Vasant Saberwal has shown, members of the Punjab Forest Department presented alarming images of gullied landscapes, despoiled fields and general environmental catastrophe to justify forest reservation and an extension of the powers of that department. Two acts passed in 1890 and 1900 gave government strong powers in the region, ostensibly to protect existing vegetation and reclaim lands affected by *chos* (see later section).<sup>45</sup>

Along southern India's coast, sand drift impacted on agriculture, in some cases for the better. Southeastern Tirunelveli lies in the rain shadow of the Ghats during the south west monsoon from May to September and is affected by the dry season of February to April. In 1885, B. R. Branfill drew attention to its 'shifting sand-wastes' which 'move eastwards with the prevailing winds of the dry season at the rates of several fathoms yearly, overwhelming everything in their course and leaving a desert of coarse sand behind them'. The bright red sands near Tirunelveli were, however, extremely helpful. During the wet season of the northeast monsoon (from October to February), they collect rainwater, explained Branfill, releasing it gradually such that they sustained 'extensive fruit-gardens throughout the year'.<sup>46</sup>

### **French reclamation models**

In seeking a solution to, and a precedent for, government action, Australasian and Indian advocates of reclamation commonly held up the example of successful French reclamation. As with climatic and hydrological anxieties, French forestry (as well as biblical examples) provided evidence of both the dangers of sand drift and of successful reclamation methods. In the late-eighteenth century in southwest France, in the *département* of Gascony, a 240 km belt of inland coastal dunes threatened farmland and forests. In one instance sand engulfed an entire village.<sup>47</sup> The French government intervened to stop its spread and under the direction of engineer N. T. Brémontier, coastal dune stabilisation in Gascony and in parts of Les Landes began in the late 1700s. Reclamation continued into the nineteenth century, with work largely complete by 1817. In this time, a totally new landscape emerged. Dune stabilisation, afforestation (principally in pine) and drainage redeemed a 320,000 ha area of marshland, making it suitable both for agriculture and forestry.<sup>48</sup> Other European states, like Denmark, Prussia, Hungary, southern Russia, and Britain, facing similar problems of coastal and

inland dune encroachment, also solved them using methods adapted from France.<sup>49</sup>

Well aware of France's successful precedent, colonists in Australasia and officials in India mentioned shifting sands in France to emphasise the threat of sand drift and the possibility of redemption from this 'evil' through state intervention. Along with many Australasian advocates, Travers upheld the French model 'of populous and fertile districts having by this means been converted into barren wastes'.<sup>50</sup> Kirk praised the transformation of 'immense wastes of trackless sand' in the Gulf of Gascony. As humans had turned the garden into a desolate waste, so too, he believed, 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'.<sup>51</sup> Addressing the problems of West Australian sand drift, F. Codrington-Ball discussed in detail nineteenth-century French reclamation. The 'French Government', he observed, 'had already solved the problem of "How to make profitless and destructive sand drifts return a handsome revenue to the State"'. By following the example of France, Codrington-Ball predicted that residents of Fremantle and Geraldton 'could discover some cheap and easy method of converting the desert into a Garden of Eden'.<sup>52</sup> In India, Tremenhare also cited Les Landes' successful reclamation as a model for the Punjab.<sup>53</sup> Like other environmental anxieties, settlers emphasised the threat sand drift posed to agriculture and future generations, strongly emphasising that reclamation could also earn governments money. By the twentieth century settlers increasingly relied upon local, and overseas models adapted to local contexts.

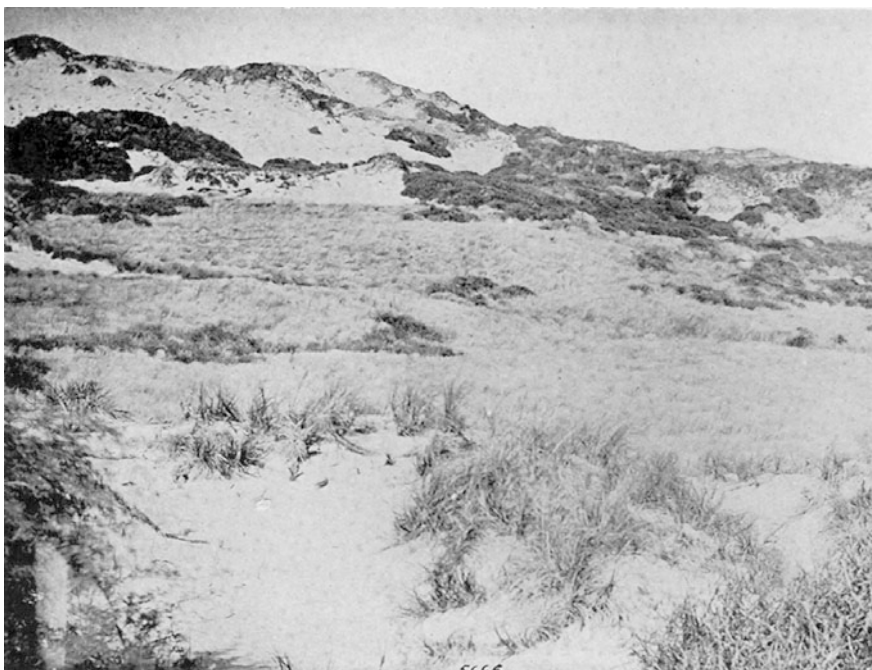
### **Local action: Redeeming wastelands**

A case study of local reclamation comes from North Island farmer John Handley, whose militant attitude towards nature echoed Manning's in Geraldton. Just as keeping new land weed free and preventing rivers washing soil away became difficult, so 'in some places', noted Handley, on his property at Okehu (near Wanganui) 'the sand hills have come to be looked upon as an enemy that has to be battled against'. Handley confessed 'to a sense of relief in leaving the depressing influence of the sand hill wilderness and felt doubly glad that the fat pastures and rich wheat fields could be shielded against the grey invader'. Land such as this represented wilderness, or as they frequently termed it, wasteland, the existence of which broke biblical injunctions to productively use

land. Although redeeming ‘fallen land’ gave Handley great satisfaction, he warned against complacency. Personifying sand drift as an enemy extended the metaphor of sand drift as an evil, and gave urgency to its removal. Echoes of such militaristic endeavour resonated into the next century. ‘Constant vigilance was required,’ he warned, ‘lest the “grey invader” attack the “fat pastures and rich wheat fields.”’ Despite his adversarial tone, Handley displayed an ethos of environmental protection shared by many other farmers who sought to maintain long-term land quality.<sup>54</sup>

In contrast to most other writings, in 1891, M. Murphy presented sand drift to Christchurch’s New Brighton Improvement Society as an opportunity rather than a problem, a rare example of a non-declensionist narrative. While acknowledging some ‘drawbacks’ to the area, Murphy believed New Brighton ‘has one of the finest beaches in the world’, 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’, declared Murphy ‘is that you will do your part and complete the picture’. Sand drift, Murphy implied, represented something unnatural, but affected land could be restored to its originally fertile state. Illustrating the manner in which colonial knowledge travelled, Murphy also held up Gascony sand reclamation and the recommendations of Victoria’s Ferdinand von Mueller, as models for the Society to follow.<sup>55</sup> Adapting these models, Murphy presented reclamation as part of the civic improving ethos of the day, which had seen plantings undertaken throughout the city of Christchurch.<sup>56</sup>

As in some parts of Australia, the New Zealand government formed societies to combat shifting sands when local resources could not adequately deal with the problem. In Dunedin, in 1884, preventing drifting sand sweeping onto a public reserve proved beyond the resources of the municipal council, so government formed the Ocean Beach Domain Board, giving it the powers in 1892 to raise a loan of up to £10,000 and in 1894 to levy rates (Figure 7.2).<sup>57</sup> 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, it extended plantings and fencing.<sup>58</sup> As evidence of the strong desire to solve sand drift, the following year it received authorisation to raise up to £20,000.<sup>59</sup> Experience elsewhere in Dunedin, however, was mixed. Road Board planting largely arrested the spread of sand over the road between Musselburgh and Tomahawk Lagoon, but further down Otago’s Peninsula, near Taiaroa Head, marram grass planting failed, with sand covering ‘up an entire farm to a very great depth’.<sup>60</sup>



*Figure 7.2* 'Partly reclaimed dune at south end of Ocean Beach, Dunedin. Hills not planted'

If government and local action stimulated reclamation attempts in Dunedin, then voluntarism characterised the efforts of another local, rural community further up the coast. Southern Maori District MHR, Tame Parata (1832/8–1917), described the formation of an improvement society in Waikouaiti (approximately 30 km north of Dunedin, Figure 7.3) to protect 'a peninsula from being cut off by the sea from the mainland'.<sup>61</sup> Through voluntary collection, the society raised over £230 to spend on protection measures, including fencing and extensive planting, even going 'to the expense of' introducing 'native plants from Stewart Island and the Chatham Islands'. On Arbor Day, Maori and European schoolchildren planted these trees. Later, although Parata noted proudly that toetoe (*Cortaderia* genus) and marram grass grew well there, 'all along the South Island sand is drifting on to the valuable land, and it wants to be arrested'.<sup>62</sup> As these Australasian examples suggest, the success of sand drift reclamation depended on local initiatives in urban areas, sometimes with government support. Over ensuing decades, the state assumed an ever-greater role in directing solutions to sand drift.





*Figure 7.3* ‘Sand-spit, Waikouaiti Bay. In Centre artificial foredune; natural dunes beyond’

### **Late-1800s government action: Western Australia and NSW**

By the late-nineteenth century, the environmental anxieties of individual communities triggered several Australian colonial governments and authorities to bring legislative action to bear against drifting sand. This action was co-incident with increasing government support for agricultural and pastoral development through the establishment of agricultural departments and the like (see below) and with the emphasis on government-led development. Prevailing sentiment initially precluded overt government intervention in the affairs of individuals lest it stymie private enterprise. In 1888, John Arthur Wright asked ‘what right ... has the Government [of Western Australia] to fence in [a] person’s property or what right has the Municipality to do it?’<sup>63</sup> Colonial governments mostly favoured a compromise between their efforts and the money and energy of private individuals. Gradually, as the twentieth century lengthened and as the state became more actively involved in environmental activities, state bodies such as the various newly created forest departments assumed responsibility for reclamation work, efforts often

undertaken systematically using the advice of scientific experts but until then, and despite scientific advice, responses often remained ad hoc.

Western Australia passed some of the earliest specific legislation designed to combat sand drift through the Geraldton Sand-hills Planting Act (1872). Later, in 1888, Western Australian legislators proclaimed a general sand drift act. Western Australia's Director of Public Works, Wright, observed that the 'very serious evils' of the 'sand drifts, both at Fremantle and at Geraldton' meant 'some radical steps' needed to be 'taken at once to stop it'.<sup>64</sup> Fremantle's Sand-drift Commission, after hearing evidence from residents about drifting sand and its causes, recommended expenditure both from individuals affected by the drift and by municipal authorities.<sup>65</sup> Later parliamentary debate on the Bill provoked widespread recognition of the need for action, but heated exchanges on who should foot the cost – only those whose land the drift affected, the whole town or the colonial government?<sup>66</sup> Fremantle residents, outraged not only at a lack of consultation about the Bill but also by the provision that ratepayers bore half the cost of the reclamation, succeeded in persuading the Governor to defer its passing and to insert more favourable terms.<sup>67</sup> Once passed, the Act empowered municipal councils or road boards to declare a sand drift area and granted it powers to compel owners to fence and vegetate that area. If the owner failed to undertake any of these measures, the Council could do so, reclaiming costs against the owner. Any road board which did not act accordingly within six months of the provision coming into force could itself be liable and the works taken over by the Director of Public Works.<sup>68</sup> How successful was this measure and where was it applied?

Concerns about sand drift focussed on Fremantle.<sup>69</sup> Contemporary newspaper reports suggest mixed success within 18 months of its passing. The *West Australian* editorial of 24 June 1891 reported that a 'great amount of fencing has been completed' along with the planting of 'spear-grass, rye grass, native fig and other plants suitable for a sandy soil'. Although noting the very good work undertaken, much 'still remains to be done'. The editor also pointed out irregularities in the Act's enforcement. Council, it alleged, compelled landowners of smaller areas, rather than wealthier landowners of larger areas, to arrest sand drift. Cattle remained a problem, destroying vegetation and preventing dune stabilisation. Although noting the need to more strictly enforce provisions against stray cattle, overall, the editor felt confident that Fremantle's problem, like Albany (south of Perth) and Geraldton's, would be resolved.<sup>70</sup> Another correspondent concurred, noting some

successes, but observed that greater efforts, particularly by the Council to macadamise roads, were required,<sup>71</sup> evidence supported elsewhere.<sup>72</sup>

On Australia's eastern coast, Newcastle's Council left sand drift decision making to colonial government, as it was unable to reach agreement to purchase land owned by one of the principal landowners affected by the sand drift, the Australian Agricultural Company. The Company would only agree to foot one third of reclamation costs if the experiment succeeded and it gained an exemption from local taxes, a position unacceptable to the municipal council. On 14 October 1886, NSW's parliament enacted the Newcastle Sand-drift Reclamation Act. This authorised resumption of a grant of £3000 towards reclamation costs. After 15 months of stabilisation and planting work involving some 25 men, the reclamation was declared finished, and a caretaker appointed to look after the area, which became a recreation reserve, Empire Park. Trees from the local State Forest Nursery at Gosford afforded protection.<sup>73</sup> Despite these efforts, however, the problem remained. In 1890, Council requested £1000 from the colonial government to keep Darby Street sand free. In 1891, Alderman John Thorn 'stated that the plantation at the sea beach was fast being covered, the sand being now level with the tops of the fence.'<sup>74</sup> In the next century, however, the problem apparently abated.<sup>75</sup>

### **New Zealand's 1903 Sand-drift Act**

With government also taking on a more active role in promoting agricultural development through the provision of state scientific advice, under the Native Minister, James Carroll (1857–1926), New Zealand introduced its own Sand-drift Bill in 1903 specifically to prevent sand dunes from spreading onto agricultural land. Although I have found no evidence to connect this legislation with that of the various Australian states, some knowledge of the Australian cases is likely given the similarity of the measures and the legislation's wording. New Zealand's proposal empowered the Minister of Lands to delegate to local councils the necessary reclamation work. Settlers bore reclamation costs on their own land, but could appeal against any decision to a Stipendiary Magistrate, who, in conjunction with two Assessors, would review individual cases.<sup>76</sup>

During debate, parliamentarians presented sand drift in now-familiar terms, as an evil threatening to destroy agricultural and economic prosperity. Reclamation works, they pointed out, offered national salvation and profit. Discussion suggests a perceived worsening of the problem, as well as increasing acceptance of state intervention to alleviate

environmental problems. As in some Australian states, New Zealand sand drift threatened both agricultural and urban lands, providing further evidence of the importance of considering together urban and rural areas in environmental history.<sup>77</sup> Introducing the Bill, James Carroll pointed out 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. '[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.' Without forest to arrest its inland spread, 'the danger of the valuable tracts of land lying along the coast being covered with sand is increasing every day.'<sup>78</sup> To add credence to his argument, Carroll quoted from the *Edinburgh Review* on the evils of deforestation and sand drift, especially alerting listeners to '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].' Deforestation, observed Carroll, meant the alternation of floods and droughts 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.<sup>79</sup>

The Bill received a supportive but critical response among MHRs. Most agreed on the necessity for action but not on suitable strategies.<sup>80</sup> Particular criticism focussed on the extensive powers granted to the Crown to proclaim reclamation areas.<sup>81</sup> Most MHRs preferred local authorities to reclaim sand drift areas rather than the Crown.<sup>82</sup> Both Sir William Steward (Waitaki) and Robert Houston (Bay of Islands), moreover, doubted that settlers could afford the measure, while William

Field (Otaki) believed that Maori could not.<sup>83</sup> Some even expressed pessimism about the success of any measure. According to Robert McNab, himself an active proponent of forestry (Chapter 5), ‘there are large areas ... in this country that you will never be able to protect from the drifting sand.’ ‘[T]he day will come’, he predicted, ‘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.’<sup>84</sup>

Environmental anxiety infused the debate. At the bill’s second reading, W. C. F. Carncross (Taieri) 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 Paekakariki up to Foxton [on the south western coast of the North Island], 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 sand hills the sand flies in clouds with every wind, and on a day it is carried for miles. In the neighbourhood of the sand hills 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.<sup>85</sup>

Other MHRs expressed greater confidence in measures. Legislation, proclaimed A. D. Willis (Wanganui), ‘will be the means of saving thousands of acres of fertile land which would otherwise be smothered’.<sup>86</sup> As ‘a member of the Wanganui Harbour Board’, he recounted that some ‘three hundred acres of a perfect wilderness’ was granted to tenants, ‘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'.<sup>87</sup> Job Vile (Manawatu) and W. C. Buchanan (Wairarapa) echoed that experience, pointing out the success of tree planting in their districts.<sup>88</sup>

Passed in October 1903,<sup>89</sup> 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 measures. Expenses were recovered through 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.<sup>90</sup> The emphasis placed on government action at the local level and reluctance to grant too much power to central governments illustrate that, despite the emergence of nationalism and the strengthening of central government, people continued to experience and alleviate environmental problems at the local level and to resist an increasing role of central government in their lives.

Parliamentary debates on sand drift mirrored the narrative structures used elsewhere to describe the impact of deforestation on timber supplies, climate and hydrology (Chapters 4 to 6). Seizing on emotive examples – of sands devouring acre upon acre of fertile land, of stinging sand reddening eyes and stifling breath – proponents promised that legislation could save lands from desolation. In contrast to earlier descriptions principally reliant on foreign – especially French – examples, politicians at the 1903 debate almost exclusively presented examples of sand drift from New Zealand. All parliamentarians agreed that colonisation had increased sand drift's scope and demanded immediate attention. Perception of the threat of sand drift likely arose because their rapid spread enabled people to see the process occurring within a relatively short period.<sup>91</sup>

### **Evaluating the effectiveness of New Zealand's Sand-drift Act**

Did the Act successfully address sand drift? It enjoyed greater success in more densely settled areas than in those where the population was sparse.<sup>92</sup> Inland sand encroachment in Cromwell, Central Otago, supports this interpretation, demonstrating at once legislative limitations and increased government reliance on scientific bureaucracy to solve environmental problems. With remedial action hampered by bureaucratic

lethargy and further slowed by World War One, Cromwell's drifting sands continued to spread long after decisions were made to reclaim them, a reminder that environmental changes commonly do not follow human time-scales or react in ways expected by state legislators or scientists.<sup>93</sup>

Towards the end of the nineteenth century, Cromwell council spent hundreds of pounds on attempts to arrest a drift threatening the town.<sup>94</sup> The drift originated in the 'Great Flood' of 1878, which deposited 'sand about 4 feet deep' on the lower flats of the Clutha River and compounded existing problems. Council marram planting temporarily arrested its spread,<sup>95</sup> but by 1915 it was once more threatening the town (Figure 7.4). That year the Secretary of the Upper Clarke Fruit Growers Association requested Cromwell's mayor to take measures 'to have the sand nuisance on Sugar Loaf Terrace controlled'.<sup>96</sup> With a note that 'a revival of the old sand drift trouble' appears to be happening, the Public Works Department became involved.<sup>97</sup> In 1916, government sent a deputation, but by 1917, when Cromwell's mayor again petitioned the government for help, action still had not been taken.<sup>98</sup>



*Figure 7.4* 'Catching-fence in process of being buried. Dunes, Cromwell. Fence originally 15 ft [4.6 m] tall'

Meanwhile, Cromwell Borough Council formed a sub-committee to report on the costs of 'quelling the sand drift', estimated at £960.<sup>99</sup> By 1916, it had spent £1840 13s 1d on reclamation works, but without lasting success.<sup>100</sup> Three years later, the situation had become desperate. The Town Clerk implored Sir William Fraser, the local MHR, to lobby 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'.<sup>101</sup> Government finally commissioned a report and provided two grants each of £100 to plant marram grass, money only made available provided the Council supplemented this with half of the amount donated by Government.<sup>102</sup> Although it is tempting to see Cromwell Borough Council resorting to hyperbole to overplay the effects of sand drift to secure Government money, the Council's spending of over £3500 on arresting sand drift by 1923 clearly demonstrates the great threat shifting sands posed to the town.<sup>103</sup> Sand problems continued in Cromwell into the 1920s, with both Council and government continuing to direct money towards reclamation.<sup>104</sup> Cromwell's case study demonstrates that government was slowly making funds available to arrest sand drift, and that reclamation took place in areas of close settlement.<sup>105</sup>

Based on the case study of Cromwell, coupled with evidence discussed in the previous section, the legacy of the 1903 Act appears mixed. Its passing betokened increasing government intervention in society and its use of science to improve the economy, and, particularly, agriculture. In the decade or so before the Act, the Liberal Government created, and later expanded, new departments like those of Labour, Education, and Agriculture.<sup>106</sup> The last, formed in 1891, demonstrated the importance of agricultural development to Liberal policy.<sup>107</sup> Policies actively encouraged closer land settlement. Voluntary settlement, direct purchase of Maori land, government loans to settlers and, perhaps most famously of all, John McKenzie's 'Lands for Settlement' scheme involving the breaking up of larger estates, all sought to entrench this yeoman ideal.<sup>108</sup> Earlier, such government intervention would have been hotly debated and resisted. Sand drift clearly threatened the Liberals' policies of land settlement and improvement, but the issue was overshadowed as the Government's energies were directed towards pushing through its other policies. If New Zealand's Sand-drift Act exemplified a general increase in Liberal Government activity in society and economy, it also stood as a compromise between the worst of unfettered capitalism on one hand and the dangers of socialistic intervention on the other.



The Act recognised that the government could direct sand reclamation, but granted it the power to recoup the cost of reclamation through rates. Intervention still had its limits. For example, a request in 1908 to purchase land on which to conduct sand drift experiments and to produce a leaflet on sand drift prevention fell on deaf ears.<sup>109</sup>

Government action against and drift in the twentieth century also demonstrated an increasing tendency to use scientific expertise to delineate possible solutions. 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'.<sup>110</sup> 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 Department of Agriculture. 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 (DSIR) in 1926.<sup>111</sup> This body provided guidance and research into methods of improving agricultural production such as through the development of artificial fertilisers.<sup>112</sup> The message was that science could increase agricultural productivity and prosperity.<sup>113</sup>

Although government made a start through its use of science to identify the problem, sand drift continued to eat away at valuable agricultural land, as effective measures were not enacted. A gap existed between sanctioning initiatives and shaping environmental behaviour, a gap indicative of the limitations of government power. As T. H. Potts had noted over 30 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'.<sup>114</sup> To his statement might well be added the caveat that natural events themselves could also 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?

Government made only limited use of both Arbor Day, introduced nationally in 1892, and its recently established Forestry Branch (1896). The best policy remained to make use of existing government departments. In 1910, the MHR for Taumaranui requested the Minister of Agriculture to supply teachers with sand-binding plants in sand-dunes districts. The Minister of Agriculture promised to give any 'application for roots of marram grass or seeds of lupin' 'sympathetic consideration', noting that it is 'desirable to familiarise children, in districts where there are

sand-dunes, with the use of sand-binding plants'.<sup>115</sup> Despite this and the example of Waikouaiti cited above, few other attempts during Arbor Day seem to have addressed shifting sands, a reflection perhaps of the event's emphasis on aesthetic planting and ceremony. Planters also concentrated their initial efforts on school grounds and public reserves, not beaches and sand-affected zones.<sup>116</sup> Reclaiming sand, moreover, required considerably 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. If Arbor Day does not appear to have contributed greatly to sand reclamation, then neither did the Forestry Branch.<sup>117</sup> The exception to this occurred at Sandy Point (Southland), where '[t]wo skilled tree-planters', working for three weeks, planted some 16,100 Marram grass sets and 1260 *Pinus muricata*, erected 88 chains of wire-netting fencing and lined out 5000 seedling pines for future operations.<sup>118</sup> Given the concentration of the Forestry Branch on establishing nurseries and undertaking planting in treeless areas, the lack of sand reclamation work is puzzling. Financial difficulties perhaps forced it to concentrate solely on its mandate to re-forest treeless areas.<sup>119</sup>

### **Northern Indian case studies**

In the Siwalik range, Punjab, deforestation and over-grazing, combined with the underlying friable rock of the area, contributed to massive rates of gulying, soil loss and sand drift (see earlier section). Despite the warnings of foresters such as Baden Powell and others from the late 1870s, British policies of land settlement continued to encourage villagers to graze animals, leading to a cycle of uncontrolled exploitation which had devastating consequences.<sup>120</sup> The removal of vegetation and forest on the uplands resulted in soil loss on the upper slopes and sand drift on the plains below, exacerbated by changed climatic conditions and the effects of the monsoon. E. P. Stebbing estimated that, as a consequence of deforestation and over-grazing, sand swept over in excess of 70,000 acres (28,328 ha) of previously fertile lands. Under fire prevention legislation, late-nineteenth-century policies of land reservation managed to prevent erosion in some areas, but the overwhelming problem remained in the twentieth century.<sup>121</sup> As a result, The Punjab Land Preservation Act, 1900 specifically targeted erosion, empowering the Provincial Government, where necessary, to extinguish private property and to prohibit certain activities such as forest clearance, grazing, vegetation removal, or channel widening.<sup>122</sup> But as with sand drift legislation

in Australasia, the legislation struggled to deal effectively with the problem. A special Punjab Denudation Committee (1910), along with increasingly detailed scientific reports into the problem of denudation and erosion, capture later responses and resonate with similar efforts undertaken in Australasia. Finally in 1939, the former Punjab Forest Department established a special Anti-Erosion Circle in West Pakistan to re-afforest denuded land and undertake more detailed surveys.<sup>123</sup>

Similar problems affected United Provinces, as its Deputy Conservator of Forests, E. Benskin, outlined in 1922. He lashed ‘the reckless extermination of forests’ which had continued ‘unchecked for centuries’, such that forest covered only seven per cent of land area in the region, most of it growing in the hills and sub-montane regions. As he went on:

The appalling rate at which that portion of the country known as the Gangetic Plain is being eroded, the increasing sterility of the soil, the sinking of the spring water levels, the severity of the climate ... are directly due to the wholesale clearance of the natural forests.

It required, he continued, ‘such a Herculean effort to combat that Government has, up to quite recent years, hesitated to take the initial step’.<sup>124</sup> As Benskin observed, forest encouraged rainfall, protected soil and prevented denudation. Drawing from American evidence, he noted that it also led to the loss of navigable rivers through the release of siltation after deforestation, a point little appreciated in India. After citing evidence of problems in the Jumna valley (through which the 1384 km long Jumna River flows, eventually into the Ganges) and with the Hoshiarpur *chos*, resulting from grazing disturbance of the soil, he noted there were two options available to solve the problem: either ‘the artificial way of the engineer’ through dams or ‘the more natural way of the forester’ through planting.<sup>125</sup> Deforestation, coupled with grazing, he noted, contributed to the problem of flash flooding and massive rates of soil erosion. Without grazing, he observed, sissoo and khair (*Acacia catechu*) would grow and thereby check the downstream rush of water, preventing soil erosion and the development of deep ravines. The impacts, he continued, were not only readily apparent in the ravines and appearance of wasteland, but also in declining cultivation. With sudden floods from the tributaries of the Jumna resulting from denudation, the area of cultivation had declined considerably over the last 50 years ‘in many villages of the Saharanpur Tarai’.<sup>126</sup>

Benskin also surveyed the attempts to redeem such ‘wasted’ land through afforestation. In 1879, Dietrich Brandis furnished a report on

the issue of wasteland and its use in Agra, Etawah and its neighbouring districts, with an urgent recommendation to establish fuel and fodder reserves with the aim of mitigating the effects of famines. While government discouraged Brandis from proceeding with the plan, J. S. Fisher of the Imperial Civil Service started to address the problem. In 1884, he persuaded zamindars who owned ravine land of some 13 square kms west of the town of Etawah (Figure 7.5) to 'hand over their land for the creation of a fodder and fuel reserve and for the protection of the ground from erosion and further deterioration'. With investment from zamindars, all subsequent profits would be divided equally among landowners. The scheme appeared to offer a suitable model for elsewhere but, by and large, it did not take off. Next, in 1901, an experimental plantation was begun on the insistence of the military. Hobart Hampden, Deputy Conservator of Forests, began a small plantation of 344 ha next to the railway line at Kalpi, Jalaun District, as well as a smaller plot near Ata railway station, eventually extended to cover 4371 ha. Although not financially successful, the experiment proved that severely eroded ravine land could be redeemed through light ploughing, the use of dams to control erosion and the planting of babul (*Acacia arabica*). Similar experiments took place elsewhere such that in 1912 an Afforestation division was formed. Through land purchase areas, such as 1800 ha of babul forest near Kunehta and Bandhur Bazurg, the area of land under tree cultivation and management was extended. Although understandably expressing an aversion to enforcing compulsory purchase of ravine land for reclamation, in 1914 government ordered the surveys of ravine lands in Bundelkhand, Muttra and Agra districts. As a result of the Etawah Conference, and using section 38 of the Indian Forest Act 1878, management of ravine areas was passed onto government voluntarily by such landowners as the Rajas of Bhareh and Partabnair. This transferred over about 12,141 ha of land to government management, in return for which landowners received a flat rental, until the value of the land increased through the maturing of the crops or trees. As Benskin noted 'The proposition is justified on the grounds of insurance against famines, saving of valuable country from erosion, improvement of agricultural amenities, and reclamation of waste and worthless land, as well as making it a popular measure with the owners.'<sup>127</sup> Interestingly, both a special branch of the agricultural department and a special afforestation branch of the Forests Department were deputed to effect reclamation, with eventually the agricultural department becoming responsible for Bundelkhand, the Forest Department for Etawah and Agra Districts (Figure 7.6).



Typical ravine scenery in the Etawah district ;  
there are over 100,000 acres of this type of land in the district.



Photos. by C. R. C. Cox, I. F. S.

The commencement of a ravine showing typical erosion.

*Figure 7.5* Erosion, Etawah district

State efforts in northern India to meet the problems of soil erosion, flooding and drifting sand, like those in Australasia, took place relatively late in the nineteenth century, the sheer magnitude of the problem proving daunting to plans to begin reclamation, as one author noted.



Ravine land before planting.



The same land 5 years later.

*Figure 7.6* Environmental redemption through reclamation

Unlike Australasia, in India the state took the lead in reclamation work, a reflection of utilitarianism. When local efforts at reclamation were still required in northern India, private lands (through the transferral of such ravine lands from private hands to state control) were managed by either

the forests or agriculture departments. Later, while private investment occurred, investors still relied on the expertise of state foresters. In 1919, a Cawnpore-based Improvement Trust ‘intimated their intention of acquiring a stretch of land adjoining the Allenbagh plantation which they desired to be afforested at their expense through the Forests department’.<sup>128</sup> Further, foresters in northern India drew from American forest literature focussed on the hydrological impact of forests, as evinced both from the bibliography of Benskin’s book and its mention in the body of the text. Finally, unlike those in America and Australasia, Indian foresters continued to articulate the forests–climate argument alongside hydrological concerns, as demonstrated by the example of United Provinces (see also Chapters 5 and 6).

### **Australian inland sand drift and science**

In inland Australia, sand drift and soil erosion were also giving authorities major environmental headaches, leading many to rethink their environmental assessments of such areas, but also, as in New Zealand and northern India, to look to commissions, legislation and, increasingly, to science to manage such areas on the assumption that they could be ‘redeemed’ for agricultural or forestry purposes. In many parts of inland Australia, colonists’ optimism that cultivation or tree planting would increase rainfall, coupled with land shortages elsewhere, had, as noted in previous chapters, lured many into agriculturally marginal areas. Many of those arid and semi-arid zones into which settlers moved are now officially termed rangelands. Comprising some 70 percent of Australia’s surface area, they represent a diversity of environments characterised by a uniformly low rainfall.<sup>129</sup>

Authorities recognised their environmental differences from coastal areas, which settlers continued to try to improve and on which closer land settlement policies continued.<sup>130</sup> Relatively soon after pastoral expansion it became apparent that this venture – through soil compaction, burning and simply the sheer weight of numbers of stock – severely depleted the soil and led to erosion.<sup>131</sup> Experience of the Western Lands of inland NSW, for instance, forced land officials into a re-evaluation of existing agricultural policies and to recognise that certain environments could not support closer settlement. Initial optimism about that region’s agricultural worth soon gave way to more realistic assessments of both its environmental capacity and how settlers should use it. Legislation attempted to manage settlement patterns. The 1884 Crown Land Act, for instance, divided ‘the western third of New South

Wales from the eastern two thirds', tacitly acknowledging that the area 'required different management from the land in the rest of the State'. Ultimately, however, such legislation could not prevent either overstocking or environmental degradation.<sup>132</sup> In 1901, the eight-man Royal Commission on Western Lands heard evidence from NSW, Victoria, South Australia and Queensland residents who presented a litany of environmental problems. The Report, as one contemporary noted, provided 'a cyclopaedia of information' on 'the condition of the far western portion of' NSW.<sup>133</sup>

The region, the Commission observed, is 'essentially a country of almost invariably low rainfall and inevitably recurring drought'. Faced with meeting increased rental costs, pastoralists effectively 'plundered' (as the Commission described it) pastures. Stock rates climbed. The annual average of 9.5 million stock capacity from 1879 to 1884 shifted to 13.5 million per year between 1885 and 1897. Environmental and economic events compounded farmer's problems. Rabbits competed with stock, further destabilising vegetation, with the resulting environmental changes favouring the growth of non-edible plants. Wool prices also plummeted while the effects of the 1895 to 1901 drought hit pastoral profits hard. Altogether, the Commission estimated that from the early 1890s, settlers abandoned about 405,000 ha of leasehold land totalling over £1.6 million in value. Settlers also walked away from over 2.1 million ha of resumed land valued at over £8 million. The Commission recommended the abandonment of policies of closer land settlement, the extension of leases and the cessation of agricultural pursuits in the Western Lands. The report as a whole criticised those who fell 'under the seductive influence of a short run of good seasons' and failed 'to recognise that drought is the predominant characteristic of the west, and not merely an enemy to be ordinarily encountered'.<sup>134</sup> Its findings signalled a gradual shift in attitudes, a questioning of earlier assessments of the agricultural potential of all of Australia and a realisation that certain European practices needed to be abandoned in the face of their environmental unsuitability.

Contemporaries reinforced such assessments, and while yet mindful of environmental limitations, held that science might yet prevent sand drift. 'New South Wales and Australia generally has been for one hundred years, or nearly, trying to force old-world methods upon a new world, land, and climate', observed C. A. Benbow in 1901. 'The process', he continued, 'has partly killed the west, and created conditions which threaten to bury the land to the foot of the mountains.' While 'Old-world methods need not be totally ignored', he argued, 'new are



distinctly called for, or disaster to the whole country must follow'. 'Make a new system for the west', he demanded, 'which will be distinctly Australian, conforming to Australian conditions'.<sup>135</sup> Benbow's plan exemplified a realisation of the limitations of both existing land-use practices and environmental expectations derived from European experience. His support for local plants also evinced emerging national pride in Australia's environmental distinctiveness and his belief in the need to find indigenous solutions to environmental problems.

Benbow upheld the need to copy 'Nature's plans'. Otherwise, he warned, 'a very severe penalty will be meted out' and 'proud civilised man will ... be driven off the land'.<sup>136</sup> Cleaving to nature's plans meant introducing a 'special kind of vegetation' found in other areas of low rainfall, such as parts of South Africa and Central and South America. So, for instance, Benbow believed that the nopal cactus (*Opuntia cochinellifera*) would suit that part of Australia. Able to 'resist a dry atmosphere and powerful sunshine' and to 'occupy arid soils, or sand districts, and resist long droughts', he explained, the cactus would be able to prepare 'the soil for other plants' such as (unspecified) fodder plants from the pampas. Possibly with South Africa in mind, Benbow also recommended the introduction of eland.<sup>137</sup> Writing two years later, J. H. Maiden agreed with Benbow's planting principles. With '*conservation of vegetation*' the 'watchword', coupled with a policy of keeping stock off conserved areas, Maiden recommended the establishment of 'experimental depôts' to test introductions 'from the arid country in India, North Africa and the Western United States'. He also recommended the planting of different species. Based on detailed knowledge of the French experience in Les Landes, these included the Maritime Pine (*Pinus pinaster*) in addition to a host of other indigenous varieties such as 'the Desert Oak (*C. Decaisneana*) of Western Australia, the Needlewood (*Hakea leucop-tera*)', from Arizona and Western Texas, 'running mesquite (*Bouteloua oligostachya*)' and date palm (*Phoenix dactylifera*). Indicating the inter-connection of environmental anxieties and responses, Maiden drew on his detailed description of French reclamation methods from an article in Cape Town's *Agricultural Journal*. Casting his net wide, he also drew from an account of sand reclamation in the Umballa District, India, for information about the 'Mung grass' (*Saccharum arundinaceum*), and on the *Dictionary of Economic Products of India* for details of kans grass (*Saccharum spontaneum*). Maiden advocated following the highly successful model of French reclamation, but adapted to meet local circumstances. 'The sagacious Frenchman uses his native and well acclimatised vegetation', noted Maiden, and he felt that the Australians

could learn much from this, instead of preferring 'to plant anything other than *his* native vegetation.'<sup>138</sup>

Maiden also criticised that 'too little attention is given to directing the rays of science upon the ultimate causes of the existing state of things'. Likening the situation of the scientist faced with drifting sands to that 'of an anxious physician who is trying to cope with an obscure disease', Maiden expressed confidence that 'the bacillus of the drifting sands' could, through scientific observation and collection, be remedied.<sup>139</sup> Maiden's analysis evinces growing state confidence in science to solve environmental problems. By the early-twentieth century, the government scientists of South Australia and Victoria were leading the way in research into soil science, trends that would culminate in the establishment of the CSIR (Council of Scientific and Industrial Research), Australia's equivalent of New Zealand's DSIR, in 1926.<sup>140</sup> Arguments presented by the Commission and by experts such as Benbow and Maiden also appealed to a growing ecological consciousness, one that recognised the interconnection of people, plants and animals. Although, as Libby Robin demonstrates, ecology only really took off in Australia in the 1930s, after erosion fears were sparked by images of the US Dust Bowl, its origins lie, in part, in the ecologically nationalistic arguments put forward by the likes of Benbow and Maiden as well as, in New Zealand, by Leonard Cockayne (see Chapter 5 and below).<sup>141</sup> Belief that 'Nature' provided ready solutions to the problems of inland drifting sands through the introduction of overseas and local plants adapted to arid or semi-arid regions, also reflected wider medical understandings of disease, particularly hygienists' appeals to follow 'the laws of nature' in treating illness, a connection further underlined by the medical metaphor used by Maiden (Chapter 2).

The beginnings of wider knowledge about such semi-arid environments did not spell an end to environmental anxieties. Nor did it stop the highly charged language of fear and urgency that characterised them. Introducing his 1901 paper, Benbow held that, unless checked, the fate befalling the once fertile lands of Africa, Egypt and Persia, 'buried by sand drifts', also awaited Australia. Characterising 'travelling sand' in Australia as 'a very, very great evil, already serious, and likely to become greater, because on a large scale only a mountain range can stop it', Benbow urged action 'with as little delay as possible, lest greater difficulties present themselves with a far greater loss'.<sup>142</sup> Maiden and Benbow's arguments typified growing calls for scientific experts to report on sand drift. As a recently professionalising discipline with state support, foresters also laid claim to reclamation. Sand drift areas, Maiden claimed,

‘should be placed under the control of the Forest Department’, with ‘a special staff of officers to deal with reclamation matters’.<sup>143</sup> Although established as a branch under the Occupation of Lands Branch in 1876 and variously passed from department to department, NSW’s Forestry Act 1909 finally created an independent forests department only in 1910.<sup>144</sup> This took place at Gosford’s state plantation, which supplied plants for Newcastle’s reclamation. Plantations established along coastal NSW also employed prison labour and, continuing the narrative of environmental redemption, emphasised tree planting’s morally and spiritually uplifting value in redeeming both fallen men and fallen land.<sup>145</sup>

Other states looked to legislative solutions. Illustrating the failure of its 1890 Sand-Drift Act, Western Australia passed a new one in 1919. Its principal difference to the earlier Act centred on the power of authorities to impose penalties of up to £20 if owners failed to abate the nuisance.<sup>146</sup> Similarly, in 1924, South Australia introduced a Sand-Drift Act in response to the expansion of settlement into the agriculturally marginal Mallee district. Its failure to deal with inland dunes led to the appointment of a special Sand Drift Committee in 1933 to further examine the issue.<sup>147</sup> Impelled by drought and images of the US Dust Bowl, scientific professionals such as wildlife biologist Francis Ratcliffe began to present detailed scientific reports of inland sand drift and soil erosion. Ratcliffe’s 1936 report on South Australia’s sand erosion, for instance, demonstrated serious degradation of inland areas through overstocking, rabbits and drought.<sup>148</sup> Another, on ‘Soil Erosion and Sand Drift’ in southwestern Queensland (1937), evinced greater optimism. Although in South Australia Ratcliffe found deserts ‘encroaching on good country nearer the coast’, in southwestern Queensland he could discover ‘no sign of the “advancing desert”’. Instead, he noted, the latter’s ‘desert sand hill-system ... appears to be a remarkably stable unit’. Both accounts display a lack of hyperbole characteristic of many other such accounts of that period and earlier. Indeed, Ratcliffe specifically criticised the over-dramatised representations of sand drift. ‘Because of its obvious and spectacular news value’, he observed, reports ‘rarely omitted’ ‘the assertion that sand from the central desert is encroaching on and ruining valuable and fertile country’. While acknowledging the seriousness and importance ‘of the economic utilisation of the arid pastoral regions of Australia’ for the future, he took issue with the many ‘accounts designed to stir the national conscience in this matter’. They ‘give an erroneous and distorted picture of the true state of affairs’ and ‘blind the public to the true nature and cause of the deterioration and the changes which are undoubtedly taking place’.<sup>149</sup> For Ratcliffe, indeed, science required

not hyperbole and alarm, but objective language based on scientific evidence. As he later wrote in his immensely popular and influential *Flying Fox and Drifting Sand*, 'we discovered that the advancing desert was nothing but a bogey and a myth'.<sup>150</sup>

Not all scientists, however, followed Ratcliffe's lead. As noted, New Zealand's government, in using science to try to define and solve sand drift, commissioned Cockayne's extensive report on its extent in New Zealand.<sup>151</sup> Cockayne contributed to New Zealand conservation by combining nationalism with ecological arguments, urging for instance protection of New Zealand native forests for their value to tourism and science, and for their significance to national identity.<sup>152</sup> Cockayne's 1911 report discussed North and South Island sand dunes, furnished detailed lists of plants suitable for dune reclamation, and investigated their extent in New Zealand, in the process drawing from southern France and northern German reclamation.<sup>153</sup> According to him, while inland dunes occur in New Zealand, coastal dunes remained by far the greatest problem. '[T]heir movement inland', he noted, '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'.<sup>154</sup> By stressing the national level of the threat, Cockayne emphasised the urgent need for government action. 'The fact that we possess an area of more than 300,000 acres [121,40 ha] of sand 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'. Elaborating, he pointed out:

*Dune-reclamation, the world over has been considered rather the work of the State than of the individual [emphasis in original]. 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.*

In a similarly impassioned tone he continued: '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'.<sup>155</sup> According to him, even if the costs of doing so would be uneconomic, government had a duty to arrest sand drift. Cockayne echoed the cries of Whitcombe and others, implying that central government had a moral responsibility to protect its citizens from sand drift but, unlike those earlier, couched his arguments in scientific terms.

Cockayne recommended the establishment of research stations to systematically investigate efficacious means of reclamation. To this effect, he had already established a small experimental garden near the New Brighton coast, Christchurch (Figure 7.7).<sup>156</sup> Cockayne also roundly criticised the moribund Sand-drift Act. ‘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.’<sup>157</sup> According to Cockayne, sand drift alleviation required the skills of the scientific expert. Despite his pleas and those of supporters such as Field, the Minister still held that ‘it is not the duty of the State to protect and cover with vegetation areas of sand hills 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’.<sup>158</sup>

Things began to change in 1913, when the New Zealand Government instructed the Department of Lands and Survey to establish an



*Figure 7.7* ‘Interior of Plantation of Dunes, New Brighton’

experimental sand reclamation station at the mouth of the Rangitata River, Canterbury.<sup>159</sup> The following year, another report, by Australian forester E. Phillips Turner, summarised sand reclamation projects in Europe and South Africa. Phillips Turner identified private planting as the most successful at arresting sand drift. Along the western coast of the North Island, between Wellington and New Plymouth, he noted, 'probably several thousand acres of privately owned sand dunes has [*sic*] already been reclaimed by means of either marram grass or tree-lupin'.<sup>160</sup> According to Phillips Turner, the state had reclaimed 'only a comparatively small area' – a total of seven km 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 [809 ha]) has been planted by leasees [*sic*] of Government runs'. Leasees, he noted, were eligible to receive £2 per acre for 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'. Reminiscent of the Tree-Planting Encouragement Acts, the Government paid settlers on Crown land £2 per acre of successfully reclaimed land, a measure indicating the failure of the Sand-drift Act. In the First World War, as the example of Cromwell indicates, war spending curtailed many reclamation projects.<sup>161</sup> Its ending saw the new State Forest Service (SFS), created in 1919, briefly take on the role of sand drift before relinquishing it to the Public Works Department in the late 1920s.<sup>162</sup>

## Conclusion

Australasian settlers and land officials in India shared the same environmental anxieties and responses to sand drift. Almost all used highly alarmist language to play up its threat to agriculture and to emphasise the urgency of redeeming what they regarded as an evil threatening potentially productive environments. Throughout the nineteenth century, officials drew on models of French reclamation to exhort authorities to take action. By its end, local examples also informed both anxieties and solutions to sand drift, with measures increasingly framed in nationalistic terms. While from the mid-nineteenth century to the early-twentieth century, local bodies sought to combat sand drift, increasingly by the late-nineteenth century some colonial governments took reclamation measures, not always successfully however. Although specifically targeting rural areas, most legislation failed in the countryside but succeeded

in areas of closer settlement, which had higher rating bases. Along with other environmental anxieties, those about sand drift contributed to increasing colonial government intervention in society, as local bodies were often unable to combat spreading sands. In Australasia intervention by states, either through direct taxation of those affected or more indirectly by matching local council grants with government money, still promoted a mixture of private and state action until well into the twentieth century. Authorities in India also utilised local systems – such as calling on zamindars or rajas to transfer land to state organisations for afforestation or planting out in crops – but took a more active state role in reclamation work, to the extent that even private companies looked to the expertise of foresters for such undertakings. Consistent with experience of other environmental anxieties, Indian measures relied a great deal more on state intervention than those in Australasia.

By the twentieth century, governments across Australasia and India were increasingly relying upon scientific surveys of sand drift. Sometimes employing the same language of fear as other nineteenth-century environmental anxieties, the new reports were undertaken by scientifically trained observers, reflective of both growing specialisation and the increasing cultural authority of science. Scientists like Francis Ratcliffe in Australia, Leonard Cockayne in New Zealand or E. Benskin in United Provinces reported on sand drift. Unlike drifting sand on the coast, which generally failed to change prevailing policies of closer settlement, inland sand drift – more properly understood as soil erosion – did in some parts of Australia and India. Experience of the devastation of the Western Lands Division of NSW, the mallee lands of northwestern Victoria and the Murray-mallee of South Australia, for instance, caused settlers to rethink existing land use practices, as did British experience in the Siwalik. Throughout the period and regions studied, the local issues – from political and economic factors to the underlying geographical causes of sand drift itself – influenced the degree of environmental anxiety and the effectiveness of responses.

# Conclusion

If, as I think, history has relevance and power to shape the present, then this study of European responses to environmental transformation is particularly timely. We inhabit a planet facing myriad pressures. Increasing population, pollution and extinction are everyday realities, squeezing the quantity as well as the quality of remaining ecosystems and impacting in deleterious ways on our own existence. We live, in short, in a time of increasing environmental anxiety whose problems, I would contend, originate in part in the experience of empire.

Imperialism set in motion social, economic, religious and environmental change on a scale never before seen, with legacies still reverberating today. Not least, it brought Europeans into contact with unfamiliar colonial environments, including in South Asia and Australasia. That encounter in South Asia and Australasia, I have argued in this book, resulted in environmental anxieties prompting a series of deep and far-reaching responses. A close investigation of them helps to move historiographical debate beyond simple narratives of colonial environmental destruction. Their investigation demonstrates the ambiguities and complexities of colonial views of the natural world as settlers responded to changing environments in light of changing societies and political ideas. It complicates interpretations of conservation as either representing a radical critique of colonialism or a hegemonic form of imperialism. Further, studying settler views of the environment sheds light on how settlers viewed their society, economy and health as intimately attuned to environments and environmental changes.

Fundamentally, this book has demonstrated how environmental anxieties and responses, moderated by local colonial circumstances, developed new hitherto unexamined regional inter-relationships. Environmental anxieties connected colonial South Asia and Australasia



at different points in the nineteenth and early-twentieth centuries. As a result of shared educational backgrounds and experiences, often the same groups played a prominent role in expressing concerns about the damaging effects of both existing environments and environmental change across the British Empire. They acted as experts – as ‘centers of calculation’ – marshalling research, evidence and advice on environmental change and environmental responses. Their authority varied over time and in response to different anxieties. An artistic education secured the authority of artists like Alfred Sharpe to pass judgment on matters of aesthetic taste. The scientific training in botany and natural history of Scottish-trained doctors or German-educated scientists announced their expertise on environmental processes. An ability to improve health increased the prestige of the medical profession. The deployment of similar environmental anxieties, then, connected South Asia and Australasia at different points in time.

The belief that productive environments figured as the norm also shaped environmental experiences across empire. Christianity compelled colonists to cultivate and improve land, but it also gave some a strong moral stake in ensuring its long-term fertility. When productivity deteriorated, when their own actions seemed to create a dry and infertile wilderness or when they discovered environments that did not meet cultural expectations, colonists set about ‘restoring’ them to a perceived natural state. Declining productivity, after all, undermined colonisation’s legitimacy, stunting its ability to improve and use resources to their maximum potential. Settlers also framed their environmental anxieties within biblical narratives. Sometimes ignoring the environmental impacts of previous peoples, colonists believed that productive and well-watered parts of Australasia and South Asia represented the Garden of Eden. Most colonists believed they could improve unproductive or unhealthy environments through a variety of environmental reforms, including tree planting, forest conservation, garden making, swamp drainage and urban design. Some scientists and land officials also held that the state should be responsible for guaranteeing productive environments through conservation because forests, they argued, ensured a colony’s long-term economic development, in particular, by safeguarding its agriculture from drought, flooding and timber famine.

Articulations of, and responses to, shared environmental anxieties were moderated by local colonial circumstances. Local political or economic factors might influence the development of different responses to the same environmental problems. Local environmental conditions might mean that settlers would introduce general principles, rather than

the exact same practices, to places facing similar problems. In political terms, bureaucratic responses to environmental anxieties made headway in India before Australasia, thanks to the strength of utilitarianism in India from the 1850s and the ability of conservationists to build on this. Such factors made India an imperial leader in state forestry, one turned to by other states for advice. Despite Scottish-educated doctors and German-trained scientists being active in India, *laissez-faire* attitudes restricted their impact on government bureaucratic intervention in the Australasian colonies until later in the nineteenth century when growing environmental problems contributed to changes in attitudes. In environmental terms, local areas faced with environmentally similar problems encouraged the exchange of similar responses. Local political, economic and environmental conditions thus shaped the nature of environmental anxieties and their responses. These factors, although not occurring in a linear process, contributed to the extension of professionalisation and state resource management. Individuals and groups used environmental anxieties to argue for the extension of bureaucratic responses to problems and to emphasise their own disciplinary expertise.

Since the end of Empire some health and environmental problems have been solved and others remain. New anxieties have also arisen. There is thus as great an urgency to interrogate our cultural assumptions and our role in environmental change as there was in the past. How humans can balance the needs of development with environmental use remains as pressing a concern today as it was in the nineteenth century. As with past environmental concerns, we must also evaluate present ones in light of who wins and who loses. And, with the acceleration of processes set in motion during imperialism, the question of whether we can live healthily, sustainably and happily in cities, is equally pertinent now as then. While the mechanisms for understanding the impacts of environmental transformation have undoubtedly changed, the questions we ask – and perhaps even the language we use to discuss it, notably in its alarmism and desire to return environments to an original state – have not. The concept of environmental anxiety thus has the potential to illuminate how different societies at different times and places responded to environmental anxieties. Those concerns were at the forefront of Reverend W. B. Clarke's mind when, in 1876, he warned his fellow New South Welshmen of the 'destructive as well as conservative tendencies' of civilisation.<sup>1</sup> Clarke's warning is, I think, of even greater urgency now than when first articulated. It is up to us all to decide now which of those paths – destruction or conservation – we will follow.

# Notes

## 1 Origins of Environmental Anxieties

1. C. R. Markham, 'On the Effects of the Destruction of Forests in the Western Ghats of India on the Water-Supply', *Journal of the Royal Geographical Society of London*, 36 (1866): 180.
2. C. A. Bayly, *The Birth of the Modern World, 1780–1914: Global Connections and Comparisons* (Malden, MA; Oxford: Blackwell, 2004), 199–283.
3. Tony Ballantyne, *Orientalism and Race: Aryanism in the British Empire* (London: Palgrave Macmillan, 2001), 13–17; Ballantyne, 'Race and the Webs of Empire: Aryanism from India to the Pacific', *Journal of Colonialism and Colonial History* 2, 3 (2001): 1–25.
4. Thomas R. Metcalf, *Imperial Connections: India in the Indian Ocean Arena, 1860–1920* (Berkeley and London: University of California Press, 2007), 1. The idea of a Pacific Ocean world also picks up on the work of Tony Ballantyne on racial ideas: *Orientalism and Race: Aryanism in the British Empire* (London: Palgrave Macmillan, 2001). One could also extend the examination of India as a sub-imperial hub in the Pacific beyond environmental and health connections to examine Indian indentured labour.
5. Ian Tyrrell, *True Gardens of the Gods: Californian-Australian Environmental Reform, 1860–1930* (Los Angeles and London: University of California Press, 1999). See also, Alan H. Grey, 'North American influences in the development of New Zealand's landscape, 1800–1935', *New Zealand Geography*, 40, 2 (1984): 66–77; K. Brown, 'The Conservation and Utilization of the Natural World: Silviculture in the Cape Colony circa 1902–10', *Environment and History*, 7, 4 (November, 2001): 427–47. I thank the book's reader for alerting me to this study. William Beinart and Peter Coates, *Environment and History: The Taming of Nature in the United States and South Africa* (London: Routledge, 1995).
6. Gregg Mitman, 'In Search of Health: Landscape and Disease in American Environmental History', *Environmental History*, 10 (April, 2005): 185. Exceptions include Arnold, *The Problem of Nature: Environment, Culture and European Expansion* (Oxford; Cambridge, MA: Blackwell, 1996); Linda Nash, *Inescapable Ecologies: A History of Environment, Disease and Knowledge* (Berkeley: University of California Press, 2006).
7. Warwick Anderson, 'Postcolonial Histories of Medicine', in Frank Huisman and John Harley Warner, eds, *Locating Medical History: The Stories and their Meanings* (Baltimore and London: Johns Hopkins University Press, 2004), 287. Thanks to Cathy Coleborne for alerting me to this chapter.
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  19. Simon Schama, *Landscape and Memory* (London: Harper Collins, 1995), 13.
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  22. Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (Cambridge and New York: Cambridge University Press, 1995); Grove, *Climate and Empire: Colonialism and Global Environmental History, 1400–1940* (Cambridge: Cambridge University Press, 1997). The idea of forest conservation as a form of development in India, for instance, picks up the work of scholars such as Richard Drayton (*Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World* [New Haven: Yale University Press, 2000]) and S. Ravi Rajan (*Modernizing Nature: Forestry and Imperial Eco-Development 1800–1930* [Oxford: Oxford University Press, 2006]).
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  25. Drayton, *Nature's Government*, xvii.
  26. Clarence J. Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient times to the end of the Eighteenth Century* (Berkeley: University of California Press, 1967); Raymond Williams, *The Country and the City* (London: Penguin, 1975); Mark Elvin and Liu Ts'ui-jung, eds, *Sediments of Time: Environment and Society in Chinese History* (Cambridge: Cambridge University Press, 1998); Grove, Vinita Damodaran, and Satpal Sangwan, eds, *Nature and the Orient: The Environmental History of South and Southeast Asia* (Delhi: Oxford University Press, 1998).
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  28. On railways and industrialisation, note W. G. Hoskins, *The Making of the English Landscape* (London: Book Club, reprint, 1981), 211–32, 254–69. In an equally brilliant book, James Winter, *Secure from Rash Assault: Sustaining the Victorian Environment* (Berkeley; London: University of California Press, 1999) shows the limits of steam power in agriculture, which for instance, only could operate on large, flat fields.
  29. See, Winter, *Secure from Rash Assault*.
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31. There is a vast literature on this topic, on which almost any general text on this period will also focus. Note, Oliver MacDonagh, *Early Victorian Government 1830–70* (London: Weidenfeld and Nicolson, 1977); Anthony S. Wohl, *Endangered Lives: Public Health in Victorian Britain* (London: Harvard University Press, 1983).
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33. Williams, *Country and the City*.
34. Martin J. Wiener, *English Culture and the Decline of the Industrial Spirit, 1850–1980* (Cambridge; New York: Cambridge University Press, 1981).
35. Keith Thomas, *Man and the Natural World: Changing Attitudes in England, 1500–1800* (New York and Oxford: Oxford University Press, reprint, 1996), 190.
36. Thomas, *Man and the Natural World*; James Serpell, *In the Company of Animals: A Study of Human-Animal Relationships* (Cambridge: Cambridge University Press, reprint, 1996); D. G. Charlton, *New Images of the Natural in France: A Cultural History 1750–1800* (Cambridge: Cambridge University Press, 1984), 199–204.
37. Thomas, *Man and the Natural World*, 221–2.
38. David Elliston Allen, *The Naturalist in Britain: A Social History* (Princeton: Princeton University Press, reprint, 1994).
39. Boris Ford, ed., *The Cambridge Cultural History of Britain: The Romantic Age in Britain* (Cambridge: Cambridge University Press, 1992).
40. Peter Gay, *Pleasure Wars: The Bourgeois Experience from Victoria to Freud*, Volume 5 (London: Harper Collins, reprint, 1998), 11.
41. Gay, *Pleasure Wars*; Gay, *The Naked Heart: The Bourgeois Experience, Victoria to Freud*, Volume 4 (London: Harper Collins, reprint, 1998).
42. 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: Penguin, 1990), especially 78–112, 143–68.
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45. Denoon and Mein-Smith, 87–8.
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  57. B. Ribbentrop, *Forestry in British India* (Calcutta: Government Printing, India, 1900), 39.
  58. *Otago Daily Times* (ODT), 13 September 1869, 3.
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  60. Grove, 'Conserving Eden: The (European) East India Companies and Their Environmental Policies on St. Helena, Mauritius and in Western India, 1660 to 1854', *Comparative Studies in Society and History*, 35, 2 (April, 1993): 318–51.
  61. Metcalf, *Ideologies of the Raj* (Cambridge: Cambridge University Press, 1994).
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  64. Crosby, *Ecological Imperialism*; Garden, *Australia, New Zealand*.
  65. Mike Davis, *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* (London and New York: Verso, 2001).
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69. Baber, 185–6.
  70. Bayly, *Empire and Information: Intelligence Gathering and Social Communication in India, 1780–1870* (New York: Cambridge University Press, 2000).
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  86. Caroline Jordan, *Picturesque Pursuits: Colonial Women Artists and The Amateur Tradition* (Carlton: Melbourne University Press, 2005), 169.
  87. David Lambert and Alan Lester, 'Introduction: Imperial Spaces, Imperial Subjects', in Lambert and Lester, eds, *Colonial Lives Across the British Empire: Imperial Careering in the Long Nineteenth Century* (Cambridge: Cambridge University Press, 2006), 2.
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  104. Livingstone, *Putting Science*, 12.
  105. Sir Henry Elliot (Secretary to the Government of India) to The Board of Administration for the affairs of the Punjab, handwritten, 20 February 1851, Camp Vah: IOR/H/M/761/645 (quote). For tree planting suggestions, see Sir Henry Elliot (Secretary to the Government of India) to The Board of Administration for the affairs of the Punjab, handwritten, 20 February 1851, Camp Vah: IOR/H/M/761/645. The latter was reproduced as 'Minute by the Most Noble the Marquis of Dalhousie, K. G. Governor General of India', 20 February 1851, read on 12 August 1851 and reprinted in *Select Papers of the Agri-Horticultural Society of the Punjab, from its commencement to 1862* (Lahore: Lahore Chronicle Press, 1868), 1–5.
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## 2 Imperial Health Anxieties

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  7. Kenneth Thompson, 'Trees as a Theme in Medical Geography and Public Health', *Bulletin of the New York Academy of Medicine*, 54 3 (1975): 518–23 (quotation 521).
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  13. Ideas in this paragraph are based on: G. E. R. Lloyd, 'Introduction', *Hippocratic Writings*, in G. E. R. Lloyd, ed., trans by J. Chadwick and W. N. Mann (New York and London: Penguin and Harmondsworth, 1983, [1950]), 9–61; Clarence J. Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient times to the end of the Eighteenth Century* (Berkeley: University of California Press, 1990, [1967]); Caroline Hannaway, 'Environment and Miasmata', in W. F. Bynum and Roy Porter, eds., *Companion Encyclopedia of the History of Medicine Volume 1* (London and New York: Routledge, 1993), 292–308.
  14. 'Malaria and the value of the Eucalyptus', *IF*, 7, 4 (April, 1882): 336.
  15. James Preece, 'Missionary Papers. Documents which relate to James Preece, lay missionary in New Zealand' (Place of publication unknown: unpublished MS: July 1999 and January 2000), 22. Thanks to Dr Marjan Lousburg for bringing this to my attention.
  16. Linda Nash, 'Finishing Nature: Harmonizing Bodies and Environments in Late-Nineteenth Century California', *Environmental History*, 8, 1 (January, 2003): 36 (quotation); Mary Dobson, "'Marsh Fever" – the geography of malaria in England', *Journal of Historical Geography*, 6, 4 (1980): 357–89; Alain Corbin, *Le Miasme et la Jonquille: L'odorat et l'imaginaire social XVIIIe-XIXe siècles* (Manchecourt: Maury Eurolivres, 2000, [1986]); Valencius, *The Health of the Country: How American Settlers Understood Themselves and their Land* (New York: Basic Books, 2002).
  17. Harrison, *Climates and Constitutions*, 11–18.

18. Harrison, *Public Health in British India: Anglo-Indian Preventive Medicine, 1859–1914* (Cambridge, Cambridge University Press, 1994), 61, 49.
19. Sir Henry Rawlinson, *Hansard*, 26 February 1867, vol. 185: 1049. He also pointed out that Indian troops would not have expected to serve overseas. Indian troops had already served in China among other places.
20. In contrast to Mark Harrison, David Arnold dates the development of this fear to the eighteenth century. Arnold, 'Introduction: Tropical Medicine before Manson', in *Warm Climates*, 1–19.
21. Arnold, *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India* (Berkeley: University of California Press, 1993); Arnold, *Tropics*; Donald Denoon, 'Temperate Medicine and Settler Capitalism: On the Reception of Western Medical Ideas', in *Disease, Medicine and Empire*, 121–38.
22. Nancy Leys Stepan, *Picturing Tropical Nature* (London: Reaktion Books, 2001); Michael R. Dove, "'Jungle" in Nature and Culture', in Ramachandra Guha, ed., *Social Ecology* (Delhi: Oxford University Press, 1998), 90–115.
23. Robert Wyatt Meadows, 'A Short History of My Life', MS Papers 1700, 9 (Wellington: Alexander Turnbull Library).
24. J. Stirling, *Observations on the Climate and Geographical Position of Western Australia, and on its Adaptation to the Purposes of a Sanatorium for the Indian Army in a Letter Addressed to J. R. Martin, Esq* (London: J. C. Bridgewater, 1859), 3.
25. 'Malaria and the value of the Eucalyptus': 337.
26. Anderson, *Cultivation of Whiteness*, 76.
27. Charles Dilke, *Travellers' Tales of Early Australia & New Zealand: Greater Britain, Charles Dilke visits her new lands, 1866 & 1867*, ed. Geoffrey Blainey (North Ryde [NSW]: Methuen Haynes, 1985 [1868]), 90.
28. Anderson, *Cultivation*, 77; for an alternative reading, see H. R. Woolcock, "'Our Salubrious Climate": Attitudes to Health in Colonial Queensland', in *Disease, Medicine and Empire*, 176–93.
29. Anderson, *Cultivation*, 83–4.
30. Harrison, *Climates and Constitutions*, 142–3; for the later nineteenth century, see Arnold, *Colonizing the Body*, 254–60.
31. Over 62,000 Melanesians from the 1860s worked as indentured labour on plantations in Queensland. Kay Saunders, 'The Workers' Paradox: Indentured Labour in the Queensland Sugar Industry to 1920', in Kay Saunders, ed., *Indentured Labour in the British Empire, 1834–1920* (Beckenham: Croom Helm, 1984), 213–59 (figure from 'Appendix 1', 246); Harrison, "'The Tender Frame of Man": Disease, Climate, and Racial Difference in India and the West Indies, 1760–1860', *Bulletin of the History of Medicine*, 70, 1 (1996): 68–93; J. M. Powell, 'Medical Promotion and the Consumptive Immigrant to Australia', *Geographical Review*, 63, 4 (October, 1973): 449–76; Stefan Petrow, *Sanatorium of the South?: Public Health and Politics in Hobart and Launceston, 1875–1914* (Hobart: Tasmanian Historical Research Association, 1995); Curtin, *Death by Migration*.
32. *Hansard*, 14 July 1863, vol 172, c 776.
33. 'Arboriculture in its relation to Climate', *IF*, 1, 2 (October, 1875): 153–4.
34. Radhika Ramasubban, 'Imperial Health in British India, 1857–1900', in *Disease, Medicine and Empire*, 38–40.

35. Harrison, *Public Health*; Arnold, *Tropics and the Travelling Gaze*; Arnold, *Science, Technology and Medicine*, 76–81.
36. Harrison, *Public Health*, 97.
37. Harrison, *Public Health*; Ramasubban, 'Imperial Health', 38–60; Kaushik Roy, 'Managing the Environment: Disease, Sanitation and the Army in British-India, 1859–1913', in Ranjan Chakrabarti, ed. *Situating Environmental History* (New Delhi: Manohar, 2007), 187–219.
38. Dane Kennedy, *The Magic Mountains: Hill Stations and the British Raj* (Berkeley and Los Angeles: University of California Press, 1996); Curtin, *Death by Migration*.
39. Queeny Pradhan, 'Empire in the Hills: The Making of Hill Stations in Colonial India', *Studies in History*, 23 (2007): 34–55.
40. Judith T. Kenny, 'Climate, Race, and Imperial Authority: The Symbolic Landscape of the British Hill Station in India', *Annals of the Association of American Geographers*, 85: 4 (December, 1995): 699, 702.
41. Dilke, 182.
42. Kennedy, 'Diagnosing the Colonial Dilemma: Tropical Neurasthenia and the Alienated Briton', in Durba Ghosh and Dane Kennedy, eds, *Decentring Empire: Britain, India and the Transcolonial World* (New Delhi: Orient Longman, 2006), 157–81; also Anderson, *Cultivation*, 120–4.
43. Arnold, *Tropics and the Travelling Gaze*; Douglas M. Peers, "'There is Nothing More Poetical than War": Romanticism, Orientalism and Militarism in J. W. Kaye's Narratives of the Conquest of India', in Julie F. Codell, ed., *Imperial Co-Histories: National Identity and the British and Colonial Press* (London; Cranbury, NJ; Mississauga, Ontario: Associated University Presses, 2003), 273–99; Nigel Leask, *British Romantic Writers and the East, Anxieties of Empire* (Cambridge: Cambridge University Press, 1992); Bewell, *Romanticism and Colonial Disease*.
44. Mrs Muter, *Travels and Adventures of An Officer's Wife in India, China, and New Zealand*, Volume 1 (London: Hurst and Blackett, 1864), 125–6.
45. Muter, *Travels*, 134.
46. Macpherson quoted in Hugh Cleghorn, *The Forests and Gardens of South India* (London: W. H. Allen & Co., 1861), 298.
47. Dhruv Kumar Singh, "'Clouds of Cholera": and Clouds Around Cholera, 1817–70', in Deepak Kumar, ed., *Disease and Medicine in India: A Historical Overview* (New Delhi: Tulika Books, 2001), 144–65; Ian Catanach, 'Plague and the Tensions of Empire: India, 1896–1918', in Arnold, ed., *Imperial Medicine and Indigenous Societies* (Manchester: Manchester University Press, 1988), 149–71.
48. Kenny, 706.
49. Pradhan, 55.
50. Pradhan, 49.
51. Kenny, 706–8. On cholera, note: Arnold, 'Cholera and Colonialism in British India', *Past and Present*, 113 (1986): 118–51.
52. Muter, vol 1, 131, 133–5.
53. Meadows, 16.
54. 'Malaria and the value of the Eucalyptus', *IF*, 7, 4 (April, 1882): 336.
55. Desmond, *European Discovery*, 258–85 (quote, 277).
56. Dove, "'Jungle" in Nature and Culture'.
57. D. Brandis, 'On the cultivation of the different species of Eucalyptus in Northern India', *IF*, 2, 2 (October, 1876): 141–4.

58. Cleghorn to Secretary of Government, 17 August 1859, no 755, in Cleghorn, 'Correspondence Regarding Kumari Cultivation', H. Cleghorn, 'Third Report on Forest Operations', 31 August 1860, in Cleghorn, *Forests*, 139.
59. Brandis, 'On the cultivation': 143.
60. R.W. Doughty, *The Eucalyptus: A Natural and Commercial History of the Gum Tree* (Baltimore: Johns Hopkins, 2000) 128.
61. On which see Grove, 'Conserving Eden: The (European) East India Companies and their Environmental Policies on St. Helena, Mauritius, and in Western India, from 1660 to 1854', *Comparative Studies in Society and History*, 35, 2 (April, 1993): 318–51.
62. For an entertaining chapter on the Baron, see Hay, *Gum*, 71–103. On its anti-malarial properties note especially, Hay, *Gum*, 88–90, and Thompson, 'Trees as a Theme in Medical Geography and Public Health', *Bulletin of the New York Academy of Medicine*, 54, 3 (1975): 518–23.
63. Ian Tyrrell, *True Gardens of the Gods: Californian-Australian Environmental Reform, 1860–1930* (Berkeley, California: University of California Press, 1999), endnote 18 from page 23, referenced on 69–70; see also Thompson, 'Trees as a Theme': 524. Its anti-malarial properties generally went unchallenged until the late 1890s, when the importance of the host, the *Anopheles* mosquito, in transferring malaria was discovered. Michael Warboys, 'Germs, Malaria and the Invention of Mansonial Tropical Medicine: From 'Diseases in the Tropics' to 'Tropical Diseases'', in David Arnold, ed., *Warm Climates and Western Medicine: The Emergence of Tropical Medicine, 1500–1900* (Amsterdam: Rodopi, 1996), 186–98.
64. 'Arboriculture in its relation to Climate': 151.
65. J. L. Laird, 'The Eucalyptus Globulus: From a botanical, economical and medical point of view, translated from the French by J. E. Planchon, Professeur à la Faculté de Montpellier', *IF*, 1, 2 (October, 1875): 175–7.
66. J. E. O'Connor, 'The Cultivation of "Eucalyptus Globulus" and other Australian Gums in India', *IF*, 2, 2 (October, 1876): 120–35.
67. 'Malaria and the value of the Eucalyptus', *IF*, 7, 4 (April, 1882): 339, 337.
68. Laird, 157.
69. Dr. J. Maitland cited in 'Plantation of Australian Trees, Nilgiri Hills', in Cleghorn, pp. 180–1.
70. Reproduced in 'Arboriculture in its relation to Climate': 142–4.
71. O'Connor: 124.
72. Cleghorn to Secretary to Government, R.D., Utakamand, 8 November 1859, No 836, 'Firewood of the Nilgiri Hills', in Cleghorn, 160.
73. 'South Australian Eucalyptus', *IF*, 3, 4 (April, 1878): 317–19.
74. Cleghorn, 'Memorandum: Fuel and Firewood Jungles', Madras, 5 April 1859, H. Cleghorn to Secretary of Government, 17 August 1859, no 755, in Cleghorn, *Forests*, 149–57.
75. Cleghorn, 42–3, 171–91.
76. Cleghorn, 'Third Report on Forest Operations', 31 August 1860, in Cleghorn, *Forests*, 63.
77. Brandis to Editor Ootacamund, 7 April 1882, 'The Forests of South India', *IF*, 7, 4 (April, 1882): 366.
78. Brandis, 'On the Distribution of Forests in India', *IF*, 9, 5 (May, 1883): 224; O'Connor, 'Cultivation of "Eucalyptus Globulus"': 120.

79. Conservator of Forests, Mysore and Coorg, to the Secretary to the Chief Commissioner of Mysore, 29 October 1877, Bangalore [*sic*], No. 1688, 'Report on the Exotic Trees in the fuel Plantations of the Nundidroog Division, Mysore', IF, 3, 4 (April, 1878): 357–9.
80. Cleghorn, 'Third Report on Forest Operations', 31 August 1860, in Cleghorn, *Forests*, 82.
81. O'Connor: 128.
82. O'Connor, 'Cultivation of "Eucalyptus Globulus"': 120–35.
83. Brandis, 'On the Cultivation of the different species', 137–8.
84. Brandis, 'On the Cultivation of the different species', 141.
85. Paucity of Records: R. N. Parker, 'Eucalyptus in North-West India', IF, 39, 2 (February, 1913): 81–6. Difficulty of identification: Brandis, 'On the Cultivation of the different species', 140.
86. On fungus and white ants: J. C. McDonnell to Editor, IF, 6, 4 (April, 1881): 335; 'Decay of Eucalyptus at Changa Manga', IF, 7, 1 (July, 1881): 98–100. On soil and water: H. L. Wright, 'Eucalyptus Experiments in the Simla Hills', IF, 40, 7 (July, 1914): 360–5.
87. Note, for instance, 'South Australian Eucalyptus', IF, 3, 4 (April, 1878): 317–19; Laird, 'Eucalyptus Globulus': 156–79; 'Decay of Eucalyptus at Changa Manga', IF, 7, 1 (July 1881): 98–100; 'Mueller's Eucalyptographia', IF, 11, 5 (May, 1885): 237; 'The Timber Trees of New South Wales', IF, 11, 6 (June, 1885): 272–8.
88. Cleghorn, 339; G. Foster, 'Plantation of Eucalypti', IF, 2, 3 (January, 1877): 324.
89. Doughy, 129.
90. Cleghorn, 339; O'Connor, 131 complained at the 'heavy charges' incurred from importing Australian seeds.
91. Laird, for instance, recounted examples of successful drainage and health improvements in Algeria and southern France. Laird: 166–8.
92. Brandis to Editor, Ootacamund, 7 April 1882, 'The Forests of South India': 365–6.
93. Lucille Brockway, *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens* (New Haven and London: Yale University Press, 2002), 103–39.
94. 'Arboriculture in its relation to Climate', IF, 1, 2 (October, 1875): 142–55.
95. Captain Hall, Royal Engineers, 'Sub-surface Moisture in connection with the question of the deterioration of Culturable Soil ...', IF, 7, 2 (October, 1881): 131–50.
96. Elizabeth Whitcombe, 'The Environmental Costs of Irrigation in British India: Waterlogging, Salinity and Malaria', in David Arnold and Ramachandra Guha, eds, *Nature, Culture, Imperialism: Essays on the Environmental History of South Asia* (Delhi: Oxford University Press, 1996), 237–59.
97. 'Arboriculture': 150.
98. Thomas R. Metcalf, *Ideologies of the Raj* (Cambridge: Cambridge University Press, 1994).
99. Morag Bell, "'The Pestilence That Walketh in Darkness": Imperial Health, Gender and Images of South Africa, c. 1880–1910', *Transactions of the Institute of British Geographers*, New Series, 18, 3 (1993): 327–41.
100. Muter, vol. 1, 165; 135.



101. Thousands of Europeans similarly migrated from Britain to North America, South Africa and Australasia in the belief that this would improve their health. Note: Curtin, *Death by Migration*.
102. F. Napier Broome to Viceroy of India, Government House, Perth, 11 December, 1885, *Despatches on the subject of a Sanitarium in Western Australia for the British Troops Serving in India*, no. 22, presented to the Legislative Council by His Excellency's Command (Perth: Government Printer, 1886), 4.
103. F. K. Crowley, 'Broome, Sir Frederick Napier (1842–1896)', *Australian Dictionary of Biography*, Volume 3 (Melbourne: Melbourne University Press, 1969), 248–50.
104. J. Stirling, *Observations on the Climate and Geographical Position of Western Australia, and on its adaptation to the purposes of a Sanatorium for the Indian Army in a Letter Addressed to J. R. Martin, Esq* (London: J. C. Bridgewater, 1859). Many ex-EIC officers appear to have migrated to Western Australia. On which, see H. Compton to Secretary of State for India, 5 June 1883, Adelaide, British Library, India Office, IOR/L/PJ/6/102/ 1176.
105. Also note: *Military Sanatarium [sic]. Report of the Board of Commissioners*, 7 September 1858 (Tasmania: no publisher, 1858).
106. For exceptions note, Linda Bryder, "'A Health Resort for Consumptives': Tuberculosis and Immigration to New Zealand, 1880–1914", *Medical History*, 40 (1996): 459–64; Curtin, *Death By Migration*; Diana Dyason, 'The Medical Profession in Colonial Victoria, 1834–1901', *Disease, Medicine and Empire*, 194–216; L. K. Gluckman, *Tangiwai – A Medical History of New Zealand prior to 1860* (Auckland: L. K. Gluckman, 1976), 57–61; Warwick Anderson, 'Postcolonial Histories of Medicine', in Frank Huisman and John Harley Warner, eds, *Locating Medical History: The Stories and their Meanings* (Baltimore and London: Johns Hopkins University Press, 2004), 285–306.
107. Stirling, 4.
108. On the promotion of New Zealand, see Miles Fairburn, *The Ideal Society and Its Enemies: The Foundations of Modern New Zealand Society, 1850–1900* (Auckland: Auckland University Press, 1989); Ian D. Pool, 'Is New Zealand a Healthy Country?' *New Zealand Population Review*, 8, 2 (July, 1982): 2–27.
109. Michael Belgrave, 'Thomson, Arthur Saunders', *Dictionary of New Zealand Biography: Volume one, 1769–1869* (Wellington: Allen & Unwin and Dept. of Internal Affairs, 1990), 534. Henceforth DNZB. On the travels of Thomson's regiment, the Seventeenth, or the Leicestershire Regiment of Foot, see Richard Cannon, *Historical Record of the Seventeenth, or the Leicestershire Regiment of Foot* (London: Silvester & Co., 1847), 39–45.
110. David N. Livingstone, 'Human Acclimatization: Perspectives on a Contested Field of Enquiry in Science, Medicine and Geography', *History of Science*, 25 (1987): 369–70; Curtin, *Death by Migration*, 44–5.
111. A. S. Thomson, 'Climate of New Zealand', Enclosure No. 35 16 October 1850, in 'Papers relating to native inhabitants; the New Zealand Company and other affairs of the colony', *British Parliamentary Papers*, 1851 (114), 50–5.
112. All quotes in this paragraph from Thomson, 'Climate of New Zealand', 55.
113. Thomson, *New Zealand Government Gazette (Province of Nelson)*, 2, 9 (16 June, 1854): 47–53; Thomson, 'Reports on the Health of the Troops Stationed in New Zealand. No. 1', *Supplementary New Zealand Government*

- Gazette. (Province of Wellington)*, 5, 38 (Monday, 27 December 1858): i–vii; Thomson, *The Story of New Zealand: Past and Present – Savage and Civilized*, Two Volumes (London: John Murray, 1859). On Thomson’s argument of New Zealand’s healthiness for European vitality see *Story of New Zealand*, Volume 1, 45–8.
114. All quotes from Thomson, *New Zealand Government Gazette*, 52.
  115. Thomson, *New Zealand Government Gazette*, 48–9.
  116. Thomson, *New Zealand Government Gazette*, 52–3. Thomson’s studies into bodily measurements of Maori revealed that Maori were not as physically strong as Europeans. Damon Salesa, ‘“The Power of the Physician”: Doctors and the Dying Maori in Early Colonial New Zealand’, *Health and History*, 3, 1 (2001): 31–2.
  117. *New Zealand Journal*, 26 November 1842, 279.
  118. Ernst Dieffenbach, *Travels in New Zealand*, 2 Volumes (Christchurch: Capper Press, 1974), 183.
  119. *Lyttleton Times*, 29 April 1854, 7.
  120. See Despatch Number 69 mentioned in ‘Government Gazette, Province of Taranaki’, *New Plymouth Provincial Gazette* 7, no. 10 (25 May, 1859), 40. 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, National Archives (NA), Wellington.
  121. *Appendices to the Journal of the House of Representatives* (AJHR), 22 July 1868, 24.
  122. The files often provide only minimal information, meaning it is likely that many who served in India did not mention it. Returns filed by surviving servicemen or their wives provide an indicative figure of some of the Indian servicemen who took advantage of this. Of 18 who applied in Nelson Province, six had served in India; in Canterbury, the figure was six out of 29. Military Land Claims, Nelson, 1259–75: LS 66, Record 15, NA, Wellington; Military Land Claims, Canterbury, 1285A–94B: LS 66, Record 17, NA, Wellington.
  123. This figure is drawn from James Belich, *The New Zealand Wars and the Victorian Interpretation of Racial Conflict* (Auckland: Penguin, 1986), 59.
  124. See, W. F. Keane, ‘Duty Bound: A Biography of Sir J. L. C. Richardson, 1810–78’ (BA Hons. dissertation: University of Otago, 1988); John Larkins Cheese Richardson’, ‘Biography Files from India and Colonial Office’, British Library, London, CS N/1/39 f.3.
  125. John Larkins Cheese Richardson, *A Summer’s Excursion in New Zealand: with Gleanings from Other Writers* (London: Kerby and Sons; Exeter: William Roberts, 1854); Sir John Cracroft Wilson, Transcript of Diary/Recollections, 1854, of Canterbury, typed transcript by Ron Chapman, 1989, Canterbury Museum, ARC1989.80.
  126. On nearing Calcutta, Muter noted that: ‘From the yellow grass of the Canterbury plains the change for a time is charming; but the clear bracing atmosphere of New Zealand, its snow-covered mountains and blue streams, are soon missed.’ Muter, *Travels and Adventures of an Officer’s Wife in New Zealand* (Christchurch: Kiwi Publishers, 1997 [1864]), 313.
  127. Andrew Sinclair, Letters and Journals, March 1860, MS 1947, ATL.

128. E. W. Payton, *Round about New Zealand: Being Notes from A Journal of Three Years' Wanderings in the Antipodes* (London: Chapman & Hall, 1888), 171. Thanks to Tony Ballantyne for alerting me to this.
129. 'Timber in New Zealand', *IF*, 12, 6 (June, 1886): 284.
130. Andrea Scott Inglis, *Summer in the Hills: The Nineteenth-Century Mountain Resort in Australia* (Melbourne: Australian Scholarly Publishing, 2007), 45–64.
131. William Coleman, *Yellow Fever in the North: The Methods of Epidemiology (Wisconsin Publications in the History of Science and Medicine)* (Madison and London: University of Wisconsin Press, 1987), 5, xiv.
132. 'Report of the Hokitika Hospital': 77.
133. Anderson, *Cultivation*, 11.
134. *Edinburgh Review* (January 1828): 94–7 quoted in Frank Crowley, ed., *A Documentary History of Australia. Volume 1: Colonial Australia, 1788–1840* (West Melbourne: Thomas Nelson, 1980), 367.
135. John Turnbull, *A Voyage Round the World, in the years 1800, 1801, 1802, 1803, and 1804; in which the author visited the principal islands in the Pacific Ocean, and the English settlements of Port Jackson and Norfolk Island*, Volume 1 (London: A. Maxwell, 1805), 44–8 quoted in *A Documentary History of Australia*, 133.
136. Dilke, 87.
137. Anderson, *Cultivation*, 22.
138. Anderson, *Cultivation*, 20 (figures), 35–8.
139. William Howitt, *Land, Labour and God; or Two Years in Victoria* (London: Longmans, 1855), quoted in Anderson, *Cultivation*, 127.
140. Wilson, *Diary/Recollections*, 6.
141. Mrs Charles [Elizabeth] Meredith, *Notes and Sketches of New South Wales, During A Residence in that Colony from 1839 to 1844* (London: John Murray, 1844), 85.
142. *West Australian* (WA), 19 October 1885: 3.
143. Rolf Boldrewood, *Old Melbourne Memories* (1884) quoted in Paul Fox, 'The Simla of the South', *The Changing Landscape: The Garden in the Landscape: Proceedings of the Australian Garden History Fifteenth Annual National Conference*, 21–3 October 1994 (Ballarat: Australian Garden History Society, 1994), 10 (Boldrewood), 11.
144. Fox, 'The Simla', 11.
145. Alfred Deakin, 'Diary, Indian 1890–91', Deakin Papers, National Library of Australia, quoted in Fox, 'The Simla', 13.
146. Inglis, *Summer in the Hills*.
147. Anthony S. Wohl, *Endangered Lives: Public Health in Victorian Britain* (Cambridge, MA: Harvard University Press, 1983); T. Stevenson, 'Miasmas, Morbidity and Mileu: Mortality in Victorian South Australia', *Proceedings of the Royal Geographical Society (S. A. Branch)*, 81 (1980): 40–85; Alan Mayne, "'The dreadful scrouge": Responses to Smallpox in Sydney and Melbourne, 1881–2', in Roy MacLeod and Milton Lewis, eds, *Disease, Medicine and Empire: Perspectives on Western Medicine and the Experience of European Expansion* (London and New York: Routledge, 1988), 219–41; Milton Lewis and MacLeod, 'A Workingman's Paradise? Reflections on Urban Mortality in Colonial Australia 1860–1900', *Medical History*, 31 (1987): 387–402; Geoffrey W. Rice, 'Public Health in Christchurch, 1875–1910: Mortality

- and Sanitation', in Linda Bryder, ed., *A Healthy Country: Essays on the Social History of Medicine in New Zealand* (Wellington: B. Williams Books, 1991), 85–108; Pamela J. Wood, *Dirt: Filth and Decay in a New World Arcadia* (Auckland: Auckland University Press, 2005); Derek A. Dow, *Safeguarding the Public Health: A History of the New Zealand Department of Health* (Wellington: Victoria University Press; Ministry of Health; Historical Branch, Department of Internal Affairs, 1995).
148. A. K. Newman, 'Speculations on the Physiological Changes Obtaining in the English Race when Transplanted to New Zealand', *TPNZI*, 9 (1876): 44. See also John Stenhouse, "'A disappearing race before we came here": Doctor Alfred Kingcome Newman, The Dying Maori, and Victorian Scientific Racism', *NZJH*, 20, 2 (October, 1996): 128–9.
  149. 'Is New Zealand a Healthy Country?' *TPNZI*, 15 (1883): 493–510.
  150. W. D. Campbell, 'On the Draining of Towns', *TPNZI*, 9 (1876): 29–37. See also, Edward Dobson, 'Notes on the Best Method of Meeting the Sanitary Requirements of Colonial Towns', *TPNZI*, 13 (1880): 84–91; J. Turnbull Thomson, 'On the Cleansing of Towns', *TPNZI*, 11 (1878): 38–69; W. R. E. Brown, 'Draining of Towns: Results of having Outfall Drains within Sydney Harbour', *TPNZI*, 9 (1876): 260–3; J. C. Crawford, 'On Thorough Drainage', *TPNZI*, 2 (1869): 211–19; Edward Withy, 'Sanitation and Ventilation as required in a Modern House', *TPNZI*, 25 (1892): 459–78; John Goodall, 'On the Probability of a Water Supply being obtained for the City of Auckland from Mount Eden', *TPNZI*, 6 (1873): 35–40; James Stewart, 'Notes on the Proposition to Supply Auckland with Water from Mount Eden', *TPNZI*, 6 (1873): 40–2.
  151. 'The Sanitary Condition of New Zealand', *Intercolonial Medical Congress of Australasia* (Melbourne: Stilwell, 1889), 446.
  152. Anderson, *Cultivation of Whiteness*; Lewis, *The People's Health: Public Health in Australia, 1788–1950* (Westport: Praeger, 2003), 41–116; J. Ashburton Thompson, 'A Record of the Present Sanitary State of New South Wales', *Intercolonial Medical Congress*, 442–3.
  153. 'Our Science Page: Decay of Plants and Animals (from the "Chemistry of Common Things")', *New Zealand Country Journal* (NZCJ), 7, 6 (1 November 1883): 494.
  154. *New Zealand Government Gazette* (Province of Nelson), 15, 26 (9 July, 1867): 102.
  155. 15, 26 (9 July, 1867): 103–4.
  156. 'Such draining, covering, filling-up, or cleaning from vegetable growth', it noted, would 'be at the expense of, or recoverable from, the landowner or his agent.' 15, 26 (9 July, 1867): 104–7.
  157. 'Province of Nelson: Waterworks Act', *Nelson Provincial Council Votes and Proceedings*, Session 10, No.1 (1863): 7; Thompson, 'A Record of the Present Sanitary State of New South Wales', 434–47; and reference 146.
  158. Believing that ozone formed closest to the surface, health seekers maximised their exposure to it by staying as close to the surface of the sea as possible. Lena Lencek and Gideon Bosker, *The Beach: The History of Paradise on Earth* (London: Secker & Warburg, 1999), 113–38; Wood, *Dirt*; Petrow, *Sanatorium of the South?*
  159. *NZCJ*, 1, 2 (2 April 1877): 82. For similar arguments, see also, 'Sanitary Influence of Trees', *North New Zealand Settler*, 1, 4 (November, 1882): 69;

- R. Aherne, 'Utilization of Sandhills Reserve', NZCJ, 6, 6 (1 November 1882): 406; 'Beneficial Effects of Forests', NZCJ, 14, 6 (November, 1890): 520; R. McNab, 'Forestry in Its Relation to the Farm', *New Zealand Farmer* (hereafter, NZF), 24, 10 (November, 1903): 788.
160. J. B. Armstrong, 'Planting in Towns', NZCJ, 4, 1 (January, 1880): 53.
161. Charlie Challenger, 'Pioneer Nurserymen of Canterbury, New Zealand (1850–65)', *Garden History*, 7, 1 (Spring, 1979): 25–64.
162. Note, for instance, Superintendent General, Inwards Correspondence 1861–77, Otago Provincial Government, Series 7, Roll 43, Micro 414/67, HL, file 9967; Thomas Kirk to Ferdinand von Mueller, 14 June, 1886, 'Official Correspondence of Thomas Kirk, Chief Conservator of Forests 1885–8', qMS-1469–70, ATL, Wellington.
163. These included 'the various varieties of Poplar, the Maples, Planes, Elms, &c', the Tasmanian Wattle, Stringy-bark gum and 'the Willow-leaved gum and the Peppermint gum', but also included native beeches and Ribbonwoods. Armstrong, 'Planting': 50–3.
164. John Dixon Marmaduke, Personal Correspondence, 1886–1900, Box 3, Folder 16, item 97, no date, Canterbury Museum.
165. 'Sanitary Influence of Trees', NNZS, 1, 4 (November, 1882): 69.
166. NZCJ, 1, 2 (2 April 1877): 82. See also, 'Sanitary Influence of Trees': 69; R. Aherne, 'Utilization of Sandhills Reserve', NZCJ, 6, 6 (1 November 1882): 406; 'Beneficial Effects of Forests' NZCJ, 14, 6 (November, 1890): 520; R. McNab, 'Forestry in Its Relation to the Farm', NZF, 24, 10 (November, 1903): 788.
167. On this note, for instance, H. E. Meller, *Leisure and the Changing City, 1870–1914* (London; Boston: Routledge & Paul, 1976), 109–17; M. Billinge, 'A Time and Place for Everything: An Essay on Recreation, Re-Creation and the Victorians', *Journal of Historical Geography*, 22, 4 (1996): 443–59; Caroline Daley, 'A Gendered Domain: Leisure in Auckland 1890–1940' in Caroline Daley and Deborah Montgomerie, eds, *The Gendered Kiwi* (Auckland: Auckland University Press, 1999), 87–111.
168. For this theme, note, Fairburn, *Ideal Society*; Julian Kuzma, 'Landscape, Literature and Identity: New Zealand Late Colonial Literature as Environmental Text, 1890–1921' (Ph.D. diss: University of Otago, 2003).
169. Grahame Anderson, 'Wakefield Towns', in *Edward Gibbon Wakefield and the Colonial Dream: A Reconsideration* (Wellington: Friends of the Alexander Turnbull Library, 1997), 143–58; Katie Holmes, Susan K. Martin and Kylie Mirmohamadi, *Reading the Garden: The Settlement of Australia* (Melbourne: Melbourne University Press, 2008), 57–73; Michael Williams, 'The Parkland Towns of Australia and New Zealand', *Geographical Review*, 56, 1 (January, 1966): 67–89.
170. 8, 4 (July, 1884): (first quotation 281; second quotation 278); on progressive ideals, note Erik Olssen, *Building the New World: Work, Politics and Society in Caversham, 1880s–1920s* (Auckland: Auckland University Press, 1995).
171. Stephen Hamnett and Robert Freestone, eds, *The Australian Metropolis: A Planning History* (St Leonards: Allen & Unwin, 1999); Thelma Strongman, *City Beautiful: The First 100 Years of the Christchurch Beautifying Association* (Christchurch: Clerestory Press, 1999).

172. D. McArthur, 'On the Importance of Forestry', TPNZI, 15 (1882): 461–3.
173. See, for instance, D. Tannock, 'Dunedin City Corporation: Reserves Department Annual Report, 1910–11', in *City of Dunedin Departmental Reports, 1910–11* (Dunedin: no publisher, 1911), 1–11. In 1924, Tannock observed with satisfaction that during periods of heavy downpour, trees had prevented serious erosion and, moreover, purified water flowing into the catchment. Tannock, *Report 1923–24* (Dunedin: no publisher, 1924).
174. Peter S. Evans, 'The Great Wall of China: Catchment Policy and Forests Beyond the Yarra Watershed 1850–1950', in Michael Calver et al., eds, *Proceedings of the 6th National Conference of the Australian Forest History Society Inc.* (Rotterdam: Millpress Science Publishers, 2005), 613–22; R. W. Richards, *Report, 1907–08* (Dunedin: no publisher, 1908), 27.
175. Armstrong, 50.
176. Anderson, *Cultivation*, 33–4.
177. Both typhus and typhoid were commonly associated with swamps and cities. Typhus 'occurred irregularly in great epidemics', sweeping aside great swathes of the urban population whereas 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'. Wilson, 'Fevers', 400–6 (quotation, 400). Most physicians also believed, as Hokitika's Surgeon Superintendent did, that it was 'a fever generated and propagated by poverty, filth, and over-crowding'. 'Report of the Hokitika Hospital, by the Surgeon Superintendent for the 12 months ending 30th April, 1869', *County of Westland Gazette*, 13 (7 June 1869): 77.
178. Wilson, 18 June 1860: 20.
179. Note, for instance, the prevalence of miasmatic ideas popularly adopted during the 1918 Influenza Epidemic. On which, see Rice, *Black November: The 1918 Influenza Pandemic in New Zealand*, Second Edition (Christchurch: Canterbury University Press, 2005); Edna Beattie, op. cit., 2007.
180. Warboys, 'Germs, Malaria and the Invention', 181–207; Anderson, *Cultivation*.
181. Melbourne University's medical researchers engaged in laboratory research and favoured germ theory. Anderson, *Cultivation*.
182. Linda Bryder notes, for example, that Australia and New Zealand public health care went through four distinctive phases, with national power only really coming into play after World War II. Linda Bryder, 'A New World? Two Hundred Years of Public Health in Australia and New Zealand', in Dorothy Porter, ed., *The History of Public Health and the Modern State* (Atlanta: Rodopi, 1994), 313–34.
183. Dow, *Safeguarding*, 42–8.
184. Bryder, 'A New World?' 313–34.
185. Harrison, *Public Health*, 139–226; Arnold, 'Crisis and Contradiction in India's Public Health', in *History of Public Health*, 335–55.
186. Alison Bashford, 'Epidemic and Governmentality: Smallpox in Sydney, 1881', *Critical Public Health*, 9, 4 (1999): 301–16. Brian Moloughney, Tony Ballantyne and David Hood, 'After Gold: Reconstructing Chinese Communities, 1896–1913', in Henry Johnson and Moloughney, eds, *Asia In the Making of New Zealand* (Auckland: Auckland University Press, 2007), 72.

187. Prashant Kidambi, *The Making of an Indian Metropolis: Colonial Governance and Public Culture in Bombay, 1890–1920* (Aldershot: Ashgate, 2007); Arnold, *Colonizing the Body*, 200–39.
188. Note, for instance, Ramasubban, 'Imperial Health'; Roy, 'Managing the Environment', 187–219.
189. Saunders, 'The Workers' Paradox', 213–59.
190. Mayne, 'Smallpox', 229.
191. Bashford, *Imperial Hygiene: A Critical History of Colonialism, Nationalism and Public Health* (Houndsmills: Palgrave Macmillan, 2004).
192. Bashford and Claire Hooker, eds, *Contagion: Epidemics, History and Culture from Smallpox to Anthrax* (London and New York: Routledge, 2001); Moloughney et al., 'After Gold', 72–5.
193. Anderson, *Cultivation of Whiteness*, 93–126.
194. Bashford, "'Is White Australia possible?'"
195. 'Malaria and the value of the Eucalyptus': 337.
196. James Bonwick, *Climate and Health in Australasia ...* (London, Street & Co., 1886), 42.
197. This interpretation is based on Arnold, *Science, Technology and Medicine in Colonial India* (Cambridge: Cambridge University Press, 2000), 198–9.
198. Guy Woods, '1901: A Socio-Economic Profile of Australia at Federation', *Parliament of Australia: Parliamentary Library*, 2001, <http://www.aph.gov.au/library/pubs/rn/2000-01/01RN23.htm> (accessed 2 December 2008); Keith Hackson and Alan McRobie, eds, *Historical Dictionary of New Zealand* (Auckland: Longman, 1996), 309.
199. In response to its semi-tropical climate Brisbane's wealthy lived on hills while the poor below received the sewage from the wealthier. Lewis and MacLeod, 'A Workingman's Paradise?' 394–5.
200. Philippa Mein Smith, 'Infant Welfare Services and Infant Mortality: A Historian's View', *Australian Economic Review*, 24, 1 (January, 1991): 22–34; David Walker, *Anxious Nation: Australia and the Rise of Asia 1850–1939* (St. Lucia: University of Queensland Press, 1999).
201. J. Macmillan Brown: 'The East and the West', *The Press*, 24 May 1913, no page.
202. Lynda Bryder, *A Voice for Mothers: The Plunket Society and Infant Welfare, 1907–2000* (Auckland: Auckland University Press, 2003), 1; Margaret Tennant, *Children's Health, The Nation's Wealth: A History of Children's Health Camps* (Wellington: Bridget Williams Books and Historical Branch, Department of Internal Affairs, 1994), 23. On the wider context, see Bryder, *Below the Magic Mountain: A Social History of Tuberculosis in Britain* (Oxford: Oxford University Press, 1988).
203. Lewis, *People's Health*, 142–78; Denoon and Mein-Smith, *History of Australia*, 256–62.
204. Dow, *Maori Health and Government Policy, 1840–1940* (Wellington: Victoria University Press, 1999); Raeburn Lange, *May the People Live: A History of Maori Health Development, 1900–20* (Auckland: Auckland University Press, 1999); Russell McGregor, *Imagined Destinies: Aboriginal Australians and the Doomed Race Theory, 1880–1939* (Carlton: Melbourne University Press, 1997).
205. Arnold, "'An ancient race outworn:" Malaria and Race in Colonial India, 1860–1930', in Waltraud Ernst and Bernard Harris, eds, *Race, Science and Medicine, 1700–1900* (London and New York: Routledge, 1999), 123–43.

206. R. H. Makgill, 'Nature's Efforts at Sanitation', TPNZI, 35 (1902): 139.
207. 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 'generates foul gases, which force their way upwards through the drains to the higher levels of the city'. Higginson, 'Sanitary Sewerage', TPNZI, 22 (1889): 369–78 (quotation, 369–70).
208. See, for instance, Tennant, *Children's Health*, 33–7; Kirstie Ross, "'Schooled by Nature": Pakeha Tramping between the Wars', *NZJH*, 36, 1 (April, 2001): 51–61; *Sunlight League of New Zealand: Sun and Sea Bathing, Teeth and Nutrition, Mental Health* (Christchurch: no publisher, n. d. [1930s?]).
209. Margaret Pelling, 'Contagion/Germ Theory/Specificity', in *Companion Encyclopedia of the History of Medicine*, 323–5; Wood, 'Constructing Colonial Dirt: A Cultural History of Dirt in the Nineteenth Century Settlement of Dunedin, New Zealand' (Ph.D. thesis, University of Otago, 1997), 14–16.
210. Anderson, *Cultivation Whiteness*, 55.
211. Lange, *May the People Live*.

### 3 Colonial Aesthetic Anxieties

1. 'Spare the Mount', *New Zealand Herald* (NZH), 28 March 1877, 3.
2. David Lambert and Alan Lester, 'Imperial Spaces, Imperial Subjects', in Lambert and Lester, eds, *Colonial Lives Across the British Empire: Imperial Careering in the Long Nineteenth Century* (Cambridge: Cambridge University Press, 2006), 2.
3. The paradox, between wanting to have 'wilderness' and prevent its destruction, becomes a common theme in nineteenth-century scenic conservation. See, Geoff Park, *Theatre Country: Essays on Landscape and Whenua* (Wellington: Victoria University Press, 2006).
4. *The Cambridge Cultural History: Volume 6: The Romantic Age in Britain*, ed. by Boris Ford (Cambridge: Cambridge University Press, 1992).
5. Tim Bonyhady, *The Colonial Earth* (Carlton South: Melbourne University Press, 2001); Caroline Jordan, 'Progress versus the Picturesque: White Women and the Aesthetics of Environmentalism in Colonial Australia, 1820–1860', *Art History*, 25, 3 (September, 2002): 341–57; Beattie, 'Wilderness: The Sublime and Picturesque in New Zealand, 1830s–2000s', in Richard Reeve and Mick Field, eds, *Wilderness in New Zealand* (Nelson: Craig Potton, forthcoming).
6. For exceptions, see footnote 5; Hermione de Almeida and George H. Gilpin, *Indian Renaissance: British Romantic Art and the Prospect of India* (Aldershot: Ashgate, 2005); Nigel Leask, *British Romantic Writers and the East, Anxieties of Empire* (Cambridge: Cambridge University Press, 1992); Michael Franklin, ed., *Romantic Representations of British India* (London and New York: Routledge, 2006); John M. MacKenzie, *Orientalism: History, Theory and the Arts* (Manchester; New York: Manchester University Press, 1995).
7. David Arnold, *The Tropics and the Travelling Gaze: India, Landscape, and Science, 1800–56* (Delhi: Permanent Black, 2005).
8. Don Garden, *Australia, New Zealand and the Pacific: An Environmental History* (Santa Barbara: ABC-Clio, 2005), 91.



9. Thomas Dunlap, *Nature and the English Diaspora: Environment and History in the United States, Canada, Australia, and New Zealand* (New York: Cambridge University Press, 1999), 97–127; Paul Star, 'Native Forest and the Rise of Preservation in New Zealand (1903–1913)', *Environment and History*, 8 (2002): 275–94.
10. Alan Grey, *Aotearoa and New Zealand: A Historical Geography* (Christchurch: Canterbury University Press, 1994), 19.
11. Paul Shepard, *English Reaction to the NZ Landscape Before 1850 Pacific Viewpoint Monograph No 4* (Wellington: Victoria University of Wellington Department of Geography, 1969), 3.
12. Katherine Raine, '1815–40s: The First European Gardens', in Matthew Bradbury, ed., *A History of the Garden in New Zealand* (Auckland: Viking, 1995), 60.
13. De Almeida and Gilpin, *Indian Renaissance*.
14. Ray Desmond, *The European Discovery of the Indian Flora* (Oxford; New York: Royal Botanic Gardens; Oxford University Press, 1992), 258–308.
15. Eric Pawson, 'Confronting Nature', in John Cookson and Graeme Dunstall, eds, *Southern Capital Christchurch: Towards a City Biography 1850–2000* (Christchurch: Canterbury University Press, 2000), 60–84; Andrea Gaynor, *Harvest of The Suburbs: An Environmental History of Growing Food in Australian Cities* (Perth: University of Western Australia Press, 2006), 4; Michael Mann and Samiksha Sehrawat, 'A City with a View: The Afforestation of the Delhi Ridge, 1883–1913', *Modern Asian Studies*, 43, 2 (2009): 543–70. I thank Kate Hunter for alerting me to the last reference.
16. On New Zealand, see L. E. Lochhead, 'Preserving the Brownie's Portion: A History of Voluntary Native Conservation in New Zealand, 1888–1935' (Ph.D. thesis: Lincoln University, 1997); Martin Mulligan and Stuart Hill, *Ecological Pioneers: A Social History of Australian Ecological Thought and Action* (Cambridge: Cambridge University Press, 2001); Jodi Frawley, 'Campaigning for Street Trees, Sydney Botanic Gardens, 1890s–1920s', *Environment and History*, 15 (2009): 303–22. A welcome exception is Bonyhady, *Colonial Earth*.
17. Giselle Byrnes, *Boundary Markers: Land Surveying and the Colonisation of New Zealand* (Wellington: Bridget Williams Books, 2001); Paul Carter, *Lie of the Land* (London; Boston: Faber and Faber, 1996).
18. Arnold, *Tropics*, 75; 32 (quote).
19. Quoted in Leonard Huxley, ed., *Life and Letters of Sir Joseph Dalton Hooker*, Volume 1 (New York: Arno Press, 1978), 258.
20. Arnold, *Tropics*, 212.
21. Hooker to Elizabeth, Darjeeling, 9 August 1848, quoted in Huxley, *Life and Letters*, 260–1.
22. John Turnbull Thomson, 'Extracts of a Journal kept during Reconnaissance Survey of the Southern Districts', *Journal of the Royal Geographical Society*, 28 (1858), 299–300.
23. Mulligan and Hill, *Ecological Pioneers*, 43–4. Unlike Mulligan and Hill, 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: Johns Hopkins University Press, 1993), 109–60.

24. *Environment and Empire* (Oxford: Oxford University Press, 2007), 88.
25. Beinart and Hughes, *Environment and Empire*, 78–85; Nancy Lee Stepan, *Picturing Tropical Nature* (London: Reaktion Books, 2002).
26. Mary Louise Pratt, *Imperial Eyes: Travel Writing and Transculturation* (London: Routledge, 1992).
27. A useful discussion is, Francis Pound, *Frames on the Land: Early Landscape Painting in New Zealand* (Auckland 1983), 19, 25. Even for landscapes that did not fit aesthetic conventions, connoisseurs could transform them through a Claude Glass, a device which, distorting an image through a series of mirrors, enabled virtually any scene to suddenly become painterly and picturesque. Park, *Theatre Country*, 114–17.
28. Jordan, *Picturesque Pursuits: Colonial Women Artists and The Amateur Tradition* (Carlton: Melbourne University Press, 2005), 169.
29. Mrs. Charles Meredith, *Notes and Sketches of New South Wales, during A Residence in that colony from 1839 to 1844* (London: John Murray, 1844), 56.
30. Jordan, *Picturesque*, 169–70 (on Meredith's views), 11–50 (on colonial women's artistic education).
31. On the gendered notions of science and botany, note Ann B. Shteir, *Cultivating Women, Cultivating Science: Flora's Daughters and Botany in England, 1760 to 1860* (Baltimore: Johns Hopkins University Press, 1996).
32. See, for example, George Chandler, *Liverpool* (London: B. T. Batsford and Liverpool City Council, 1957), 306–19, 407–18.
33. Roger Blackley, *The Art of Alfred Sharpe* (Auckland: Bateman and Auckland Art Gallery, 1992), 15–16.
34. Blackley, 16, 18.
35. See Allen Staley, *The Pre-Raphaelite Landscape* (Oxford: Clarendon Press, 1973), 1–14 (quote, 5).
36. Staley, *Pre-Raphaelite*, 138–49. As Blackley notes, Sharpe's artistic style – his concern with naturalism – owed much to this Pre-Raphaelite tradition. Blackley, 19.
37. For reasons of consistency, I spell his name with the 'e', even when Sharpe did not.
38. Blackley, 23–5.
39. Blackley, 53–6.
40. On varying interpretations of the environmental intent of artist John Kinder (c. 1834/8–1903) gleaned through studying his artwork, see Ron Brownson, 'John Kinder's Photographs', in Brownson, ed., *John Kinder's New Zealand* (Auckland: Auckland Art Gallery Toi o Tamaki and Godwit, 2004), 91; 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): 41.
41. For an excellent introduction to Ruskin's life and works, see Kenneth Clark, *Ruskin Today* (London: J. Murray, 1964). For a potted biography of Ruskin, see especially 3–14.
42. Clark, 85–90 (quote, 85).
43. Beattie and John Stenhouse, 'Empire, Environment and Religion: God and Nature in nineteenth-century New Zealand', *Environment and History*, 13, 4 (November, 2007): 413–46.
44. David Carroll, 'Pollution, defilement and the art of decomposition', in Michael Wheeler, ed., *Ruskin and the Environment: The Storm-Cloud of the*

- Nineteenth Century* (Manchester and New York: Manchester University Press, 1995), 58–75.
45. Wheeler, 'Introduction', in *Ruskin and the Environment*, 4.
  46. Gill Chitty, "'A great entail": The Historic Environment', in *Ruskin and the Environment*, 104.
  47. Quoted in Chitty, 105.
  48. 'Spare the Mount', NZH, 28 March 1877, 3.
  49. 'Circumspice', 'The Hills Around Auckland', NZH, 19 May 1877, 5.
  50. Ruskin, quoted in Malcolm Andrews, *Landscape and Western Art* (Oxford: Oxford University Press, 1999), 183.
  51. Quoted in Landow, 64.
  52. Wheeler, 'Introduction', 3. On collecting, see Tom Griffiths, *Hunters and Collectors: The Antiquarian Imagination in Australia* (Cambridge: Cambridge University Press, 1996).
  53. The work first appeared as a series of articles in the *New Zealand Herald* and was later republished in 1890 in the *Newcastle Morning Herald and Miners' Advocate*. 'Hints for Landscape Students in Watercolour' is reprinted in full in Blackley, 131–41. Unless referred to otherwise, when I quote from 'Hints' I use the transcription found in the above pages. Quote from 'Hints', 141.
  54. Nicholas Thomas, *Possessions: Indigenous Art/Colonial Culture* (London: Thames and Hudson, 1999), 12.
  55. Rollo Arnold, 'Some Australasian Aspects of New Zealand Life, 1890–1913', *New Zealand Journal of History*, 4, 1 (April, 1970): 54–76 (quote, 54); also note, Thomas, *Possessions*.
  56. NZH, 26 April 1884, 6.
  57. 'Water Colours at the Exhibition', NZH, 21 April 1883, 6.
  58. Blackley, 68.
  59. Leonard Bell, *Colonial Constructs: European Images of Maori, 1840–1914* (Auckland: Auckland University Press, 1992).
  60. Thomas, 65 and Bell, *Colonial Constructs*.
  61. Sharpe exhibited *Burial Place of Hone Heke* alongside two other works in April 1883 at the Auckland Society of Arts: *Entrance to the Stalactite Caverns of Waiomio* and *View from Shoal Bay, Auckland*. See Blackley, 62–3.
  62. Quoted in Blackley, 116. This image is reproduced in Blackley's book on 107.
  63. Cattle, it should be noted, were a popular and common feature, both as staffage and symbols of the introduction of European 'civilisation' into wild lands.
  64. H. L. Gibbs to Keating, 5 February 1896 quoted in J. W. Turner, *Manufacturing in Newcastle, 1801–1900* (Newcastle: Newcastle Public Library, 1980), 88. For details of the plant, see 69–92.
  65. Sharpe, 'From Nature to Nature's God', *Newcastle Morning Herald and Miners' Advocate* (NMH), 12 June 1888, 2. For other works expressing a similar viewpoint note, 'Evening in the Forest', NMH, 12 January 1882, 2; 'Temples not Made with Hands', *Observer and Free Lance* (OFL), 6 March 1886, no page; 'A Day with Nature', NMH, 1 February 1888, 2.
  66. Sharpe, 'Earth is Fair', NMH, 20 February 1888, 2.
  67. 'Water Colours at the Exhibition', 6. On artistic criticism of Sharpe's style in *Burial Place* and other works, see Blackley, 57–64.
  68. On this note, Blackley, 89–93.

69. Blackley, 44.
70. Wheeler, 'Introduction', 3. For other artists who both painted in a naturalistic manner and advocated the necessity of knowing about the scientific forms of nature, see Andrews, 186–7.
71. See Jordan, *Picturesque Pursuits*; Bonyhady, *Colonial Earth*.
72. William Swainson to G. F. Swainson 20 July 1851, Ash Island, Hunter River, New South Wales, in *William Swainson, FRS, FLS, Naturalist and Artist: Family Letters and Diaries 1809–1855 Final Destiny New Zealand*, transcribed, edited and published by Geoffrey M. Swainson (Palmerston North: G. Swainson, 1992), 59.
73. For instance, in the version of 'Hints' published in Australia, he changed 'from a New Zealand standpoint' to 'from an Australasian standpoint'. 'Hints', NMH, 11 March 1890, 8.
74. 'Hints: General Notes', NMH, 8 April 1890, 6.
75. See, for instance, Mulligan and Hill, 53–71.
76. Sharpe, 'Hints: General Notes', NMH, 8 April 1890, 6.
77. Sharpe, 'Newcastle Resources', NMH, 21 March 1895, 3.
78. Jordan, 'Progress versus the Picturesque', 341–57.
79. De Almeida and Gilpin, *Indian Renaissance*.
80. Bonyhady, *Colonial Earth*, 191–217.
81. Blackley, 94.
82. Sharpe, 'Auckland', NZH, 9 August 1879, 3.
83. On Ruskin's abhorrence of ugliness, see Clark, *Ruskin Today*, 135.
84. Judith Roberts, 'English Gardens in India', *Garden History*, 26, 2 (Winter, 1998): 115–35.
85. Mann and Sehwat, 'A City with a View': 543–70.
86. NZH, 2 November 1880, 6.
87. Helen Leach, *Cultivating Myths: Fiction, Fact and Fashion in Garden History* (Auckland: Godwit, 2000), 97–100; Filippo Pizzoni, *The Garden: A History in Landscape and Art*, translated by Judith Landry (London: St. Martin's Press, 1997), 184–215.
88. James Winter, *Secure from Rash Assault: Sustaining the Victorian Environment* (Berkeley and Los Angeles, 1999), 189–208.
89. For perhaps the best overview of this movement, note Konrad Ott, Thomas Potthast, Martin Gorke and Patricia Never, 'Über die Anfänge des Naturschutzgedankens in Deutschland und den USA' [On the beginnings of the Concept of Nature Protection in Germany and the USA], in E. V. Heyen, ed., *Jahrbuch für Europäische Verwaltungsgeschichte. Naturnutzung und Naturschutz in der europäischen Rechts- und Verwaltungsgeschichte* [Yearbook for European Administrative History. Exploitation and Protection in the History of European Law and Administration] (Baden-Baden: Nomos, 1999), 1–55.
90. Bonyhady, *Colonial Earth*, 219–47.
91. Beattie, 'Colonial Geographies of Settlement: Vegetation, Towns, Disease and Well-Being in Aotearoa/New Zealand, 1830s–1930s', *Environment and History*, 14, 4 (November, 2008): 583–610.
92. Ott et al., 'Über die Anfänge', 48.
93. Paul Fox, *Clearings: Six Colonial Gardeners and their Landscapes* (Carlton: Miegunyah Press, 2004).
94. Star and Lochhead, 'Children of the Burnt Bush: New Zealanders and the Indigenous Remnant, 1880–1930', in Eric Pawson and Tom Brooking, eds,

- Environmental Histories of New Zealand* (Melbourne: Oxford University Press, 2002), 119–35; see also, Star's perceptive, 'Native Forest and the Rise of Preservation'.
95. Star, 'The Place of Native Forest in New Zealand's Mental Landscape', in John Dargavel and Brenda Libbis, eds, *Australia's Ever-Changing Forests IV: Proceedings of the Fourth National Conference on Australian Forest History* (Canberra: Centre for Resource and Environmental Studies; The Australian National University, 1999), 85–98.
  96. NZH, 1 June 1880, 6.
  97. NZH, 21 May 1880, 6.
  98. NZH, 2 August 1879, 5.
  99. George F. Chadwick, *The Works of Sir Joseph Paxton, 1803–1865* (Birkenhead: Architectural Press, 1961). On Birkenhead Park and Paxton, see also Barry Bergdoll, *European Architecture, 1750–1890* (Oxford: Thames and Hudson, 2000), 244–5.
  100. Sarah Faiks, Jarrett Kest, Amanda Szot and Molly Vendura, 'Revisiting Riverside: A Frederick Law Olmsted Community' (MA project: School of Natural Resources and Environment, University of Michigan, 2001), <[www.sre.umich.edu/emi/pubs/riverside/Rschapter3.pdf](http://www.sre.umich.edu/emi/pubs/riverside/Rschapter3.pdf)>.
  101. Fox, *Clearings*, 100–43.
  102. 'The Hill Reserve', NMH, 27 August 1890, in 'King Edward Park: Photographs and Paper Clippings', Newcastle Region Public Library LHD 712.5/KIN.
  103. Craig Bagley and John Trigger, *Research Report No.39: The Future of an Historic Park: King Edward Park Management Strategy* (Newcastle: Newcastle Region Public Library, LHQ 339.49944/HUN/8/No.39, n. d.), 9–10.
  104. 'The Hill Reserve', NMH, 27 August 1890 in 'King Edward Park: Photographs and Paper Clippings', Newcastle.
  105. These included the addition of 49 acres to the reserve in 1894 and the erection of a band rotunda, built 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; and, in 1978, the beginning of significant landscaping of its north-western section and widespread tree planting. See Bagley and Trigger, 9–15. Sharpe also designed other parks in the Newcastle area. See, Beattie, 'Environmental Anxiety in New Zealand, 1850–1920: Settlers, Climate, Conservation, Health, Environment' (Ph.D. diss. University of Otago, 2005), 139–43.
  106. NZH, 24 August 1876, 6.
  107. Simon Schama, *Landscape and Memory* (London: Harper Collins, 1996), 21–242; Stephen Daniels, 'The Political Iconography of Woodland in later Georgian England', in Denis Cosgrove and Daniels, eds, *The Iconography of Landscape: Essays on the Symbolic Representation, Design and Use of Past Environments* (Cambridge: Cambridge University Press, 1988), 43–82. Of course, it is not just in Western culture that trees play an important symbolic role: Douglas Davies, 'The Evocative Symbolism of Trees', in *Iconography of Landscape*, 32–42.
  108. Sharpe's reference comes from John Keats' (1795–1821) unfinished poem, 'Hyperion', 1820.
  109. 'Trees in Streets', NZH, 29 August 1884, 3.

110. 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, 59–63.
111. 'The Poplars at St. Paul's', NZH, 23 February 1885, 3.
112. NZH, 28 February 1885, 6.
113. OFL, 2 January 1886, 11.
114. For instance, in the version of 'Hints' published in Australia, he changed 'from a New Zealand standpoint' to 'from an Australasian standpoint'. 'Hints', NMH, 11 March 1890, 8. 'Hints', 131.
115. Quoted in Blackley, 116.

#### 4 Scottish-Trained Doctors, Environmental Anxieties and Imperial Development, 1780s–1870s

1. John Hutton Balfour, 'Remarks on the Teaching of Science in Universities', letter copy, Royal Botanic Garden, Edinburgh 30 March, 1869 in 'Papers of John Hutton Balfour, Dean of Faculty of Medicine', Da 43, Volume 3, Special Collections, University of Edinburgh Library.
2. Not all of graduates at Scottish institutions, of course, were Scottish-born, hence I distinguish Scottish-trained rather than Scottish-born unlike Richard Grove. See, T. S. Pensabene, *The Rise of the Medical Practitioner in Victoria* (Canberra: Australian National University Press and Health Research Project, 1980), 64.
3. Derek A. Dow, ed., *The Influence of Scottish Medicine: An Historical Assessment of Its International Impact* (Casterton Hall; New Jersey: Parthenon Publishing, 1988); in particular note, Warwick Brunton, "'To imitate if not to rival, in their arrangements, the asylums of the Home Country": The Scottish Influence on New Zealand Psychiatry before World War II' (Paper presented at New Zealand History Associate Conference, Dunedin, November 2003); John D. Hargreaves, *Academe and Empire: Some Overseas Connections of Aberdeen University, 1860–1970* (Aberdeen: Aberdeen University Press, 1994), especially 5–32, 54–5, 61–7; John M. MacKenzie, *Empires of Nature and the Nature of Empires: Imperialism, Scotland and the Environment: The Callander Lectures, delivered in the University of Aberdeen, 2–7 November 1995* (East Linton: Tuckwell Press, 1997); Kapil Raj, 'Colonial Encounters and the Forging of New Knowledge and National Identities: Great Britain and India, 1760–1850', *Osiris*, 2nd series, 15 (2000): 119–34; Jan Oosthoek, 'Worlds Apart? The Scottish Forestry Tradition and the Development of Forestry in India', *Journal of Irish and Scottish Studies*, 3, 1 (2010): 69–82.
4. Richard H. Grove, *Ecology, Climate and Empire: Colonialism and Global Environmental History, 1400–1940* (Cambridge: Cambridge University Press, 1997); Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (New York: Cambridge University Press, reprint, 1997), 380–473; Grove, 'Scottish Missionaries, Evangelical Discourses and the Origins of Conservation Thinking in Southern Africa 1820–1900', *Journal of Southern African Studies*, 15, 2 (January, 1989): 163–87; James Beattie, 'W. L. Lindsay, Scottish Environmentalism, and the "Improvement" of Nineteenth-Century New Zealand', in Tony Ballantyne and

- Judith A. Bennett, eds, *Landscape/Community: Perspectives from New Zealand History* (University of Otago Press: Dunedin, 2005), 43–56.
5. Grove, *Green Imperialism*, 11.
  6. Grove, *Green Imperialism*, 380–473.
  7. S. Ravi Rajan, *Modernizing Nature: Forestry and Imperial Eco-Development 1800–1930* (Oxford: Oxford University Press, 2006), Richard H. Drayton, *Nature's Government: Science, Imperial Britain, and the 'Improvement of the World'* (New Haven: Yale University Press, 2000), 234–8.
  8. Roy M. MacLeod, 'Scientific Advice for British India: Imperial Perceptions and Administrative Goals, 1898–1923', *Modern Asian Studies*, 9, 3 (1975): 347.
  9. Charles Newman, *The Evolution of Medical Education in the Nineteenth Century* (London: Oxford University Press, 1957), 12–13.
  10. See, 'Medical Licences: Return to an Address of the Honourable The House of Commons dated 14 April 1856', printed 17 July 1856 in 'Papers of John Hutton Balfour, Dean of Faculty of Medicine', Da 43, Volume 1, Special Collections, University of Edinburgh Library.
  11. Newman, *The Evolution of Medical Education*, 109; Derek Dow and Michael Moss, 'The Medical Curriculum at Glasgow in the Early Nineteenth Century', *History of Universities*, 7 (1988): 227–57.
  12. Balfour, *Guide to the Royal Botanic Garden, Edinburgh* (Edinburgh: Edmonston & Douglas, no date [1850s or 1860s?]).
  13. Balfour, 'Notice of the Palm-House in the Royal Botanic Garden at Edinburgh', from the *Transactions of the Botanical Society of Edinburgh*, Volume 6, Session 1857–8 in H. Cleghorn, Attics 65.5.1, no. 11, Special Collections, University of Edinburgh Library.
  14. J. H. Balfour, 'Remarks on the Teaching of Science in Universities', letter copy, Royal Botanic Garden, Edinburgh 30 March, 1869 in 'Papers of John Hutton Balfour, Dean of Faculty of Medicine'.
  15. Grove, *Green Imperialism*, 11; Grove, *Ecology, Climate and Empire*, 67. See also, Pallavi Das, 'High Cleghorn and Forest Conservancy in India', *Environment and History*, 11, 1 (2005): 57.
  16. Satpal Sangwan, 'From Gentlemen Amateurs to Professionals: Reassessing the Natural Science Tradition in Colonial India, 1780–1840', in Grove, Vinita Damodaran, and Satpal Sangwan, eds, *Nature and the Orient: the Environmental History of South and South East Asia* (Delhi: Oxford University Press, 1998), 217.
  17. Newman, *Evolution of Medical Education*, 97; Sangwan, 'From Gentlemen Amateurs', 217. On botanical education in medicine, see Anand C. Chitnis, *The Scottish Enlightenment: A Social History* (London: Croom Helm, 1976), 177–84, especially 178–9; Lewis Pyenson and Susan Sheets-Pyenson, *Servants of Nature: A History of Scientific Institutions, Enterprises, and Sensibilities* (New York and London: W. W. Norton & Company, 2000), 152–4; Theodor Puschmann, *A History of Medical Education* (New York and London: Hafner Publishing Company, 1966 [1891]), 408–10. On the use of museums and botanical gardens in Edinburgh, see Chitnis, *The Scottish Enlightenment and Early Victorian English Society* (Beckenham, Kent: Croom Helm, 1986), 11.
  18. Hooker to Hector, 13 January 1866, Royal Botanical Gardens, Kew, in *My Dear Hector: Letters from Joseph Dalton Hooker to James Hector, 1862–1893*,

- edited by John Yaldwyn and Juliet Hobbs (Wellington: Museum of New Zealand Te Papa Tongarewa Technical Report 31, December 1998), 66.
19. See, *My Dear Hector*; D. J. Galloway, 'Joseph Hooker, Charles Knight, and the Commissioning of New Zealand's First Popular Flora: Hooker's *Handbook of the New Zealand Flora* (1864–1867)', *Tuhinga*, 10 (1998): 31–62.
  20. Mark W. Weatherall, *Gentlemen, Scientists and Doctors at Cambridge, 1800–1940* (Cambridge: Boydell Press, 2000), 33, 35–6, 110–41. On the more modest background, see Douglas M. Haynes, 'Victorian Imperialism in the British Medical Profession: An Argument', in Durba Ghosh and Dane Kennedy, eds, *Decentring Empire: Britain, India and the Transcolonial World* (New Delhi: Hyderabad, 2006), 138. Haynes' interpretation is contested by Anne Crowther and Marguerite Dupree, 'The Invisible General Practitioner: The Careers of Scottish Medical Students in the late Nineteenth Century', *Bulletin of the History of Medicine*, 70, 3 (1996): 397.
  21. The classic study remains, David Elliston Allen, *The Naturalist in Britain: A Social History* (Princeton: Princeton University Press, reprint, 1994). On colonial natural history note, Beattie and John Stenhouse, 'Empire, Environment and Religion: God and the Natural World in Nineteenth-Century New Zealand', *Environment and History*, 13, 4 (November, 2007): 413–46; MacKenzie, 'Missionaries, Science and the Environment in Nineteenth-Century Africa,' in Andrew Porter, ed., *The Imperial Horizons of Protestant Missions, 1880–1914* (Grand Rapids: Eerdmans, 2003), 106–30; Sujit Sivasundaram, 'Natural History Spiritualized: Civilizing Islanders, Cultivating Breadfruit, and Collecting Souls', *History of Science*, 39 (2001): 417–43; John Pearn, *A Doctor in the Garden: nomen medici in botanicis: Australian Flora and the World of Medicine* (Herston, Queensland: Amphion Press, 2001).
  22. See, 'Medical Licences: Return to an Address of the Honourable The House of Commons dated 14 April 1856', printed 17 July 1856 in 'Papers of John Hutton Balfour, Dean of Faculty of Medicine', 3–35.
  23. Mark Harrison, *Public Health in British India: Anglo-Indian Preventive Medicine, 1859–1914* (Cambridge: Cambridge University Press, 1994), 26.
  24. Michael Peter Belgrave, "'Medical men" and "lady doctors": The Making of a New Zealand Profession, 1867–1941' (Ph.D. diss.: Victoria University of Wellington 1985), Table 3.2, 100.
  25. Diana Dyason, 'The Medical Profession in Colonial Victoria, 1834–1901', in MacLeod and Milton Lewis, eds, *Disease, Medicine, and Empire: Perspectives on Western Medicine and the Experience of European Expansion* (London and New York: Routledge, 1988), Table 10.1 'Qualifications from British institutions held by doctors registered before 1901 in Victoria', 196.
  26. Pensabene, 57–81.
  27. See, Haynes, 130–56.
  28. Harrison, *Public Health in British India*.
  29. See endnote 4.
  30. Grove, *Green Imperialism*, 380–473; E. P. Stebbing, *The Forests of India*, Volume 1 (London: John Lane, 1922), 71–87; 231–51.
  31. Michael Mann, 'Ecological Change in North India: Deforestation and Agrarian Distress in the Ganga-Jamna Doab 1800–50', *Environment and History*, 1, 2 (1995): 201–20.



32. Calculated from Table 11.4, 'Estimate of sleepers (crossties) and acres of forest cleared, India, 1850–1940', in Michael Williams, *Deforesting the Earth: From Prehistory to Global Crisis, An Abridgment* (Chicago: University of Chicago Press, 2006), 359.
33. Calculated from Morris David Morris, 'The Population of All-India, 1800–1951', *Indian Economic and Social History Review*, 9 (1974): 311–12.
34. On agricultural expansion, see David Ludden, *An Agrarian History of South Asia: The New Cambridge History of India*, Volume 4 (Cambridge: Cambridge University Press, 1999), 131–140, 209–19.
35. C. R. Markham, 'On the Effects of the Destruction of Forests in the Western Ghauts [sic] of India on the Water-Supply', *Journal of the Royal Geographical Society of London*, 36 (1866): 188–9.
36. Grove, *Green Imperialism*, 399–407.
37. Grove, *Green Imperialism*.
38. Das, 57.
39. Das, 55–80; H. Cleghorn, F. Royle, R. Baird-Smith and R. Strachey, 'Report of the Committee appointed by the British Association to consider the probable effects in an economic and physical point of view of the destruction of tropical forests', *Report of the Proceedings of the British Association for the Advancement of Science* (London: John Murray, 1852).
40. Cleghorn, Memorandum, 5 April 1859 quoted in Stebbing, *Forests*, Volume 1, 315.
41. Note, for instance, Cleghorn, 'Third Report on Forest Operations', 31 August 1860, in Cleghorn, *The Forests and Gardens of South India* (London: W. H. Allen & Co., 1861), 59–125.
42. Cleghorn, 'Second Annual Report, 1858–9', 31 December 1859, in *Forests and Gardens*, 33.
43. Cleghorn to Government, 7 December 1858, in 'Correspondence regarding kumari cultivation', in *Forests and Gardens*, 126.
44. Cleghorn 'First Annual Report on Forest Operations in the Madras Presidency', 1 May 1858, in *Forests and Gardens*, 17.
45. See, 'Appendix (H): Rules for the Preservation of Jungles in the District of Coimbatore', in Cleghorn, 'Third Report on Forest Operations', 31 August 1860, in *Forests and Gardens*, 124–5.
46. Cleghorn 'First Annual Report on Forest Operations in the Madras Presidency', 1 May 1858, in *Forests and Gardens*, 17.
47. Cleghorn, *Report Upon the Forests of the Punjab and the Western Himalaya* (Roorkee: Thomason Civil Engineering College, 1864), ii–iii.
48. Cleghorn, *Report Upon the Forests of the Punjab*, 192–4.
49. Cleghorn, *Report Upon the Forests of the Punjab*, 196–8; 237–43.
50. Stebbing, *Forests of India*, Volume 1, 213.
51. Stebbing, *Forests of India*, Volume 1, 111–14.
52. Grove, *Green Imperialism*, 428–36.
53. Gibson, 'Report on Deforestation in South Conkan', *Transactions of the Medical and Physical Society of Bombay* (1846): 37–41.
54. Grove, *Green Imperialism*, 428–36.
55. On which, see Raymond L. Bryant, 'Forest Problems in Colonial Burma: Historical Variations on Contemporary Themes', *Global Ecology and Biogeography Letters*, 3, 4 (1993): 123–4.

56. Hugh Falconer, *Report on the Teak Forests of the Tenasserim Provinces* (Calcutta: F. Carbery, Military Orphan Press, 1852), 25.
57. Falconer, *Report*, 26.
58. Falconer, *Report*, 12.
59. Falconer, *Report*, 29–34.
60. Stebbing, *Forests of India*, Volume 1, 231–55.
61. See, Grove, *Green Imperialism*, 460–2; Stebbing, *Forests of India*, Volume 1, 206–7 (quote 206).
62. Stebbing, *Forests of India*, Volume 1, 219.
63. Rex Wright-St Clair, *Thoroughly A Man of the World: A Biography of Sir David Monro* (Christchurch: Whitcome and Tombs, 1971), 27–8.
64. Wright-St Clair, *Thoroughly A Man of the World*, 48, 71–7, 260–1. Monro supported tree-planting measures in parliament. On Scottish graduates as pastoralists, see Dow, 'Counting Sheep Pleasant for Scot Doctors', *New Zealand Doctor*, 31 March 1999: 41.
65. Monro, 'On the Leading Features of the Geographical Botany of the Provinces of Nelson and Marlborough, New Zealand', *TPNZI*, 1 (1868): 8.
66. Wright-St Clair, *Thoroughly A Man*, 13, 156.
67. Belgrave, "'Medical Men" and "Lady Doctors"', 143–4.
68. Brian P. J. Molloy, 'Sinclair, Andrew', *DNZB* (updated 16 December 2003), <[www.dnzb.govt.nz](http://www.dnzb.govt.nz)> (accessed October 2009).
69. Dyason, 'Medical Profession', 195, 196.
70. Pearn, *Doctor in the Garden*, 382–3.
71. Pearn, *Doctor in the Garden*, 124–5.
72. Dyason, 'Medical Profession', 197.
73. Stephen Legg, op. cit.
74. Rollo Arnold, 'The Virgin Forest Harvest and the Development of Colonial New Zealand', *New Zealand Geographer*, 32 (1976): 105–26; Williams, 'The Clearing of the Woods', in R. L. Heathcote, ed., *The Australian Experience: Essays in Australian Land Management and Resource Management* (Melbourne: Longman Cheshire Pty Ltd, 1988), 115–26.
75. Francis Robert Moulds, *The Dynamic Forest: A History of Forestry and Forest Resources in Victoria* (Richmond, Victoria: Lynedoch Publications, 1991), 13–28; S. M. Legg, 'Debating Forestry: An Historical Geography of Forest Policy in Victoria and South Australia, 1870 to 1939' (Ph.D. diss.: Department of Geography and Environmental Science, Monash University, 1995).
76. M. M. Roche, *Forest Policy in New Zealand: An Historical Geography 1840–1919* (Palmerston North: Dunmore Press, 1987).
77. Beattie and Paul Star, 'Global Influences and Local Environments: Forestry and Forest Conservation in New Zealand, 1850s–1920s', *British Scholar*, 3, 1 & 2 (September, 2010): 191–218.
78. David Arnold, *The Tropics and the Travelling Gaze: India, Landscape, and Science, 1800–1856* (Delhi: Permanent Black, 2005), 193–4; Galloway, 'Joseph Hooker'.
79. Hooker to Sir H. Barklay, 6 July 1868, no place, quoted in Leonard Huxley, ed., *Life and Letters of Sir Joseph Dalton Hooker*, Volume 2 (New York: Arno Press, 1978), 7. I am indebted to Professor Eric Godley for alerting me to this. On Hooker's uncertainty about the forests–rainfall connection, see Bonham

- C. Richardson, *Igniting the Caribbean's Past: Fire in British West Indian History* (no place: University of North Carolina Press, 2004), 85.
80. Emphasis in original. *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: John Dick, 1862), 5, 7.
  81. *Otago Colonist* (OC), 24 January 1862, 4.
  82. *Place and Power*, 18–23, 25–7.
  83. Donal P. McCracken, *Gardens of Empire: Botanical Institutions of the Victorian British Empire* (London: Leicester University Press, 1997), 132–81; Drayton, *Nature's Government*, 170–220; Lucile H. Brockway, *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens* (London: Academic Press, 1979), 77–102. By the late-nineteenth century, the role of botanical gardens shifted from classification, collecting and transferring to the improvement of species.
  84. See, Warwick Brunton, 'Our Endeavours have ever come too short of our desires' (unpublished, draft MS). I thank the author for sharing his research on Lindsay.
  85. Frederic Boase, *Modern English Biography Containing Many Thousand Concise Memoirs of Persons who have Died Since the Year 1850, with an Index of the Most Interesting Matter*, Volume II I–Q (Truro: Netherton and Worth, 1897), 438.
  86. *Testimonials in Favour of William Lauder Lindsay, MD ... As a Candidate for the Office of Conservator of the Museum of the Royal College of Surgeons* (Edinburgh: Murray & Gibb, 1853), 10.
  87. Pearn, 'Courage and Curiosity: Surgeon-Explorers in Australia and New Zealand. Part I. Discovery and Bridgehead', *Australian New Zealand Journal of Surgery*, 62 (1992), 228; W. D. Swinton, 'Physicians as Explorers: Joseph Hooker: Botanical Journeys in Antarctica and India', *Canadian Medical Association Journal*, 117 (8 October, 1977): 824–8; J. Burton, 'The Naturalist in Medicine with particular reference to Australia', *Medical Journal of Australia*, 1, 17 (29 April 1950): 449–563.
  88. Lindsay stated that he arrived in Dunedin on 7 October 1861. Lindsay, *Contributions to New Zealand Botany* (London: Williams & Norgate, 1868), 10–11. However, the *Otago Witness* (OW) records 'W. L. Lindsay' as being a steerage passengers aboard the *Robert Henderson*. OW, 12 October 1861, 3.
  89. Brunton, 'Our Endeavours have ever come too short of our desires'.
  90. Lindsay, *Contributions to New Zealand Botany*, 10–11.
  91. Lindsay, *Place and Power*, 26, 28.
  92. See Beattie, 'Looking for a Lost Arcadia: European Environmental Perception in the Dunedin area, 1840–1860', in Tom Brooking and Neil Clayton, eds, title not yet confirmed (Dunedin: University of Otago Press, forthcoming).
  93. *Contributions*, 28.
  94. 'On the Conservation of Forests in New Zealand', *Journal of Botany British and Foreign*, 6 (1868): 40–42, 39, 45.
  95. Displacement theory originated in the work of J. D. Hooker, Charles Darwin and A. R. Wallace. To these naturalists, and many others around the world, the displacement of native plants, animals and humans by European ones seemed common sense and inevitable. See, for instance, Paul Star, 'From Acclimatisation to Preservation: Colonists and the Natural World in

- Southern New Zealand, 1860–1894' (Ph.D. diss.: University of Otago, 1997), 115–25; Alfred Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (Cambridge: Cambridge University Press, 1986).
96. Beattie and Star, 'State Forest Conservation and the New Zealand Landscape: Origins and Influences, 1850–1914', in Tony Ballantyne and Judith Bennett, eds, *Landscape/Community: Perspectives from New Zealand History* (Dunedin: Otago University Press, 2005), 43–56.
  97. Earlier, forestry departments had been created in 1874 and 1885, only for each to be disestablished after two years or less. See Roche, *Forest Policy in New Zealand: An Historical Geography 1840–1919* (Palmerston North: Dunmore Press, 1987), 67–121.
  98. Lindsay, *Place and Power*, 6.
  99. Wright, *Bureaucrats' Domain*.
  100. Michael E. Hoare, *Reform in New Zealand Science, 1880–1926* (Melbourne: Hawthorn Press, 1976).
  101. Winsome Shepherd and Walter Cook, *The Botanic Garden Wellington: A New Zealand History, 1840–1987* (Wellington: Millwood Press, 1988), especially 33–43.
  102. On the NZI, see C. A. Fleming, *Science, Settlers and Scholars: The Centennial History of the Royal Society in New Zealand* (Wellington: Royal Society of New Zealand, 1987), 11–43. See also R. K. Dell, 'Hector, James', *Dictionary of New Zealand Biography, vol. 1, 1769–1869 (DNZB)* (Auckland: Auckland University Press, reprint, 1988), 183–4.
  103. For background, see Beattie and Star, 'State Forest Conservation', 17–29.
  104. 'II. – Recommendations of Committees', *Appendices to the Journal of the House of Representatives* (AJHR), H-5, 1874, 13.
  105. Dr A. Wjeikof, 'The Results of the Destruction of Forests upon the River Wolga at Astracan', *Transactions and Proceedings of the New Zealand Institute* (TPNZI), 4 (1871): 374–6.
  106. 'Enclosure 2 in No. 1: Extract from Dr Hector's Memorandum, 18th November, 1868', in AJHR, D22, 3. See also Roche, *Forest Policy in New Zealand*, 87–8.
  107. 'Papers relating to state forests, their conservation, planting, management, &c.', in AJHR, H5, 35–6.
  108. 34 out of a total of 78 members spoke. Roche, *History of Forestry*, 86.
  109. Roche, *History of Forestry*, 86.
  110. Calculated from NZPD, 14 July 1874, 79–94; 31 July, 350–81; 4 August, 399–426. See Graeme Wynn, 'Conservation and Society in Late Nineteenth-Century New Zealand', *New Zealand Journal of History*, 11, 2 (October, 1977): 130–4. As Bryce put it succinctly, 'I said we should let the people alone.' NZPD, 31 July 1874, 367.
  111. See, for instance, Rolleston, NZPD, 4 August 1874, 404–5.
  112. Roche, *History of Forests*, 87.
  113. Belgrave, "'Medical Men" and "Lady Doctors"', 144–151; Belgrave, 'Medicine and the Rise of Health Professionals in New Zealand, 1860–1939', in Linda Bryder, ed., *A Healthy Country: Essays on the Social History of Medicine in New Zealand* (Wellington: Bridget Williams Books, 1991), 7–24. On similar processes happening in other medical fields in New Zealand, see Tom Brooking, *A History of Dentistry in New Zealand* (Dunedin: Otago

University Press, 1980). In England, note Joan Lane, *A Social History of Medicine: Health, Healing and Disease in England, 1750–1950* (London and New York: Routledge, 2001), 11–31. Dow, *Safeguarding the Public Health: A History of the New Zealand Department of Health* (Wellington: New Zealand Historical Branch, 1995); Dow, *Maori Health and Government Policy, 1840–1940* (Wellington: Victoria University Press in association with the Historical Branch, Dept. of Internal Affairs, 1999). For New Zealand, these societal and cultural changes are expertly summarised in Erik Olssen, 'Towards a New Society', in Geoffrey Rice, ed., *Oxford History of New Zealand* (Auckland: Oxford University Press, 1992), 254–84; R. J. Polaschek, *Government Administration in New Zealand* (Wellington: New Zealand Institute of Public Administration; London: Oxford University Press; London, 1958), 3–55, 93–111. On Australasia, see Donald Denoon, *Settler Capitalism: The Dynamics of Dependent Development in the Southern Hemisphere* (Oxford: Clarendon Press, 1983), 150–4, Denoon, Philippa Mein-Smith with Marivic Wyndham, *A History of Australia, New Zealand and the Pacific* (Oxford: Blackwell, 2000), 218–47.

## 5 German Science and Imperial Forestry, 1840s–1900s

1. J. D. Hooker to James Hector, 9 August 1879, no place, in John Yaldwyn and Juliet Hobbs, eds, and Juliet Hobbs, transcriber, *My Dear Hector: Letters from Joseph Dalton Hooker to James Hector, 1862–1893* (Wellington: Museum of New Zealand/Te Papa Tongarewa Technical Report 31, December 1998), 138.
2. Hooker to T. H. Huxley, 12 September 1854, no place, in Leonard Huxley, ed., *Life and Letters of Sir Joseph Dalton Hooker, O. M., G. C. S. I.: Based on Materials Collected by Lady Hooker*, Volume 1 (London: John Murray, 1918), 426.
3. Thanks to Brett Bennett for this observation.
4. Peter Vandergeest and Nancy Lee Peluso, 'Empires of Forestry: Professional Forestry and State Power in Southeast Asia, Part 2', *Environment and History*, 12 (2006): 384; Gregory Barton, *Empire Forestry and the Origins of Environmentalism* (Cambridge: Cambridge University Press, 2002); S. Ravi Rajan, *Modernizing Nature: Forestry and Imperial Eco-Development 1800–1930* (Oxford: Oxford University Press, 2006).
5. For sake of simplicity I refer throughout this period to Germany. Notwithstanding loose confederations of German states, which dated from 1815, most states only unified in 1871.
6. The meaning of *Naturwissenschaft* varied depending on the context of its use. In the sense described above, it would be useful to translate it as natural science. Thanks to James Braund for his comments on meaning. On the wider context of professionalisation, see Charles E. McClelland, *The German Experience of Professionalization: Modern Learned Professions and their Organization from the Early Nineteenth Century to the Hitler Era* (New York: Cambridge University Press, 1991), 34–5.
7. James Albisetti, Charles E. McClelland and R. Stephen Turner, 'Science in Germany', *Osiris: 2nd Series*, 5 (1989): 291.
8. See, McClelland, *German Experience of Professionalization*.

9. On Bildung and the *Bildungsbürgertum*, see W. H. Bruford, *The German Tradition of Self-Cultivation: 'Bildung' from Humboldt to Thomas Mann* (London: Cambridge, 1975); Peter Gay, *The Bourgeois Experience, Victoria to Freud*, Volumes 1–5 (Glasgow: Harper Collins, 1984–98).
10. McClelland, *State, Society, and University in Germany 1700–1914* (New York: Cambridge University Press, 1980).
11. Lewis Pyenson and Susan Sheets-Pyenson, *Servants of Nature: A History of Scientific Institutions, Enterprises, and Sensibilities* (London & New York: W. W. Norton & Co., 2000), 57–8. Quote from Andreas W. Daum, 'Science, Politics and Religion: Humboldtian Thinking and the Transformations of Civil Society in Germany, 1830–1870', *Osiris: 2nd Series*, 17 (2002): 115.
12. McClelland, *State, Society, and University*, 153–4; Pyenson and Sheets-Pyenson, *Servants of Nature*, 57–60. I am also indebted to James Braund for helping draw the fine distinctions in meaning and translation of these educational options.
13. Pyenson and Sheets-Pyenson, *Servants of Nature*, 57–8.
14. Joachim Radkau, 'Holzverknappung und Krisenbewusstsein im 18. Jahrhundert', *Geschichte und Gesellschaft*, 9 (1983): 513–43.
15. Henry E. Lowood, 'The Calculating Forester: Quantification, Cameral Science, and the Emergence of Scientific Forestry Management in Germany', in Tore Frängsmyr, J. L. Heilbron, and Robin E. Rider, eds, *The Quantifying Spirit of the 18th Century* (Berkeley: University of California Press), 1990, 315–42; Jan Oosthoek, 'Themes in European Woodland History', in John Dargavel, Denise Gaughwin and Brenda Libbis, eds, *Australia's Ever-Changing Forests V: Proceedings of the Fifth National Conference on Australian Forest History* (Canberra: Centre for Resource and Environmental Studies, The Australian National University, 2002), 34–6.
16. For a sophisticated overview of the development and principles of *Forstwirtschaft*, see Rajan, *Modernizing Nature*, 35–44.
17. See, Ulrike Kirchberger, 'German Scientists in the Indian Forest Service: A German Contribution to the Raj?' *Journal of Imperial and Commonwealth History*, 29, 2 (May, 2001): 6.
18. J. C. Brown, *Schools of Forestry in Germany, with Addenda Relative to a Desiderated British National School of Forestry* (Edinburgh: Oliver and Boyd, 1887).
19. *Österreichs Wald: Vom Urwald zur Waldwirtschaft* (Vienna: Druckhaus Grasl, 1994).
20. Kirchberger, 'German Scientists'; Oosthoek, 'Themes'; Rajan, *Modernizing Nature*.
21. Rajan, *Modernizing Nature*; Oosthoek, 'Themes', 35.
22. Brandis, 'Progress of Forestry in India', *IF*, 10, 10 (October, 1884): 455.
23. See the essays in Andrew Cunningham and Nicholas Jardine, eds, *Romanticism and the Sciences* (Cambridge: Cambridge University Press, 1990); for an excellent study on science and arts and the view of nature in early German romanticism, see Joan Steigerwald, 'The Cultural Enframing of Nature: Environmental Ethics during the early German Romantic Period', *Environment and History*, 6, 4 (2000): 451–96.
24. Steigerwald, 'Cultural Enframing of Nature', 472–81; Malcolm Nicholson, 'Alexander von Humboldt and the Geography of Vegetation', in *Romanticism and the Sciences*, 169–185; Alexander von Humboldt, *Personal Narrative of a*

- Journey to the Equinoctial Regions of the New Continent*, abridged and translated by Jason Wilson (London: Penguin, 1995).
25. Humboldt, *Personal Narrative*, 150–1.
  26. In India in the 1830s, discussion of the geographical theory of plant distribution was dominated by the ideas of Humboldt and Joachim von Schouw (1789–1852), Professor of Botany at the University of Copenhagen and Director of the Royal Danish Botanic Garden at Copenhagen. Sangwan, 'From Gentlemen Amateurs to Professionals: Reassessing the natural science tradition in colonial India, 1780–1840', in Richard H. Grove, Vinita Damodaran and Satpal Sangwan, eds *Nature and the Orient: The Environmental History of South and South East Asia* (Delhi: Oxford University Press, 1998), 221. Some inspired by Humboldt to follow his botanical and geographical path include several who visited Australasia and/or India: J. D. Hooker, Ernst Dieffenbach, Ferdinand von Mueller, Richard Schomburgk and Ferdinand von Hochstetter.
  27. Note, Stephen Jeffries, 'Alexander von Humboldt and Ferdinand von Mueller's Argument for the Scientific Botanic Garden', *Historical Records of Australian Science*, 11, 3 (June, 1997): 301–10; Nicholson, 'Alexander von Humboldt'; Grove, *Green Imperialism*. By the 1840s and 1850s, taxonomy in German plant science had given way to an inductive approach. Faced with criticism, this in turn developed into an emphasis on plant physiology and hence adaptation. See Eugene Cittadino, *Nature as the Laboratory: Darwinian Plant Ecology in the German Empire, 1880–1900* (Cambridge: Cambridge University Press, 1990).
  28. Even after the reforms of the later nineteenth century, English scientists still acknowledged German scientific institutions and education as superior. George Haines IV, *Essays on German Influence upon English Education and Science, 1850–1919* (Hamden, Connecticut: Connecticut College & Archon Books, 1969), 47–87. For the contribution to botanical sciences in the colonies, note Sophie C. Ducker, 'Australian Phycology: The German Influence', in D. J. and S. G. M. Carr, eds, *People and Plants in Australia* (Academic Press Australia: Sydney, 1981), 116–38; Thomas George Vallance, 'Early German Connexions [*sic*] with natural history, geology and mining in New South Wales and Queensland', in Johannes H. Voigt, ed., *New Beginnings: Germans in New South Wales: A Commemorative Volume/Neuanfänge: Deutsche in New South Wales und Queensland: Eine Festschrift* (Stuttgart: Institute for Foreign Cultural Relations, 1983), 269–78; Kirchberger, 'German Scientists'.
  29. See Cittadino, *Nature as Laboratory*, 144; McClelland, *German Experience of Professionalization*, 37; McClelland, *State, Society, and University*, 155.
  30. I. M. Salanha, 'Colonialism and Professionalism: The German Forester in India', *Environment and History*, 2 (1996): 195–219.
  31. Kirchberger, 'German Scientists', 14.
  32. Kirchberger, 'German Scientists'.
  33. B. Ribbentrop, *Forestry in British India* (Calcutta: Government Printing, India, 1900), 239, 233.
  34. W. Schlich, 'Review of the Forest Administration in British India', *IF*, 10, 8 (August, 1884): 374.
  35. Ribbentrop, *Forestry*, 233.

36. Brandis, 'Progress of Forestry in India', *IF*, 10, 10 (October 1884): 465; 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): 187–237.
37. Note, for instance, 'Mr. Brandis' Work in the NW Provinces and Oudh', *IF*, 11, 4 (April, 1885): 147–58; 'Dietrich Brandis: The Founder of Forestry in India', *IF*, 10, 8 (August, 1884): 342–57.
38. Ribbentrop, *Forestry*, 79–81, 85, 93.
39. Salanha, 'Colonialism and Professionalism': 201.
40. Brandis, *Indian Forestry* (Woking: Oriental University Institute, 1897), 33–4.
41. Brandis, 'Progress of Forestry in India', *IF*, 10, 10 (October, 1884): 458. This article appeared over several issues.
42. Brandis, 'Progress of Forestry in India', *IF*, 10, 11 (November, 1884): 503.
43. Brandis, 'Progress', *IF*, 10, 10 (October, 1884): 460–1.
44. Brandis, 'Progress of Forestry in India', *IF*, 10, 11 (November, 1884): 502.
45. Dietrich Brandis, 'The Influence of Forests on Rainfall', translated by B. H. Baden Powell, *IF*, 14, 1 (January, 1888): 10–19 (quote, 18).
46. Brandis, 'Progress of Forestry in India', *IF*, 10, 11 (November, 1884): 505.
47. Ribbentrop, *Forestry*, 108–11.
48. Ribbentrop, *Forestry*, 114–15.
49. Bennett, 'Rethinking State and Professional Forestry in British India'; Richard Drayton, *Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World* (New Haven and London: Orient Longman, 2000), 229–38. 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 after 1878 with the passing of amendments to the Act of 1865.
50. K. Sivaramakrishnan, 'A Limited Forest Conservancy in Southwest Bengal, 1864–1912', *Journal of Asian Studies*, 56, 1 (February, 1997): 75–112; Sivaramakrishnan, *Modern Forests: Statemaking and Environmental Change in Colonial Eastern India* (New Delhi: Oxford University Press, 1999).
51. 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: Oxford University Press, reprint, 1996), 86–122; Jacques Pouchepadass, 'British Attitudes Towards Shifting Cultivation in Colonial South India: A Case Study of South Canara District, 1800–1920', *Nature, Culture and Imperialism*, 123–51; Ramachandra Guha, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya* (Delhi: Oxford University Press, 1991); Guha and Madhav Gadgil, 'Forestry and Social Conflict in British India: A Study of the Ecological Bases of Peasant Protest', *Past and Present*, 123 (1989): 141–77.
52. Bennett, 'Rethinking State and Professional Forestry in British India', 11; Benjamin Weil, 'Conservation, Exploitation, and Cultural Change in the Indian Forest Service, 1875–1927', *Environmental History*, 11 (April, 2006): 319–43.
53. Ramachandra Guha and Madhav Gadgil, *This Fissured Land: An Ecological History of India* (Delhi: Oxford University Press, 2003).
54. Ribbentrop, *Forestry*, 106.



55. Ribbentrop, *Forestry*, 94–120.
56. Ribbentrop, *Forestry*, 96, 91 (quote).
57. Ribbentrop, *Forestry*, 99.
58. Ribbentrop, *Forestry*, especially 1–32, 169–218.
59. Ribbentrop, *Forestry*, 57–8, 60 (quote).
60. Ribbentrop, *Forestry*, 50–3, 52 (quote).
61. Ribbentrop, *Forestry*, 49. On Fa, see James Legge, *A Record of Buddhistic Kingdoms: Being An Account by the Chinese Monk Fa-Hien of his Travels in India and Ceylon (A. D. 399–414) in Search of the Buddhist Books of Discipline* (New York: Paragon Book Reprint Co., 1965).
62. Vasant K. Saberwal, 'Science and the Desiccationist Discourse of the 20th Century', *Environment and History*, 3 (1997): 337.
63. Barton and Bennett, 'Environmental Conservation and Deforestation in British India, 1855–1947', *Itinerario*, 32 (2008): 83–104.
64. From 'Table 9.2: Estimates of Railway Sleepers used and Resultant Area of Forest Cleared in Australia, 1855–1950', in Williams, 'Clearing of the Woods', 124.
65. Brett J. Stubbs, 'Forest Conservation and the Reciprocal Timber Trade between New Zealand and New South Wales, 1880s–1920s', *Environment and History*, 14, 4 (November, 2008): 497–522 (percentages from Figure 1, 506). For other Australian colonies, see John Dargavel, *Fashioning Australia's Forests* (Melbourne: Oxford University Press, 1995), 28–31. Tony Dingle, *The Victorians: Settling* (McMahons Point, NSW: Fairfax, Syme and Weldon Associates, 1984), 134, 104–8.
66. On the general influence of German-speaking scientists, note James Braund, 'German-speaking Scientists in New Zealand 1773–1951: Research Past, Present and Future', in Bernadette Luciano and David G. Mayes, eds, *European Studies: An Interdisciplinary Series in European Culture, History and Politics* (Amsterdam; New York: Rodopi, 2005), 173–287.
67. D. J. and S. G. M. Carr, 'Karl Goebel in Australia and New Zealand', *People and Plants in Australia*, 167–79; Sophie C. Ducker, 'Australian Phycology: the German Influence', *People and Plants in Australia*, 116–38; Ann Moyal, 'Collectors and Illustrators: Women botanists of the nineteenth century', *People and Plants in Australia*, 333–56; Robert A. Stafford, 'A Far Frontier: British Geological Research in Australia during the nineteenth century', in R. W. Home and Sally Gregory Kohlstedt, eds, *International Science and National Scientific Identity: Australia between Britain and America* (Dordrecht, Boston, London: Kluwer Academic Publishers, 1991), 75–96.
68. James N. Bade, ed., *Eine Welt für sich: Deutschsprachige Siedler und Reisende in Neuseeland im 19. Jahrhundert* (Bremen: Edition Temmen, 1998); Joseph Vondra, *German-Speaking Settlers in Australia* (Melbourne: Cavalier Press, 1981).
69. Rod Home, 'Science as a German Export to Nineteenth Century Australia', in Tom Griffiths and David Lowe, eds, *Working Papers in Australian Studies No. 104* (London: Sir Robert Menzies Centre for Australian Studies; Institute of Commonwealth Studies University of London, no date): 5.
70. See also, Thomas A. Darragh, 'Ludwig Becker, a Scientific Dilettante: His Correspondence with J. J. Kaup and Others', *Historical Records of Australian Science*, 11, 4 (December, 1997): 501–22; Gabrielle L. McMullen, "'An Able Practical and Scientific Man": Gustav Adolph Hugo Thureau, German-trained

- Mining Geologist', *Historical Records of Australian Science*, 11, 2 (December, 1996): 149–77.
71. Charles Daley, 'Baron Sir Ferdinand Von Mueller, KCMG, MD, FRS, Botanist, Explorer, and Geographer', *The Victorian Historical Magazine*, 10 (1924–25): 23–32, 34–75; 'Introduction', in Home, A. M. Lucas, Sara Maroske, D. M. Sinkora and J. H. Voigt, eds, *Regardfully Yours: Selected Correspondence of Ferdinand von Mueller, Volume I: 1840–1859*, Volume 1 (Bern: Peter Lang, 1998), 9–49.
  72. I use the Anglicised spelling of Müller's name, which Mueller later adopted in Australia.
  73. Ferdinand von Mueller, *Forest Culture in its relation to industrial pursuits. A lecture, delivered by Baron Ferd. von Mueller ... on 22nd June, 1871* (Melbourne, Mason, Firth, and McCutcheon, 1871), 3.
  74. Mueller, *Forest culture*, 4 (first quote), 6 (second quote).
  75. Jeffries argues that Mueller's unsuccessful defence of the scientific purpose of the Melbourne Botanic Gardens centred on misunderstandings between the Australian public and Mueller's vision for the gardens. Jeffries, 'Alexander von Humboldt'.
  76. 'Forest Preservation', *NZF*, 10, 1 (January, 1890): 5.
  77. Mueller, *Forest Culture*, 6.
  78. H. W. Nunn, 'Hodgkinson, Clement (1818–1893)', *Australian Dictionary of Biography*, Volume 4 (Melbourne: Melbourne University Publishing, 1972), 403–4.
  79. R. Wright, *The Bureaucrats' Domain: Space and the Public Interest in Victoria, 1836–84* (Melbourne: Oxford University Press, 1989), 183.
  80. Mueller, *General Information Respecting the Present Condition of the Forests and Timber Trade of the Southern Part of the Colony* (Perth: Government Printer, 1882).
  81. S. M. Legg, 'Debating Forestry: An Historical Geography of Forest Policy in Victoria and South Australia, 1870 to 1939' (Ph.D. diss.: Department of Geography and Environmental Science, Monash University, 1995), 123–70.
  82. Mueller, in *Royal Commission on Vegetable Products: Fourth Progress Report* (Melbourne: Government Printer, 1887), 210–21 (quote 218).
  83. Legg, 'Debating Forestry', 123.
  84. M. Calver, 'Forestry Papers in Victoria', Melbourne University, 33.
  85. K. F. Wells, N. H. Wood and P. Laut, 'Loss of Forests and Woodlands in Australia: A Summary by State, based on Rural Local Government Areas' (Canberra: CSIRO Institute of Biological Resources, Division of Water and Land Resources, 1984), no page (statistic gleaned from table appended to map).
  86. Schomburgk, *Influence of Forests on Climate* (Adelaide: Government Printer, 1873), 4–5. This paper was originally read before the Philosophical Society on 9 August 1870.
  87. Schomburgk, *Influence of Forests*, 4.
  88. A useful summary of Schomburgk's ideas appears in *Royal Commission on Vegetable Products*, 1887, 186–200.
  89. Pauline Payne, "'Science at the Periphery": Dr Schomburgk's Garden', in Roy MacLeod and Philip F. Rehbock, eds, *Darwin's Laboratory: Evolutionary Theory and Natural History in the Pacific* (Honolulu: University of Hawai'i Press, 1994), 245; Payne, *The Diplomatic Gardener: Richard Schomburgk, Explorer and*

- Botanic Garden Director* (North Adelaide: Jeffcott Press, 2008); Schomburgk, *Wattle Farming* (Adelaide: Government Printer, 1884).
90. Mueller, in *Royal Commission on Vegetable Products*, 1887, 216.
  91. Legg, 'Debating Forestry', 99–103.
  92. Legg, 'Debating Forestry', 121. For his biography, note Sally O'Neill, 'Krichauff, Friedrich Eduard Heinrich Wulf (1824–1904)', *Australian Dictionary of Biography*, Volume 5 (Melbourne: Melbourne University Press, 1974), 44.
  93. Ernst Dieffenbach, *Travels in New Zealand with Contributions to the Geography, Geology, Botany, and Natural History of That Country*, Volume 1 (Christchurch: Capper Press, reprint, 1976 [1843]), 367–8.
  94. Vaughan Wood, 'Appraising Soil Fertility in Early Colonial New Zealand: The "Biometric Fallacy" and Beyond', *Environment and History*, 9, 4 (2003): 393–405.
  95. Gerda Bell, 'Ernst Dieffenbach', in *Eine Welt für Sich*, 181–94. For a useful biography of Dieffenbach see Bell, *Ernest Dieffenbach* (Palmerston North: Dunmore, 1976).
  96. On this connection, note: Dieffenbach to uncle, Berlin, 13 June, 1843, in MS-1564, Alexander Turnbull Library, Wellington, copy from City Archive Friedberg, Hessen.
  97. Johann Spitzka, *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* (Vienna: Hof- und Staatsdruckerei, 1877), ii.
  98. Gerhard Holzer, 'Ferdinand von Hochstetter, insbesondere als Neuseelandforscher' ['Ferdinand von Hochstetter, in particular as New Zealand Researcher'] (Diplomarbeit in Geschichte: University of Vienna, 1984), 8–9.
  99. Les Kermode, 'Ferdinand von Hochstetter', in *Eine Welt für sich*: 203–14.
  100. 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: J. G. Cotta, 1867), 254. This was originally published as *Neu-Seeland* (Stuttgart: J. G. Cotta, 1863).
  101. Hochstetter, *New Zealand*, 255.
  102. Hochstetter, *New Zealand*, 142.
  103. Hochstetter, *New Zealand*, 142.
  104. On this, note for instance, Michael R. Dove, "'Jungle" in Nature and Culture', in *Social Ecology*, 90–115; Ajay Skaria, *Hybrid Histories: Forests, Frontiers and Wildness in Western India* (Delhi: Oxford University Press, 1999).
  105. T. H. Potts, NZPD, 7 October 1868: 188; Charles O'Neill, NZPD, 1 October 1873: 1545; 'The Forests of the Colony [from Hansard 7th October, 1868]', in 'Papers relating to state forests, their conservation, planting, management, &c.', AJHR, H-5, Vol. 2, 1874: 1; Wood, NZPD, 31 July, 1874, 380–1.
  106. 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; as did Frederick S. Peppercorne and Charles O'Neill. O'Neill, NZPD, 1 October 1873: 1545–6; Peppercorne, *On*

- the Influence of Forests on Climate and Rainfall* (Napier: R. Coupland Harding, 1880), 4; Walker, 'Report of the Conservator of State Forests', C3, vol. 1, AJHR, 1877, 47; *Nelson Examiner and New Zealand Chronicle*, 24 February 1872, 7.
107. Walker spent four and a half months in Germany, visiting the forest academies of Tharandt (Saxony), Aschaffenburg (Bavaria), Neustadt-Egerswalde (Prussia), and Mariabrunn (Austria). Walker, 'Report on State Forests and Forest Management in Germany and Austria', Staff Corps, Deputy Conservator of Forests, Madras, 1 October 1872, in 'Part III: Various Reports on State Forests', H5B, AJHR, Vol. 2, 1874, 1–26. George Ross, 'An account of the laws and regulations relating to the management of village and ecclesiastical forests in the province of Hanover', May 1872, in 'Part III: Various Reports on State Forests', H5B, AJHR, Vol. 2, 1874, 56–8.
  108. J. R. Hacket, 'Forest Culture in Germany with suggestions for the future cultivation of Forests in New Zealand', Read 14 December 1883, Nelson Philosophical Society, MU156, R-1M03-131D, Te Papa Tongarewa/The Museum of New Zealand, 8.
  109. Hacket, 'Forest Culture'.
  110. Among many other examples, Grossmann quoted from Professor Schwappach's text *Forestry* to highlight the value of forests. J. P. Grossmann, *The Evils of Deforestation* (Auckland: Brett Printing and Publishing Co., 1909), 6.
  111. Postcards from the Königliche Forst-Akademie (Royal Forest Academy) at Tharandt, indicate earlier correspondence with German foresters or visits to this institution. Diplomatic and Consular Reports, No. 596 Miscellaneous Series, Foreign Office, September 1903. 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's (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, in Robert McNab: Papers relating to afforestation in New Zealand 1895–1908, HL, MS 0608.
  112. 'Practical Forestry: Schoolboys at Knapdale', 20 August 1903, *The Ensign*: no page, in McNab Papers.
  113. Paul Star, 'Ecology, A Science of Nation?: The Utilization of Plant Ecology in New Zealand, 1896–1930', *Historical Records of Australian Science*, 17, 2 (December, 2006), 197–207. On Cockayne, see also A. D. Thomson, 'Leonard Cockayne', NZDB, 3, 1901–20, 107–9; Thomson, 'Annotated summaries of letters to colleagues by the New Zealand Botanist Leonard Cockayne – 1', *New Zealand Journal of Botany*, 17, 3 (1979): 389–403. On the importance of ecology and the significance of Cockayne, see Thomas R. Dunlap, *Nature and the English Diaspora: Environment and History in the United States, Canada, Australia, and New Zealand* (Cambridge: Cambridge University Press, 1999), 139–63.
  114. For instance, for the production of his 1909 *Report on the Sand Dunes of New Zealand* (Wellington: Department of Lands, 1909), Cockayne acknowledged

- the special overseas help he received from three colleagues in the United States and Professor L. Diels at the University of Marburg (2).
115. Beattie and Paul Star, 'State Forest Conservation and the New Zealand Landscape: Origins and Influences, 1850–1914', in Tony Ballantyne and Judith Bennett, eds, *Landscape/Community: Perspectives from New Zealand History* (Dunedin: Otago University Press, 2005), 43–56.
  116. Libby Robin, 'Ecology: A Science of Empire?' in Tom Griffiths and Libby Robin, eds, *Ecology and Empire: Environmental History of Settler Societies* (Seattle: University of Washington Press; Edinburgh: Keele University Press, 1997), 64–75.
  117. On the general influence of German-speaking scientists, note Braund, 'German-speaking scientists in New Zealand'.

## 6 South Asian and Australasian Forestry Anxieties and Exchanges, 1870s–1920s

1. F. S. Peppercorne, *On the Influence of Forests on Climate and Rainfall* (Napier: R. Coupland Harding, 1880), 3.
2. Campbell Walker, 'Report of the Conservator of State Forests', *Appendices to the Journal of the House of Representatives* (AJHR), C3, vol. 1, 1877, 48.
3. Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens, and the Origins of Environmentalism, 1600–1860* (New York: Cambridge University Press, 1995).
4. David Livingstone, *Putting Science in Its Place: Geographies of Scientific Knowledge* (Chicago and London: University of Chicago Press), 138.
5. Tony Ballantyne, *Orientalism and Race: Aryanism in the British Empire* (Houndmills; New York: Palgrave Macmillan, 2002).
6. Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge, MA: Harvard University Press, 1987), esp. 215–57.
7. Ian Tyrrell's fascinating work, for instance, examines Californian-Australian connections. Ian Tyrrell, *True Gardens of the Gods: Californian-Australian Environmental Reform, 1860–1930* (Los Angeles and London: University of California Press, 1999); Alan Grey, 'North American Influences on the Development of New Zealand Landscapes, 1800–1935', *New Zealand Geographer*, 40 (1984): 66–77.
8. 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): 187–237; S. Ravi Rajan, *Modernizing Nature: Forestry and Imperial Eco-Development 1800–1930* (Oxford: Oxford University Press, 2006).
9. On the background, note Paul Star, 'The Place of Native Forest in New Zealand's Mental Landscape', in John Dargavel and Brenda Libbis, eds, *Australia's Ever-Changing Forests IV: Proceedings of the Fourth National Conference on Australian Forest History* (Canberra: Centre for Resource and Environmental Studies; The Australian National University, 1999), 85–98.
10. Tessa Kristiansen, 'Wilson, John Cracroft 1808–1881', *Dictionary of New Zealand Biography*, updated 16 December 2003, <<http://www.dnzb.govt.nz>> (1 March 2005).
11. On his career in India, note 'Biography Files from India and Colonial Office, "India Office Records"', British Library, Dec. 2004, OIR 354.54; 'Papers of

- Sir John Cracroft Wilson (1808–81)', Canterbury Museum, ARC1990. 7, Box 1, Folder 1.
12. Wilson, *New Zealand Parliamentary Debates* (henceforth NZPD), 31 July 1874, 361.
  13. Grove, *Green Imperialism*, 168–263.
  14. Earl of Kimberley to Governor the Right Hon. W. H. Gregory, Downing street, 13 June 1873, in 'II. Victoria, South Australia, Ceylon', AJHR, H-5A, vol. 2, 1874, 7.
  15. Peppercorne's articles appeared in the *Transactions and Proceedings of the New Zealand Institute* (TPNZI) in 1879 and as a separate pamphlet the following year. Peppercorne, 'Influence of Forests on Climate and Rainfall', TPNZI, 12 (1879): 24–32; Peppercorne, *On the Influence of Forests*.
  16. Dr Meldrum, 'On Weather, Health, and Forests in Mauritius', TPNZI, 15 (1882): 524.
  17. Wilson: 361.
  18. In 1873, for instance, he introduced the Grasslands and Fires Prevention Bill modelled on legislation in the Australian colony of Victoria. Wilson, NZPD: 468.
  19. Wilson, NZPD, 1874: 362.
  20. John Douglas to the Government Agent, Central Province, Colombo, 3 July 1873, in 'II. Victoria, South Australia, Ceylon', AJHR, H-5A, vol. 2, 1874, 12–13.
  21. OW, 22 November 1873, 2.
  22. 'Biographical File 15: East India Company/India Office and British Government of India', Oriental and India Office Collections (OIOC), 920.054, British Library.
  23. Bernard John Foster, 'FERGUSSON, Right Hon. Sir James', in A. H. McLintock ed., *An Encyclopaedia of New Zealand* (Wellington: G.P. Print, 1966) in Te Ara <<http://www.teara.govt.nz/1966/F/FergussonRightHonSirJamesKcmg/FergussonRightHonSirJamesKcmg/en>> (1 March 2005). Fergusson returned to India the next decade, serving as Governor of Bombay (28 April 1880–27 March 1885). For details of Fergusson's influence on Vogel, see Michael Roche, *History of Forestry* (Wellington: GP Print, 1990), 85, 88.
  24. E. P. Stebbing, *The Forests of India*, Volume 3 (London: John Lane, 1923), figure on 475. Other estimates put it at 20 per cent. See, Saint-Hill Eardley-Wilmot, 'Indian State Forestry', *Transactions of the Royal Scottish Arboricultural Society*, 23 (1910): 217–18.
  25. Inches Campbell Walker to H. M. Brewer, Wellington, 16 August 1876 'Official Correspondence of I. Campbell-Walker, 1876–7', Alexander Turnbull Library, qMS-1468. Note, in these files, Campbell Walker's first initial is incorrectly referred to as 'J'. not 'I'.
  26. Walker, 'Report of the Conservator of State Forests', 12–49; Walker, 'State Forestry: Its aim and object', TPNZI, 9 (1876): 187–203; Walker, 'The Climatic and Financial Aspect of Forest Conservancy as applicable to New Zealand', TPNZI, 9 (1876): xxvii–xlix.
  27. See 'Climatic and Financial Aspect'.
  28. Walker, 'Report of the Conservator of State Forests', 48.
  29. Preceding quotes all from Walker, 'Climatic and Financial Aspect', xxviii–xxxix.

30. Walker, 'Climatic and Financial Aspect', xxviii-xxix.
31. Walker, 'Report', 49.
32. Sangwan, 'Making of a Popular Debate': 198-9; James Beattie, 'Climate Change, Forest Conservation and Science: A Case Study of New Zealand, 1840-1920', *History of Meteorology*, 5 (2009): 1-18.
33. Figure from Roche, *History of Forestry*, 93.
34. Walker, 'Report of the Conservator of State Forests', 47. Walker also later corresponded with Croumbie Brown. John Croumbie Brown, *Schools of Forestry in Germany, with Addenda Relative to a Desiderated British National School of Forestry* (Edinburgh: Oliver and Boyd; London: Simpkin, Marshall and Co., 1887), 16.
35. Indeed, five of the 1874 forestry papers that appeared in the AJHR originated in the research of Indian foresters on forest practices outside South Asia, such as Germany and Scotland. J. P. Grossmann, *The Evils of Deforestation* (Auckland: Brett Printing and Publishing Co., 1909), 5-6. Other published sources also referred to his work, illustrating his on-going significance for conservation. See, for instance, H. J. Matthews, *Tree Culture in New Zealand* (Wellington: Govt. Printer, 1905), 1; 'The Passing of the Forest', NZF, 26 September 1905: 770.
36. Outward Letterbook (Forests) December 1885-May 1889, LS 53, Box 17, National Archives (NZ), Wellington.
37. H. Calthrap to Minister of Crown Lands, Punjab, India, 25 July 1885, LS 53, Box 1 1881/15, NA.
38. After serving in New Zealand, he became Deputy, then, Conservator of Forests, Madras. In 1888, he was responsible for a forest area of some 6872.71 square miles (17,800 square km). Walker, 'Progress Report of Forest Administration in the Southern Circle, Madras, for the year 1886-87', in *Annual Administration Reports of the Forest Department (Southern and Northern Circles), Madras Presidency, for the Official year 1886-87* (Madras: Government Press, Madras, 1888). Figure from 2.
39. 'Timber in New Zealand', IF, 12 (June 1886): 281-4.
40. See, W. Edgar Spooner, *Report on the Working and Condition of the Punjab Agri-Horticultural Society's Gardens, Lahore, for the year 1881-82* (Lahore: Abya Press, 1882).
41. T. H. Kirk to Commissioner of State Forests, 3 June 1887, 'Telegrams of State Forest and Agriculture Department, 1886-1889', qMS-1470, ATL.
42. T. Kirk to Edgar Spooner, Wellington, 25 June 1887, LS 53, Box 15, NA.
43. Spooner, 'Government Aid to Agriculture, Horticulture, and Forestry in India', NZF, 9, 9 (September, 1889): 383; 'Tree Planting in South Australia', NZF, 8, 9 (August, 1889): 285; 'Growth of Eucalyptus Trees', NZF, 8, 9 (August, 1889): 290; 'The Carob Tree', NZF, 7, 9 (July, 1889): 246.
44. Sir John Cracroft Wilson, 'Transcript of Diary/Recollections, 1854, of Canterbury', typed transcript by Ron Chapman, 1989, Canterbury Museum, ARC1989.80, 24. For later official introductions, note G. Bidie, Honorary Secretary to the Agri-Horticultural Society, to the Acting Secretary to the Board of Revenue, 18 August 1868, in File 7071930: Internal Affairs 1 1870/1930, NA.
45. The article was only signed 'Tau-Tha' but was clearly written by someone at Dehra Dun (since his journey started from here on 5 July 1886). The author arrived in Auckland on 10 August 1886 and made his way to Wellington (22 August) via the Central North Island. He then departed for Christchurch

- (23 August) and travelled to Dunedin, before leaving from Bluff on 27 August. 'Three Months' Privilege Leave to New Zealand', IF 12 (December, 1886): 546.
46. Quotes from 'Tau-Tha': 554, 557, 560.
  47. 'Condition of Forestry in New Zealand', IF, 18 (November, 1892): 416.
  48. OW, 6 August 1886, 9.
  49. Gregory Barton, *Empire Forestry and the Origins of Environmentalism* (Cambridge University Press, Cambridge, 2002), 121–3; Roche, 'Sir David Hutchins and Kauri in New Zealand', in John Dargavel, ed., *Aracucarian Forests* (Kingston: Australian Forestry History Society Inc. Occasional Publications No. 2, 2005).
  50. J. M. Powell, *Environmental Management in Australia, 1788–1914: Guardians, Improvers and Profit: An Introductory Survey* (Melbourne: Oxford University Press, 1976). Forest historian John Dargavel makes a similar point in *Fashioning Australia's Forests*, 64–5.
  51. Stephen Pyne, *Burning Bush: A Fire History of Australia* (New York: Henry Holt and Co., 1991), 260.
  52. Note: *Argus*, 14 June 1876, 7; A. G. L. Shaw, 'Loch, Henry Brougham [Baron Loch] (1827–1900)', *Australian Dictionary of Biography*, vol. 5 (Melbourne: Melbourne University Press, 1974), 98–9.
  53. M. Carver, 'Reports' in 'Forestry in Victoria, 1838–1919', Melbourne University Library, 1–6.
  54. Previously there had been the position of Inspector of Forests. Carver, 'Summary', in 'Forest Papers', 4.
  55. Responsibility for forests shifted between Lands and Survey, the various mining and agricultural departments, and even the Botanic gardens.
  56. The report is commented upon in *The Age*, 3 April 1895, 6. I have been unable to obtain a copy of the original report.
  57. B. Ribbentrop, 'Report of the State Forests of Victoria', *Victoria Votes and Proceedings*, volume 4 (Melbourne: Government Printer, 1895), 3.
  58. Ribbentrop, 3–4.
  59. Legg, 'Debating Forestry', 117.
  60. Ribbentrop, 5–8.
  61. See, Raymond L. Bryant, *The Political Ecology of Forestry in Burma, 1824–1994* (London: C. Hurst & Co, 1997), 81; Stebbing, *Forests of India*, Volume 3, 55–79.
  62. Francis Robert Moulds, *The Dynamic Forest: A History of Forestry and Forest Industries in Victoria* (Richmond, Victoria: Globe Press, 1991), 47–60.
  63. Peppercorne, *Geological and Topographical Sketches of the Province of New Ulster ...* (Auckland: Government Printer, 1852). Peppercorne probably hailed from Surrey, where he worked as a surveyor as early as 1838. See, 'Tithe map of part of the parish of Mortlake', Surrey History Centre, 6332/1.
  64. Peppercorne, *Influence of Forests*, 31, 28.
  65. Peppercorne, *Influence of Forests*, 29.
  66. Peppercorne, *On Irrigation and Canalisation Works (Ancient and Modern)* (Napier: R. Coupland Harding, 1879).
  67. Peppercorne, *Australian Meteorology and Hydrology* (Napier: R. Coupland Harding, 1879).
  68. Peppercorne, *Rainfall and Water Conservation in New South Wales* (Sydney: John Sands, 1881), 12.
  69. Peppercorne, *Rainfall*, 16–23.



70. On these early teleconnections, see Richard H. Grove and John Chappell, eds, *El Niño – History and Crisis: Studies from the Asia-Pacific Region* (Cambridge: Cambridge University Press, 2000); Don Garden, 'El Niño, Irrigation Dams and Stock Banks: Examining the Repercussions of the 1876–78 El Niño in Australia and New Zealand', *History of Meteorology*, 4 (2008): 1–26; Garden, *Floods, Droughts and Cyclones: El Niños that Shaped our Colonial Past* (North Melbourne: Australian Scholarly Publishing, 2009).
71. Alfred Deakin, *Irrigated India: An Australian View of India and Ceylon, Their Irrigation and Agriculture* (London: W. Thacker & Co.; Melbourne: E. A. Petherick, 1893).
72. Beattie, 'Re-Thinking Science, Religion and Nature in Environmental History', *Historical Social Research/Historische Sozialforschung*, 29, 3 (November, 2004): 82–103.
73. 'Forwarding Report on Forest Branch Dept for 1884', LS 53/ Box 1 1885/23, NA.
74. Paul Star, 'Tree Planting in Canterbury, New Zealand, 1850–1910', *Environment and History*, 14, 4 (November, 2008): 563–82; Legg, op cit.
75. Tyrrell, *True Gardens*, 90–3.
76. J. M. Powell, 'Enterprise and Dependency: Water Management in Australia', in Tom Griffiths and Libby Robin, eds, *Ecology and Empire: Environmental History of Settler Societies* (Edinburgh: Edinburgh University Press, 1997), 107.
77. D. W. Meinig, *On the Margins of the Good Earth: The South Australian Wheat Frontier, 1869–1884* (Adelaide: South Australian Government Printer, 1988), 45–6, 59–60.
78. Powell, 'Enterprise and Dependency': 107.
79. R. L. Heathcote, *Back of Bourke: A Study of Land Appraisal and Settlement in Semi-Arid Australia* (Melbourne: Melbourne University Press, 1965), 85–166.
80. Heathcote, *Back of Bourke*, 23.
81. OW, 10 January 1874, 1; *Taranaki Herald*, 7 January 1874, 2; *North Otago Times*, 27 February 1874, 4.
82. Walker to Commissioner of State Forests, State Forests Office, 8 September 1876, F 10, 76/2 September 1876, NA.
83. Wakefield, NZPD, 7 July 1885, 449–50.
84. 'Arbour Days', NZF, 9, 8 (August, 1889): 298–9.
85. Legg, 'Debating Forestry', 86–91.
86. Legg, 'Debating Forestry', 87.
87. *Debates in the Houses of Legislature during the Second Session of the Seventh Parliament of South Australia, 25 July to 18 December 1873* (Adelaide: Government Printer, 1873), 1316.
88. *Debates in the Houses of Legislature*, 15 July 1874, 936–7; 26 August 1874, 1446.
89. *Debates in the Houses of Legislature*, 9 September 1874, 597.
90. Note, for instance, 'Forestry in Victoria', *Votes and Proceedings of Victoria* (Melbourne: Government Printer, 1901), 63–4.
91. William Rolleston, NZPD, 4 August 1874, 404–5.
92. 'The Planting of Forest Trees Ordinance 1858', *The Ordinances of the Province of Canterbury, Session 10*, October to December 1858.
93. See 'An Act to amend "The Forest Trees Planting Encouragement Act, 1871"', *Statutes of New Zealand* (Wellington: Govt. Printer, 1872), 283–5.
94. NZPD, 15 September 1871, 459–62; 8 November 1871, 918–19.

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96. *Otago Daily Times* (ODT), 13 September 1869, 3.
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98. Mueller to James Hector, Melbourne, 10 August 1874, in R. W. Home, A. M. Lucas, Sara Maroske, D. M. Sinkora and J. H. Voigt, eds, *Regardfully Yours: Selected Correspondence of Ferdinand von Mueller, Volume II: 1860–1875* (Bern: Peter Lang, 2002), 710–11.
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100. Note, 'No. 86: Papers Relating to Forest Conservancy', *Victoria: Legislative Papers Presented to Parliament*, vol. 3, part 2 (Melbourne: Government Printer, 1874); 12–17; Mueller, *Western Australia: General Information Respecting the Present Condition of the Forests and Timber Trade of the Southern Part of the Colony* (Perth: Government Printer, 1882), 18.
101. George S. Perrin, 'Conservation of New Zealand Forests', *AJHR*, Sess. II, C-8, 1897, 1–56.
102. Perrin, 'Conservation', 37.
103. Powell, *An Historical Geography of Modern Australia: The Restive Fringe* (Cambridge: Cambridge University Press, 1988), 33–41.
104. Rajan, *Modernizing Nature*.
105. Roche and John Dargavel, 'Imperial Ethos, Dominions Reality: Forestry Education in New Zealand and Australia, 1910–1965', *Environment and History*, 14 (2008): 523–43; Brett Bennett, 'An Imperial, National and State Debate: The Rise and Near Fall of the Australian Forestry School, 1927–1945', *Environment and History*, 15, (2009): 217–44.
106. For different interpretations of these developments, see Rajan, *Modernizing Nature*; Barton, *Empire Forestry*.
107. Powell, 'The Empire Meets the New Deal: Interwar Encounters in Conservation and Regional Planning', *Geographical Research*, 43, 4 (December, 2005): 337–60.
108. Bennett, 'An Imperial, National and State Debate': 217–244 (quote 220).
109. Roche and Dargavel, 'Imperial Ethos': 523–43 (quote 527).
110. Roche and Dargavel, 'Imperial Ethos': 530.
111. Bennett, 'An Imperial, National and State Debate': 233.
112. The Commission travelled to Wellington, Invercargill, Tapanui, Dunedin, Fairlie, Hokitika, Greymouth, Nelson, Blenheim, Wellington, Napier, New Plymouth and Dargaville between 26 February and 30 May 1913. See 'Minutes of Evidence' in 'Report of the Royal Commission on Forestry', *AJHR*, C12, 1913, 1–87.
113. 'Report of the Royal Commission on Forestry', *AJHR*, 1913, xv.
114. 'Report of the Royal Commission on Forestry', *AJHR*, 1913, 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. Philip Walsh, 'On the Disappearance of the New Zealand Bush', *TPNZI*, 29 (1896): 490–6.
115. See Appendix 1 in 'Report of the Royal Commission on Forestry', *AJHR*.

116. On nationalism and later conservation see, Beattie and Star, 'Global Influences and Local Environments: Forestry and Forest Conservation in New Zealand, 1850s–1925', *British Scholar*, 3, 2 (September, 2010), 191–218, 211 (first figure). Michael Roche, *History of New Zealand Forestry* (Wellington: Government Print, 1990), Table 3.2 Revocation of State Forest Lands, 1890–1920, 138 (second figure).
117. Roche, *History of Forestry*, 185. On Ellis, see Roche, 'Latter day "Imperial Careering": L. M. Ellis – A Canadian forester in Australia and New Zealand, 1920–41', *ENNZ: Environment and Nature in New Zealand*, 4, 1 (April, 2009): 58–77.
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121. Cotton, 15 May, Wellington, in 'Report of the Royal Commission on Forestry', *AJHR*, 1913, 82.
122. The report was entitled 'Final Report on the Southern Appalachian and White Mountain Watersheds'. Schiff, *Fire and Water*, 121.
123. Appendix C No. 2 C.A. Cotton, 'Remarks on Erosion of Slopes in New Zealand', in 'Report of the Royal Commission on Forestry', lii–liii.
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125. 'Report of the Royal Commission on Forestry', *AJHR*, 1913, xv.
126. Chilton, Fairlie, 15 March 1913, No. 21, in 'Report of the Royal Commission on Forestry', 17–18.
127. NZPD, 4 August 1874, 403. For a more thorough discussion, see Beattie, 'Climate Change'.
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## 7 Thwarting Imperial Agricultural Development: The Spectre of Drifting Sands, 1800s–1920s

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30. J. A. Wright, 30 November 1888, *Western Australia Parliamentary Debates, Legislative Council and Legislative Assembly*, Session 10 October 1888–7 December 1888, vol. 14 (Perth: Government Printer, 1889), 412.
31. *Perth Gazette and Western Australia Times* (PGWAT), 10 April 1868, 3.
32. 'The Geraldton Sand-Hills Planting Act 1872', 36 Vic, 10.
33. PGWAT, 10 April 1868, 3.
34. PGWAT, 10 April 1868, 3.
35. Henry Gray to Editor, PGWAT, 17 July 1868, 3
36. PGWAT, 25 June 1869, 2–3.
37. Mann, 'Ecological Change in North India'.
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51. Kirk, 'Notes on the Plants': 54.
52. WA, 9 August 1894, 3.
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54. 'Sandhill Fighting at Okehu', *New Zealand Farmer* (NZF), 18, 11 (November, 1898): 392–3.
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56. Beattie, 'Colonial Geographies of Settlement: Vegetation, Towns, Disease and Well-Being in Aotearoa/New Zealand, 1830s–1930s', *Environment and History*, 14, 4 (November, 2008): 583–610.
57. K. C. McDonald, *City of Dunedin: A Century of Civic Enterprise* (Dunedin: Dunedin City Corporation, 1965), 200–1.
58. 'Ocean Beach Domain Board', 1/1, Dunedin City Council Archives (DCCA).
59. McDonald, *City of Dunedin*, 253–4.
60. Allen, 28 September 1903, *New Zealand Parliamentary Debates* (NZPD), 7.
61. The voluntary nature of the committee is emphasised by the words of Tame Parata, who related how we 'formed ourselves into an improvement society'. Parata, 28 September 1903, NZPD, 13.
62. Parata, 28 September 1903, NZPD, 13.
63. WA, 11 September 1888, 4.
64. 30 November 1888, 412.
65. 'Report of the Committee appointed to inquire into The Origin and Causes of the Sand drift in the South Ward At Fremantle', *Western Australia Parliamentary Papers* (Perth: Government Printer, 1888); on its hearings, note WA, 11 September 1888, 4; 15 September 1888, 3.
66. Note: *Western Australia Parliamentary Debates*, Session 10 October 1888–7 December 1888, vol. 14, 30 November 1888, 411–12; 3 December 1888, 431–4.
67. WA, 17 December 1888, 2; 19 December 1888, 3.
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69. The provisions of the Act also extended to other towns. Rockingham, for instance, proclaimed a sand drift within its town in 1899. Note, for instance, WA, 24 July 1899, 4.
70. WA, 24 June 1891, 3.
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72. *Western Australia Parliamentary Debates, Legislative Council and Legislative Assembly*, Session 1890–1, Volume 1 (30 December 1890–26 February 1891) (Perth: Government Printer, 1891), 2 February 1891, 103–4; WA, 7 December 1893, 6; WA, 23 February 1899, 4–5.

73. Dixon, 'Sand-Drift', 76–82; J. Maiden, 'The Sand Drift Problem in New South Wales', *Journal and Proceedings of the Royal Society of New South Wales*, 30 (1903): 84.
74. 25 August 1890, 140; 5 October 1891, 'Newcastle City Minute Book', 5 May 1890–30 November 1891, AB 756, Newcastle Region Library, 509.
75. Maiden, 'Sand-Drift Problem': 92.
76. Carroll, 28 September 1903, NZPD, 4.
77. Eric Pawson, 'Confronting Nature', in John Cookson and Graeme Dunstall, eds, *Southern Capital Christchurch: Towards a City Biography 1850–2000* (Christchurch: Canterbury University Press, 2000), 60–84; Andrea Gaynor, *Harvest of The Suburbs: An Environmental History of Growing Food in Australian Cities* (Perth: University of Western Australia Press, 2006), 4.
78. Carroll, 28 September 1903, NZPD, 3.
79. Carroll, 4.
80. Field, 28 September 1903, NZPD, 11.
81. Fraser, 28 September 1903, NZPD, 6.
82. For instance, Fraser, 28 September 1903, NZPD, 6; Allen, 28 September 1903, NZPD, 7; Mander, 28 September 1903, NZPD, 8.
83. Steward, 28 September 1903, NZPD, 8; Houston, 28 September 1903, NZPD, 6; Field, 28 September 1903, NZPD, 10. Of the 14 MHRs who spoke during the debate, only the Caversham MHR, T. K. Sidey supported the Bill outright. Sidey, 28 September 1903, NZPD, 12.
84. McNab, 28 September 1903, NZPD, 8. Both Houston and F. Mander (Marsden) actually doubted whether the drift could be stopped at all. Houston, 28 September 1903, NZPD, 6; Mander, 28 September 1903, NZPD, 8.
85. Carncross, 20 October 1903, NZPD, 590.
86. Willis, 28 September 1903, NZPD, 12.
87. Willis, 28 September 1903, NZPD, 11.
88. Vile, 28 September 1903, NZPD, 13; Buchanan, 28 September 1903, NZPD, 10.
89. 22 October NZPD, 713.
90. *Statutes of New Zealand* (Wellington: Government Printer, 1903), 57–8.
91. The inclusion of sand dunes in popular literature also evinces how commonplace they were in New Zealand society. 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: John Long, 1902), 275–6. Thanks to Dr Julian Kuzma for this reference.
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97. Town Clerk to Minister for Public Works, Cromwell, 5 July 1915, in 'Sand Dunes – Cromwell'.
98. See 'Sand-Drift at Cromwell; 19 December 1916', Memo 25 April 1917, in 'Sand Dunes – Cromwell'.
99. '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', in 'Sand Dunes – Cromwell'.
100. Calculated from 'Sand Dunes – Cromwell'.
101. Town Clerk, Borough of Cromwell, to Sir William Fraser, Cromwell, 2 July 1919, in 'Sand Dunes – Cromwell'.
102. 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'.
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