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## About the Journal

*International Review of Environmental History* takes an interdisciplinary and global approach to environmental history. It publishes on all thematic and geographical topics of environmental history, but especially encourages articles with perspectives focused on or developed from the southern hemisphere and the 'global south'. This includes but is not limited to Australasia, East and South East Asia, Africa and South America.

*International Review of Environmental History's* editorial board includes historians, scientists, and geographers who work on environmental history and the related disciplines of garden history and landscape studies. This methodological breadth distinguishes *International Review of Environmental History* from other environmental history journals, as does its attempt to draw together cognate research areas in garden history and landscape studies.

The journal's goal is to be read across disciplines, not just within history. We encourage scholars to think big and to tackle the challenges of writing environmental histories across different methodologies, nations, and timescales. We embrace interdisciplinary, comparative, and transnational methods, while still recognising the importance of locality in understanding these global processes.

The Centre for Environmental History at The Australian National University sponsors the journal, and ANU Press will publish hardcopy and free electronic versions of the journal. It is also supported by the Historical Research Unit; Faculty of Arts and Social Sciences; and the Environmental Research Institute, University of Waikato, New Zealand. Our open-access policy means that articles will be available free to scholars around the world, ensuring high citation rates and impact in and beyond the field of history.

*International Review of Environmental History* is happy to consider future special issues focusing on themes drawn from conferences or collaborations.

## Submission Details

Please send article submissions or abstracts to the Editor, Dr James Beattie, History, University of Waikato, Private Bag 3105, Hamilton 3240, New Zealand. Email: [jbeattie@waikato.ac.nz](mailto:jbeattie@waikato.ac.nz).

Abstracts should be no more than 200 words, and include a list of keywords. Articles should be in the range 5,000 to 8,000 words (including footnotes), although longer submissions may be considered after consultation with the editor.

Style and referencing: please use footnotes in Chicago Style, and follow British spelling. For more details on Chicago Style, please see [www.chicagomanualofstyle.org/tools\\_citationguide.html](http://www.chicagomanualofstyle.org/tools_citationguide.html).

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# TABLE OF CONTENTS

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Introduction James Beattie	1
Ecologists, Environmentalists, Experts, and the Invasion of the 'Second Greatest Threat' Matthew K. Chew	7
Environmental Disturbance Triggering Infestations of Gorse, Rabbits, and Thistles in Southern New Zealand: 1850 to 1980 Peter Holland and Guil Figgins	41
Environmental Non-Government Organisations in China since the 1970s Sheng Fei 费晟	81
'Hungry dragons': Expanding the Horizons of Chinese Environmental History—Cantonese gold-miners in colonial New Zealand, 1860s–1920s James Beattie	103
(Re)Interpreting exotic plantation forestry in 1920s New Zealand Michael Roche	147
Thomas Potts and the Forest Question: Conservation and Development in New Zealand in the 1860s Paul Star	173

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# INTRODUCTION

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JAMES BEATTIE

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and Associate of the  
Centre for Environmental History  
The Australian National University

Welcome to the first volume of *International Review of Environmental History*. The volume's six articles showcase the core aims of the journal by presenting a breadth of themes and disciplinary perspectives over a range of geographical regions and environmental types. They also present bold, new interpretations that aim to push the methodological and geographical boundaries of environmental history, while at the same time speaking across disciplines. It is a healthy statement of our field, I think, that three of the six articles in this volume are by scholars who are not environmental historians—two bio-geographers, an ecologist, and an historical geographer.

Matt Chew's stimulating article leads the volume. In **'Ecologists, Environmentalists, Experts, and the Invasion of the "Second Greatest Threat"'**, Chew—from Arizona State University—presents a detailed analysis of the scientific findings underlying the development of invasion biology, and concludes that the claims made for it as representing the 'second greatest threat' to biodiversity are simply wrong. In an exercise in scientific hermeneutics, Chew traces the various claims for the importance of invasion biology back to the work of Edward O. Wilson and to the papers on which he based his interpretations. Chew's analysis of the slippages and elisions which occur when both analysing and citing work is an important reminder of the significance of our scholarship to the shaping of government policy, the setting of public debate, and the establishment of sub-disciplines.

The second article of this volume remains with the theme of ecology. In **'Environmental Disturbance Triggering Infestations of Gorse, Rabbits, and Thistles in Southern New Zealand: 1850 to 1980'**, University of Otago bio-geographers Peter Holland and Guil Figgins present a fascinating ecological reconstruction of the impacts of introduced rabbits and weeds in southern New Zealand. This detailed reconstruction, based on painstaking readings of farm and station diaries, allows them to examine the environmental factors which permitted rabbits to thrive in certain parts of the region but not in others. Through the application of ecological analysis to historical evidence, they identify the pathways of rabbit dispersal and the role of such factors as vegetation

clearance and infrastructure in creating conditions favourable to the spread of rabbits. Their work demonstrates, as they note, 'that ecological theory, with its emphasis on interactions and interconnections between living things and their environments, can deepen our understanding of the spread, establishment, and dominance of these three introduced organisms after episodes of environmental disturbance, natural as well as artificial, have created opportunities for them to thrive'. Their findings have great relevance now as southern New Zealand rabbit populations recover from the impacts of rabbit calicivirus disease (RCD), introduced in the late 1990s.

The third article reflects two particularly important dimensions of China's recent growth: the environmental costs of rapid industrialisation, and the corresponding emergence of environmental groups. Indicative of the broader growth of environmental history in China is membership of the Association for East Asian Environmental History, which has increased from 193 in 2009 to 376 by May 2014.<sup>1</sup> In **'Environmental Non-Government Organisations in China since the 1970s'**, Fei Sheng 费晟, of Sun Yat-sen University, China, surveys the rise of environmental groups in China over the last 45 years. Fei explains their rise, in part by pointing to modernisation's growing environmental and health impacts, as well as greater levels of international co-operation and the emergence of the Internet. While political challenges remain, Fei is optimistic that among China's rising generations, greater awareness of environmental issues and better scientific training will ensure that environmental protection is strengthened in the future.

My own article—**'“Hungry dragons”: Expanding the Horizons of Chinese Environmental History—Cantonese gold-miners in colonial New Zealand, 1860s–1920s'**—seeks to incorporate Chinese migrants into the bigger picture of settlement, development, and environmental change that occurred across the British Empire. It emphasises Chinese entrepreneurs' use of colonial and Chinese capital to remake environments in Otago and southern China, and how this in turn created local, national, and international resource demand. A focus on Cantonese in New Zealand also underlines the important role of Pacific resource frontiers as hinterlands for the coastal province of Guangdong, in contrast to the importance of land frontiers for much of the rest of China. As well, I examine what Chinese environmental impacts in colonial New Zealand can reveal of China's own environmental history.

The final two articles remain in New Zealand, and present revisionist accounts of, respectively, disciplinary interpretation and global resource shortages of relevance and interest to scholars world-wide. In **'(Re)interpreting Exotic**

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<sup>1</sup> 'Membership', Association for East Asian Environmental History, [www.aeah.org/membership.htm](http://www.aeah.org/membership.htm), accessed 30 May 2015.

**Plantation Forestry in 1920s New Zealand'**, Michael Roche of Massey University revisits historical debates about the rise of exotic timber plantations in New Zealand in order to assess why timber plantations came to constitute such a large percentage of New Zealand's twentieth-century timber production. Roche's paper is part of a wider debate about the role of plantations forest policy more generally throughout the British world, and now, the developing world. His article also provides a fascinating discussion of how disciplinary differences—in this case, among historical geographers and environmental historians—and differences in periodisation can affect interpretations of continuity and discontinuity in the transition from nineteenth- to twentieth-century forest policy.

Paul Star's article, **'Thomas Potts and the Forest Question: Conservation and Development in New Zealand in the 1860s'**, reinterprets the first call for forest conservation in New Zealand. This revisionist article seeks to explain the origins of forest conservation in New Zealand, a subject that has received attention from several prominent scholars, including Graeme Wynn, Michael Williams, and Michael Roche. Star warns against viewing Potts' call for forest conservation and tree-planting as proto-environmentalism because, he says, different factors were at play, most notably, he argues, the doctrine of waste, which applied also to other comparable colonial societies such as the United States.

Together, the contributions uphold the journal's goal to be read across disciplines and to encourage scholars to 'think big' and to tackle the challenges of writing environmental histories across different methodologies, nations, and time-scales. The contributors to this volume embrace interdisciplinary, comparative, and transnational methods, while still recognising the importance of locality in understanding these global processes.

## Journal Aims

Before closing, I will summarise the journal's aims, and look ahead to the next volume. While the journal publishes on all thematic and geographic topics pertaining to environmental history, the journal developed to strengthen environmental history in the southern hemisphere and the 'Global South'. The simple reason was that no specific journal actively catered to Australia, New Zealand, India, Africa and South and Central America, as well as East and South East Asia. The expertise of the editorial board reflects the focus of the journal on these areas as well as broader global environmental issues.

A second key aim of the journal is to break down the barriers dividing wealthy and poor scholars, students, and readers. The journal eschews subscription fees and is freely available as an open-access publication. (For traditionalists, there is also a print-on-demand option.) This upholds some of the fundamental ideals of the Academy, regarding the dissemination, encouragement, and free exchange of ideas. It is also backed by research which has revealed that the high access costs to academic journals unfairly disadvantages scholars and students working in places like South America, South East Asia, and Africa, many of whose universities often cannot afford to subscribe to expensive journals.<sup>2</sup>

A third motivation is to provide a forum for highly original—even contentious—scholarship that promises to reshape the field or which offers bold overviews of particular sub-fields of help to teachers or students approaching a topic for the first time. A particular advantage of an online journal such as this is that it enables publication of scholarly articles that may be longer than most journals accept, or which may contain a large number of high-quality images.

## The Next Volume

Preparation for the next volume of *International Review of Environmental History* is already well underway and I have received six submissions. Two have been referred and accepted for publication: Ts'ui-jung Liu and I-chun Fan, 'The Colonist Land System in Xinjiang during the Qing Dynasty: An Environmental History Perspective'; and Joanna Bishop, 'New Perspectives on Methodology in Garden History'.

## Acknowledgements

It is a great honour to be this journal's first editor, and I am indebted to the support of many in making this publication possible. *International Review of Environmental History* is published with the support of the Centre for Environmental History, The Australian National University, whose Director, Professor Tom Griffiths, has enthusiastically backed this venture from the outset. In 2013, Professor Bruce Clarkson, Director of Environmental Research Institute, University of Waikato, granted me the time to devote to planning and preparing the journal by giving me teaching buy-out. I also thank Professor Greg Barton, who while at The Australian National University, initiated discussions with ANU Press about the journal and provided a cracking copy

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2 Much of this scholarship is summarised in: Right to Research Coalition, 'Why Open Access?' [www.righttoresearch.org/learn/whyOA/index.shtml#Developing\\_Countries](http://www.righttoresearch.org/learn/whyOA/index.shtml#Developing_Countries), accessed May 2015.



editor. Brett M. Bennett, Associate Editor, has taken a lead in soliciting papers and in reading and commenting on material, and I am especially grateful to him, and my supportive and active Editorial Board, for permitting me to test ideas and share material with them. Further support for the journal has also come through the Historical Research Unit, University of Waikato. Finally, I am thankful for the copy editing skills of Ina Mae Barton and Austin Gee, and for the permission from Wynston Cooper for use of one of his photographs for the cover of the journal. I also thank ANU Press Editor Emily Tinker and her staff for their support and professionalism.

James Beattie, Editor  
Hamilton, June 2015



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# ECOLOGISTS, ENVIRONMENTALISTS, EXPERTS, AND THE INVASION OF THE 'SECOND GREATEST THREAT'

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## Abstract

The commonplace, quantitative assertion that 'invasions' of exotic (introduced) organisms constitute the 'second greatest threat' of species extinction debuted in Edward O. Wilson's 1992 book, *The Diversity of Life*. Based only on three interrelated publications summarising concerns about the conservation status of North American freshwater fishes, Wilson laconically extended the claim to planetary significance. This inspired the most-cited article ever published in the American journal *BioScience*, subsequently underpinning thousands of peer-reviewed publications, government reports, academic and popular books, commentaries, and news stories. While carefully recounting the origin, promotion, and deployment of the 'second greatest threat', I argue that its uncritical acceptance exemplifies confirmation bias in scientific advocacy: an overextended claim reflexively embraced by conservation practitioners and lay environmentalists because it apparently corroborated one particular, widely shared dismay about modern society's regrettable effects on nature.

Keywords: invasion biology, Edward O. Wilson, 'invasive species'.

In recent centuries, and to an accelerating degree during our generation, habitat destruction is foremost among the lethal forces, followed by the invasion of exotic animals.<sup>1</sup>

Edward O. Wilson, 1992

[O]n reflection I think that assertion [that alien species constitute the second greatest global threat to biodiversity] has been debunked so often (yet is endlessly repeated) that it no longer deserves the status of a myth, and is best described merely as a straightforward lie.<sup>2</sup>

Ken Thompson, 2014

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1 Edward O. Wilson, *The Diversity of Life* (Cambridge, MA: Harvard University Press, 1992).

2 Ken Thompson, *Where Do Camels Belong?: The Story and Science of Invasive Species* (London: Profile, 2014), 47–48.

In 1992, the discourse of conservation biology acquired a new axiom, thanks largely to the influence of Edward O. Wilson: 'Habitat loss is the single greatest threat to biodiversity, followed by the spread of alien species'.<sup>3</sup> Researchers concerned about the spread of alien species adopted Wilson's statement and routinely began to insert some version of it in the introductory remarks of their publications. The idea of the 'second greatest threat' has persisted in peer-reviewed literature ever since, despite significant criticisms of its empirical merits. Outside academic circles the statement has become an ingrained orthodoxy, repeated and amplified in government agency plans and policy papers, reports by non-governmental organisations, research solicitations, press releases, and direct public information.

A historical perspective offers a useful window to understand the origins and persistence of this idea. This article argues that the trope of the 'second greatest threat' became established in conservation biology and invasion biology because it was a classic confirmation bias that appealed to the belief and activism of its practitioners and adherents. Without denying the effects of biotic redistributions via human agency and subsequent ecological adjustments, it warns against heuristic, categorical representations of 'alien' or 'invasive' species as demons that have breached the gates of paradise, defilers that can never properly belong inside them.<sup>4</sup> The conviction that there are 'alien' species (loosely modelled on the nationality of people) denatured by experiencing human transportation is morbidly fascinating but 'theoretically weak'.<sup>5</sup> And asserting that these alien species invade, while idiomatically convenient, is objectively obsolete, like saying the sun rises. It seems like a sentimental throwback to the deterministic rules of prehistoric species occurrence propounded by the ecologist Frederic Clements.<sup>6</sup> The threat of an overabundant, insistent nature is just as troubling as that of a sickly, waning nature. Combined, they have been used to conjure the crisis of nature forced into civil war, and facilitated the rise of a new, expert chorus of regret and recrimination.

3 David S. Wilcove, David Rothstein, Jason Dubow, Ali Phillips, and Elizabeth Losos, 'Quantifying threats to imperiled species in the United States', *BioScience* 48 (1998): 607–15.

4 Invasion biologists and their allies routinely invoke paradise, as in Daniel Simberloff, Donald C. Schmitz, and Tom C. Brown, eds., *Strangers in paradise: impact and management of nonindigenous species in Florida* (Washington DC: Island Press, 1997). For a discussion of the permanence of alienness and other attributes acquired in the process of becoming non-native, see Matthew K. Chew and Andrew L. Hamilton, 'The rise and fall of biotic nativeness, a historical perspective', in *Fifty Years of Invasion Ecology: The Legacy of Charles Elton*, ed. David M. Richardson (Chichester: Wiley Blackwell, 2011), 35–47.

5 Chew and Hamilton, 'The Rise and fall of biotic nativeness'.

6 Frederic E. Clements (1874–1945) was a pioneering American plant ecologist who proposed a superorganismic theory of vegetation succession that has been discredited in its rigid developmental details but remains one of the field's most influential conceptions. See, for example, Sharon Kingsland, *The Evolution of American Ecology* (Baltimore: Johns Hopkins University Press, 2005).

Conservation biology favours threat narratives because its tenets explicitly include both scientific *and* environmentalist commitments that are mutually constitutive of the discipline. Its practitioners believe that they work in a 'crisis discipline', which means that they 'must act [often] before knowing all the facts'.<sup>7</sup> The assumption that conservation biology solves crises, preferably before they happen, has meant that the field provides a meaningful career choice for many people who want to improve the world or to save nature. But studying the environment with the primary goal of 'saving' it entails applying values that are difficult or impossible to support empirically, and is an approach that generates susceptibility to confirmation bias. Moreover, it requires the construction of an ideal state of nature from which we can aim to 'restore' or 'conserve' against change. There is little reason to assume that scientists today are any better than those of yesteryear at correctly gauging how nature *should be*, because such statements assume value judgments that have changed over time and space.

The assumption that introduced species are the *second* greatest threat (as opposed to first or 10th) relies on the assumption that we can measure biodiversity and then extrapolate the risks to individual species and all species as a whole. It is, quite simply, a metaphor for a variety of phenomena—not only apples and oranges, but every single species on Earth!—that simply cannot be measured without huge errors. The notion that we can quantify and rank threats to biodiversity exemplifies the interest in using science to achieve the goal of preserving nature. Like earlier attempts to find Frederic Clements' climax community or John Phillips' biotic community, the attempt to define biodiversity has proven illusive. Scholars have attempted to summarise, constrain, or dictate what biodiversity means, but to little apparent effect.<sup>8</sup> It seems to be an ineffable liquid that takes the shape of any vessel it purportedly occupies while lending it an attractive tint. That is not inconsistent with an observation by the founder of the term, Walter Rosen, who quipped that biodiversity was obtained by taking 'the logical out of biological' to transform an object of scientific investigation into an object of advocacy.<sup>9</sup>

7 Michael E. Soulé, 'What is conservation biology?' *BioScience* 35 (1985): 727–34.

8 See, for example, David Takacs, *The Idea of Biodiversity: Philosophies of Paradise* (Baltimore: Johns Hopkins University Press, 1996); Timothy J. Farnham, *Saving Nature's Legacy: Origins of the Idea of Biological Diversity* (New Haven, CT: Yale University Press, 2007); Daniel P. Faith, 'Biodiversity', in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Fall 2008 ed., [plato.stanford.edu/archives/fall2008/entries/biodiversity](http://plato.stanford.edu/archives/fall2008/entries/biodiversity), accessed 13 June 2014; James Maclaurin and Kim Sterelny, *What is biodiversity?* (Chicago: University of Chicago Press, 2008); José Luiz de Andrade Franco, 'The concept of biodiversity and the history of conservation biology: From wilderness preservation to biodiversity conservation', *História* [São Paulo] (2013): 21–48.

9 Walter Rosen, quoted in Takacs, *The Idea of Biodiversity*, 37. Takacs interpreted this comment as 'ironic', but that should not be taken to suggest it was flippant or untrue.

Social scientists recognise that the field of ecology (the forerunner and main core of conservation biology and invasion biology) has been metaphor-intensive since its inception.<sup>10</sup> It is tempting to make allowances for threats to biodiversity as a sort of interim metaphorical muddle destined someday to be sorted out in a more principled fashion.<sup>11</sup> In his 2011 book, *Metaphors for Environmental Sustainability*, Brendon Larson examined ‘how two prominent scientists have recently coined [problematically] resonant metaphors that have drawn media attention’. He proceeded by assuming his subjects ‘use these metaphors with the best intention, to make change in the world’.<sup>12</sup>

This paper focuses specifically on the origin and spread of the ‘second greatest threat’ metaphor, first in Wilson’s writings, and later in conservation biology and invasion biology scholarship. There is little evidence to suggest that the ‘second greatest threat’ was self-consciously metaphorical. That option is effectively unavailable to conservation biologists because the practice is blind to its own subjective judgments about what they conceive to be an ideal state of nature, which underpins the discipline’s core values. This explains much of the so-called controversy in the field of invasion biology about whether there should be distinctions between ‘native’ and ‘alien’ species. Millions of dollars of funding, patronage, and careers are on the line if this narrative changes. Having used the rhetoric of threats to justify funding and policy, there is no turning back for adherents.

Admittedly, there is no evidence to indicate—nor claim made in this paper—that the authors who constructed, promoted, or cited the ‘second greatest threat’ did so maliciously, or with intent to deceive. Wilson and his followers believe that there is a destructive agency inherent in introduced species that are able to invade and restructure ecosystems and economies. There has been good reason to worry about the impacts of introduced species. The problem is not so much in seeing specific instances of introduced species as being problematic, but rather in the idea that there is a category of ‘alien’ species that is somehow one of the greatest threats to the world’s ecological and economic stability.

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10 Matthew K. Chew and Manfred D. Laubichler, ‘Natural enemies—Metaphor or misconception?’, *Science* 301 (2003): 52–53.

11 Chew and Laubichler, ‘Natural Enemies’; also see Joel B. Hagen, *An Entangled Bank: The Origins of Ecosystem Ecology* (New Brunswick, NJ: Rutgers University Press, 1992), 12–14.

12 Brendon M. H. Larson, *Metaphors for environmental sustainability* (New Haven, CT: Yale University Press, 2011), 27.

## Edward O. Wilson: An environmentalist's progress

The deployment of soldiers during World War II acquainted many young men from temperate 'Allied' countries with the ecology of tropical Pacific islands, such as Hawaii and Guam, among others. William L. Brown Jr. was one such American soldier who survived the Pacific Theatre only to gravitate back as a researcher. Serving as a technician in the US Army Air Force's 36th Malaria Survey Unit apparently whetted his appetite for studying insects. He completed a Bachelor of Science in Zoology and Entomology followed in 1950 by a PhD from Harvard.<sup>13</sup> Brown was instrumental in luring Edward O. Wilson to graduate studies at Harvard, and in redirecting Wilson's taxonomic research interests from the ants of Alabama to the more widely distributed 'trapjaw' *Dacetina* ants.<sup>14</sup> Escaping his socially insular Gulf Coast roots was a requisite step on the path toward Wilson's avowed goal at age 17 of becoming 'an important scientist', and turning his attention to the fate of the world.<sup>15</sup>

In the 1960s and 1970s, Wilson accumulated academic credentials and honours, achieving his goal of becoming an important scientist through his involvement in developing and promoting the ideas of Island Biogeography and Sociobiology. But he eschewed environmental activism until 1980, 'unforgivably late', as he described it.<sup>16</sup> Wilson attributed his environmental epiphany to Norman Myers' estimates of tropical rainforest destruction rates in *The Sinking Ark* (1979), a polemic after the fashion of Charles Elton's *The Ecology of Invasions* (1958) and Rachel Carson's *Silent Spring* (1962). None of these were scholarly books written for technically adept audiences. Rather, they were deftly written polemical tracts by authors who warned about the impending environmental catastrophe that they saw unfolding as a result of human action. How scientific their verdicts were, and even how scientifically these writers understood what they feared, was never as important as how well they made their fears resonate with those of their readers.

Wilson's first intentional foray into environmentalist commentary was a short piece commissioned by the *Harvard Magazine*. There he wrote, 'the one process ongoing in the 1980s that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats'.<sup>17</sup> This comment summarises the professional fears of a taxonomist: that things will go—and go

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13 Ted R. Schultz, Richard B. Root, and Thomas Eisner, 'William L. Brown, Jr.: June 1, 1922–March 30, 1997', in *Memorial Statements, Cornell University Faculty 1996–97* (Ithaca, NY: Office of the Dean of the Faculty, Cornell University, 1997), 12–16, [ecommons.library.cornell.edu/bitstream/1813/18230/2/Brown\\_Stuart\\_M\\_Jr\\_1996.pdf](https://ecommons.library.cornell.edu/bitstream/1813/18230/2/Brown_Stuart_M_Jr_1996.pdf), accessed 28 November 2014.

14 Edward O. Wilson, *Naturalist* (Washington DC, Island Press, 1984), 132.

15 Wilson, *Naturalist*, 99.

16 Wilson, *Naturalist*, 355.

17 Edward O. Wilson, 'Resolutions for the 80s', *Harvard Magazine* 83 (1980): 21.

away—unclassified. In 1985, Wilson echoed a strategy Elton had attempted in inter-war Britain, using his academic pulpit to call for a comprehensive, publicly funded inventory of biota in the name of protecting what was deemed to be in the public interest. Wilson's vision of a full-employment plan for taxonomists was more expansive than Elton's. The Englishman wanted an accounting of British animal populations.<sup>18</sup> The American's proposal encompassed all life on the planet.<sup>19</sup> Neither man's argument was enthusiastically received at the time. It would be over two decades before Elton girded his loins for another overt foray as a public intellectual. But Wilson was on the cusp of a major role in formulating, and more importantly, promoting the concept of *biodiversity*.

When writing for general audiences, Wilson rarely shied from sweeping statements, including his own assertions that *his* ideas and claims are widely accepted by the scientific community. In *Scientific American*, he claimed without substantiation, '[v]irtually all ecologists, and I include myself among them, would argue that every species extinction diminishes humanity'.<sup>20</sup> He likewise asserted that 'systematists are in wide agreement that, whatever the absolute numbers, more than half of the species on earth live in moist tropical forests', and 'every tropical biologist has stories of the prodigious variety in this one habitat type'.<sup>21</sup> Wilson's claims of representing consensus have been coupled with vagueness. After discussing his idea that 'human nature is rooted in heredity', he once continued: '[i]n the 1970s a great many ordinary people believed these hereditarian propositions to be more or less true'.<sup>22</sup> Both the source of the information and the meaning of the statement are obscure; nevertheless, it sounds significant, and carries the confident authority of the 'important scientist'.

Wilson provided a clue for interpreting such vague yet global pronouncements in the final chapter of his 1994 autobiography, *Naturalist*. Discussing biophilia, his hypothesis that humans innately bond with other species, he wrote: '[b]y the ordinary standards of natural science, the evidence for biophilia remains thin, and most of the underlying theory of its genetic origin is highly speculative. Still, the logic leading to the idea is sound, and the subject is too important to neglect'.<sup>23</sup> Thus, Wilson excused (at least) his own lack of scientific rigour by suggesting that an idea—one of *his* ideas—is so important that it should be believed now and examined later. He could do this because he is, indeed, an important scientist. Island Press trumpeted his status on the dust jacket of *Naturalist*: 'Edward O. Wilson—University Professor at Harvard, winner of

18 Matthew K. Chew, 'Ending with Elton: Preludes to Invasion Biology' (PhD diss., Arizona State University, 2006), 126.

19 Edward O. Wilson 'The Biological Diversity Crisis', *BioScience* 35 (1985): 700–706.

20 Edward O. Wilson, 'Threats to Biodiversity', *Scientific American* 261 (1989): 108–16 (114).

21 Wilson, 'Threats to Biodiversity', 108, 110.

22 Wilson, *Naturalist*, 335.

23 Wilson, *Naturalist*, 362.



two Pulitzer prizes, eloquent champion of biodiversity—is arguably one of the most important thinkers of the twentieth century. His career represents both a blueprint and a challenge to those who seek to explore the frontiers of scientific understanding'. Popular acceptance of Wilson's importance, whether via putative-wide agreement or an exclusive writing prize is clearly significant to Wilson and the industry of Wilson promotion. Environmentalists with or without academic ecological credentials are his core constituency.

Wilson the scientist participated in a 1964 symposium on the evolutionary aspects of species introductions. However, biological invasions other than human incursions do not feature prominently in his environmentalist writings prior to 1992, even though the idea is more than implied by the tenets of theoretical Island Biogeography.<sup>24</sup> Invasions are absent from 'Resolutions for the 80s [sic]' (1980), *Biophilia* (1984), and 'The Biological Diversity Crisis' (1985), although each of these addresses habitat loss and resulting extinctions.<sup>25</sup> Invasions are absent from his foreword and introductory chapter in *Biodiversity* (1988), where the topic is subsequently mentioned or covered by other authors. Invasions went unmentioned in his published 1988 dialogue with Edward Lueders and writer Barry Lopez.<sup>26</sup> In 1989's 'Threats to Biodiversity', Wilson finally invoked the example of the intentional introduction of a new large predator, the Nile perch (*Lates niloticus*) to Lake Victoria. He mentions that '[t]he list of such biogeographic disasters is extensive', without elaborating.<sup>27</sup>

By 1990, Wilson acquired the habit of deploying the four horsemen of the (biblical) apocalypse to symbolise environmental catastrophe. His first foray was in a venue appropriate to eschatological speculation: *Chronicles*, a 'weapon in fighting the culture war' published by the Rockford Institute, which works 'to preserve the institutions of the Christian West: the family, the Church, and the rule of law; private property, free enterprise, and moral discipline; high standards of learning, art, and literature'.<sup>28</sup> For his part, in *Chronicles* Wilson christened his horsemen 'global warming', 'ozone depletion', 'toxic waste accumulation', and 'mass extinction by habitat destruction'.<sup>29</sup>

24 Robert H. MacArthur and Edward O. Wilson, *The Theory of Island Biogeography* (Princeton, NJ: Princeton University Press, 1967).

25 Wilson, 'Resolutions'; Edward O. Wilson, *Biophilia: The Human Bond With Other Species* (Cambridge, MA: Harvard University Press, 1984); Edward O. Wilson, 'The biological diversity crisis: A challenge to science', *Issues in Science and Technology* 2 (1988): 20–29.

26 Edward O. Wilson, 'The Current State of Biological Diversity', in *BioDiversity* (Washington DC: National Academy Press, 1988), 3–18; Edward Lueders, *Writing Natural History: Dialogues with Authors* (Salt Lake City, UT: University of Utah Press, 1989), 7–35.

27 Wilson, 'Threats to biodiversity'.

28 Thomas Fleming, 'From the President'; and Anonymous, 'Defending Christendom', from 'About The Rockford Institute', 2013–14, [www.chroniclesmagazine.org/about/the-rockford-institute](http://www.chroniclesmagazine.org/about/the-rockford-institute), both accessed 28 November 2014.

29 Edward O. Wilson, 'The New Environmentalism', *Chronicles* 14 (1990): 16–18.

## The advent of the ‘second greatest threat’

By the time Wilson entered the Rockford Institute’s culture war as an apocalyptic arms dealer, his 1992 book, *The Diversity of Life*, must have been in contemplation, if not preparation. Perhaps influenced by then-recent publications like *Ecology of Biological Invasions of North America and Hawaii* (mentioned in his endnotes), Wilson renamed his horsemen for a chapter called ‘Biodiversity Threatened’ and established the shape of things to come:<sup>30</sup>

[i]n recent centuries, and to an accelerating degree during our generation, habitat destruction is foremost among the lethal forces, followed by the invasion of exotic animals. Each agent strengthens the others in a tightening net of destruction. In the United States, Canada, and Mexico, 1,033 species of fishes are known to have lived entirely in fresh water within recent historical times. Of these, 27, or 3 percent, have become extinct within the past hundred years, and another 265, or 26 percent, are liable to extinction. They fall into one or another of the categories utilized by the International Union for the Conservation of Nature and Natural Resources (IUCN) which publishes the *Red Data Books*: Extinct, Endangered, Vulnerable, and Rare. The changes that forced them into decline are:

Destruction of physical habitat	73% of species
Displacement by introduced species	68% of species
Alteration of habitat by chemical pollutants	38% of species
Hybridization with other species and subspecies	38% of species
Overharvesting	15% of species <sup>31</sup>

Wilson’s categories and percentages invite scrutiny. They are hardly straightforward. The extents of these ‘lethal forces’, these ‘agents’, are not self-evident. Invoking ‘agency’ raises unanswerable questions. Wilson offers no further explanation; we are left to fend for ourselves. From a scientific perspective, his explanation appears cursory, even careless. It seems to exemplify the tongue-in-cheek concept of ‘proof by blatant assertion’, providing scant justification for any quantitative claim that ‘invasion by exotic animals’ follows habitat destruction as a ‘lethal force’.<sup>32</sup>

‘Overharvesting’ is perhaps Wilson’s most coherent category, though it is less straightforward than Jared Diamond’s (1989) ‘overkill’.<sup>33</sup> It fails to discriminate between, for instance, the institutionalised wastage caused by non-target ‘by-

30 See Harold A. Mooney and James A. Drake, eds., *Ecology of Biological Invasions of North America and Hawaii* (New York: Springer, 1986).

31 Edward O. Wilson, *The Diversity of Life* (New York: Knopf, 2002), 253–54.

32 Joel E. Cohen, ‘On the Nature of Mathematical Proofs’, in *A Random Walk in Science*, ed. Robert L. Weber and Eric Mendoza (New York: Crane Rusak, 1973), 34–36.

33 Jared Diamond, ‘Overview of Recent Extinctions’ in *Conservation for the Twenty-first Century*, ed. David Western and Mary Pearl (New York, Oxford University Press, 1989), 37–41.

catch', industrial-scale exploitation, and locally intensive subsistence-level consumption. When collapsed, the category provides little explanatory value, but explaining is not the point. Eliciting remorse by assigning blame is the point.

'Destruction of physical habitat' suggests many possibilities, not all of which are anthropogenic. Wilson excluded the effects of chemical pollutants, except perhaps those (like acid mine drainage) that might be said to physically destroy rather than alter habitats. The line between habitat alteration and destruction is difficult to draw when the operative context is extinction; a habitat altered to the extent that a population fails seems tantamount to a habitat destroyed. 'Alteration of habitat by chemical pollutants' seems understandable, at least as long as the array of potential sources, identities, and effects of such pollutants is left unspecified. Are we to assume that Wilson meant something like 'chemicals not typically generated except by industrial process, or rarely found in detectable quantities'? Does habitat alteration differ from physical destruction as a matter of degree? If so, can both result in extinction, or does extinction signal actual destruction of habitat?

'Displacement by introduced species' is simultaneously vague and over-precise. The ecological implication of 'displacement' is that individuals or populations have been competitively excluded from either a functional or geographical niche, an effect that is easier to imagine than demonstrate.<sup>34</sup> Furthermore, in any ecologically strict sense, displacement does not include trophic exploitation (being eaten) by a new predator, a commonly feared outcome of introducing game-fish species. Wilson did not disclose whether his 'introduced species' were purposely stocked, or if they were themselves fishes, or indeed even animals.

'Hybridization with other species and subspecies' is a surprisingly terse construction. It glosses over two necessary questions: the perennially debated, 'what constitutes a species?' and the subtler, but more interesting, 'what constitutes extinction?' If species are demarcated by an inability to interbreed, can individuals representing two 'real' species mate and produce offspring? We know that some, such as horses and donkeys, can be mated to produce viable, but infertile, mules. But in a widely discussed case, the descendants of introduced 'American' ruddy ducks (*Oxyura jamaicensis*) are interbreeding with 'European' white-headed ducks (*O. leucocephala*), and producing fertile

34 See, for example, Mark A. Davis, 'Biotic globalization: does competition from introduced species threaten biodiversity?', *BioScience* 53 (2003): 481–89; Dov F. Sax, John J. Stachowicz, and Steven D. Gaines, eds., *Species invasions: insights into ecology, evolution and biogeography* (Sunderland, MA: Sinauer, 2005).

offspring.<sup>35</sup> Were these two really different species, or were they essentially two populations denied access to each other long enough to diverge perceptibly to the human eye and mapmaker, but in reproductively inconsequential ways?

The population resulting from this reunion is neither 'ruddy' nor 'white-headed', as was once conceived. But it is still a population of ducks. Left unmolested, it might be fully capable of persisting. If we insist that they were two species, did the merger produce an extinction event? The answer is *yes* according to one criterion (the white-headed duck might no longer occur as such), and *no*, because those ducks mated and passed their genes to successive generations; no line of inheritance ended. It is a matter of convention, like patrilineal naming. In some social traditions, a family giving birth to a generation of daughters cannot continue 'in name'; but through motherhood, each female's genes will 'flow into the future' along with the name-begetting father's.

Philosophers Matthew Haber and Andrew Hamilton formally distinguished between these different kinds of events, calling them Type I and Type II extinctions. Type I extinctions represent one fundamental fear of environmentalism: for whatever reason, organisms become rare, reproduction success diminishes, and lineages ultimately fail. In Type II extinctions, lineages merge or diverge as reproduction continues, and labels change; whether new taxa subsume or succeed others is up to the classifier.<sup>36</sup> By including hybridisation in his list of threats, Wilson conflated the two extinction concepts; perhaps without noticing, certainly without giving notice to his readers. As will become evident, this was not the only tacit component of Wilson's claim, nor was it the most problematic.

Wilson's numbers added up to 232 per cent, so (as he went on to confirm) his 'lethal agents' coexist or even co-operate. We might have hoped for some discussion of common or inevitable combinations, but none was forthcoming. Some primary effects would seem to render secondary agents insignificant. For example, reservoir impoundment replaces one physical habitat with another. Habitats for 'river fish' are thereby destroyed, but in the process, 'lake fish' habitats are created. Populations of river fishes will persist in a reservoir only if

35 Judith M. Rhymer and Daniel Simberloff, 'Extinction by hybridization and introgression', *Annual Review of Ecology and Systematics* 27 (1996): 83–109; Kay Milton, 'Ducks out of water: Nature conservation as boundary maintenance', in *Natural Enemies: People–Wildlife Conflicts in Anthropological Perspective*, ed. John Knight (London: Routledge, 2000), 229–46.

36 Matthew H. Haber and Andrew L. Hamilton, 'Coherence, consistency, and cohesion: Clade selection in Okasha and beyond', *Philosophy of Science* 72 (2005): 1026–40. Haber and Hamilton point out that their extinction typology is detectable in literature that would have been available to Wilson well before *The Diversity of Life* was published; notably, Mark Wilkinson, 'A Commentary on Ridley's Cladistic Solution to the Species Problem', *Biology and Philosophy* 5 (1990): 433–46.

the newly prevailing conditions still effectively meet their habitat requirements. The arrival of lake fishes in a reservoir might correlate with an extinction of river fishes without actually causing it.

Ecologically, it does not matter whether a fish species arrives in a reservoir by surviving the damming process, by swimming downstream from an unaffected reach, by dumping from a bait bucket, or by pumping from a government hatchery's tanker truck. Any persisting population demonstrates that habitat exists; non-persistence demonstrates otherwise. Even in the latter case, some mature individuals may survive without breeding much, or at all, or where survivorship of young to adulthood has ceased. Such populations must dwindle, as has been the case for several fishes in the serially impounded, much-diverted, and much-diminished lower Colorado River. Researchers familiar with these cases have stated that '[w]e have no doubt that if nonnative species vanished, the big-river fishes would persist in today's modified habitats'.<sup>37</sup> Unfortunately there is no way to cleanly separate those factors in the real world.

As noted earlier, Edward O. Wilson is not an ichthyologist. He is by training a myrmecologist, a specialist in ants. What prompted him to construct an argument of such potential significance with reference to taxa so different from his invertebrate stock-in-trade? *The Diversity of Life's* endnotes, consisting primarily of parenthetical asides rather than formal citations, mentioned three salient journal articles, but also suggested that Karsten Hartel, Wilson's colleague at the Harvard Museum of Comparative Zoology, provided the tabular 'threats' analysis. I emailed Wilson, asking whether he knew of any statement or analysis prior to his own to the effect that invasive species constituted the second-ranked cause of extinction. He responded by encouraging me to contact Hartel. Hartel subsequently confirmed that he provided Wilson with information from the three articles identified in the book, but balked at taking responsibility for Wilson's synthesis.<sup>38</sup> Whether Wilson or Hartel came up with the idea, Wilson ultimately composed and published it. Rather than pressing the matter of ultimate responsibility any further, I set about attempting to reproduce Wilson's table of threats, seemingly a matter of reviewing readily available published material.

There is substantial overlap both in the topics and authorship of the three articles Wilson listed as sources. Hoping to reduce both repetition and confusion, I refer to them below by single word 'proxies'. The first article is 'Conservation Status of the North American Fish Fauna in Fresh Water' by Jack E. Williams and

37 Wendel L. Minckley, Paul C. Marsh, James E. Deacon, Thomas E. Dowling, Philip W. Hedrick, William J. Matthews, and Gordon Mueller, 'A conservation plan for native fishes of the lower Colorado River', *BioScience* 53 (2003): 219–34.

38 Edward O. Wilson, email message to author, 6 February 2002; Karsten Hartel, emails to author, 4 June 2004 and 21 June 2004.

Robert R. Miller (herein after CONSERVATION). Wilson's (1992) totals of 1,033 species, 27 extinctions and 265 International Union for Conservation of Nature (IUCN)-listed extant species appeared there.<sup>39</sup> The last two numbers derived, in turn, from the 1990 IUCN *Red List of Threatened Animals*, which included no data regarding specific threats.<sup>40</sup>

The second and slightly earlier article, 'Extinctions of North American Fishes During the Past Century' (herein after EXTINCTIONS), is also by Williams and Miller, this time collaborating with James D. Williams. Wilson's (1992) five impact-ranking percentages appear here, where they were derived from and pertain specifically and *only* to the 40 extinct taxa discussed in EXTINCTIONS.<sup>41</sup>

Like Wilson's threat categories (which should mirror them, but do not exactly), those in EXTINCTIONS were drawn with imprecision. For example, in a summary table EXTINCTIONS describes the Miller Lake lamprey (*Entosphenus minimus*) as having been exterminated by 'chemical alteration or pollution'. The article's text disclosed this as the intended effect of an applied ichthyocide. Their nativeness notwithstanding (and, it seems, undetermined at the time), the lampreys, which prey on other fishes in an unappealing, parasite-like manner, were considered pests and treated as such.<sup>42</sup> Meanwhile, 'chemical alteration or pollution' applied to 14 other taxa discussed in EXTINCTIONS, none of which were purposely poisoned.

'Introduced species' (sans Wilson's 'displacement by') affected 27 taxa in EXTINCTIONS. In all but two of those cases, the presence of introduced species, when correlated with the absence of a native species, was interpreted as unquestionably contributing to a native's extirpation. In the remaining two cases, impacts other than hybridisation (a separate category) were not mentioned.

The species accounts in EXTINCTIONS were peppered with rhetorical qualifiers, such as 'apparently', 'believed', 'contributed', 'may', 'presumed', 'probably' and 'undoubtedly'. The article's attributions of impacts to introduced species were much too speculative to support any calculation of summary percentages. The authors of EXTINCTIONS seemed eager to identify exotics as plausible

39 Jack E. Williams and Robert R. Miller, 'Conservation Status of the North American Fish Fauna in Fresh Water', *Journal of Fish Biology* 37A (1990): 79–85.

40 *Red List of Threatened Animals* (Geneva: International Union for the Conservation of Nature, 1990). The published IUCN *Red List of Threatened Animals* began including threat data in 1994.

41 Robert R. Miller, James D. Williams, and Jack E. Williams, 'Extinctions of North American Fishes During the Past Century', *Fisheries* 14 (1989): 22–38.

42 In 1992, reports of the demise of the Miller Lake lamprey proved to be premature. See Oregon Department of Fish and Game, 'After 50 years Miller Lake lamprey returns to Miller Lake', [www.dfw.state.or.us/news/2010/july/072710b.asp](http://www.dfw.state.or.us/news/2010/july/072710b.asp), accessed 23 June 2014.

culprits; like Vichy Captain Louis Renault in the 1942 film *Casablanca*, they 'round[ed] up the usual suspects'. In effect, EXTINCTIONS was literally an article of faith in the inferences drawn by its sources.<sup>43</sup>

The last article Wilson linked to his 'threats' table appeared in the same issue of *Fisheries* as EXTINCTIONS. Eight authors, led by the same Jack E. Williams (this time including James D. Williams but not Miller), compiled 'Fishes of North America Endangered, Threatened or of Special Concern: 1989' (herein after FISHES). They included 'all fishes of the North American continent that the American Fisheries Society believes should be classified as endangered, threatened, or of special concern'. In summary, they relied on something resembling US Endangered Species Act status definitions, but not the official listings.

The complexity of the FISHES authors' task was enormous. The dynamic state of fish taxonomy precluded durable consensus even on the total number of species. The authors relied on 'other lists, original data, and discussions with pertinent agencies and knowledgeable individuals', although their references did not specifically identify data sources, agencies, individuals, or contact dates.<sup>44</sup>

The IUCN also relies on knowledgeable individuals. Their lists are scientific to the uncertain extent that contributed knowledge is scientific. The upshot is that the numbers published by IUCN, and by the authors of EXTINCTIONS, FISHES, and CONSERVATION were not really data regarding fishes; if anything, they were data regarding what a group of self-identified, self-selected experts believed and chose to report about fishes. Sometimes even the best available information is not really very good. Setting a low bar for Wilson and others to come, these authors were generating a de facto opinion poll without controlling the question being asked. That does not render the accounts untrue, but it does render them unreliable, untestable, and resistant to defensible aggregation. They represent the beliefs (the *doctrine*, it seems) of members of a professional association, but they are anecdotal.

FISHES included 364 taxa (including species and subspecies) purportedly affected by five categories of threats. The threats identified did not correspond well either with categories listed in EXTINCTIONS, or with Wilson's (1992) formula (Table 1). CONSERVATION and EXTINCTIONS accounted for all of Wilson's numbers and something like his categories. The dissimilarities between Wilson's categories and their supposed sources shows that his account elided an idiosyncratic and irreproducible set of judgments. This was no simple transcription error.

43 Miller et al., 'Extinctions', 22–38.

44 Jack E. Williams, James E. Johnson, Dean A. Hendrickson, Salvador Contreras-Balderas, James D. Williams, Miguel Navarro-Mendoza, Don E. McAllister, and James E. Deacon, 'Fishes of North America Endangered, Threatened, or of Special Concern', *Fisheries* 14 (1989): 2–19.



Wilson grafted already questionable summary percentages from one article onto data from another. Then he inserted them into novel categories. By drawing conclusions contingent on summary numbers extracted from such disparate and dubious sources, he glossed over numerous taxonomic and procedural objections. His conceptions could not ameliorate the weaknesses of the data he relied upon. His sources were not ‘doing science’, and neither was he.<sup>45</sup>

Table 1: A comparison of threat categories.

EXTINCTIONS	Wilson, 1992	FISHES
Physical habitat alteration	Destruction of physical habitat	Present or threatened destruction, modification, or curtailment of its habitat or range
Chemical alteration or pollution	Alteration of habitat by chemical pollutants	
Introduced species	Displacement by introduced species	Other natural or man-made factors affecting its continued existence (hybridisation, introduction of exotic or transplanted species, predation, competition)
Hybridisation	Hybridisation with other species and subspecies	
Overharvesting	Overharvesting	Overuse for commercial, recreational, scientific, or educational purposes
(No corresponding category)	(No corresponding category)	Restricted range
(No corresponding category)	(No corresponding category)	Disease

Source: Robert R. Miller, James D. Williams, and Jack E. Williams, ‘Extinctions of North American Fishes During the Past Century’, *Fisheries* 14 (1989): 22–38; Edward O. Wilson, *The Diversity of Life* (New York: Knopf, 2002), 253–54; Jack E. Williams, James E. Johnson, Dean A. Hendrickson, Salvador Contreras-Balderas, James D. Williams, Miguel Navarro-Mendoza, Don E. McAllister, and James E. Deacon, ‘Fishes of North America Endangered, Threatened, or of Special Concern’, *Fisheries* 14 (1989): 2–19.

## Quantifying threats: The second generation

Under the auspices of the IUCN Species Survival Commission, a self-identified ‘Invasive Species Specialist Group’ (ISSG), ‘a worldwide network of experts on the conservation impacts of invasive species’, formed in 1994, two years after Wilson published his analysis. ISSG granted membership only by invitation, and made its conservation orientation explicit.<sup>46</sup>

45 Williams et al., ‘Conservation Status’; Miller et al., ‘Extinctions’; Williams et al., ‘Fishes of North America’; Williams, email to author, 4 June 2004, did not respond further after I suggested that his results did not support Wilson, and questioned his category formulations.

46 Mick N. Clout, ‘Introducing ISSG’s Newsletter’, *Aliens* 1 (1995): 1.



At roughly the same time, Wilson protégé Daniel Simberloff, then at Florida State University, wrote an entry titled 'Introduced Species' for the *Encyclopedia of Environmental Biology* (1995). He subsequently cited 'Introduced Species' in a 1997 book chapter he also authored, as the source for the observation that '[n]onindigenous species are second only to habitat destruction in harming native communities'.<sup>47</sup> However, the encyclopedia entry includes no such claim.<sup>48</sup> Simberloff's best guess regarding the citation anomaly is that the pieces were written concurrently and the claim in question might have appeared in a preliminary draft but not the final version.<sup>49</sup> Questions about where it came from and where it went thus persist, but since it spawned only two (necessarily copy-cat) citations, one in a 1998 advocacy document written for public consumption by a Defenders of Wildlife staff member, another in a 2009 (peer-reviewed) article by three Portuguese authors for the journal *Ecography*, the lineage appears fairly moribund.<sup>50</sup>

In 1997, spurred by the 1996 Norway/UN Conference on Alien Species, the Scientific Committee on Problems of the Environment (SCOPE), IUCN, and CAB International (formerly Britain's Commonwealth Agricultural Bureaux) initiated the Global Invasive Species Programme (GISP) 'to conserve biodiversity and sustain human livelihoods by minimizing the spread and impact of invasive alien species', a likewise applications-oriented effort.<sup>51</sup> A 1999 book 'based on a selection of papers presented' at the Norway conference was introduced by its editors, who immediately resurrected Jared Diamond's (1989) 'evil quartet' for the occasion.<sup>52</sup> Their second paragraph flatly declared, without attribution that '[m]ost biologists consider [alien invasive species] the second most important threat factor after habitat destruction'.<sup>53</sup> This statement seems to have been overlooked by most subsequent authors, but unlike Simberloff's lost 1985 assertion, it actually appeared in print and has been cited a few times. The authors of a notable amplification wrote, 'The Norway / United Nations

47 Daniel Simberloff, 'Biogeographic approaches and the new conservation biology', in *The Ecological Basis of Conservation*, ed. Steward T. A. Pickett, Richard S. Ostfeld, Mosche Shachak, and Gene E. Likens (New York: Springer, 1997), 274–84.

48 Daniel Simberloff, 'Introduced species', In *Encyclopedia of Environmental Biology*, vol. 2, ed. William A. Nierenberg (New York: Academic Press, 1995), 323–36.

49 Daniel Simberloff, email to the author, 26 July 2014.

50 See Sara Vickerman, *National Stewardship Initiatives: Conservation Strategies for Landowners* (Washington, DC: Defenders of Wildlife, 1998), 55; Luis Reino, Jordi Moya-Laraño, and António C. Heitor, 'Using survival regression to study patterns of expansion of invasive species: will the common waxbill expand with global warming?', *Ecography* 32 (2009): 237–46.

51 Diversitas, 'Global Invasive Species Programme' (2011), [www.diversitas-international.org/activities/past-projects/global-invasive-species-programme-gisp](http://www.diversitas-international.org/activities/past-projects/global-invasive-species-programme-gisp). See also Sarah Simons, 'Closure of the Global Invasive Species Programme' (BCGI Resources Centre, April 13, 2011), [www.bghi.org/resources/news/0794](http://www.bghi.org/resources/news/0794), accessed 28 November 2014.

52 Jared Diamond, 'Overview of Recent Extinctions'.

53 Odd T. Sandlund, Peter J. Schei, and Aslaug Viken, 'Introduction: the many aspects of the invasive alien species problem', in *Invasive Species and Biodiversity Management* (Dordrecht: Kluwer, 1999), 1–11.

Conference on Alien Species considers alien invasive species as the second most important threat, after habitat destruction, to indigenous biodiversity'.<sup>54</sup> Still, only a relative handful of authors have relied on the Norway statement, which seems to lack any apparent methodological basis.

Nevertheless, by 1999 a nascent discipline of invasion biology was well in evidence, having generated several anthologies of proceedings and being served by two specialised peer-reviewed journals, neither of which was ever formally controlled by ISSG or GISP. Practitioners were also publishing in broader conservation biology and ecology journals, in regional natural history and taxon-based journals, and occasionally in the two major 'high impact' generalist journals, *Science* and *Nature*. On 3 February 1999, US Presidential Executive Order 13112 established a National Invasive Species Council (NISC) and defined terms including 'invasive species' for purposes of federal management actions.

Given its pedigree of applications-oriented, international, and interdisciplinary organisations, it was practically inevitable that 'invasive species'—related articles would appear in inter-organisational journals. One such is *BioScience*, produced by the American Institute of Biological Sciences (AIBS). AIBS membership is open to individuals, organisations, and institutions, so the content of *BioScience* is eclectic by comparison with most journals. Like *Nature* and *Science*, *BioScience* includes features by science writers, correspondence arising, professional news, editorials, and book reviews, alongside research articles. Occasional issues are themed; for example, in 1998 (volume 48) the peer-reviewed articles in numbers four and nine focused on particular topics. Number eight (August) was more typical. Its four peer-reviewed articles were titled, in order of appearance, 'The Reproductive Biology of Fire Ant Societies', 'Quantifying Threats to Imperiled Species in the United States', 'Animal Clones and Diversity', and 'Water for Food Production: Will There Be Enough in 2025?'. The second of these prominently cited Wilson's *The Diversity of Life* and reified his threat ranking while expanding it beyond freshwater fishes. It included a statement that (by the standards of the time) 'went viral' in the discourse of invasion biology and rapidly became one of its central dogmas.

The lead author of 'Quantifying Threats to Imperiled Species in the United States' was David Wilcove, an American born shortly after Charles Elton's *Ecology of Invasions* began incubating in the library stacks. Wilcove cites a childhood (and continuing) interest in birds and pre-teenage exposure to the 'height of the environmental movement of the early 1970s' as his impetus to study biology, culminating in a 1985 Princeton PhD. Reacting to the anti-environmentalism of

54 Roger Mann and Julia M. Harding, 'Salinity tolerance of larval *Rapana venosa*: implications for dispersal and establishment of an invading predatory gastropod on the North American Atlantic coast', *The Biological Bulletin* 204 (2003): 96–103.

the early Reagan years, he began his professional career studying rare species in Virginia for The Nature Conservancy (TNC), a non-profit, United States-based organisation. He soon moved to the Wilderness Society and went from there in 1988 to a position as Senior Ecologist with the Environmental Defense Fund (EDF). At the EDF his early work focused on describing the practical and legal challenges of protecting endangered species in the United States. Stating 'I like writing' in a 1996 interview for the *EDF Letter*, he demonstrated it with an impressive output of technical and popular articles, reviews, a recurring column for the Cornell Laboratory of Ornithology's *Living Bird* magazine, several book chapters, and in 1999, a book of his own: *The Condor's Shadow: The Loss and Recovery of Wildlife in America*, with a foreword by Edward O. Wilson.<sup>55</sup>

Wilcove was one among a throng of late baby boomers sincerely motivated by the increasing environmental consciousness of the 1960s and 1970s who populated the enrolment lists of university biology departments and aspired to staff positions at environmental organisations. The movement had money, but rarely money to burn, and competition for even the lowest paying jobs was always intense. Those like Wilcove who had luck, enthusiasm, and the proper academic credentials got a foot in the door. Fewer found a long-term home behind it. It is difficult to stand out among so many well-qualified peers. Meanwhile, environmental organisations have foibles and faults that can dismay true-believing tyros. Wilcove managed to thrive as well as anyone under such conditions. He established and maintained connections in the power centres of the groups he worked for, and contact with the power centres of federal agencies that invited his participation in significant activities. He simultaneously established himself as a journeyman populariser through magazine articles, and a capable member of interdisciplinary teams. Unlike Wilson, Wilcove's personal testimony as an environmentalist included no mid-life epiphany and 'road to Damascus' conversion to activism, but he had barely attained mid-life by the time he entered this story.

In 1994, TNC set to work on a tour-de-force report to be titled *Precious Heritage: The Status of Biodiversity in the United States*.<sup>56</sup> Wilcove and a team of co-authors whose credentials included tenures in a variety of environmental groups and

55 Anonymous, 'Pew Fellows: David S. Wilcove, Ph.D.,' Pew Fellows Program in Marine Conservation (1999), accessed 18 October 2002, [www.pewmarine.org/PewFellows/pf\\_WilcoveDavid.html](http://www.pewmarine.org/PewFellows/pf_WilcoveDavid.html); Anonymous, 'Professor David Wilcove, Ecologist, Joins PEI's Faculty' [Princeton Environmental Institute, Princeton, NJ], *PEI News* (Fall 2001): 3, [web.princeton.edu/sites/pei/PDFfiles/PEIFallNL2001.pdf](http://web.princeton.edu/sites/pei/PDFfiles/PEIFallNL2001.pdf), accessed 18 October 2002; David S. Wilcove, 'Curriculum Vitae', Princeton University (2001), [www.eeb.princeton.edu/FACULTY/Wilcove/cv.pdf](http://www.eeb.princeton.edu/FACULTY/Wilcove/cv.pdf), accessed 18 October 2002; David S. Wilcove, 'Publications by David S. Wilcove', Princeton University (2001), [www.eeb.princeton.edu/FACULTY/Wilcove/Publications.pdf](http://www.eeb.princeton.edu/FACULTY/Wilcove/Publications.pdf), accessed 18 October 2002; David S. Wilcove, *The Condor's Shadow: The Loss and Recovery of Wildlife in America* (New York: W. H. Freeman, 1999).

56 Deborah B. Jensen and Thomas F. Breden, Preface to *Precious Heritage: The Status of Biodiversity in the United States*, ed. Bruce A. Stein, Lynn S. Kutner, and Jonathan S. Adams (Oxford: Oxford University Press, 2000), xiv.

academic institutions were tasked with producing a chapter on invasive species. The volume's lead editor was Bruce Stein, a TNC stalwart who had just co-edited their booklet, *America's Least Wanted: Alien Species Invasions of U.S. Ecosystems*.<sup>57</sup> At about the same time, David Wilcove found himself collaborating with Edward O. Wilson and others, including Jane Lubchenco, (then) future Administrator of the US National Oceanographic and Atmospheric Administration, on a perspective article for *Science*, titled 'Building a Scientifically Sound Policy for Protecting Endangered Species'.<sup>58</sup>

Daniel Simberloff 'generously provided advice on the new TNC book through ... participation in project workshops and through ... analyses of heritage data'.<sup>59</sup> Simberloff had recently co-authored 'Biological Invasions: A Growing Threat' for the National Academy Press' *Issues in Science and Technology* and was translating *Killer Algae*, a French biologist's narrative of apparent disregard—by the Jacques Cousteau-led Oceanographic Museum in Monaco—for a biological invasion of the Mediterranean Sea.<sup>60</sup> He would shortly pen the foreword for the University of Chicago Press's 2000 reissue of Elton's *Ecology of Invasions by Animals and Plants*.<sup>61</sup> Simberloff was also co-editing *Strangers in Paradise: Impact and Management of Nonindigenous Species in Florida*, with a foreword by Wilson, for Island Press. In that foreword, Wilson inflated his 1992 claim about US freshwater fishes by declaring that '[o]n a global basis [conservation biologists] recognize that the two great destroyers of biodiversity are, first, habitat destruction, and, second, invasion by exotic species'.<sup>62</sup>

TNC's *Precious Heritage* would not see print until 2000. Wilcove's team finished their chapter ahead of the curve. In the venerable academic tradition of filling two CV lines with one publication, they submitted the piece to *BioScience*, advisedly, if confusingly, acknowledging it as 'part of an ongoing collaboration ... as part of the forthcoming book' and thanking Wilcove's recent collaborator Jane Lubchenco, among others, for 'their helpful reviews of earlier versions'. It was more than auspiciously timed. Simberloff was also a member of *BioScience's*

57 Bruce A. Stein and Stephanie R. Flack, *America's Least Wanted: Alien Species invasions of U.S. Ecosystems* (Arlington, VA: The Nature Conservancy, 1996).

58 Thomas Eisner, Jane Lubchenco, Edward O. Wilson, David S. Wilcove, and Michael J. Bean, 'Building a scientifically sound policy for protecting endangered species', *Science* 269 (1995): 1231–32.

59 Stein, Kutner and Adams, acknowledgements in *Precious Heritage*, xix.

60 Andre Meinesz, *Killer Algae*, trans. Daniel Simberloff (Chicago: University of Chicago Press, 1999); Don C. Schmitz and Daniel Simberloff, 'Biological Invasions: A Growing Threat', *Issues in Science and Technology* 13 (1997): 33–40.

61 Daniel Simberloff, foreword to *The Ecology of Invasions by Animals and Plants*, by Charles S. Elton (Chicago: University of Chicago Press, 2000), vii–xiv; Wilcove, *The Condor's Shadow*, xiii–xv.

62 Edward O. Wilson, foreword to *Strangers in Paradise: Impact and Management of Nonindigenous Species in Florida*, ed. Daniel Simberloff, Don C. Schmitz, and T. C. Brown (Washington, D.C.: Island Press, 1997), ix–x.

Editorial Board.<sup>63</sup> He does not specifically remember handling the submission, however, and the current *BioScience* managing editor reported such information 'may have been lost to the ages'.<sup>64</sup>

'Quantifying Threats to Imperiled Species in the United States' appeared in *BioScience* well before its publication in *Precious Heritage*, where it stands as chapter eight under the heading 'Leading Threats to Biodiversity'. Although the two versions are similar in many respects, they are not identical. The book chapter includes an introductory vignette about the extinction of a Hawaiian bird, the 'o'o (*Moho braccatus*), attributed to a combination of causes including habitat loss and avian malaria, a disease accidentally introduced to the islands in the 1820s. It also includes a section headed with the title, 'Horsemen of the Environmental Apocalypse', which appeared in *BioScience* sans emphasis. A further nod to Wilson and the equally citable Paul Ehrlich followed in both versions: '[i]n general, scientists agree that habitat destruction is currently the primary lethal agent (Ehrlich 1998, Wilson 1992) followed by the spread of alien species (Wilson 1992)' [citations in originals].<sup>65</sup>

'Wilson, 1992' is *The Diversity of Life*, and what appeared there was explained above. Neither quotes nor careful paraphrases, the ideas attributed in this case to Wilson merely resemble his statements. Wilcove's 'the spread of alien species' is far more general than either Wilson's 'invasion of exotic animals' or his 'displacement by introduced species'. Furthermore, although 'scientists generally agree' looks credibly like a Wilsonism, it cannot be found in the 1992 edition of *The Diversity of Life* (although it suggests another possibility, discussed below). It is not clear until much later in these twin works that the statements attributed to Ehrlich and Wilson were the hypotheses of their study, or perhaps more appropriately the thesis of their essay. Returning to comparisons, *BioScience* readers were told more about methodology and statistics, and that no anthropogenic threats were identified for 52 of the species examined. Both versions contain a lengthy disclaimer, also customised to the needs of each publication and its audience. Their differences are notable and are emphasised below in bold-face:

*BioScience* version:

**We emphasize at the outset [some eight hundred words into the article] that there are some important limitations to the data we used. The attribution of a specific threat to a species is usually based on the judgment of an expert source,**

63 Anonymous, masthead in *BioScience* 44 (1994), number nine and following.

64 Emails to the author from Daniel Simberloff, 26 July 2014, and James Verdier, 13 August 2014.

65 David S. Wilcove, David Rothstein, Jason Dubow, Ali Phillips, and Elizabeth Losos, 'Quantifying Threats to Imperiled Species in the United States', *BioScience* 48 (1998): 607–15; David S. Wilcove, David Rothstein, Jason Dubow, Ali Phillips, and Elizabeth Losos, 'Leading Threats to Biodiversity: What's Imperiling U.S. Species', in *Precious Heritage*, ed. Stein, Kutner, and Adams, 239–54.

such as a USFWS [Fish and Wildlife Service] employee who prepares a listing notice or a state **Fish and Game** employee who monitors **endangered** species in a given region. Their evaluation of the threats facing that species may not be based on experimental evidence or **even** quantitative data. Indeed, such data often do not exist. With respect to species listed under the [US Endangered Species Act], Easter-Pilcher (1996) has shown that many listing notices lack important biological information, including data on past and possible future impacts of habitat destruction, pesticides, and alien species. Depending on the species in question, the absence of information may reflect a lack of data, an oversight, or a determination by USFWS that a particular threat is not harming the species. **The extent to which such limitations on the data influence our results is unknown.**<sup>66</sup>

*Precious Heritage* version:

There are some important limitations to the data we used. The attribution of a specific threat to a species is usually based on the judgment of an expert source, such as a USFWS employee who prepares a listing notice or a state **natural heritage program** employee who monitors **imperiled** species in a given region. Their evaluation of threats facing that species may not be based on experimental evidence or quantitative data. Indeed, such data often do not exist. With respect to species listed under the [US Endangered Species Act], Easter-Pilcher (1996) has shown that many listing notices lack important biological information, including data on past and possible future impacts of habitat destruction, pesticides, and alien species. Depending on the species in question, the absence of information may reflect a lack of data, an oversight, or a determination that a particular threat is not harming the species.<sup>67</sup>

Like their precursors a generation (by reference) removed, Wilcove et al. confirmed the inevitable consensus. It seems clear that any 'quantifying' conclusions based on such dubious data are no less dubious. As the saying goes, 'the plural of anecdote is not data'.<sup>68</sup> They could gloss over this problem in the TNC book; after all, their message was primarily environmental advocacy, not scientific analysis. But *BioScience* is published by, and for, professional biologists. It includes commentaries and editorials, but 'Quantifying Threats' was published as a research paper, with other research papers in the issue. Intervention by a *BioScience* editor may account for the slightly more explicit wording of the disclaimer in 'Quantifying Threats'. If so, it remains puzzling that *BioScience* included an assertive statement in the central column of the article's first page, emphasised with paragraph borders and a larger, bolder font (Figure 1).

66 Wilcove et al., 'Quantifying Threats', 608–609.

67 Wilcove et al., 'Leading Threats to Biodiversity', 241.

68 Economist Roger Brinner of the Parthenon Group claims credit for coining the 'plural of anecdote' phrase 'decades ago' but cannot himself 'remember exactly when'. Email to author, 20 September 2004.



# Quantifying Threats to Imperiled Species in the United States

*Assessing the relative importance of habitat destruction, alien species, pollution, overexploitation, and disease*

David S. Wilcove, David Rothstein, Jason Dubow, Ali Phillips, and Elizabeth Losos

**B** iologists are nearly unanimous in their belief that humanity is in the process of extirpating a significant portion of the earth's species. The ways in which we are doing so reflect the magnitude and scale of human enterprise. Everything from highway construction to cattle ranching to leaky bait buckets has been implicated in the demise or endangerment of particular species. According to Wilson (1992), most of these activities fall into four major categories, which he terms "the mindless horsemen of the environmental apocalypse": overexploitation, habitat destruction, the introduction of non-native (alien) species, and the spread of diseases carried by alien species. To these categories may be added a fifth, pollution, although it can also be considered a form of habitat destruction.

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**Habitat loss is the  
single greatest threat  
to biodiversity, followed  
by the spread of  
alien species**

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passed by them—is responsible for endangering species. In general, scientists agree that habitat destruction is currently the primary lethal agent (Ehrlich 1988, Wilson 1992), followed by the spread of alien species (Wilson 1992). However, apart from several notable exceptions—including studies of North American fishes by Williams et al. (1989), endangered plants and animals in the

fine-scale analysis of the types of habitat destruction affecting US plants and animals protected under the federal Endangered Species Act (ESA). We also speculate on how these threats have changed over time and are likely to change in the future. We conclude with a brief discussion of the implications of our findings for the long-term protection of imperiled species in the United States.

## **An overview of the threats**

To obtain an overview of the threats to biodiversity in the United States, we tabulated the number of species threatened by five categories of threats: habitat destruction, the spread of alien species, overharvest, pollution (including siltation), and disease (caused by either alien or native pathogens). We restricted this

Figure 1: Detail from the first page of Wilcove et al. (1998).

Source: David S. Wilcove, David Rothstein, Jason Dubow, Ali Phillips, and Elizabeth Losos, 'Quantifying threats to imperiled species in the United States', *BioScience* 48 (1998): 607–15.

This teaser to journal browsers is, as usual, a direct quote from the body of the paper. But the quote includes only part of the statement actually made by Wilcove et al. Here again it is useful to compare the two versions:

*BioScience* version:

The major findings of this **study** confirm what most conservation biologists have long suspected: Habitat loss is the single greatest threat to biodiversity, followed by the spread of alien species. However, the discovery that nearly half of the imperiled species in the United States are threatened by **alien species—combined** with the growing numbers of alien species—suggests that this particular threat may be far more serious than many people have heretofore **believed**.<sup>69</sup>

<sup>69</sup> Wilcove et al., 'Quantifying Threats', 614.

*Precious Heritage* version:

The major findings of this **chapter** confirm what most conservation biologists have long suspected: Habitat loss is the single greatest threat to biodiversity, followed by the spread of alien species. However, the discovery that nearly half of the imperiled species in the United States are threatened by **invasive aliens—coupled** with the growing numbers of alien species—suggests that this particular threat may be far more serious than many people have heretofore **recognized**.<sup>70</sup>

Wilcove et al. thus clearly signalled their satisfaction at confirming a supposedly broad bias, but gave it a puzzling twist. Their claim ‘most conservation biologists have long suspected’ something that ‘may be far more serious than many people have heretofore believed/recognized’ approaches the paradoxical, but it might only be an awkward bit of boundary work disparaging the sceptical.

Perhaps the most important conclusion to be drawn from this comparison is that Wilcove et al. either considered the terms ‘alien species’ and ‘invasive aliens’ synonymous or they were comfortable drawing different conclusions for different audiences. The lexicon of biological invasion has long been criticised from within and without for its imprecision and militaristic, metaphorical constitution.<sup>71</sup> In an attempt to control the damage, some authors have parsed the terms *alien* (= non-native = introduced = non-indigenous) and *invasive* such that the latter should be considered a small subset of the former.<sup>72</sup> In this regard, perhaps ‘Quantifying Threats’ tacitly exemplifies invasion biology’s early rush to claim a precious heritage: identification of their new post-Cold War alarmism with that of a Cold War Cassandra, the ‘father of animal ecology’, Oxford zoologist Charles S. Elton.

Elton was a proto-environmentalist and occasional populariser of population ecology who influenced better-known contemporaries, including Aldo Leopold and Rachel Carson. Even though Elton used and promoted the term ‘invasions’, his views on the matter of introduced species were considerably more complex and nuanced than those of the distant followers who claimed his legacy.<sup>73</sup> In his foreword to the otherwise facsimile 2001 reissue of Elton’s *The Ecology*

70 Wilcove et al., ‘Leading Threats’, 252.

71 See, for example, Banu Subramaniam, ‘The aliens have landed! Reflections on the rhetoric of biological invasions’, *Meridians: feminism, race, transnationalism* 2 (2001): 26–40; Robert I. Colautti and Hugh J. MacIsaac, ‘A neutral terminology to define “invasive” species’, *Diversity and Distributions* 10 (2004): 135–41; Brendon M. H. Larson, ‘The war of the roses: demilitarizing invasion biology’, *Frontiers in Ecology and the Environment* 3 (2005): 495–500; Jozef Keulartz and Cor van der Weele, ‘Framing and reframing in invasion biology’, *Configurations* 16 (2008): 93–115.

72 See, for example, Petr Pyšek, David M. Richardson, Marcel Rejmánek, Grady L. Webster, Mark Williamson, and Jan Kirschner, ‘Alien plants in checklists and floras: towards better communication between taxonomists and ecologists’, *Taxon* 53 (2004): 131–43.

73 Chew, *Ending with Elton*, 270–86.



of *Invasions by Animals and Plants*, Simberloff attempted to distance modern invasion biology from those nuances. As much as anything, Simberloff's purpose then and in later writings was not to praise Elton, but to bury him: to de-emphasise Elton's significance to the nascent discipline, and succeed him as its de facto leading light.<sup>74</sup>

Given the strong disclaimer's internal repudiation of the paper's basis, neither version of 'Quantifying Threats' recommends itself as a reliable foundation stone for a scientific subdiscipline. But uniquely among competing proposals such as Wilson's 'mindless horsemen', and Diamond's 'evil quartet', the 'second greatest threat' became firmly entrenched in both the popular and technical literature of 'biological invasions'.

Responding to an early abstract of the present paper, Wilcove wrote:

The primary reason we did the study was to see if, in fact, alien species emerged as a significant threat to biodiversity. Based on the data we obtained from The Nature Conservancy, the Network of Natural Heritage Programs and Conservation Data Centers, and the Fish and Wildlife Service, alien species emerged as the second most frequent threat to imperiled species (after habitat destruction). I do not know how E. O. Wilson's written statement about alien species may have influenced other scientists, but it did affect our analysis. Had the data shown otherwise, we would not have hesitated to disagree with him.<sup>75</sup>

Nevertheless, it seems unlikely that Wilcove's team ever contemplated the prospect of falsifying Wilson's assertion, and both the history of the paper's development and its methodology show that publicly disagreeing with Wilson was an unlikely outcome. Recall that TNC's *Precious Heritage*, like Wilcove's *The Condor's Shadow*, opened with a Wilson foreword.<sup>76</sup>

A 1999 reissue of *The Diversity of Life* included a new foreword of its own, in which Wilson again inflated his own 1992 claims by stating that '[e]xperts generally agree that on a worldwide basis the causes of extinction, which are virtually all due to human activity, can be ranked from the top down as follows: habitat destruction or degradation, the spread of exotic (nonnative) species, pollution, overharvesting and disease'.<sup>77</sup> He also rushed to endorse *Quantifying Threats* (making him one of the earliest to do so) and repeated its findings: 'The data that measure the factors endangering U.S. species, as compiled by David S. Wilcove and his co-workers in 1998 ... are habitat loss, 88 percent, exotics, 46 percent; pollution, 20 percent; overharvesting, 14 percent; and disease, 2 percent'.

74 Chew, *Ending with Elton*, 274; Simberloff (personal communication, 2008) concurred with my assessment.

75 David S. Wilcove, email to author, 20 September 2002.

76 As of June 2014, Edward O. Wilson has written forewords to at least forty books, mostly with explicitly environmentalist themes.

77 Edward O. Wilson, *The Diversity of Life* (New York: W. W. Norton, 1999), xvii.

Wilson neither repeated nor mentioned the procedural caveats of Wilcove et al. And neither Wilson nor his editors apparently fretted over the recursive logic of allowing a book to reify one of its own claims by citing a paper that reified *its* claims by citing an earlier printing of the book. Finally, and even more strangely, we have at last encountered Wilson making the statement, ‘experts generally agree ...’ which Wilcove et al. seemingly attributed to him before he made it. There are three likely explanations: (1) coincidence; (2) Wilcove et al. saw Wilson’s 1999 foreword before it was published; and (3) Wilson used the inflated statement of Wilcove et al. as a basis for inflating his own.

In 2002, I asked Wilson whether he felt Wilcove et al. had appropriately cited his work, given the differences between his statements in *The Diversity of Life* (1992) and the conceptually expanded paraphrase in the *BioScience* paper. His response: ‘Yes, I believe it fair to say that specialists are in agreement that habitat destruction is the primary extinction agent, followed by invasive species.’<sup>78</sup> It had been 10 years since the original publication of *The Diversity of Life*, three since its new foreword, and more than three since the *BioScience* article, and here was a third formulation. We have seen that ‘invasive species’ does not wholly correspond with ‘exotic’ or ‘alien’ species. Wilcove’s ‘scientists’ are not necessarily Wilson’s 2002 ‘specialists’ or his 1999 ‘experts’. Either the whole idea was very vague, its terminology very fluid, or both. And there was no certain way to tell whether Wilson felt it was more important to uphold the alleged consensus founded on his 1992 book than to reflect on it critically in the presence of a sceptical nobody.

The year 2002 also saw the advent of Wilson’s book, *The Future of Life*, this time with the straightforward trade publisher Alfred A. Knopf (by then a division of Random House). Unconstrained by any university association, Wilson could say whatever his specialist expertise moved him to. He did not mention Wilcove in the text or endnotes, but devoted part of a chapter to introduced species. Here, again, he attempted to represent something as a scientific consensus regarding

the forces that hammer nature everywhere in the world ... These factors are summarized by conservation biologists under the acronym HIPPO:

*Habitat destruction.* Hawaii’s forests, for example, have been three-fourths cleared, with the unavoidable decline and extinction of many species.

*Invasive species.* Ants, pigs, and other aliens displace the native Hawaiian species.

*Pollution.* Fresh water, marine coastal water, and the soil of the islands are contaminated, weakening and erasing more species.

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78 Edward O. Wilson, email to author, 10 February 2002.

*Population.* More people means more of all the other HIPPO effects.

*Overharvesting.* Some species, especially birds, were hunted to rarity and extinction during the early Polynesian occupation.<sup>79</sup>

A strained acronym for a poorly wrought taxonomy; but if conservation biologists had already summarised it thus, Wilson was merely the messenger. Alas, the acronym HIPPO appears to have originated (at least in print) in this context. Those who later used it and identified a source, invariably cited *The Future of Life*. Wilson apparently invented a term while vaguely attributing it as a common usage, invented a consensus, or both.

In 2004, Jessica Gurevitch and Dianna Padilla of Stony Brook University cited 'Quantifying Threats' as the major impetus for a paper with a question for a title: 'Are invasive species a major cause of extinction?' Unlike 'Quantifying Threats', the publishing journal chose to identify their effort as an opinion piece, but not for lack of data analysis. The New York pair noted the strong influence exerted on the results of Wilcove et al. by the inclusion of Hawaiian endemics and questioned the degree to which alien species had been blamed for their predicaments. They subdivided alien species contributions into functional types (for example, herbivory by livestock, competition from plants, alien pathogens, and parasites) and de-aggregated effects on plants and animals. Based further on information from the IUCN Red List, Gurevitch and Padilla concluded that 'the assumed importance of the invaders in causing widespread extinctions is to date unproven, and is based upon limited observation and inference. Evidence supporting a general and primary role for invasive aliens in extinctions remains limited'. They went on to caution that '[w]e must be as specific and as clear as possible about the nature of threats to species at risk ... The generalization that alien species are playing a widespread role in extinctions is, to date, too unspecific to be either accurate or useful'. And, unlike Wilcove et al., they admitted more work was needed to understand the relative impacts of alien species in different systems.<sup>80</sup>

Their cautionary assertions attracted a vigorous rejoinder in the form of a letter from two Spanish ichthyologists, published in early 2005. Miguel Clavero and Emili García-Berthou took issue with Gurevitch and Padilla's methods, accepting anecdotal inferences they claimed the Stony Brook pair had overlooked. Tellingly, though, the Spaniards concluded that '[a]lthough extinction is often the end result of invasions, there are other ecological and evolutionary impacts of biotic

<sup>79</sup> Edward O. Wilson, *The Future of Life* (New York: Alfred A. Knopf, 2002), 50.

<sup>80</sup> Jessica Gurevitch and Dianna K. Padilla, 'Are invasive species a major cause of extinctions?', *Trends in Ecology & Evolution* 19 (2004): 470–74.

homogenization that are less understood [citing two references] thus prevention and the precautionary principle are of particular relevance to invasive species'.<sup>81</sup> They did little more than to demarcate the boundary of acceptable thinking.

Later in 2005, Wilcove joined a colleague from Beijing to again quantify threats, this time to 437 species of Chinese vertebrates, and to compare them with the 1998 conclusions of Wilcove et al. regarding 'imperiled' American species. Publishing again in *BioScience*, they relied primarily on the *China Red Data Book of Endangered Animals*. Again, they essentially cautioned readers against relying on the results. They excluded 'potential or hypothetical threats' and 'did not try to distinguish between ongoing and historical threats because such information is often lacking, and the distinction itself is problematic in the case of habitat destruction'. They went on to detail 'five important assumptions ... attached to these data:'

First, although the Red Data Book and other sources used in this study represent an impressive compilation of information on threats to species, we do not know the extent to which they may be biased for or against particular threats. In other words, some of the many contributors to the Red Data Book may have focussed on particular threats to the exclusion of others. The same is true for the data underlying Wilcove and colleagues' (1998) analysis of threats to US vertebrates. Thus, our comparisons are based on the assumption that all threats had equal probabilities of being detected and recorded for each species and country. Second, in most cases there is little actual experimental evidence connecting a particular threat to a particular species. The determination that a given human activity is now or has been a threat to a species is typically the result of someone's professional judgment, rather than the result of a formal experiment. We assume that documented threats are accurate, and that any biases in the data are consistent across all vertebrate classes and between the two countries. Third, because the faunas of both countries are essentially allopatric, we assume that the threats to biodiversity in each nation are independent, notwithstanding obvious linkages through international commerce. Fourth, although individual species in each country may be listed under multiple threats (a reflection of the reality that many species are threatened by more than one factor), we considered the data independent because any species theoretically could fall into any of the individual categories or combination of categories. (It is possible, however, that imperiled species with broader ranges encounter more threats and therefore contribute disproportionately to our data.) Fifth, we assumed no interaction between threats, although in reality there probably are (e. g., between habitat destruction and the spread of alien species).<sup>82</sup>

81 Miguel Clavero and Emili García-Berthou, 'Invasive species are a leading cause of animal extinctions', *Trends in Ecology & Evolution* 20 (2005): 110.

82 Li Yiming and David S. Wilcove, 'Threats to vertebrate species in China and the United States', *BioScience* 55 (2005): 147–53.

Having thus (again) disclaimed any expectation of producing accurate or precise results, they proceeded with their analysis. This time 'alien species' ranked a distant fourth of five putative threats, affecting only three per cent of the taxa reviewed. They called the contrast between the American and Chinese situations 'striking' in relationship to two types of threats, one of which ('alien species') was 'harder to explain'. After paying lip-service to the possibility that there might be actual differences (but ignoring the possibility that the American results might have been skewed), they offered their preferred explanation: 'it may simply be an artifact of neglect: Chinese ecologists have not focussed on alien species as a threat to biodiversity until relatively recently'. They followed that observation with supporting citations and comments that apparently had not been eligible for evaluating their data, pre-analysis. And evidently the disparity appeared too significant to explain away, leading them to conclude there were significant differences between the situations in the two countries.<sup>83</sup> To his credit, Wilcove (unlike Wilson) did not attempt to universalise his geographically constrained conclusions, but the awkward shifting of blame for differing results on a perceived naïveté among Chinese scientists raised a spectre of Western academic condescension that even his Chinese colleague's placement as lead author could not diminish.

A little less than two years later another quantification of threats was undertaken, this time in Canada, by five Canadians whose results (published yet again in *BioScience*) diverged substantially from those of *Quantifying Threats*. Like Gurevitch and Padilla (but independently, it seems), they noted the extent to which the results of Wilcove et al. were influenced by the heavy representation of Hawaiian endemics. The Canadian team found 'introduced species' to be 'the least common broadscale threat' in Canada. They also criticised Wilcove et al. for failing to consider threats from 'native species interactions' and 'natural disasters', each of which they found to be more significant than 'introduced species'.<sup>84</sup>

## 'Me, too!': Generations three and following

In the interest of saving time, graduate science students with heavy reading loads are commonly encouraged to skip the introductions (and even the conclusions) of peer-reviewed papers. As one online pundit explained: 'it's all regurgitation and conjecture'.<sup>85</sup> However, introductions have other functions. The ways authors

83 Yiming and Wilcove, 'Threats to vertebrate species'.

84 Oscar Venter, Nathalie N. Brodeur, Leah Nemiroff, Brenna Belland, Ivan J. Dolinsek, and James W. A. Grant, 'Threats to endangered species in Canada', *Bioscience* 56 (2006): 903–10.

85 Isaiah Hankel, '130 Things Surviving Graduate School Taught Me About Business Success' (2014), [www.isaiahhankel.com/graduate-school](http://www.isaiahhankel.com/graduate-school), accessed 5 June 2014.

introduce papers helps situate them in disciplinary contexts. It establishes their bona fides. In case the name of the field leaves room for doubt, the introductions of invasion biology papers are places for authors to bemoan the existence of their objects of study, which are to be resisted, not deemed objectively interesting. The Wilson/Wilcove declaration, 'invasive exotic species are the second greatest threat to biodiversity', justifies studying any particular case because it implies the result will be used to resist an invasion. By citing it, authors laconically declare themselves fellows of the alien deprecation league. Like the alien/native dichotomy itself, the 'second greatest threat' rapidly attained the status of a truism, a fact everyone (who was anyone) simply understood to be the case.

As such, the nearly 1,200 citations recorded by the Web of Science (June 2014) for 'Quantifying Threats' represent an indeterminate percentage of the number of times some form of the statement has appeared in peer-reviewed literature since 1998. It appears with considerably less frequency in the two specialist journals (*Biological Invasions* and *Diversity and Distributions*, where it might be considered somewhat redundant to make such declarations) than in general ecology- and conservation-related titles.

In his 2009 Oxford University Press book *Invasion Biology*, Macalester College ecologist Mark Davis devoted about two pages to critiquing 'Quantifying Threats' and its credulous reception. Citing Gurevitch and Padilla's concerns and the Canadian results of Venter et al., Davis framed the effort of Wilcove et al. as a case of too much, too soon, and too good to be true, beginning: 'In any discipline, it is important that preliminary ideas or tentative conclusions made on the basis of one or a few studies do not acquire a life of their own, eventually assuming a level of validity and generality that is unjustified on the basis of the actual data'.<sup>86</sup> How often this has actually happened in other disciplines is a moot point Davis did not pursue. His analysis, too, reproduced the full 'disclaimer' from 'Quantifying Threats' and drew a strong conclusion: '[i]t is difficult to believe that all those who have cited this article actually have read it'.

Lax citation practices are a well-known rattling skeleton in academe's closet. Categorising and quantifying their occurrence to determine whether ecologists, conservation biologists, or invasion biologists are any more predisposed to citing unread sources based on their reputed content than practitioners in any other discipline would be a monumental undertaking. But the flexibility with which the claim of Wilcove et al. has been deployed is impressive. There are so many extant permutations that it is impractical, even electronically, to inventory them. Many paraphrasers fail to acknowledge that the finding was limited to the United States. Few ever note that it was strongly skewed by the inclusion

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86 Davis, *Invasion Biology*, 181–83.

of Hawaiian cases, and virtually none that it was grounded in anecdotal data. They have often generalised it vaguely or globally (as might be suggested by the article's teaser), but even then the full title and its implications usually appeared among their references. Some attached a geographical or taxonomic scope relevant to their own work.

I reviewed the first 25 relevant results of a 17 June 2014 Google Scholar search for peer-reviewed papers published in 2014 that cited 'Quantifying Threats' regarding the effects of introduced species to determine how current authors were using and contextualising the 'second greatest threat' statement. Firstly, its ubiquity in the literature was confirmed by the fact that these 25 appeared in 23 different journals and one MSc thesis, and were produced by authors from at least 14 countries. Twenty-three listed it in their introductions among litanies of putatively established facts. Only two accurately confined the scope of 'Quantifying Threats' to the United States. Six explicitly expanded it to a 'global' or 'worldwide' finding. Twelve paraphrased it in such vague terms as to represent it as a universal truism. Five suggested it specifically applied to their own areas of interest: 'agricultural landscapes', 'plants', 'local biodiversity', 'coastal ecosystems', and 'indigenous species'. The last, in full: 'Exotic species are considered the second most insidious cause of biodiversity loss and population decline of indigenous species.'<sup>87</sup>

## Experts, ecologists, environmentalists

During a 2004 television interview, University of California linguist George Lakoff was commenting on the rhetoric of the ongoing US Presidential campaign. He observed that one party was actively dismissing the science of environmental issues and appealing instead to common sense. In the process, Lakoff conflated three identities: '[w]ho are the *experts*? They're *ecologists*, *environmentalists*' [emphasis added].<sup>88</sup> Lakoff's assertion seemed common-sensical in its own way, perhaps because the distinction between being an environmentalist and being an ecologist is vague, even to those who claim such identities.

87 Kamal J. K. Gandhi, Annemarie Smith, Diane M. Hartzler, and Daniel A. Herms, 'Indirect Effects of Emerald Ash Borer-Induced Ash Mortality and Canopy Gap Formation on Epigeic Beetles', *Environmental Entomology* 43 (2014): 546–55.

88 David Brancaccio and George Lakoff, 'Talking About Talk', *NOW With Bill Moyers* (New York, Thirteen/WNET for PBS, first broadcast 23 July 2004). An active environmentalist himself, George Lakoff consults for the Sierra Club and 'dozens of environmental organizations'; cf. Katy Butler, 'Winning Words', *Sierra* (July–August 2004) [www.sierraclub.org/sierra/200407/words.asp](http://www.sierraclub.org/sierra/200407/words.asp).



A 1976 college biology textbook stated: ‘most ecologists are environmentalists, because of the nature of their training and interests. The reverse is not necessarily true, however; not all environmentalists are ecologists’.<sup>89</sup> Twenty years later, another biologist concluded, ‘many undergraduates enrol for introductory ecology classes in the expectation that ecology will offer enlightenment as well as factual knowledge—an enlightenment with moral and spiritual dimensions’, and wondered, ‘how should we cope with the divergence between the academic’s definition of ecology as a branch of disinterested science, and the general public’s understanding of ecology as a life philosophy or quasi-religion that connect[s] interpretations of how ecosystems function to moral imperatives and spiritual significance?’<sup>90</sup>

These are indicative, not isolated comments. Since the founding of the first ecological societies a century ago, ecologists have concerned themselves with nature conservation. The Ecological Society of America’s 1926 ‘Naturalist’s Guide to the Americas’ was compiled by its ‘Committee for the Preservation of Natural Conditions’ because, it claimed, the society’s ‘membership includes a larger proportion of persons interested in the preservation of natural conditions for research in pure science and for educational work than any other of our national scientific societies’.<sup>91</sup> Despite that declaration of objective purpose, the body of the book opened with an outline of ‘The Value of Natural Areas to Literature and Art’, followed by ‘The Value of Natural Preserves to the Landscape Architect’. Spiritual matters are addressed obliquely in a quotation from a Harvard University emeritus president: ‘Something more than economic remedies must be found for the great evils which beset modern society, and particularly for the diseases, physical and moral, which are caused by congestion of population’.<sup>92</sup> It seems ecologists have been concerned about threats of one kind or another since ecology began, and at least some have taken their ecological knowledge to authorise their opinions.

Many arguments have been deployed to justify seeing the ecological sciences as sources of deeper truths. Other arguments are devoted to exposing expert eco-piety as naïve disregard of Realpolitik or fraudulent self-serving. All those can hardly be summarised here. Looking at the advent of the ‘second greatest threat’, the most charitable possible conclusion is that Edward O. Wilson and (subsequently) David Wilcove et al. sincerely believed what they wrote and submitted it for publication assuming there was no time to be lost in making

89 William C. Scheffler, *Biology: Principles and Issues* (Reading, MA: Addison-Wesley, 1976), 266.

90 Mark Westoby, ‘What Does “Ecology” Mean?’ *Trends in Ecology and Evolution* 12 (1997): 166.

91 Victor E. Shelford, ‘Chairman’s Preface’, in *Naturalist’s Guide to the Americas* (Baltimore, MD: Williams & Wilkins, 1926), v–vii.

92 Charles W. Eliot, quoted by Stanley White, ‘The Value of Natural Preserves to the Landscape Architect’, in *Naturalist’s Guide to the Americas*, ed. Shelford, 8–9.



such vital information available. They certainly could have done that in ways that more clearly and appropriately emphasised the contingency of their source materials and their methods. However, there seems to be little reason to doubt that Wilson was serving his own purposes as much as any other. Perhaps he too readily accepted his own opinion as inevitably consonant with objective reality. His justification for ignoring not only norms of scientific practice but also the simplest rules of logic are hard to fathom. He is by any measure a celebrity, which may be the key point. The world occupied by celebrity scientists has a peculiar characteristic. Having achieved (or assumed) a state of peerlessness, a celebrity scientist is no longer subject to peer review. But having abandoned peer review, he is no longer speaking as a scientist.

'Quantifying Threats' (reduced to its primary, oft-repeated, and strangely elastic central claim) became a celebrity itself, identified by *BioScience* as its most-cited article (as of 1 August 2014).<sup>93</sup> In this light, Mark Davis' assessment that few of those who cite the paper can actually have read it takes on gloomy new significance. Nevertheless, its reification by repeated reference, abetted by Wilson's endorsement, quickly (and persistently) made citing it a catechistic imperative for invasion biologists, whether supplicant tyros or established true believers. Meanwhile its authors, especially the four routinely subsumed under the shorthand 'et al.', did not share in their brainchild's celebrity.<sup>94</sup> In 2008, lead author Wilcove published a second book, *No way home: the decline of the world's great animal migrations*, perhaps an ironic coda to his disparagement of the new class of great migrations as the 'second greatest threat' to biodiversity.<sup>95</sup>

In 2011, two more Canadian authors 'surveyed reviewers of the journal *Biological Invasions* to obtain a better sense of how invasion biologists evaluate several foundational issues'. One of those issues was the credibility of the 'second greatest threat'. They found that 'only 27.3 per cent of respondents [115 of 422] ranked invasive species as the first or second greatest threat to biodiversity'. The corresponding author of that paper, Brendon Larson, has been a leading observer and sometime critic of invasion biology for the past decade, publishing numerous thoughtful articles on the field's affinity with hyperbolic advocacy and reliance on militaristic constitutive metaphors. His willingness to discuss ranking threats to biodiversity suggests he still operates largely within the framing pioneered by Wilson in 1992. Despite Wilson's foundational role in

93 Anonymous, 'Most-Cited Articles', *BioScience*, [bioscience.oxfordjournals.org/reports/most-cited](http://bioscience.oxfordjournals.org/reports/most-cited), accessed 3 September 2014.

94 As of the time of writing, David S. Rothstein is an attorney for the US Fish and Wildlife Service; Jason Dubow is Director of Environmental Planning for the State of Maryland; Ali Phillips could not be positively identified online; Elizabeth Losos is President and CEO of the Organization for Tropical Studies.

95 (Washington, D.C.: Island Press, 2008).

setting the terms of the issues Larson and his colleague were examining, they never mentioned him. That as much as anything suggests Wilson's framing has succeeded to paradigmatic status.

Over the years I have talked to many life scientists who found 'Quantifying Threats' wanting in some respects, but who chose not to openly challenge it. I did not collect their stories and can offer only general impressions. Some suggested no one really took the paper seriously, so it did not require serious attention from serious minds engaged in serious science. That seems either naïve or disingenuous. A few felt that openly criticising 'Quantifying Threats' could jeopardise their careers or standing in conservation biology circles. Hesitancy and rationalisation may be the rule, but there are exceptions; two have already been noted (Davis; Gurevitch and Padilla). Invasion biology's relentless proselytising in the news and popular media spawned responses there as well. Two in particular are relevant here: science writer Emma Marris' personal manifesto, *Rambunctious Garden: saving nature in a post-wild world*, and British plant ecologist Ken Thompson's wide-ranging rebuttal of invasion biology's more hyperbolic (perhaps egregious) assertions, *Where do Camels Belong?: the story and science of invasive species*. Marris merely acknowledged the existence of 'Quantifying Threats' and its famous finding.<sup>96</sup> She went on to say, 'Biodiversity may be the most problematic goal precisely because it embraces so much: several levels of biological organization, from genes to whole landscapes. Nevertheless, it may come closest to capturing what people like about nature'.<sup>97</sup> Marris kept one foot inside the Wilsonian paradigm, even if only for lack of a clear alternative. Thompson took another tack, calling the 'second greatest threat' 'a straightforward lie'.<sup>98</sup> But he also invoked biodiversity with less hesitation than Marris. This brings us back to the problem of deciding who (if anyone) the liars were and whether their lies (if any) were straightforward.

Ecology is hardly monolithic, and it has been noted that 'ways in which ecological scientists interrelate their own beliefs about environmental advocacy, values, and scientific integrity is an extremely complex issue'.<sup>99</sup> Operating in a consistent, principled manner at the intersection of ecology and environmental advocacy (or its precursors) has never been simple. During the 1970s early proponents of science studies were already observing its hazards. Sociologist Dorothy Nelkin tracked American ecologists' excitement at suddenly feeling relevant as popular environmentalism coalesced, to being 'overwhelmed' by relevance, to being

96 Emma Marris, *Rambunctious Garden* (New York: Bloomsbury USA, 2011), 103.

97 Marris, *Rambunctious Garden*, 163.

98 Thompson, *Where do Camels Belong?*, 47–48.

99 Derek S. Reiners, William A. Reiners, and Jeffrey A. Lockwood, "The relationship between environmental advocacy, values, and science: a survey of ecological scientists' attitudes," *Ecological Applications* 23 (2013):1226–42.

disillusioned by actual policy outcomes and the (commercial) professionalisation and exploitation of a once primarily academic discipline, all in the space of a single decade. Nelkin noted, 'the tendency to adjust one's research to "useful" directions may follow less from intellectual conviction than from professional opportunity'. She concluded with still relevant questions: '[a]s scientists become increasingly involved in public policy problems, does this inevitably encourage greater outside direction of scientific work? And if scientists avoid such involvement, can they reduce interference [in] the working of their disciplines? The ecologists' dilemma suggests that outside relationships and controls will develop willy-nilly whenever the work of scientists is perceived to be relevant to public problems'.<sup>100</sup> A decade later, concerning the relationship of science to press coverage, she wrote, 'Often errors derive less from inaccurate reproduction of details than from the inevitable distortions that occur in translating complex technical terms into lay English'.<sup>101</sup> She meant errors propagated by reporters, perhaps never anticipating the trajectory of 'biodiversity', an object of reverent qualitative advocacy that was to be insinuated into scientific discourse as if it were actually an object of quantitative analysis.

In a posthumously published essay, Nelkin did have something salient to say about Wilson, albeit in the context of Wilson's 1989 book, *Consilience*, and it was not exactly complimentary:

Harvard University entomologist Edward O. Wilson (1989), a founder and advocate of sociobiology and evolutionary psychology, has explicitly equated science and religion: 'Perhaps science is a continuation on new and better tested ground to attain the same end [as religion]. If so, then, in that sense science is religion liberated and writ large' ... Science, he claims, 'offers the boldest metaphysics of the age ... there is a general explanation of the human condition proceeding from the deep history of genetic evolution.' Without directly relying on the notion of a God, he and other evolutionary psychologists use a language replete with theological metaphors that convey concepts of immortality and essentialism. And they invest their theories with ethical implications and moral obligations.<sup>102</sup>

Nelkin went on to conclude:

The God talk, the cosmic claims, the organizations for dialogue and reconciliation are all ways to minimize the distance between science and religion, to answer

100 Dorothy Nelkin, 'Scientists and Professional Responsibility: The Experience of American Ecologists', *Social Studies of Science* 7 (1977): 75–95.

101 Dorothy Nelkin, *Selling Science: How the press covers science and technology* (New York: W. H. Freeman, 1987), 126.

102 Dorothy Nelkin, 'God Talk: Confusion between Science and Religion', *Science, Technology & Human Values* 29: 2 (2004): 139–52; 148.

the accusations of critics, and to compete for credibility in the public domain. By drawing on powerful images of Christianity, scientists are seeking to attract converts—to convince the public and many skeptics of the power of their ideas.<sup>103</sup>

Whether or not she intended ‘God Talk’ to appear posthumously, it was the kind of dangerous confrontational piece many others have reserved for their final words on fraught topics. Nelkin saw Wilson’s exertions as an attempt to become very important indeed by moving beyond science to prophecy, where neither methods nor peers constrained him.

His appropriation of St. John’s apocalyptic four horsemen reveals the clarity of Nelkin’s insight. The second greatest threat was not a demonstrable fact of the world awaiting scientific discovery. It was the sum of specific fears selected, calculated, cultivated and wholesaled by Edward O. Wilson in a work published by Harvard University Press, retailed by David Wilcove et al. in *BioScience*, then ‘virally’ distributed and adopted as the password of invasion biology through misreading and misleading citation. Biodiversity was conceived as a threatened quality. Opinion polls of true believers regarding those threats, compiled by their prophets, cast light on some of conservation biology’s apocalyptic concerns. They have catechistical, boundary-marking applications for practitioners of that ‘crisis discipline’ and offer a *raison d’être* verging on gnosis for invasion biologists. As points of departure for ecological science, they offer neither destination nor means of conveyance. If it is valuable (or indeed, possible) to truly quantify threats to biodiversity, clearer objectives and more principled methods are needed.

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103 Nelkin, ‘God Talk’: 150.

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# ENVIRONMENTAL DISTURBANCE TRIGGERING INFESTATIONS OF GORSE, RABBITS, AND THISTLES IN SOUTHERN NEW ZEALAND: 1850 TO 1980

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## Abstract

In the first four decades of organised European settlement in southern New Zealand, gorse was planted in straight lines on farms and stations for hedges and shelter, rabbits were released at localities around the coast and in the interior for recreation and the pot, and thistle seeds were inadvertently carried to properties as pollutants in sacks of imported grass seed and the fleeces of sheep. Within a decade of becoming established on a property, each became a nuisance. Entries in farm and station letter books and diaries, ledgers and cash books, the minute books of local and national government agencies, and reports to parliament enabled us to characterise the dispersal routes and refuges of rabbits in the former tussock grass and low shrub country of southern New Zealand, and to investigate the nature, cost and effectiveness of control measures employed by land holders, local bodies and the state. We suggest that ecological theory, with its emphasis on interactions and interconnections between living things and their environments, can deepen our understanding of the spread, establishment, and dominance of these three introduced organisms after episodes of environmental disturbance, natural as well as artificial, have created opportunities for them to thrive.

**Keywords:** environmental disturbance, gorse, rabbits, thistles, ecological opportunities, habitats of disturbance, refuge areas, pest control and eradication, farms as ecological systems, ecological succession.

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## Introduction

Through their efforts to burn or uproot native plants, drain wetlands and plough the topsoil, did European settlers in southern New Zealand inadvertently trigger ecological processes that would facilitate the spontaneous spread, establishment, and dominance of introduced species such as gorse, thistles, and rabbits? Entries in European settlers' diaries and letter books, local and national government reports, and the records of land companies suggest that this was the case, and we have evaluated the evidence in the light of ecological theory.

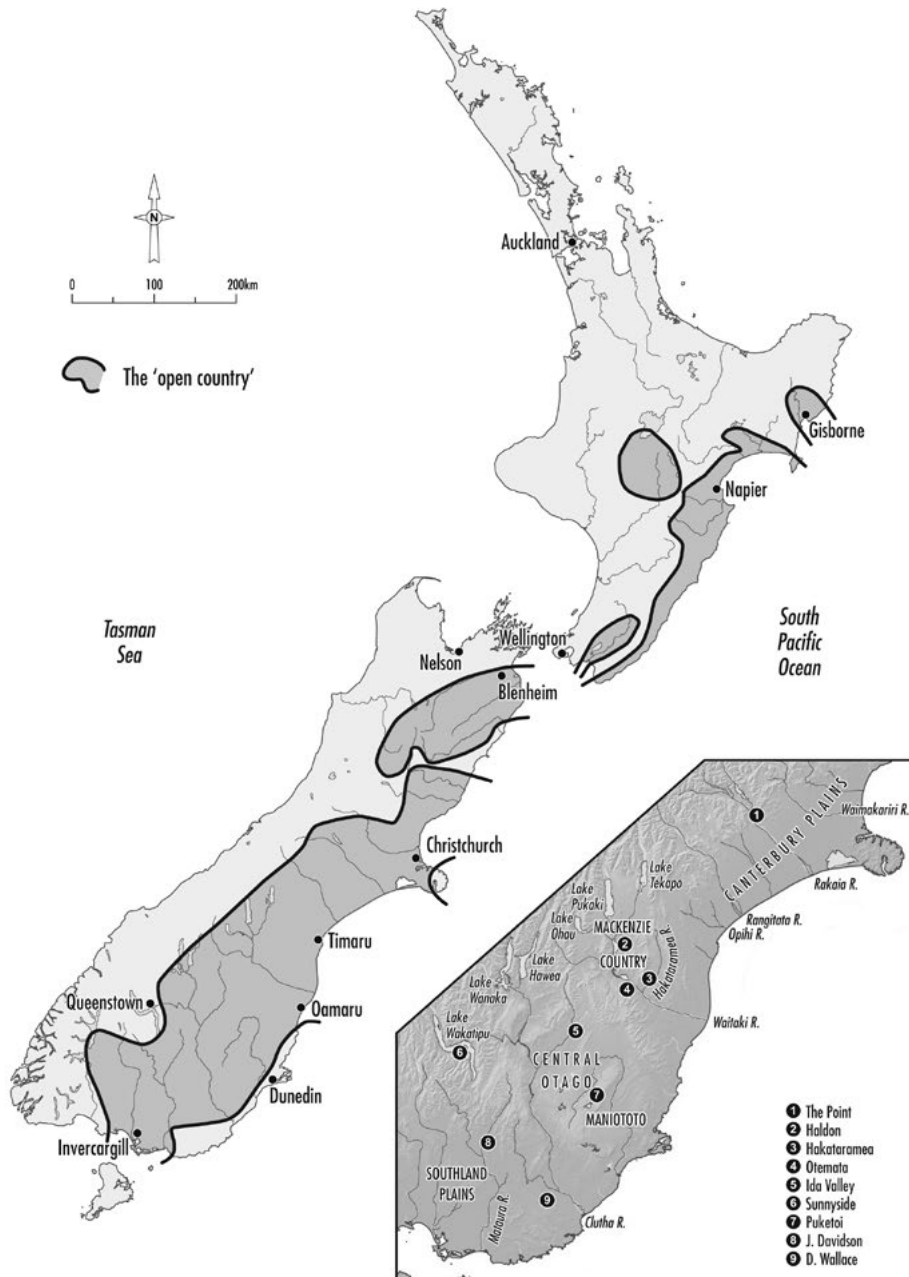
In southern New Zealand, extensive tussock grass and low shrublands with stands of trees in gullies and moist ground (hereafter termed 'the open country') (Map 1), were known to the indigenous Māori (*tangata whenua* or *iwi*), who had fostered the development and persistence of this vegetation type by burning. The open country was dotted with places where such valued resources as plant and animal foods, scents and dyes were collected, criss-crossed by paths, and filled with meaning for *iwi*, who passed on their knowledge of it to succeeding generations.<sup>3</sup> As organised European settlement got under way, surveyors mapped what they believed would be helpful to settlers: notably, coastlines, rivers and streams, water bodies and wetlands, well-used tracks, topographical features, and areas of wooded land.<sup>4</sup> With the progression of European settlement, the communal landscapes of *iwi* were erased and in their place geometrical mosaics of large and small properties, each occupied by a family and regulated by the laws of the day, were established. Surveyors laid out grids of roads and section boundaries, imposed straight lines and obtuse angles on the landscape, delimited reserves for roads and tracks, and stored the details in land registers<sup>5</sup> that recorded an individual's right to occupy a property. In essence these early surveys were forward-looking, and an expression of society's vision for the new land as well as how it would be occupied. Aside from Māori place names current in the 1840s and '50s, there were few mementoes on early maps of the prior landscape, *iwi* or their images of the land and, as George Griffiths has shown, several recorded Māori place names were spurious.<sup>6</sup>

3 M. J. Stevens, 'Ngāi Tahu and the 'nature' of Māori modernity', in Eric Pawson and Tom Brooking, *Making a New Land: Environmental Histories of New Zealand* (Dunedin: Otago University Press, 2013), 293–309.

4 Eric Pawson and Peter Holland, 'Lowland Canterbury landscapes in the making', *New Zealand Geographer* 61 (2005): 167–75.

5 G. Byrnes, 'Surveying spaces: constructing the colonial landscape', in B. Dalley and B. Labrum, *Fragments. New Zealand Social and Cultural History* (Auckland: Auckland University Press, 2000), 54–75; G. Byrnes, *Boundary Markers: Land Surveying and the Colonisation of New Zealand* (Wellington: Bridget Williams Books, 2001).

6 G. J. Griffiths, *The Spurious Māori Place Names of Southern New Zealand* (Dunedin: Otago Heritage Books, 2002).



Map 1: The open country of southern New Zealand, showing the principal rivers, lakes, place names, and pioneer properties mentioned in the text.

Source: Redrawn from vegetation maps in I. Wards (ed.), *New Zealand Atlas* (Wellington, Government Printer, 1976).



Compared with forested areas in the North Island, the open country of southern New Zealand was readily transformed into productive farms and sheep stations. Rural settlers based the economies of their properties on fine wool produced for the British market, and subsequent decisions about land use and landscape fell into place like checkers on a board. Several were to have significant environmental consequences for southern New Zealand, but few European settlers were alert to the ill effects in prospect. In his old age, Alexander Beange ruefully recalled his first year at Mimiha, five kilometres east of Wyndham in the Maitai valley, Southland, where he had pioneered a 500-acre block: 'The whole area was covered with tussock, and there was not a gorse bush or a rabbit to be seen ... in twelve years the settlers gradually brought the land under cultivation.'<sup>7</sup> Until the 1860s, as Beange and other European settlers discovered, the open country of southern New Zealand was the kingdom of grass, dominated by perennial native grasses and broad-leaved herbs, with occasional trees, shrubs, and bracken fern (*Pteridium esculentum*) in damp ground. Across the area, settlers found logs and tree stumps in moist places, remnants of fire several centuries before, which they used for pit props as well as for fuel, fence-posts and construction.<sup>8</sup>

Through newspapers and magazines, settlers had access to practical advice as well as commercial sources of the materials and tools they needed to transform their lowland properties into productive pastures and crop-land. The first generation believed that environmental transformation would catalyse economic improvement and result in more palatable herbage for sheep and cattle, fewer places where livestock would come to harm, and more efficient management. In this regard, we follow James Beattie and John Stenhouse in asking if the first generation of European settlers also recognised their parallel roles of stewards and transformers of the environment, and if these ideals were put into practice.<sup>9</sup>

Within a few years of settlement, the boundaries of a farm or lowland station had been wholly or partly delineated with hedges and fences to keep the family's livestock in and their neighbours' animals out. A property was split into blocks for the homestead and out-buildings, fields for crops, paddocks for sown pasture, and larger areas for extensive grazing, each bounded by hedges or fences. Land holders gave informal names to individual fields and paddocks to facilitate management, found that groves of cabbage trees (*Cordyline australis*) indicated damp ground, and learned to avoid tracts of soil too thin or stony to cultivate. The surveyor, Frederick Tuckett, as well as other early residents

7 *Southland Times*, 26 January 1949.

8 M. S. McGlone and J. M. Wilmshurst, 'Dating initial Maori environmental impact in New Zealand', *Quaternary International* 59 (1999): 5–16; B. P. J. Molloy, C. J. Burrows, J. E. Cox, J. A. Johnston, and P. Wardle, 'Distribution of sub-fossil forest remains, eastern South Island, New Zealand', *New Zealand Journal of Botany* 1 (1963): 68–77.

9 James Beattie and John Stenhouse, 'Empire, Environment and Religion: God and Nature in nineteenth-century New Zealand', *Environment and History* 13 (2007): 413–46.



wrote informative accounts for the guidance of intending settlers<sup>10</sup> about the environmental diversity of southern New Zealand but, as Vaughan Wood has shown, not all early settlers were deluded by the 'biometric fallacy' that associated substantial biomass and rapid crop growth in newly cleared land as evidence for a nutrient-rich soil suited to agriculture in the long term.<sup>11</sup>

Gorse, rabbits, and thistles reached New Zealand from south-eastern Australia and the British Isles in the mid-nineteenth century. These three species have intertwined histories and exemplify the problems caused by many other introduced plant and animal species that became naturalised in New Zealand. This article is primarily concerned with the experiences of the first three generations of European settlers in the lowlands of southern New Zealand. At first, they held out high hopes for the first two species, but all three became serious nuisances. We suggest that the history, impact, and control of pest animals and noxious weeds are aspects of an ecological system that are usefully investigated holistically. We also show how ecological factors and forces relating to these undesirable newcomers were modulated by the social structures, environmental perceptions, and beliefs of settler society.

European settlers undertook widespread landscape change, normally with backing from private capital, and we ask (a) if individual human agency, being the actions of autonomous individuals who believe that change is possible,<sup>12</sup> predominated in the early years of organised settlement, and (b) if collective human agency, which is 'expressed in the cultural, infrastructural and communications resources that enable collective action',<sup>13</sup> became necessary later.

The agency of the non-human world was central to the difficulties faced by land holders in this period. The world of the rural settler was co-constituted by a wide range of human and non-human actors working upon each other to create networks and relationships that would shape a new and varied set of cultural and physical landscapes. On a settler's property, large flocks of sheep (Photo 1) and small herds of cattle were raised for meat and fibre, while bullocks and

10 Peter Holland, Kevin O'Connor, and Alexander Wearing, 'Remaking the grasslands of the open country', in *Environmental Histories of New Zealand*, ed. Eric Pawson and Tom Brooking (Melbourne: Oxford University Press, 2002), 69–83 & 302–304.

11 Vaughan Wood, 'Appraising soil fertility in early colonial New Zealand: the 'biometric fallacy' and beyond', *Environment and History* 9 (2003): 393–405.

12 D. J. Davidson, 'The applicability of the concept of resilience to social systems: some sources of optimism and nagging doubts', *Society and Natural Resources* 23 (2010): 1135–49.

13 H. Lorimer, 'Human–Non-human', in P. Cloke, P. Crang, and M. Goodwin, *Introducing Human Geographies* (London: Hodder Arnold, 2005), 37–51; S. Whatmore, 'Dissecting the autonomous self: hybrid cartographies for a relationship ethics', *Environment and Planning D: Society and Space* 25 (1977): 37–53; R. Yarwood and N. Evans, 'Taking stock of farm animals and rurality', in C. Philo and C. Wilbert, *Animal Geographies of Human–Animal Relations* (London: Routledge, 2000), 98–114.

horses were kept for transport and power, and dogs were valued as working animals. Over time, different relationships developed between the human and the non-human worlds through the medium of introduced plants and animals, and the new land was perceived by settlers as a blank canvas on which newcomers—people, plants and animals—would soon dominate. Relationships and processes that linked the human and non-human worlds were modified by social, economic, ecological, and technological changes, and the economy of a farm or station was both sustained and constrained by introduced plants and animals. This dynamic fostered new relationships between people and nature, as land holders learned to deal with environmental problems thrown up by the biophysical processes of native and introduced species, and as plants and animals exploited the ecological opportunities created by settlers.<sup>14</sup>

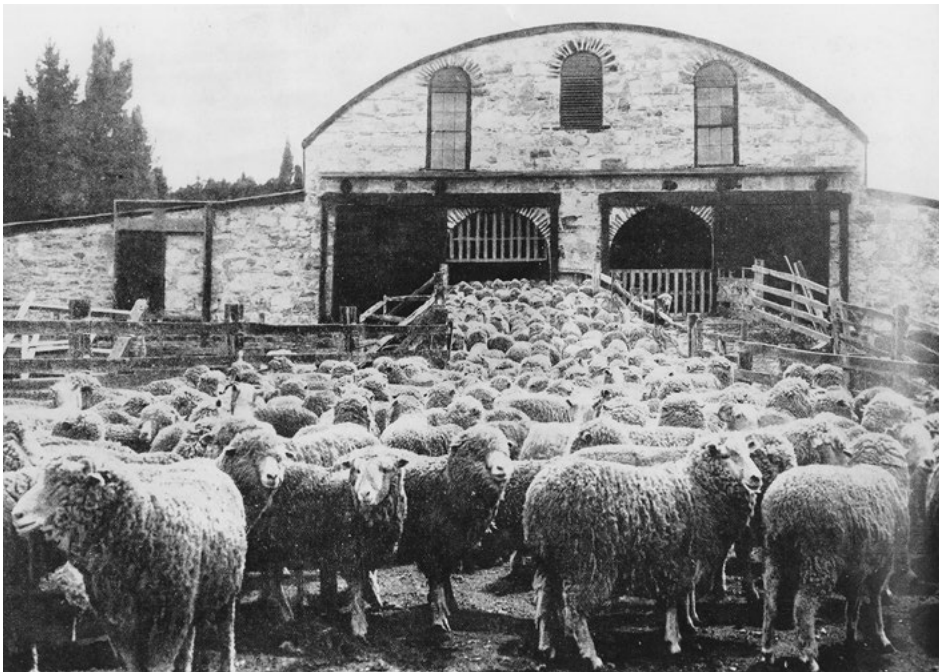


Photo 1: Sheep recently mustered from the hill country and held in the yards waiting to be shorn, Teviot Station, Central Otago, *Otago Witness*, 10 February 1904, 38.

Source: Hocken Collections, Uare Taoka o Hākena, University of Otago, c/nE5259/20A.

14 O. Jones, 'Non-human rural studies', in P. Cloke, T. Marsden and P. Mooney, *Handbook of Rural Studies* (London: Sage, 2006), 185–202; O. Jones and P. Cloke, 'Non-human agencies: trees in place and time', in C. Knappett and L. Malafouris, *Material Agency: Towards a Non-anthropocentric Approach* (New York: Springer, 2008), 79–96.

An element of ecological theory, the succession model as applied by the French-Canadian plant ecologist, Pierre Dansereau, underpinned our approach and methods.<sup>15</sup> The core notions of plant succession are rooted in research undertaken in the United States in the late nineteenth and early twentieth centuries, particularly the studies of Henry Cowles on sand dunes flanking Lake Michigan, the proposals of H. C. Gleason a decade later about the end-point of a succession, and the investigations of Frederick Clements in the Oklahoma dustbowl.<sup>16</sup> Succession theory postulates an orderly sequence of steps in the establishment of mature vegetation cover on a newly exposed area of bare rock or mineral sediment. Initially, fast-growing and short-lived plants with seeds that germinate in full sun on bare ground, low biomass, high productivity, and broad niches will predominate.<sup>17</sup> This pioneer system allows larger, longer-lived and slower-growing plants to become established, and progressively gives way to structurally complex systems with smaller and more specialised niches as well as greater biodiversity. Since the 1980s, after several decades of probing debate, successional studies have reappeared in the ecological literature.<sup>18</sup>

Dansereau knew about the findings of research into the secondary successions<sup>19</sup> that develop after forest clearance, landslide, erosion, cultivation, or fire, including old field systems triggered by farm abandonment.<sup>20</sup> He viewed a productive farm as a managed ecological system occupying ground that had been wholly or partly bared by cultivation before being sown with commercial varieties of herbaceous and woody plants to ensure food for people and grazing for domesticated animals. Among his proposals was that an agro-system is home to short-lived plant and animal species selected for their high fecundity,

15 The French-Canadian plant biogeographer, ecologist, and environmentalist Pierre Dansereau was born in 1911 and received his initial university education in agricultural science. He became known in Canada and abroad for his research into the structure, composition, and dynamics of forest vegetation, which he taught in several North American universities. In 1972, after a decade as assistant director of the New York Botanical Garden, he returned to Montreal where he undertook and directed research in the burgeoning field of environmental studies from a base at the Université du Québec à Montréal. In later life, his prime concern was to show how ecological principles apply to the human environment, and a corner-stone of his approach was that a farm is a special type of ecological system. In 1988, Peter Holland attended a presentation in Montreal by Professor Dansereau about relations between agro-systems and ecology. The latter died in 2011, a few days short of his 100th birthday.

16 F. E. Clements, *Plant Succession and Indicators* (New York: H. W. Wilson, 1928); H. C. Cowles, 'The ecological relations of the vegetation of the sand dunes of Lake Michigan', *Botanical Gazette* (1899); H. C. Gleason, 'The causes of vegetation cycles', *Annals of the Association of American Geographers* 1 (1911): 3–20. D. Worster, *Nature's Economy: A History of Ecological Ideas*, 2nd ed. (New York: Cambridge University Press, 1994) is the classic reference work on the role of ecological thinking in environmental history.

17 C. Gibson and V. Brown, 'Plant succession: theory and applications', *Progress in Physical Geography* 9 (1985): 473–93.

18 J. P. Sullivan, P. Williams and S. Timmins, 'Secondary forest succession differs through naturalised gorse and native kanuka near Wellington and Nelson', *New Zealand Journal of Ecology* 31 (2007): 22–38.

19 F. B. Golley, *Ecological Succession* (Stroudsburg, PA: Halstead Press, 1977).

20 F. A. Bazzaz, 'Succession in abandoned fields in the Shawnee Hills, Southern Illinois', *Ecology* 49 (1968): 924–36.

palatability, and rapid growth, all of them demanding of water, nutrients, and other environmental resources. To Dansereau, the managed ecological systems of a farm or station are analogous to the early stages of a secondary succession, except that human agency has populated them with a small number of specially selected species, controlled irruptions of weedy plants and pest animals, limited predation, and supplemented local environmental resources.

We suggest that the notions of environmental and social resilience<sup>21</sup> are also informative: the former is a measure of the capacity of a mature ecosystem to recover to something approaching its prior state after damage wrought by animate and inanimate forces, while the latter reflects the capacity and ability of individuals to survive and make progress after an economic or environmental set-back. We argue that these qualities, in combination with the notions of human and non-human agency and the enlistment of ecological thinking, open a window onto the problems experienced by early farm and station holders with gorse, rabbits, and thistles during and after episodes of gross environmental disturbance in southern New Zealand.

Our primary sources were the records maintained by nineteenth-century European land holders in southern New Zealand, notably daily records kept by one or two residents of individual properties over periods of at least five years. In their diaries and letter books, land holders, and managers recorded the nature of work done on the property and by whom. Even though these requirements reduced the number of documentary sources available to us, we were able to locate seven runs of diaries or letter books that contained details of land transformation in the principal environments of the South Island open country: (a) the diaries of James Murison of Puketoi Station near Patearoa in the Maniototo; (b) the journal of the Phillips family, whose sheep station, The Point, lay on the north bank of the Rakaia River a short distance from Windwhistle in mid-Canterbury; (c) the diaries of Joseph Davidson, who farmed a 500-acre block on the outskirts of Waikaia in northern Southland; (d) the diaries of John Wither, who held leases on three adjoining blocks of mostly pastoral land across Lake Wakatipu from Queenstown; (e) the diaries of David Wallace, who farmed near Clinton in eastern Southland; (f) the diaries and personal papers of James Preston, who held leases on properties in the Maniototo, the upper Waitaki Valley, and the Mackenzie Country; and (g) the National Mortgage & Agency

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21 F. S. Chapin III, S. R. Carpenter, G. P. Kofinas, C. Folke, N. Abel, W. C. Clark, P. Olssen, D. M. Stafford Smith, B. Walker, O. R. Young, F. Berkes, R. Briggs, J. M. Grove, R. L. Naylor, E. Pinkerton, W. Steffen, and F. J. Swanson, 'Ecosystem stewardship: sustainability strategies for a rapidly changing planet', *Trends in Ecology and Evolution* 25 (2010): 241–49.

Company Ltd. (hereafter NMA) archive.<sup>22</sup> Other information came from land company records, local and national government publications, the minute books of road, rabbit, and pest destruction boards, and newspaper articles. The mixture of formal and informal, printed, and manuscript sources for a property enabled us to calculate the time expended in man-days per annum on (a) burning, draining, ploughing, and other forms of gross environmental disturbance, (b) clipping hedge plants, chipping volunteer growth, and burning the trimmings, (c) eradicating rabbits, and (d) chipping or uprooting thistles.

## Pioneer farms and stations as ecological systems

The prime challenge for a settler family was to establish sufficient grazing and arable land to ensure a satisfactory income, and this called for environmental transformation by spade and shovel, axe and saw, fire and plough. European settlers in the open country of southern New Zealand occupied an area that had been substantially transformed from a wooded landscape with the aid of fire set several centuries earlier by Polynesian hunters. In the 1840s and '50s the open country might still have been recovering from environmental disturbance, but European settlers encountered an apparently natural landscape occupied by a small number of herbaceous species, tall and short tussock grasses, low shrubs, and trees in moist ground sheltered from the drying north-west winds of spring and summer. Sown pastures or crop-land could lift average carrying capacity from less than one to between five and 10 sheep per acre, and this objective was achieved by burning and cultivation followed by sowing judicious mixtures of grass and herbaceous broad-leaf species imported from Australia, Western Europe, and North America (Photo 2). In the drive to meet their economic goals, settlers damaged or destroyed indigenous ecosystems that were well suited to prevailing environmental conditions, and replaced them with short-term habitats of disturbance created and regularly renewed by land holders. One early consequence was a reduction in biomass, but another two outcomes were a shift from tall to short tussock and loss of the palatable fine grasses and broad-leaf herbs that had occupied sheltered ground between tall tussocks.<sup>23</sup>

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22 Except for The Point Journal, a copy of which is in the Canterbury Museum and Archive, Christchurch, the key sources are held by the Hocken Collections, Uare Taoka o Hākena, University of Otago: Joseph Davidson's diaries (AG-523 and MS-3983); John Wither's diaries (89–149); David Wallace's diaries (MS-4031); James Murison's diaries (ARC-0359); James Preston's diaries, personal and financial papers (MS-1271 and MS-1272); the National Mortgage & Agency Co. archive (UN-028).

23 Holland, O'Connor and Wearing, 'Remaking the grasslands of the open country'.





Photo 2: Alexander Dewar with a single-furrow plough drawn by a team of four draught horses on the New Zealand & Australian Land Company's Totara Farm Estate, north Otago, c. 1910–15.

Source: Hocken Collections, Uare Taoka o Hākena, University of Otago, negE1649/41.

Whether partial or substantially complete, environmental transformation created ecological opportunities for introduced and native early successional species to become established and thrive, and settlers had to learn how to minimise any adverse effects. Settlers also modified, and in some places eradicated, prior environmental features by altering their character, dimensions, and placement, thereby setting the stage for further spontaneous changes. The outcome was a dynamic mosaic of old and new ecological subsystems, the fine structures of which comprised environmentally and ecologically distinctive places, lines, and surfaces, some of them entirely artificial, others showing few direct or indirect effects of people, and the remainder intermediate between those two states.

Throughout the south, settlers occasionally incorporated extant features in the new rural landscape: patches of remnant forest and shrubland in gullies, riparian vegetation alongside creeks and streams, tracts of tussock, areas of bracken fern and low shrubs, and large and small areas of wetland. Fields cleared for pasture, grain, and root crops, and delineated by rights-of-way, fences, hedges, stone and sod walls, or rows of trees (Photo 3) offered refuge, ecological opportunities, and pathways through the landscape for introduced as well as native plant and

animal species.<sup>24</sup> Widespread and repeated environmental disturbance was a distinguishing feature of the rural landscape. Fields of grain and potatoes were renewed annually, sown pastures often had to be replaced every three to five years, and all required persistent management.



Photo 3: Tree-planting in the Maniototo, Otago, c. 1904

Source: Hocken Collections, Uare Taoka o Hākena, University of Otago, E402/3/5.

The immediate benefits of environmental transformation were improved carrying capacity for sheep and cattle, and a greater income from sales of wool, tallow, skins, meat, grain, hay, and root crops. In the long term, however, the modes of environmental transformation practised by settlers gave rise to unanticipated environmental and economic costs: infestation by and rampant growth of weedy plants, more pest animals, reduced carrying capacity for livestock, smaller economic surpluses, loss of plant nutrients, and soil erosion. The pace of seasonal and inter-annual change in a farm or station system was also more rapid and of greater amplitude than in the ecological system it replaced.

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24 E. Pollard, N. W. Moore and M. D. Hooper, *Hedges* (London: Collins, 1974) is the classic account of research into the environment and ecology of hedgerows in the British Isles, and their significance as habitats and dispersal routes for plants and animals.

## A century of gorse, rabbits, and thistles in southern New Zealand

Gorse seed was commercially available in the second half of the nineteenth century,<sup>25</sup> rabbits were introduced repeatedly after the mid-1840s, and thistle seeds, like those of many other weeds of agricultural and pastoral land, reached the Colony and spread as pollutants in sacks of grass seed.<sup>26</sup> Thistles thrived in ploughed ground, quickly became established, and dispersed as their ripe seeds were carried off by the wind. In the first two decades of organised settlement, these newcomers did not raise particular issues for land holders,<sup>27</sup> and farm and station diaries, as well as settlers' letter books from that period, contain few references to them. This was soon to change.

### Gorse

Gorse had been sown for hedges in the provinces of Taranaki and Nelson in the 1850s, and in 1859, when the Furze Ordinance became law, it was a recognised nuisance in the former. Two years later, the Nelson Provincial Council passed a similar ordinance prohibiting the use of gorse for hedges in Nelson city and requiring land holders to clip existing gorse hedges.<sup>28</sup> Despite this, until the 1880s gorse remained the hedge plant of choice in eastern and southern districts of the South Island where there were limited supplies of native timber for fence-posts and rails, let alone for lumber and fuel. Supplies of imported gorse seed were advertised in newspapers and catalogues by merchants in towns and cities. Within a decade, gorse had become a common weed on land below 700 metres and was spreading into cultivated fields and environmentally disturbed tussock grass and shrubland, as well as occupying the banks and flood-worked gravel beds of lowland streams and rivers, from which it spread onto farm-land. Its seeds could remain viable in the top soil for two or three decades.

By the 1880s, land holders were discovering that the disadvantages of a gorse hedge outweighed its benefits, and the South Molyneux District Road Board informed a prospective tenant that he was not permitted to plant gorse on the property.<sup>29</sup> The Second Schedule of the Noxious Weeds Act (1900) listed gorse as a noxious weed, and the Noxious Weeds Act (1908) required 'Every occupier

25 Peter Holland, 'Plants and lowland South Canterbury landscapes', *New Zealand Geographer* 44 (1988): 50–60.

26 Herbert Guthrie-Smith, *Tutira: the Story of a New Zealand Sheep Station*, 3rd ed. (Edinburgh: Blackwood, 1953; 1st publ. 1921), 250.

27 A. W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (Cambridge: Cambridge University Press, 1986).

28 G. M. Thomson, *The Naturalisation of Animals and Plants in New Zealand* (Cambridge: Cambridge University Press, 1922).

29 Clutha County Clerk to A. J. Paterson, 12 June 1882, Hocken Collections, Uare Taoka o Hākena, University of Otago AG-253-007/001.



of land' on which there are 'hedges or live fences, consisting of noxious weeds ... being sweetbriar [*Rosa* sp.] or blackberry [*Rubus* sp.], and also gorse [*Ulex europaeus*], broom [*Cytisus scoparius*] or hakea [*Hakea* sp.] ... (wherever the same are declared to be noxious weeds...and not forming portion of a hedge or live fence) ... shall' either clear if in small patches or 'shall clear the same at the proper season of the year along the entire length of every boundary-fence or boundary-line, and on each side of every internal fence, water-race, or watercourse to the width of at least one-quarter of a chain each year until the whole is cleared.'<sup>30</sup> Assiduous land holders trimmed hedges after flowering to constrain seed production, and grubbed out self-sown broom and gorse.

## Rabbits

There have been numerous publications about the initial release, spread, and establishment of rabbits in New Zealand.<sup>31</sup> They include accounts of how land holders and government agencies later sought to develop and employ a suite of physical, policy, and legislative tools to control the pest.

In January and August 1858 W. K. Macdonald released European rabbits in the lower Orari River valley, south Canterbury, as well as on a nearby stretch of coastal sand dunes. The following year their progeny were sufficiently numerous for family members to shoot them for sport.<sup>32</sup> The Macdonalds were not the first and would not be the last settlers to do so. G. M. Thomson noted that while early introductions of rabbits in the eastern and southern South Island either failed or the animals did not spread, later introductions were more invasive.<sup>33</sup> Between the late 1840s and the mid-1870s, rabbits spread from where they had been released, typically following railway rights of way, road verges, and river valleys to occupy environmentally disturbed habitats in farm and station:

I think it is quite time something was done to have the rabbits destroyed in the Ahuriri [River, a tributary of the Waitaki River] on the islands between the ford and top of our run paddocks [where] they are swarming. They are also thick all over the Omarama flat ... The rabbits will take to the water when hard pressed. That is how they came to the mainland.<sup>34</sup>

30 'Noxious Weeds, 1908, No. 133', 440–447: [www.enzs.auckland.ac.nz/docs/1908/1908C133.pdf](http://www.enzs.auckland.ac.nz/docs/1908/1908C133.pdf).

31 Four notable examples are: J. Druett, *Exotic intruders: the introduction of plants and animals into New Zealand* (Auckland: Heinemann, 1983); J. A. Gibb and M. J. Williams, 'The rabbit in New Zealand', in *The European Rabbit: The History and Biology of a Successful Colonizer*, ed. H. V. Thompson and C. M. King (Oxford: Oxford University Press, 1994), 158–204; B. Reddiex and G. Norbury, 'European rabbit', in *The Handbook of New Zealand Mammals*, ed. C. M. King (Melbourne: Oxford University Press, 2005); K. A. Wodzicki, *Introduced Mammals of New Zealand: an Ecological and Economic Survey*, Bulletin No. 98 (Wellington: Department of Scientific and Industrial Research, 1950).

32 W. K. Macdonald's diary, Orari Station, original in private hands.

33 Thomson, *The Naturalisation of Animals and Plants*, 85–87.

34 Manager's letter book, Benmore Station, 23 July 1874, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-3766.

The leaseholder of a station on the shores of Lake Wakatipu recorded in his diary that rabbits had recently spread to the property and by January 1875 were 'becoming numerous'. On 27 February 1877, he reported killing 42 rabbits.<sup>35</sup> His neighbour, John Wither, had seen large numbers of feral rabbits in northern Southland, about 50 kilometres from his home, in September 1877 and found them on his own property a few months later.<sup>36</sup> On 12 January 1878 and again on 11 April, James Preston recorded that visitors to Haldon Station 'went after [that is, hunted] rabbits in the [Ahuriri] river bed'.<sup>37</sup> Three years later, the entire station was plagued by rabbits. The Scottish manager of Ida Valley Station in Central Otago wrote to the absentee leaseholder on 2 August 1882: 'this drought, together with the rabbits, has made the ground very bare'.<sup>38</sup> The following April, he noted a large increase in the number of rabbits, and a major decline in pasture growth, on the station, despite good growing conditions for introduced pasture grasses.

Although rabbits preferred sown pastures, they also ate the roots of tussock grasses, shrubs, and perennial herbs, and gnawed cabbage-tree trunks.<sup>39</sup> On 22 May 1889, W. C. Scrimgeour wrote to the General Manager of the NMA about rabbits on Lake Ohau Station on the flanks of the Southern Alps:

As yet, the rabbits have not injured the feed, although they have begun to dirty the ground in places ... [but] when the rabbits increase to such a point as will affect the autumn conditions of stock (and this is likely in such country) then the loss of sheep during winter will be phenomenal.<sup>40</sup>

He believed that this would happen within five years, and expressed concern lest rabbits spill over from the headwaters of the Waitaki River into the upper catchment of the Rangitata River. Much the same concern had been expressed by the writers of a report presented to parliament three years earlier.<sup>41</sup>

The economic and environmental impacts of rabbits were quickly recognised,<sup>42</sup> but how they reached plague densities in the drier country of the central South Island has been debated for decades. G. M. Thomson believed it unlikely that the sparsely vegetated landscapes of Central Otago were

35 Diary, Mt. Nicholas Station, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-0672.

36 John Wither's diary, Sunnyside Station, Hocken Collections, Uare Taoka o Hākena, University of Otago, 89–149.

37 James Preston's diary, Haldon Station, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-1271/074.

38 Manager's letter book, Ida Valley Station, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-0658.

39 *Appendices to the Journals of the House of Representatives* (hereafter *AJHR*), I-6, 1881.

40 NMA miscellaneous papers, Hocken Collections, Uare Taoka o Hākena, University of Otago, shelf 785D, parcel.

41 'Report of the Joint Committee on Rabbit and Sheep Acts', *AJHR*, I-4, 1886.

42 D. Petrie, 'Some effects of the rabbit pest', *New Zealand Journal of Science* 1 (1883): 412–14.

brought about by rabbits alone. Before their advent, the runholders who had possession of the arid region ... were doing their best to denude the surface of the ground by overstocking with sheep and frequent burning.<sup>43</sup>

The first rabbit 'plague' peaked in the 1890s. Leaseholders were responsible for eradicating rabbits, but the rabbiters employed under contract were suspected of destroying predators and merely culling the rabbits. Eradication of rabbits was initially the responsibility of individual land holders and organised at the local level.<sup>44</sup> In the ironic words of one land holder, 'If you want to breed rabbits, keep rabbiters'.<sup>45</sup> Except where successful steps had been taken to eradicate them, large populations of rabbits persisted on Crown and Māori land, and in the final two decades of the nineteenth century, *iwi* (tribes) were suspected of introducing rabbits to previously unaffected areas as a wild food source.<sup>46</sup>

The first Rabbit Nuisance Act became law in 1876, and under the Rabbit Nuisance Act (1881) New Zealand was divided into districts, each with an inspector charged with the eradication of rabbits. In their annual reports to parliament, inspectors declared their faith in 'natural predators'—primarily introduced cats, ferrets, stoats, and weasels—as a solution to the rabbit problem, and advocated 'stringent protection of the native weka [*Gallirallus australis*] as the best natural enemy to the rabbit we possess'.<sup>47</sup> When rabbit skins realised good prices on local and overseas markets, some land holders restricted rabbit extermination to the winter months when the skins were most valuable. Rabbiters also protected their livelihood:

The price paid for rabbits is so good that it is a very great inducement [for rabbiters] to preserve the rabbits throughout the summer when they are of little or no value, and great difficulty is often experienced in getting thorough poisoning done, all sorts of schemes being adopted to hoodwink the [rabbit] inspectors.<sup>48</sup>

A further source of annoyance for government officials was the inducement paid to land holders by the owners of rabbit canning factories (Photo 4) to cease laying poison and only trap animals in their seasonal prime.<sup>49</sup>

43 Thomson, *The Naturalisation of Animals and Plants*, 92.

44 Under the Rabbit Nuisance Act (1876), properties within a rabbit district were subject to inspection by government employees with power to levy fines and lay formal charges if the work was unsatisfactory. This system continued until the formation of the national-level Rabbit Destruction Council under the Rabbit Nuisance Act (1947) and the Rabbit Act (1956). Rates were levied on land holders in areas that were the responsibility of a rabbit board or, from 1967, an agricultural pest destruction board. These charges were to cover the costs of materials and staff wages. This system remained largely in place until 1989, when agricultural pest destruction boards were brought under the control of regional councils and the Rabbit and Land Management Programme (RLMP) was inaugurated. The RLMP ran from 1989 to 1995, and its activities concerned individual properties rather than broad geographical areas. Regional and district councils currently have oversight of the rabbit nuisance as well as powers of enforcement under the Biosecurity Act (1993). Responsibility for rabbit eradication, however, was returned to individual land holders.

45 *AJHR* I-5, 1888, 129.

46 *AJHR*, I-11, 1889.

47 *AJHR*, H-18, 1887.

48 *AJHR*, H-21, 1891.

49 *AJHR*, H-19, 1892.



Photo 4: Employees and the interior of a rabbit canning factory at Alexandra, Central Otago, 1917.

Source: Hocken Collections, Uare Taoka o Hākena, University of Otago, c/nE1472/5.

Trapping, shooting, and poisoning, like hunting with dogs and ferreting, reduced rabbit numbers in cultivated land and sown pastures, but the pest found refuge in tracts of partly transformed tussock grass and shrublands, along the banks and in the seasonally dry gravel beds of rivers and streams, as well as in the sod walls that the first-generation European settlers had erected to partition their properties. They also thrived under gorse and broom hedges, in the shelter of bracken fern and matagouri (*Discaria toumatou*), and in rampant growths of gorse and broom along roads and railway rights of way. By the early 1880s, a land holder's task had changed from the simple eradication of rabbits wherever they might be on the property to a more targeted strategy of reducing or clearing refuge areas, controlling access to palatable herbage, killing as many animals as was possible, and discouraging survivors from breeding. This involved labour-intensive work in the environmental patches, bands, and surfaces of a property and, as a superintending inspector reported to parliament, 'in shearing and harvest time the difficulty of obtaining hands, together with the rapidity with which the rabbit increases at this season, to a great extent nullifies the autumn and winter efforts'.<sup>50</sup>

<sup>50</sup> AJHR, H-2:2, 1884.

In Central Otago, periodic conjunctions of drought and large numbers of rabbits left the ground almost denuded of palatable shoots for sheep and cattle, allowing populations of rabbits to become re-established a few months after intensive shooting and poisoning had virtually eradicated them from a property. In his letter book, the manager of Ida Valley Station recorded in early December 1882 that rabbits were thriving in the depleted rangeland, browsing regenerating herbs and fine grasses before they could recover sufficiently to support the normal number of sheep, and ‘breeding at a fearful rate’ after several months of drought.<sup>51</sup> The writer also suspected that intensive poisoning of rabbits had lifted the normal winter death rate among his sheep by half a point to 3.1 per cent.<sup>52</sup> The situation had improved by 1886, but he feared a resurgence in rabbit numbers after two years of intensive poisoning because the depleted vegetation cover had not had sufficient time to recover.<sup>53</sup>

In the 1890s, frequent episodes of stormy weather and intervening mild spells took place alongside economic depression, leading to fluctuating numbers of rabbits on back-country properties. Mild, moist winters, in contrast, ensured good pasture growth for sheep, but unfavourable conditions for young rabbits, which usually did better in cool, dry winters when snow and severe frost did not mask herbage and cause starvation.<sup>54</sup>

How did settlers attempt to control rabbit numbers? A former naval man, Captain J. W. Raymond of Southland, claimed to have been the first to dress oats with phosphorus for poisoning rabbits.<sup>55</sup> Phosphorus was sold in sealed cans, usually containing six pounds of the substance, by rural supply companies. Another two poisons, arsenic and strychnine, were available from pharmacies and land companies. In the late nineteenth century, when phosphorised pollard was preferred, farmers could buy it ready-mixed, although rural people were still mixing their own supplies in the first decade of the twentieth century.<sup>56</sup> Land holders in areas infested by rabbits found it an unpredictable poison. In some seasons it was freely taken by rabbits, but at other times and in different habitats the animals would not touch it. In 1896, the manager of Ida Valley Station recorded in his letter book that he was ‘not at all satisfied with the results of poisoning—plenty of poison laid but great numbers of rabbits

51 Manager’s letter book, Ida Valley Station, 1 December 1882, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-0658.

52 Ibid., letter dated 8 April 1885.

53 Ibid., letter dated 1 November 1886.

54 Peter Holland, *Home in the Howling Wilderness: Settlers and the Environment in Southern New Zealand* (Auckland: Auckland University Press, 2013), 51.

55 In addition to a long article published by *The Argus* (Melbourne) on 3 March 1881, several articles and letters to the editor about Raymond’s claim were published by the *Southland Times* (Invercargill), notably on 4 November 1880 and 21 February and 7 October 1884.

56 Holland, *Home in the Howling Wilderness*, 154.

[remain] on Poolburn face and elsewhere'.<sup>57</sup> Three years later, he could report to the absentee leaseholder: '[I] did not see many rabbits ... the poisons seemed to be clearing them well'.<sup>58</sup>

During the plague years of the late nineteenth and early twentieth centuries, the preferred means of exterminating rabbits on farm and station were poisoning, trapping, shooting, and predation by the animal's 'natural enemy'. Ferrets and other mustelids were imported from Great Britain, bred by government establishments, and then sold to land holders for about seven shillings each. In the early days, ferrets were fastened to long leads and released in rabbit burrows. On some properties, wild populations of ferrets persisted for several years until they were decimated by tuberculosis and winter cold. Although the words 'ferret', 'stoat', and 'weasel' are common in official reports, newspaper articles, and private papers, the correctness of identification is uncertain. Governmental support for introduced 'natural enemies' waned when cats and mustelids spread into indigeneous ecosystems and began to predate on native birds and reptiles.

Land holders exploited the incidental benefits of stormy weather that caused rabbits to leave their burrows, or when floods drowned the animals or forced them into the open, where they could be shot. A habitat-centred approach to pest management was evident by the 1880s, when land holders cleared shrubby growth along property boundaries, burned bracken fern, and cleared shrubs from rough ground to reduce cover. The language used in advertising and promotional material relating to pest management on productive land was often militaristic in tone: aggressor, dominance, evil, invasion, and plague.<sup>59</sup>

Between the start of the First World War and the end of the Second, labour was expensive and rabbit eradication was largely directed by rabbit boards governed by representative groups of local land holders, who reported to the Department of Agriculture in Wellington. Individual and communal agency were involved in this, and while the prime driver of rabbit eradication was protection of pastures and range land as an economic resource, there were signs of a growing feeling of stewardship for indigenous plants and animals. By 30 September 1929, the manager of the Dunedin branch of the NMA could inform the Head Office in Edinburgh: 'Rabbits are practically exterminated in Central Otago, and this, together with irrigation, has completely changed the outlook of this large tract

57 Manager's diary, Ida Valley Station, 8 August 1896, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-0658.

58 Ibid., 3 March 1899.

59 Tom Brooking and Vaughan Wood, 'The grasslands revolution reconsidered', in *Making a New Land: Environmental Histories of New Zealand*, ed. Eric Pawson and Tom Brooking (Dunedin: Otago University Press, 2013), 193–208.



of country.’<sup>60</sup> The following decade, however, rabbit numbers again increased, and rabbit boards experienced a resurgence of intense activity. In the late 1940s, public meetings were called to discuss the rabbit problem and the recently promulgated national ‘killer policy’.<sup>61</sup>

## Rabbits and cover

After the Second World War, rabbit board staff and contractors were experiencing difficulties with poisoned bait, one board reporting to the national Rabbit Destruction Council that ‘carrots and strychnine poisoning have not this year been successful, and so far phosphorised pollard had also been a failure, and [we] request the Council to advise if any further results have been obtained from the investigations into a new poison’.<sup>62</sup> But a greater problem was the large amount of cover in the rural landscape. On 21 November 1951, a contractor tendered to clear lupins that were sheltering rabbits on dredge tailings,<sup>63</sup> and in their efforts to rid one overgrown area of rabbits employees of the Cardrona Rabbit Board had to cut four lanes through a thick patch of broom and shoot in each block separately after packs of dogs had excavated burrows.<sup>64</sup> The following month an inspector reported:

it has been a heavy breeding season; there is a lot of cover about this year, which makes it difficult to hole up rabbits for larviciding.<sup>65</sup> We have a big patch of thistles on Dillon’s property, impossible for men or dogs to work, so [we] have used [a] Landrover and mower to cut same, [being] the only possible way to get the rabbits out.<sup>66</sup>

The situation had become sufficiently serious for one board to petition the Department of Agriculture to carry out trials with myxomatosis in its district.<sup>67</sup>

The importance of habitat clearance in conjunction with poisoning and shooting led to the following remit being put to the vote at the July 1971 conference of the South Island Pest Destruction Board: ‘As cover is proving a formidable barrier to

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60 NMA miscellaneous papers, Hocken Collections, Uare Taoka o Hākena, University of Otago, UN-028, Box 288.

61 Manuherikia Rabbit Board minutes, 26 January 1949, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-631-5.

62 Kokonga-Tiroiti Rabbit Board minutes, 29 June 1951, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-1590.

63 Earnsclough Rabbit Board minutes, 25 November 1951, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-744-02.

64 Cardrona Rabbit Board minutes, 6 December 1951, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-525-1.

65 Since the 1870s, chloropicrin gas, known as Larvicide, has been used to fumigate occupied rabbit burrows and warrens.

66 Cardrona Rabbit Board minutes, 31 January 1952, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-525-1.

67 Strath Taieri Rabbit Board minutes, December 1951, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-336-1.

eradication for Boards, that government make available an increased subsidy on herbicides [which were then acknowledged as more effective in the long term than burning] for purposes of pest destruction by county councils.<sup>68</sup> It failed, but throughout Otago, rabbit boards and the pest destruction boards which succeeded them found that rabbits were more numerous in, and more likely to return after shooting and poisoning to, land where gorse and broom hedges were common. The latter were described by one of those organisations as the ‘major problem in flat country’.<sup>69</sup> Rabbit boards targeted places where the pest was numerous, and in view of the heavy infestation of rabbits in his district, one exasperated manager suggested ‘that the area be bulldozed and ploughed to clear the gorse shelter from it’.<sup>70</sup> In the same spirit, an inspector employed by another board reported ‘that the Shotover River bank was to be cleared up as soon as possible, and if necessary, additional labour was to be engaged to expedite the work’.<sup>71</sup>

Removal of large and small areas of plant cover was seen as essential to managing rabbit numbers: plantations of trees with dense undergrowth, rampant broom and gorse hedges, patches of bracken fern, clumps of thistle, even sweet-briar, matagouri and cocksfoot, the ‘terrific growth’ of which was ‘causing serious delay in gaining control over rabbits’.<sup>72</sup> This had been recognised in the 1890s, when the Superintending Inspector of Rabbits reported to Parliament that the Otago Rabbit District was experiencing a ‘very serious spread of gorse and broom on river banks, mining reserves, public roads and unoccupied private lands’. Areas that had been cleared of rabbits a few months earlier were deemed at risk of reinfestation through occupation of and dispersal along lines of shrubs and tall grass on stream banks as well as gorse and broom in river beds.<sup>73</sup> The July 1956 Minutes of the Taieri Ridge Rabbit Board recorded:

68 Silver Peaks Pest Destruction Board miscellaneous papers, Hocken Collections, Uare Taoka o Hākena, University of Otago, 97-156.

69 Blackstone Pest Destruction Board minutes, 2 February 1973, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-330-2.

70 Strath Taieri Rabbit Board minutes, March 1950, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-336-1.

71 Lake Wakatipu Rabbit Board minutes, 11 June 1951, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-237.

72 Lake Wakatipu Rabbit Board minutes, 14 February 1955, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-237.

73 Manuherikia Rabbit Board minutes, 10 November 1954, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-631-5; Cairnhill Rabbit Board minutes, 24 August 1955, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-746-01; Leaning Rock Rabbit Board minutes, 6 May 1957, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-747-2; Cardrona Rabbit Board minutes, 7 August 1959, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-525-1). For comments on gorse hedges as sources of self-sown plants in railway rights-of-way see Cardrona Rabbit Board minutes, 2 February 1956, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-525-1.



The increasing growth of rough cover in the gullies was discussed by members who considered that the only satisfactory method of clearing these gullies of rabbits was to burn out the scrub. This would leave the gully in an open condition for some seasons and prevent 'pockets' of rabbits from accumulating there.<sup>74</sup>

The situation in the 1960s indicated little change in 70 years. Large and small areas of rough ground, along with belts of cover and piles of hedge clippings and orchard-tree prunings, were targeted for clearance. One inspector reported that 'a greater number of young rabbits appeared to have survived this year due to the use of 1080 and Larvicide which destroyed the natural enemy [cats, hawks, and mustelids], plus the exceptionally dry season'.<sup>75</sup> In 1962, the secretary of a rabbit board in eastern Otago was directed to advise the local county council that rampant gorse and broom on road lines were hampering the board's efforts to eradicate rabbits, and that viable seeds of these two noxious weeds were reaching previously clean areas in loads of river shingle collected by council workers for road repair.<sup>76</sup> Another inspector reported seeing 'the odd rabbit in quite heavy tussock, and when followed these rabbits do not appear to have any warren or hole to go to, but appear to live in the heavy tussock in the manner of hares'.<sup>77</sup> Rabbits were evidently exhibiting behavioural shifts that complicated the task of extermination. Large and small patches of cover offered refuge for rabbits, but rough ground alongside river courses and in valleys facilitated their persistence and dispersal.

Like land holders in the final two decades of the nineteenth century, rabbit boards used different eradication methods throughout the year, typically dogs, poisonous gases, phosphorised oats and pollard in summer, and aerial drops of carrots dressed with 1080 poison in winter. They, too, found that some poisons occasionally worked well while others were unreliable.<sup>78</sup> The national Agricultural Pests Destruction Council believed that noxious weeds and agricultural pests went 'hand in hand', and that the elected rabbit destruction boards were the obvious and logical agents to undertake this work:

74 Taieri Ridge Pest Destruction Board minutes, July 1956, Hocken Collections, Uare Taoka o Hākena, University of Otago, 97-144.

75 Mid-Wakatipu Rabbit Board minutes, 6 February 1961, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-737. Sodium fluoroacetate ('1080') is a naturally occurring, toxic plant product present in a small number of species worldwide and deters herbivory. It has been produced commercially since the early 1940s and is widely used in New Zealand to eradicate feral rabbits, rats, stoats, and weasels.

76 Strath Taieri Rabbit Board minutes, 8 March 1962, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-336-1.

77 Cardrona Rabbit Board minutes, 6 May 1963, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-525-1.

78 For an account of the methods employed by professional rabbiters in the mid-twentieth century see W. H. McLean, *Rabbits Galore—On the Other Side of the Fence* (Wellington: Reed, 1966). For information about the more limited palette of methods currently employed for eradicating rabbits see National Pest Control Agencies, *Pest Rabbits: Monitoring and Control Good Practice Guidelines* (Wellington: National Pest Control Agencies, 2012).

‘Noxious weeds would be a greater menace than the rabbit pest, and Boards should look closely at this’.<sup>79</sup> The Council had correctly assessed the related risks posed by rabbits and noxious weeds, but few pest destruction boards were willing to take on the responsibility for controlling a second noxious organism.

In 1980, J. A. Powell reported that

the Wakatipu District is like many other parts of New Zealand where better land usage, development and better stock management are all against the rabbit. The wetter season and better ground cover have been responsible for a marked decrease in rabbit numbers where no control work has been done on several areas in this district.<sup>80</sup>

In a further report to the same body, Powell recommended: ‘because of the amount of cover, [bracken] fern, briar, brush weeds, matagouri etc, neither trapping nor shooting of any sort [should be undertaken] and ... the rabbits [should be left] completely alone until they can be oat poisoned’.<sup>81</sup> Significantly, he recognised that opportunistic plant species, native as well as introduced, could thrive in the environmentally disturbed habitats of a transformed landscape and harbour other early successional plants and pest animals. Four years later, Powell showed a deeper ecological understanding of rabbit infestation when in his confidential report to Central Otago Pest Destruction Boards he stressed the importance of understanding rabbit behaviour:

Odd places, actually, showed a decrease in rabbits without any control having been applied. The removal of bracken fern, scrub manuka, and noxious brush-weed cover, coupled with improved pasture, would be the reason for the decreased rabbit numbers in a number of places ... longer grass, when wet[,] has the same effect of destroying young rabbits.<sup>82</sup>

While they were learning to manage irruptions of rabbits on their land, individual settlers recognised the role played by self-sown and planted gorse in harbouring the pest. They also found that thistles, a noxious weed of pastures and crop-land, were also involved. The agricultural and pastoral systems that they had created were proving difficult and costly to manage, and Californian thistle would continue to challenge rural people in southern New Zealand until the 1950s, when hormone herbicides became commercially available.

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79 Cardrona Pest Destruction Board minutes, 15 November 1972, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-525-2.

80 Wakatipu Coordinating Committee of the Agricultural Pests Destruction Council minutes, Hocken Collections, Uare Taoka o Hākena, University of Otago, 97-145.

81 Ibid., November 1980.

82 Confidential report to the combined Wakatipu, mid-Wakatipu, Glenorchy, and Upper Shotover Pest Destruction Boards: loose-leaf copy in the minutes of the Upper Shotover Pest Destruction Board, November 1984, Hocken Collections, Uare Taoka o Hākena, University of Otago, 97-145.

## Thistles

Entries in nineteenth- and early twentieth-century farm and station diaries frequently mentioned ‘thistles’, but rarely named the species. In New Zealand, most members of the *Cardueae* are thistles, but Californian thistle (*Cirsium arvense*), which was also known as Canadian thistle in the nineteenth century,<sup>83</sup> apparently predominated. Nodding thistle (*Carduus nutans*) and Scotch thistle (*Cirsium vulgare*) might have become established later.<sup>84</sup> The first of these is perennial and forms dense clumps with the aid of rhizomes; nodding thistle is annual or biennial, making it easier to eradicate by physical means; Scotch thistle is annual or biennial, and commonly found as a single plant. All three produce large quantities of wind-blown seed and grow in cultivated, disturbed, or waste ground, in pastures and gardens, on road verges and railway yards, and occasionally in environmentally disturbed tussock grassland. In 1922, G. M. Thomson described Californian thistle as ‘sporadically all over the country in cultivated fields ... [and] particularly abundant and aggressive in half-cleared bush’.<sup>85</sup> On farms and stations in the South, thistles were controlled in pastures and crop-land by rolling, chipping, excavating, and burning until hormone sprays became commercially available.

Thistles probably reached southern New Zealand in cargoes of imported pasture plant seeds that were then spread by the wind, as pollutants in bags of seed, in the fleeces of sheep brought in from other parts of the country, or in mud on wheeled vehicles. In July 1928, the manager of the Ashburton branch of the NMA contacted a station manager to advise the availability of Alsike clover seed ‘double-dressed to safeguard against the possibility of any Thistle seed’.<sup>86</sup> Once they had become established on a property, thistles thrived, flowered, produced heavy crops of seed, and spread rapidly. On 12 March 1878, the *Cromwell Argus* published a short piece about the abundance of thistledown in the Lake Wanaka area, and at the same time two farmers visiting New Zealand from Leicestershire reported thistledown landing on the deck of their steamer, two miles off the Hawke’s Bay coast. They later described masses of thistledown blowing ‘across the streets of Christchurch like a slight snow storm’.<sup>87</sup>

83 Thomson, *The Naturalisation of Animals and Plants*, 425.

84 C. J. Webb, W. R. Sykes, and P. J. Garnock-Jones, *Flora of New Zealand*, vol. 4, *Naturalised Pteridophytes, Gymnosperms, Dicotyledons* (Christchurch: Botany Division, DSIR, 1988).

85 Thomson, *The Naturalisation of Animals and Plants*, 425.

86 Hakataramea Station inward letters, Hocken Collections, Uare Taoka o Hākena, University of Otago, UN-028, Box 206.

87 S. Grant and J. Foster, *New Zealand: A Report on its Agricultural Conditions and Prospects* (London: G. Street, 1880), 20.

Young thistles thrived in the nutrient-rich soils of newly-ploughed ground, and threatened to suppress broom and gorse seedlings, as well as the rooted cuttings of hawthorn, that settlers established in ploughed strips or on low banks of overturned sod for hedges. In the 1860s and '70s, farmers and station holders frequently noted in their diaries and letter books how hard it was to remove weeds from around a gorse seedling without damaging the young plant. On 15 November 1875, the manager of Taipo Hill station in North Otago informed the absentee land holder that 'the hedges which have been planted this year are all doing well so far [but] they take a lot of weeding. They are sometimes smothered with weeds and we dare not touch them for fear of pulling up the [hedge] plants. We must let them grow before we can weed them'.<sup>88</sup> Ten years later, settlers and property managers were recording in their diaries the heroic efforts needed to chip or uproot gorse and broom seedlings from fields and pastures, alongside roads and tracks, and in the beds of rivers and streams.

## Rabbits and sheep

The close functional links between gross environmental disturbance, self-sown gorse, infestations of rabbits, and rampant growth of thistles are evident in farm and station diaries, the minutes of rabbit and pest destruction boards and other local body minutes, the published reports of national bodies, and newspaper articles (Table 1). Equally telling are long records of numbers of sheep shorn on a property and either the value or the number of rabbit skins sent away for sale. The latter two are fair surrogates for rabbit density because land holders were legally required to keep rabbit numbers down, properties were visited annually by government inspectors, and there were stern penalties for failing to eradicate the pest.

Table 1: Examples of the links between environmental disturbance, gorse, rabbits, and thistles.

Environmental disturbance and gorse
'James grubbing out whins [i. e. gorse] in West End Paddock' (David Wallace diaries, 4 September 1884).
'David chipping and burning whins [in partly cleared tussock] on Camping Spur' (David Wallace diaries, 28 April 1886).
'Johnnie Mitchell cutting down stray gorse growing from the fence' (Joseph Davidson diaries, 13 June 1894).
Environmental disturbance and rabbits
'Set 35 [rabbit] traps in Racecourse Paddock' (Joseph Davidson diaries, 10 August 1900).
'Shot rabbits on [recently] burned ground' (James Wither diaries, 25 September 1902).
'Mitchell got 44 rabbits out of Moffat's turnips' (Joseph Davidson diaries, 13 May 1904).

88 Nugent Wade's letter books, South Canterbury Museum, Timaru.

<b>Environmental disturbance and thistles</b>
'Three [men] cut thistles and one grubbed in ploughed paddock' (David Wallace diaries, 11 January 1879).
'John ploughing small patches of Canadian thistles in swede paddock' (Cody family diaries, 17 April 1917).
'Cutting Scotch thistles out of fescue in top paddock' (Cody family diaries, 27 December 1949).
<b>Gorse and rabbits</b>
'The first case heard was a charge against A. Christie, of Brighton, who was charged with failing to destroy the rabbits on his property.—Defendant pleaded not guilty.—R. Johnston, rabbit inspector, stated that on September 23 his attention was drawn to the number of rabbits along the gorse fences on the defendant's land at Brighton. Principally young rabbits were to be seen, and they were there in large numbers. On the 24th of September, accompanied by Stock-inspector Fullarton, [the] witness visited the place, and rode over the sections. They found the gorse very thick, and they also saw many young rabbits.' ( <i>Otago Witness</i> , 1 December 1892).
'I had a look around the gorse fence; got nine poisoned rabbits spoiled with the hawks'. (Joseph Davidson diaries, 3 August 1903).
'The road lines, gorse hedges and briars are becoming a bigger problem every year, and it is almost impossible to get rabbits out of some of these areas' (Lake Wakatipu Rabbit Board minutes, 14 February 1955).
'The Board wrote to the Otago Catchment Board for a subsidy or other financial assistance to enable the Board to eradicate the gorse on the river flats, and in particular the Von River flats where cover is harbouring rabbits' (Mid-Wakatipu Rabbit Board minutes, 19 August 1963).
'In the fumigation programme, open tussock country appeared in fair order, but any areas of cover—matagouri, briar, gorse and broom—had large quantities of rabbit' (Leaning Rock Pest Destruction Board minutes, 24 March 1970).
'The rabbit which is in this type of country appears to live in gorse hedges and broom, which is increasing very quickly. I do feel that we must do something in regards to the cover as I am sure it is our major problem on flat country' (Blackstone Pest Destruction Board minutes, 2 February 1973).
<b>Gorse and thistles</b>
'Riddle weeding gorse hedge' (Kauru Hill diaries, 28 January 1867).
'Matthew cleaning up [i. e. weeding] round hedges in garden' (Kauru Hill diaries, 29 May 1873).
'McToben cleaning gorse seed hedges' (Kauru Hill diaries, 9 October 1873).
<b>Rabbits and thistles</b>
'Cutting thistles and laying rabbit poison' (David Wallace diaries, 20 January 1906).
'The thick growth of Scotch thistles [on Morven Hill] made [rabbit eradication] work on this area arduous' (Lake Wakatipu Rabbit Board minutes, 7 April 1952).

Sources: The Kauru Hill diaries, held by the North Otago Museum and Archive, Oamaru; all other documentary sources are from the Hocken Collections, Uare Taoka o Hākena, University of Otago, Dunedin.

We traced more than three decades of such records (from 1874 to 1907) for Otematata Station in the Waitaki Valley and 40 years (from 1891 to 1930) for nearby Hakataramea Station. The former showed sheep numbers increasing from 25,000 in 1874 to 28,000 11 years later (Figure 1). The first reference to rabbits was in 1885. Three years later the number of skins sent from the property had surged to 200,000. Sheep numbers declined while rabbit numbers remained high, but began to rise again in the late 1890s. There was a second surge in numbers of rabbits killed each year between 1893 and 1895, and a subsequent decline in sheep numbers. Rabbits on the station were evidently

coming under control in the final three years of the nineteenth century, when their numbers declined to levels not seen since the mid-1880s, but later became more abundant. The situation in the first decade of the twentieth century was strikingly different from earlier years in that sheep numbers declined while numbers of rabbits killed were not historically large.

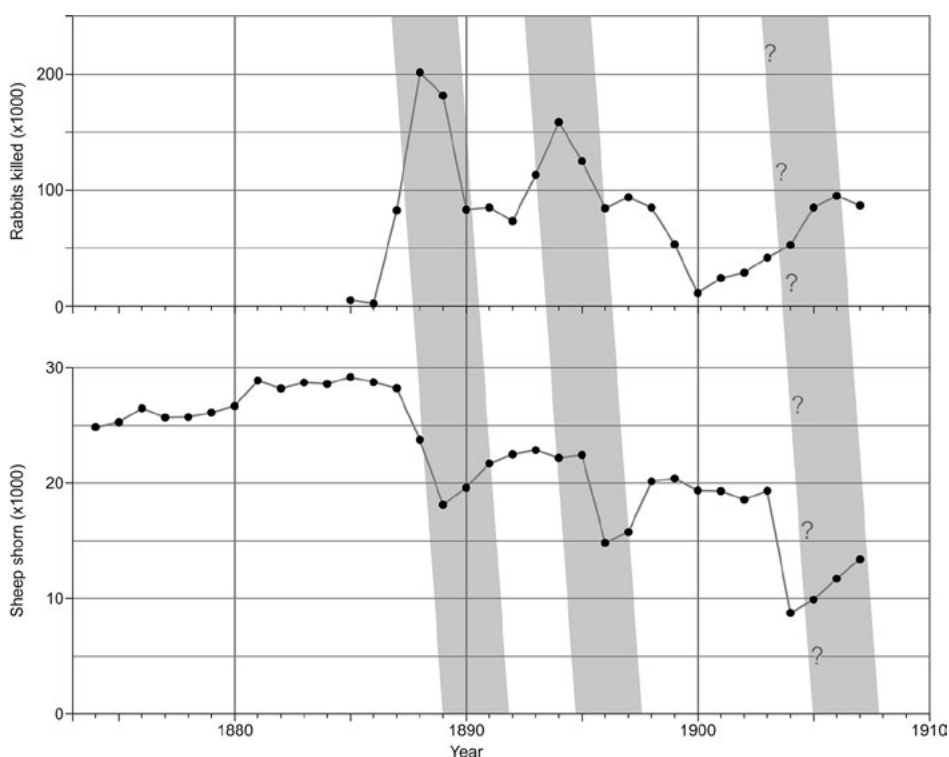


Figure 1: Numbers of rabbits killed (upper diagram) and sheep shorn (lower diagram) from 1874 to 1907 at Otematata Station in the Waitaki Valley. The three diagonal bands show the impact of spikes in rabbit density on flock size, and the question marks indicate uncertainty when increasing numbers of rabbits affected flock size.

Source: The authors' work, after NMA archive, Hocken Collections, Uare Taoka o Hākena, University of Otago, UN-028, Box 316).

The manager's records for Otematata Station include the annotation 'snow' against the 1904 tally of sheep shorn. The early years of the twentieth century were punctuated by adverse weather in Central Otago, the Mackenzie Country, and upper Waitaki Valley, as well as inland south and mid-Canterbury, but apparently not farther south. A report to the 1903 Annual General Meeting of the NMA in Edinburgh noted that 'a very serious snow storm took place in New Zealand on 17th July [1903] and from the advices we have received

I fear that a considerable number of sheep on Hakataramea Station and a smaller number in Kawarau [Station, Central Otago] have succumbed'.<sup>89</sup> The *Timaru Herald* published several short articles about the adverse effects of winter snow-storms in inland south Canterbury, and on 11 July 1903 reported that the railway line from Timaru to Fairlie was blocked by snow-drifts. The link was not restored until 20 July. On 14 October 1904, the newspaper reported a major snowfall at Burke's Pass and in adjoining parts of south Canterbury that had 'disastrous effects on [new-born] lambs.' It is likely that adverse weather in winter and early spring led to widespread major stock losses and allowed rabbit numbers to increase until they could be brought back under control in the second half of the decade.

A similar analysis for Hakataramea Station showed the number of sheep shorn reached a peak in 1901 then declined, presumably in response to the reduced availability of nutritious forage on the property, but also to the manager's awareness of long-term carrying capacity and the need to reduce flock size. This decline continued until 1930, when records ceased (Figure 2). Missing records meant that we could not confirm the loss of sheep after heavy snowfalls, but we were able to collate annual expenditure on rabbit eradication and annual income from the sale of rabbit skins. Rabbit numbers on the property varied little between 1891 and the outbreak of the First World War, but by the end of hostilities Hakataramea Station had a serious rabbit problem, one that demanded major outlays on labour and materials. The sum spent on rabbit eradication between 1919 and 1926 (£2,800), bracketing the period of intense activity, was greater than revenue from sale of the skins (£2,000), implying that pest eradication, rather than a secondary income stream, was the goal. The graph of numbers of sheep shorn each year shows a small peak in 1894, a larger peak in 1901 and then a long decline. Sheep numbers on the station were at their lowest when rabbit numbers were at their highest.

89 NMA miscellaneous documents, 1903, Hocken Collections, Uare Taoka o Hākena, University of Otago, UN-028, Box 289.

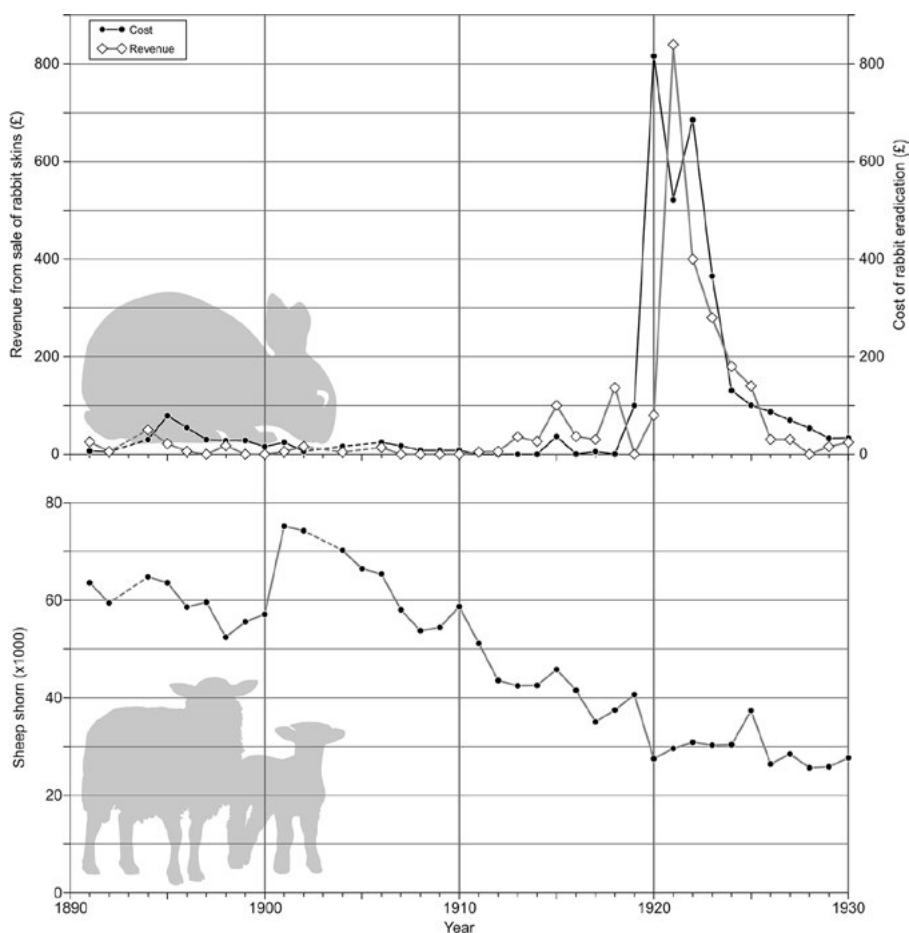


Figure 2: Cost of rabbit eradication and revenue from rabbit skins sold (upper diagram), and the number of sheep shorn (lower diagram) from 1891 to 1930 at Hakataramea Station in the Waitaki Valley.

Source: The authors' work, after NMA archive, Hocken Collections, Uare Taoka o Hākena, University of Otago, UN-028, Box 284.

## Five case studies

The following words from a letter written on 21 April 1888 by the manager of the Invercargill branch of the NMA about a property at Seaward Downs, 10 kilometres south of Edendale in Southland in which the Company had a financial interest,<sup>90</sup> point to links between cultivation, pasture management, infestations of weedy plants, rabbits, and uncontrolled gorse:

<sup>90</sup> NMA miscellaneous documents, Hocken Collections, Uare Taoka o Hākena, University of Otago, UN-028, Shelf 785D, parcel.



Everything had been most shamefully neglected, the fences being all in bad repair, the gorse overgrown and [fence] posts rotting ... Along the hedgerows rabbits are numerous but when the gorse is trimmed a few weeks trapping should get them well under [control], the fences at present being their chief station.

A great portion of the land appears to have been cropped two or three times and then left without sowing down, and now carries nothing but what has sprung up from the soil: [the grass, Yorkshire] fog and thistles chiefly, and this principally below the road where the land is very good, judging from the strong growth of the latter.

Five of our seven key sources<sup>91</sup> contained sufficient information to enable us to estimate numbers of man-days per year expended on (a) burning tussock, clearing fern and shrubs, draining wetlands, and ploughing, (b) clipping broom and gorse hedges, disposing of the trash, and chipping self-sown plants from pastures and roadsides, (c) either chipping or digging up thistles, and (d) eradicating rabbits.

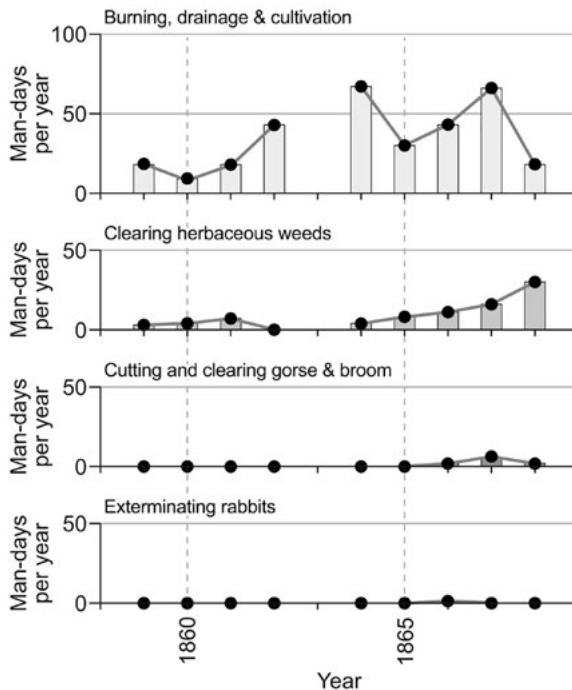


Figure 3: Man-days per annum spent on burning, cultivation, and drainage (upper diagram), chipping or digging up thistles (second diagram), and caring for domestic rabbits (bottom diagram) on Puketoi Station, Maniototo, Otago, from 1859 to 1868.

Source: The authors' work, after James Murison's diaries, Hocken Collections, Uare Taoka o Hākena, University of Otago, ARC-0612.

91 See note 20.

Our earliest documentary records were from James Murison’s station, Puketoi in Central Otago, where there could have been some cultivation before 1859 when Murison took over the lease, but from then until the station was sold a decade later the investment in human labour for land preparation and ploughing increased. In tandem, the effort to clear herbaceous weeds rose exponentially, with the most rapid increase after 1864 (Figure 3). Murison’s only references to rabbits were to hutches for two domestic animals and their progeny. Twenty years later, this property in the Maniototo was one of the worst affected by rabbits, and remained so until the late twentieth century. In his diaries, Murison referred to broom hedges around the homestead in 1867 and 1868, but not to gorse.

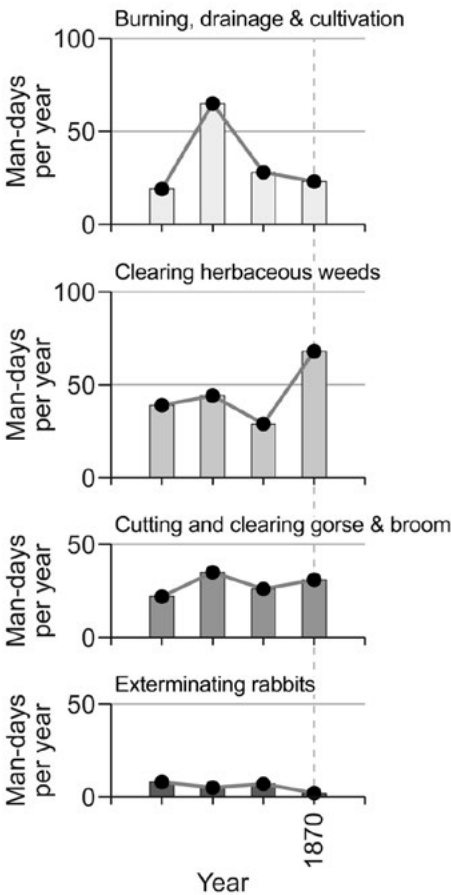


Figure 4: Man-days per annum spent on burning, cultivation, and drainage (upper diagram), chipping or digging up thistles (second diagram), clipping mainly gorse hedges and chipping volunteer growth (third diagram), and hunting rabbits for sport and food (bottom diagram) on The Point Station, mid-Canterbury, from 1866 to 1870.

Source: The authors’ work, after the Point Journal, Canterbury Museum and Archive, Christchurch.

The second long run of documentary records was for The Point Station, located on the high plains and foothills of mid-Canterbury. It had been occupied for at least a decade before the Phillips family took up the lease in August 1866, but we did not find any record of cultivation before that date. By 1870, weeds were sufficiently common to require 60 man-days of labour in newly cleared and cultivated ground on a terrace of the Rakaia River, where the family grew oats to feed their draught and saddle horses, potatoes for residents and the domestic pigs, English grasses for hay, and wheat and barley for sale in Christchurch (Figure 4). From the outset, the Phillips family, their employees and contractors had established gorse and broom hedges, and by 1868 were investing more than 30 man-days annually clipping them after flowering as well as chipping self-sown plants from sown pastures and crop-land, and along the property boundaries. The main references to rabbits were to those shot during recreational hunting trips to the nearby bed of the Rakaia River. The bags were small, on some trips rabbits were not caught, and there were few references in the diaries to these animals occupying ground away from the river bed or eating garden, pasture and crop plants.

John Wither took over the lease of Sunnyside Station on the south shore of Lake Wakatipu in 1872. He then began an annual programme of burning and grubbing tussock, clearing small shrubs and clumps of bracken fern, draining depressions, and ploughing the lower terraces. He continued this regime until 1889, but from then until he handed over to his son in 1903 he reported generally less environmentally transformative work. His investment in labour to clear herbaceous weeds remained small until the early 1880s, rose to a peak in 1887, and then declined to a long-term maintenance level. In 1898, the troughs evident in the three parts of this diagram were the consequence of heavy falls of snow and severe cold killing many of his sheep and forcing him to employ his financial resources to rebuild his flock. Rabbit eradication followed a similar pattern, although the peak was six years earlier (Figure 5). Rabbits evidently reached Sunnyside in 1875–76 but were uncommon until 1877–78, when the amount of labour required for eradication increased sharply. For a decade, labour input for pest eradication was often between 250 and 350 man-days per year, but declined after a second peak in 1890 as Wither, his employees, and contractors gained control over the pest. There was a third peak in 1900, and a rapid falling away thereafter. The station's broom, hawthorn, and gorse hedges required the normal maintenance, but Wither did not refer to self-sown plants of these three species. Figure 6 shows that extensive ploughing, burning, and wetland drainage created novel ecological opportunities for herbaceous weeds and rabbits, and as the pace of gross environmental disturbance declined, rabbits had access to progressively fewer niches and less manpower was needed to keep their numbers under control.

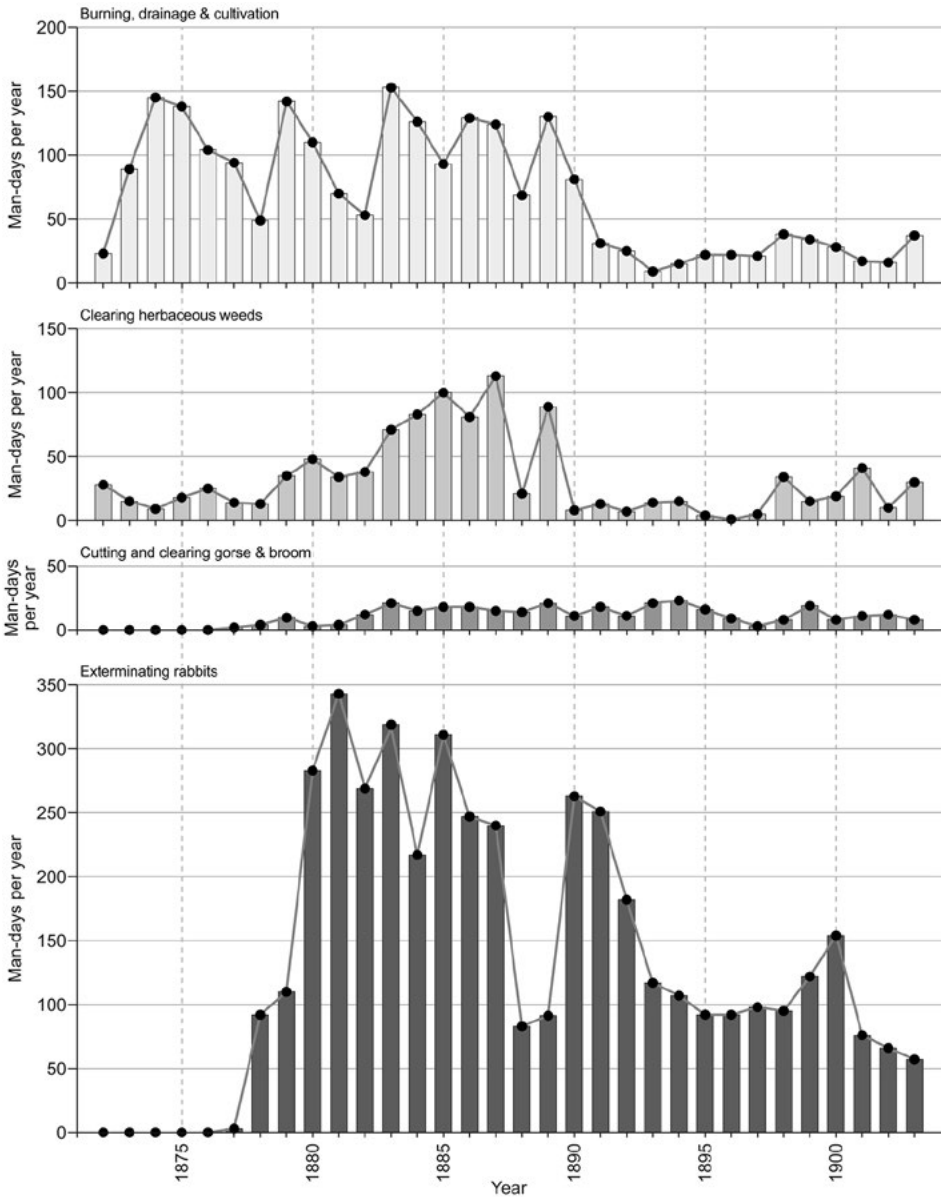


Figure 5: Man-days per annum spent on burning, cultivation, and drainage (upper diagram), chipping or digging up thistles (second diagram), clipping and clearing mostly gorse (third diagram), and exterminating rabbits (bottom diagram) on Sunnyside Station, Lake Wakatipu Basin, Otago, from 1872 to 1903.

Source: The authors' work, after James Wither's diaries, Hocken Collections, Uare Taoka o Hākena, University of Otago, 89–149.

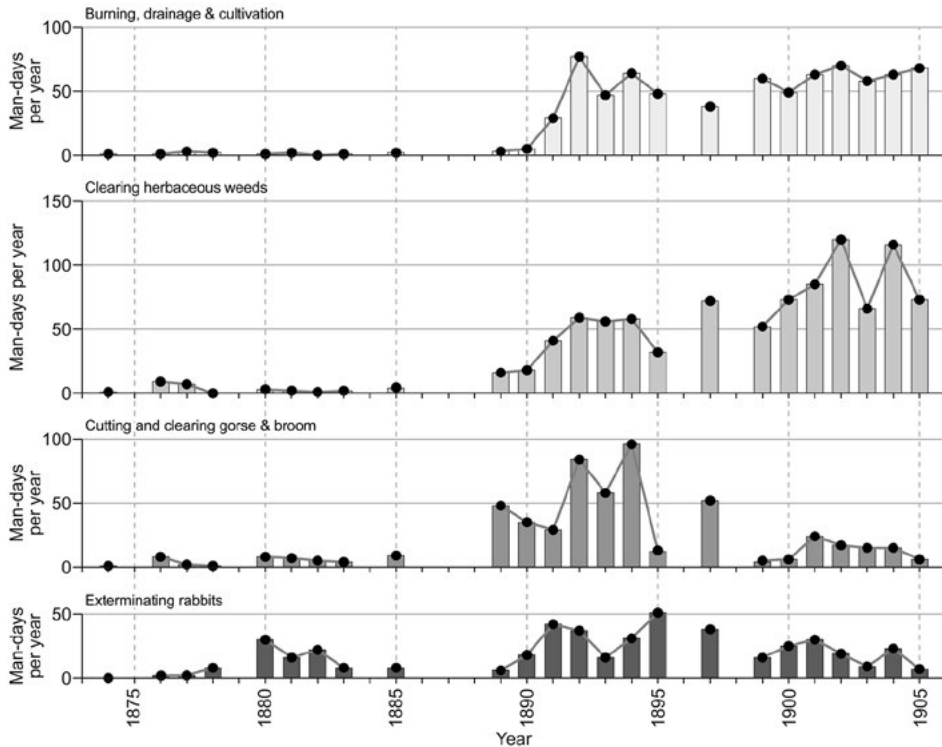


Figure 6: Man-days per annum spent on burning, cultivation, and drainage (upper diagram), chipping or digging up thistles (second diagram), clipping mostly gorse hedges and chipping volunteer growth (third diagram), and exterminating rabbits (bottom diagram) on the Davidson family farm near Waikaia in northern Southland from 1874 to 1905.

Source: The authors' work, after Joseph Davidson Senior and Junior diaries, Hocken Collections, Uare Taoka o Hākena, University of Otago, AG-523.

In the late 1870s, Joseph Davidson began to experience the first wave of rabbits moving northwards out of the Southland plains and into the low hill country along river valleys, formed tracks, and railway rights of way. Albeit with occasional recourse to professional rabbiters, he and his sons were able to keep the pest under control. The most rapid changes came after 1890, when he and his family increased the pace of tussock clearance on the low hill country and cultivated more terrace land beside the Waikaia River (Figure 6). Weed removal usually required more labour than did clearance and cultivation of tussock, shrub, and fern lands, or drainage of wetlands. There was a third surge in labour expended on rabbit extermination in 1885, then a slow decline to the end of the record in 1905. Significantly, Davidson had begun to target gorse and the much less common broom hedges as sites for rabbit extermination in the early 1890s, and after 1895 removed hedges and levelled sod walls. In the final decade of the

documentary record, Davidson was regularly poisoning rabbits in his pastures, shooting them in river and stream valleys, poisoning them in the small area of modified tussock remaining in a hilly corner of his farm, and monitoring their spread from shrubby areas on neighbouring properties. His most persistent problem, and one that would remain until herbicides became available, was infestation of cultivated fields and hedgerows by Californian and Scotch thistles, sheep sorrel, vetch, and other herbaceous weeds.

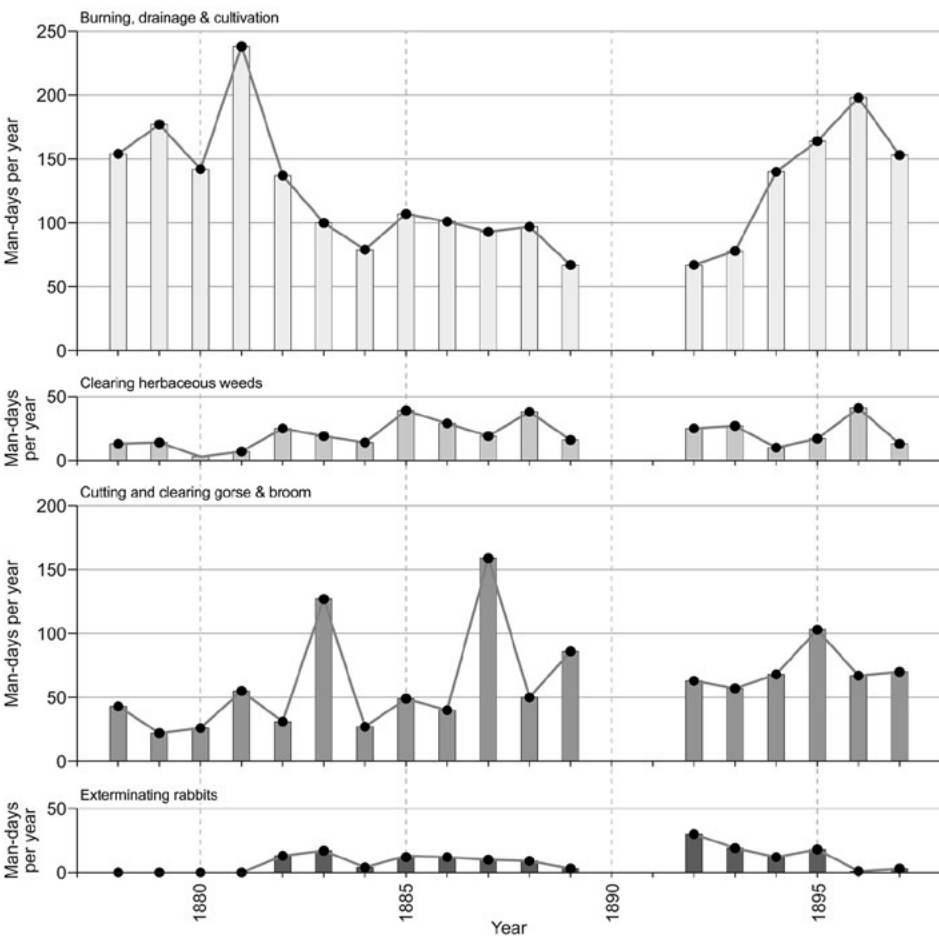


Figure 7: Man-days per annum spent on burning, cultivation, and drainage (upper diagram), chipping or digging up thistles (second diagram), clipping mostly gorse hedges and chipping volunteer growth (third diagram) and exterminating rabbits (bottom diagram) on the Wallace family farm, Clinton, Southland, from 1877 to 1897.

Source: The authors' work, after David Wallace's diaries, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-4031.

The documentary record for David Wallace's farm near Clinton in eastern Southland showed a more complex situation. After an initial surge in cultivation and burning, there was a comparatively quiet decade before a second surge that lasted six years from 1892 (Figure 7). Rabbits were a persistent but not serious problem after 1885, and herbaceous weeds were kept under control by chipping and cultivation. Maintenance of gorse and broom hedges, and removal of volunteer plants, however, required costly outlays of human labour as hedges matured and self-sown plants became established in pastures.

Rabbits also caused economic hardship and environmental difficulties for James Preston on his sheep stations in Central Otago, the upper Waitaki Valley, and the Mackenzie Country,<sup>92</sup> and he occasionally directed rabbiters to clear gorse from river beds and other preferred rabbit habitats on Haldon Station.<sup>93</sup> Over a period of five years at Black Forest Station in the upper Waitaki Valley, two thirds of his annual financial outlay went to paying for exterminating rabbits. At the end of this period, Preston was unable to carry the financial burden and had to give up the lease.

In years when damp winters facilitated a dense sward of pasture grasses, intensive land use, property development, and livestock management weighed against the rabbit.<sup>94</sup> Elsewhere in Otago, the rabbit inspector, J. A. Powell, had noted a decrease in rabbit numbers without eradication measures having been applied, and concluded that clearance of bracken, manuka, and noxious brush-weed cover, coupled with increase in the area of improved pasture, had led to the drop in rabbit numbers.<sup>95</sup>

## The rise of gorse, rabbits, and thistles in southern New Zealand

By the 1870s, settlers in the lowlands of southern New Zealand were experiencing the adverse effects of environmental disturbance; the Kauru Hill diaries from north Otago<sup>96</sup> contain many references to Californian thistles springing up a few weeks after the first furrow had been ploughed to mark the line of a fence, hedge, or plantation. The seeds of thistles and other weedy plants reached

92 Holland, *Home in the Howling Wilderness*.

93 James Preston's diary, 26 May 1911, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-0989 / 277.

94 J. A. Powell's report to the Wakatipu Coordinating Committee, Agricultural Pests Destruction Council, Hocken Collections, 97-145.

95 J. A. Powell's report to the combined Wakatipu, mid-Wakatipu, Glenorchy, and Upper Shotover Pest Destruction Boards, in minutes of the Upper Shotover Pest Destruction Board, Hocken Collections, Uare Taoka o Hākena, University of Otago, 97-145.

96 Kauru Hill and Taipo Hill Station diaries, North Otago Museum, Oamaru.



a property on the backs of sheep bought from neighbouring properties or at local sale-yards, as pollutants in sacks of pasture plant seeds and grain, and in soil on rooted trees and shrubs. They germinated and found a congenial habitat where the original vegetation cover had been fragmented, the litter layer destroyed, and the top soil exposed. In the final three decades of the nineteenth century, gorse, thistles, and rabbits made lightning progress through the grossly transformed environments of the open country, facilitated by widespread burning, ploughing, and drainage, development of a network of gravel roads, nation-wide extension of railways, and the sparsely vegetated gravel beds and banks of large and small rivers that drained from the uplands to the coast. Any experience that rural settlers might have had with these three organisms in the British Isles was scant preparation for what they would encounter in southern New Zealand.

Land holders learned how to shoot, trap, and poison rabbits, but until organic herbicides were commonly available they could only respond to outbreaks of weedy plants with axe, saw, shovel, and a box of matches, although on 3 March 1911 James Preston recorded in his diary that an unnamed resident of Haldon Station had 'put ground salt on thistles [to kill them]'.<sup>97</sup> There was the added spur of stern penalties if they failed, which diverted expensive labour from property development to pest, plant, and animal control. Interestingly, although the first three generations of settlers learned much about pest animals and weeds, in their diaries we did not find a single acknowledgement that the problems they were experiencing could have been substantially of their own making.

When viewed through the lenses of ecological theory and human and non-human agency, it is evident that in the last three decades of the nineteenth and the first half of the twentieth century rural people in southern New Zealand were experiencing the adverse consequences of gross environmental disturbance, complicated by some of the most savage weather and severe flooding on record. Directly as well as indirectly, individual human agency led to the spread and establishment of weedy plants and pest animals on farms and stations, along strips of land set aside for road and rail links, in small settlements, and in river valleys. While land holders showed considerable resilience in the face of the threats posed by introduced plant and animal pest species to their livelihoods, communal agency spurred by legislation became essential in the 1880s.

As agents, individual land holders were responsible for eradicating weedy plants and pest animals from their properties, observing the growth and behaviour of these newcomers in the partly transformed environments of their properties,

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97 James Preston's diary, Hocken Collections, Uare Taoka o Hākena, University of Otago, MS-0989 / 277.

and using that knowledge to manage adverse effects. They also consulted their neighbours about the timing and other details of control measures. When communal agency in the form of other land holders, *iwi*, or the state failed to keep rabbits under control, inspectors were hired by the state to check properties in rabbit-affected areas, advise land holders about control measures, set goals for eradication, and initiate legal action. Across southern New Zealand, the role of thistles and gorse as refuge for rabbits was known by the 1880s, but the sites where communal agency strove to bring them under control were public lands alongside roads and tracks, and in the beds and banks of rivers and streams. Even as the state was erecting regional rabbit-proof fences to restrict the spread of rabbits, individual land holders were putting up netting fences on vulnerable boundaries and within their properties to facilitate eradication of the pest and guard against re-invasion. In effect, individual and communal human agency operated in tandem from the 1880s onwards.

The experiences of land holders were shaped by new social and economic networks, as well as new plants and new animals. In the early years of organised settlement, the beneficial features of those economic, ecological, and human relationships allowed settlers to prosper, but their unanticipated consequences proved challenging in the long term because few land holders and commentators recognised the ecological nature of a farm or station. In the 1860s, James Hector had urged a scientific approach to agriculture and pastoral farming, and in a speech read to Dunedin members of the Young Men's Christian Association in 1862, he promoted the model in which every farm was a laboratory, every field an experiment, and every farmer a scientist: 'Exact observation is not merely idle curiosity but leads to very practical results. Gather facts from year to year, experiment if you can, and in time you will reap a harvest of profit.'<sup>98</sup>

Hector had in mind carefully controlled experiments in which one factor at a time would be isolated and evaluated, but ecological thinking calls for a holistic approach. Things did not work out quite as Hector had advocated, and it took time for rural people and their advisors to learn how to evaluate and apply scientific principles to manage the new and ecologically untested ecosystems that settlers had created on their properties.

One early commentator, William Pember Reeves, regretted the loss of beauty as tracts of forest, tussock grass, shrub, and wetland gave way to farms and sheep stations across New Zealand:

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98 The *Otago Daily Times* reported James Hector's lecture, 'The utility of natural science', in its 24 October 1862 issue. Hector, who was trained as medical doctor in Scotland, was appointed Director of the Geological Survey of Otago then Director of the Geological Survey and the Colonial Museum in Wellington. A productive scientist and talented administrator, he also served as Director of the Meteorological Department, the Colonial Observatory, the Wellington Time-ball Observatory, and the Wellington Botanic Garden.

Bitter the thought:  
is this the price we pay?  
The price for progress;  
beauty swept away.<sup>99</sup>

What Reeves deplored was the consequence of an unmanaged shift from an evolutionarily tested ecology to one where the desired end-point was virtually hijacked by plant and animal interlopers from the Northern Hemisphere doing what their genes had equipped them for. This is a long-standing theme in the environmental history of New Zealand, and the books by Thomas Potts, Herbert Guthrie-Smith, Andrew Clark, and Alfred Crosby chart the progress of the nation's thinking about its rural landscapes.<sup>100</sup>

It is now too late to turn back the tide of environmental transformation, but there is a growing understanding amongst rural people of the desirable features of a landscape in which sizeable remnants of once widespread ecosystems can coexist with agro-systems in a functional, economically productive, harmonious, aesthetically pleasing, and distinctive whole. Would the first generation of European settlers in southern New Zealand have done things differently if the core notions of scientific ecology had been formulated and disseminated in the second half of the nineteenth century? We may also ask what might have happened if the first generation of European settlers had developed their rural properties at a slower pace, respecting lessons that they and their neighbours had learned during their time on the land? An observant settler might have learnt enough in a decade of close observation to make reasonably reliable weather forecasts, but it would have taken a lifetime of dedicated observation and experimentation to comprehend its ecology.<sup>101</sup>

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99 William Pember Reeves, *New Zealand, and Other Poems* (London: Grant Richards, 1898). Several decades later Herbert Guthrie-Smith sounded a more optimistic note when he wrote: 'The lamentable *laissez-faire* in regard to misuse of the land and water is passing away. For the first time in the history of the globe we are about to cease to maltreat this kindly old world of ours' (*Tutira*, 3rd ed., 422).

100 Thomas Potts, *Out in the Open: A Budget of Scraps of Natural History, Gathered in New Zealand* (Christchurch: Capper Press, 1976. 1st ed. 1882); Guthrie-Smith, *Tutira*; Andrew Clark, *The Invasion of New Zealand by People, Plants and Animals: The South Island* (New Brunswick, NJ: Rutgers University Press, 1949); Crosby, *Ecological Imperialism*.

101 Guthrie-Smith, *Tutira*.

Journal. The former Hocken Librarian, Stuart Strachan, directed us to the riches of the National Mortgage & Agency Company archive held by the Hocken Collections, and the Archivist at Fletcher Challenge kindly granted permission for us to read and quote information from that material. Ossie Brown told us about current practice in rabbit extermination in Central Otago. Frank Leckie directed us to much useful manuscript and published material, and Dr George Davis advised us about government reports. The referees and the editor helped us clarify the argument. The diagrams were drafted by Tim Nolan, Black Ant Mapping Solutions, Christchurch, and Peter Holland acknowledges the generous provision of workspace and facilities by the Department of Geography, University of Otago.



# ENVIRONMENTAL NON- GOVERNMENT ORGANISATIONS IN CHINA SINCE THE 1970S

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## Abstract

The expansion of environmental non-government organisations (ENGOS) in the past two decades has been perhaps the most conspicuous phenomenon in the recent history of civil society in China. Many factors promoted the early development of ENGOS in China: the political reform of government, the defects of environmental governance, public worries about environmental problems, international interaction, and the efforts of influential elites. In recent years, ENGOS have been further boosted by the change of public ideas about the environment, the professionalisation of ENGOS, the development of the internet, and increasing environmental deterioration. Nevertheless, Chinese ENGOS are facing four major challenges: economic difficulty, low levels of specialisation, interior estrangement, and grass-roots isolation. Chinese ENGOS are not hesitant to expose environmental problems or to criticise what they perceive as negligent protection by government. However, confined by traditional culture and current political institutional arrangements, ENGOS abstain from radical confrontation with government. While Chinese environmental problems remain serious in the long term, the development of ENGOS in China is hopeful because younger generations are more actively taking part in environmental protection and a further political reform is progressing.

**Keywords:** environmental protest, Environmental Non-Governmental Organisations (ENGOS), China, development.

## Introduction

It is notable that during the past decades, Chinese Environmental Non-Government Organisations (ENGOS) have grown explosively, and continue to do so. According to open statistics, there were 2,768 registered ENGOS in 2005, with the number rising to 3,529 in 2008 and 7,881 by 2012.<sup>1</sup> The changing figure

<sup>1</sup> All-China Environmental Federation, 'Findings Report on ENGOS Development in China [中國環保民間組織調查報告]', *Environment Protection* [環境保護], 5b (2006): 61; 'China's ENGOS Increase to almost 8000', *People Daily (Overseas Edition)*, accessed 5 March 2013: [www.chinanews.com/gn/2013/12-05/5584508.shtml](http://www.chinanews.com/gn/2013/12-05/5584508.shtml), accessed 12 July 2014.

clearly shows how fast China's environmental movement is expanding while it also suggests increasing public anxiety about a deteriorating environment. While environmental issues are given great notice by the Chinese public and government, the nexus between ENGOs and government is still imbalanced. Although there is success in pushing many popular movements, Chinese ENGOs are shaped and sometimes constrained by Chinese political institutions and traditional culture. On the one hand, the public regard government as the critical factor in environmental protection while ENGOs are also themselves catalysts for change. On the other hand, most Chinese ENGOs are neither independent from state power nor tightly connected to genuine grassroots movements. Consequently, while ENGOs are usually not hesitant to expose environmental problems or to criticise a negligent government, they also abstain from radical confrontation with government and are cautious to join in street demonstrations. Chinese ENGOs seem more acceptable to government and in turn they receive more freedom and flexibility than many other civil societies in China.

## 'Civil society' and NGOs in China

The term 'civil society' is sometimes misunderstood by the Chinese public because of its translation. Normally 'civil society' is translated as *shimin shehui* or *gongmin shehui* in Chinese. Although it contains the meaning of a realm separate from government and private business, *shehui* scarcely points to organisation. A more popular and accurate counterpart of civil society in Chinese should be 'non-government organisation (NGO)'. Moreover, the conception of 'civil society' is sometimes sensitive in the Chinese official discourse because of its deep origins in Western history and culture. As Edward Shils argues, the core characteristic of civil society is *civility*—a civil collective self-consciousness which makes civil politics possible and presumes in Western societies that citizens are supposed to collaborate with each other.<sup>2</sup> Therefore civil society in the Western context presumes autonomy for non-government forces. Even though the self-organisation of citizens may be fallible, it could protect them from an incorrigible state or government.

However, China's 'top-down' or pyramidal political culture and rigid bureaucratic systems are always critical to understanding Chinese society. For example, Thomas Metzger argued that Chinese civil society is heterogeneous and so-called civility, evident in the West, is essentially absent in Chinese history. Put another way, China never enjoyed the strong tradition of spontaneous self-governance by common people apparent in many Western countries. Chinese society used

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2 Edward Shils, *The Virtue of Civility: Selected Essays on Liberalism, Tradition, and Civil Society*, Steven Grosby, ed. (Indianapolis: Liberty Fund, 1997), 335.



to be efficiently governed by emperors who, mentally and morally served by intelligent elites or Mandarins, were 'Sons of Heaven' and people were naturally their subjects. 'Public good' could be always achieved and sustained by a 'corrigible state'.<sup>3</sup> An influential Chinese political historian Xiao Gongqin also declared that Chinese traditional culture never contained an idea that society owns integrated rights free from state power.<sup>4</sup> According to these views, in China, government at different levels is most responsible for social governance. In environmental history, one of the most evident cases is management of the Yellow River by central government in imperial China. The river flooded periodically and sometimes killed millions of residents in its flood plain, while central government always sponsored dike construction and maintenance and could call up labour from all around the country.<sup>5</sup>

The arguments of the authors above have been challenged in recent years, because many scholars find that state power did not completely overwhelm the autonomy of society. In effect, they argue that local Chinese communities, at least since the sixteenth century and especially in rural areas, have been delicately led by landed gentry (*shishen*), a group not directly absorbed and constrained by collective government bureaucracy which formed a kind of proto 'third realm' of civil society.<sup>6</sup> In this framework, local elites directed many environmental issues, including construction of irrigation systems and distribution of natural resources. Ironically this situation was not finally altered until 1949 with New China's establishment, which soon turned into a totalitarian state.<sup>7</sup> During this period, China had many social movements, but almost no civil activities. For example, in the Great Leap Forward (GLF, 1958–1962), people were driven by an extreme official ideology to recklessly transform the physical environment in the name of creating a new nature and nation. Civil society and individualism, believed to be capitalist endeavors that obstructed the state from concentrating resources to initiate grand projects, were repressed for almost

3 Thomas Metzger, 'The Western Concept of the Civil Society in the Context of Chinese History', 1997, [unpan1.un.org/intradoc/groups/Public/documents/APCITY/UNPAN014782.pdf](http://unpan1.un.org/intradoc/groups/Public/documents/APCITY/UNPAN014782.pdf), accessed 12 July 2014.

4 Xiao Gongqin 蕭功秦, 'Civil Society and the Three Obstacles of China's Modernization [市民社會與中國現代化的三重障礙]', *Chinese Social Sciences Quarterly* [中國社會科學季刊] 5 (1993): 189–96.

5 Ling Zhang, 'Harmony or Disharmony: Traditional Chinese and Their Natural Environment', in Naomi Standen, ed., *Demystifying China: New Understandings of Chinese History* (Boulder: Rowman & Littlefield, 2012), 79–88; Zhang, 'Manipulating the Yellow River and the State Building of the Northern Song Dynasty', in Carmen Meinert, ed., *Nature, the Environment and Climate Change in East Asia*, (Leiden: Brill, 2013), 137–159.

6 Li Fan 李凡, *Silent Revolution: Civil Society in Modern China* [靜悄悄的革命: 當代中國的市民社會] (Hong Kong: Mirrors, 1998); Huang Zongzhi 黃宗智 [Philip Huang], "'Public sphere" and "Civil society" in China?—the third realm between state and society [中國的“公共領域”與“市民社會”—國家與社會間的第三領域]' in Huang Zongzhi ed., *The Debating Paradigms in China Studies* [中國研究的範式問題討論] (Beijing: Social Sciences Academic Press, 2003), 260–288.

7 'New China' here points to the People's Republic of China (PRC), established in 1949. In a later part of this paper, 'Chinese government' or 'government' specifically refers to the PRC government.

thirty years.<sup>8</sup> As currently every village or community has its Party branch, the limited 'third realm' of tradition has hardly recovered and so is not the crucial force to stimulate ENGOS.

The development of civil society in China resumed in the early 1980s, with the Reform and Opening-up Policies. As civil society expands, some optimists suggest that it may evolve into a civil society similar to the West.<sup>9</sup> However, other scholars highlight its distinctive traits, rooted in tradition, that may hamper its further development. Australian scholar He Baogang argues that China's civil society is currently entangled with state power, so its autonomy is hardly realised, and is a 'semi-civil society' identical with Philip Huang's definition of the 'third realm'.<sup>10</sup>

Furthermore, Gordon White classifies the emerging Chinese civil society into four categories: the first is 'the caged sector'. Sponsored and manipulated by the state, it attracts many regular people in the manner of organisations like the Communist Youth League, which absorbed millions of students; the second is 'the incorporated sector', usually professional organisations formally registered by government even if many are independent NGOs. They are more acceptable to authority because they are politically insensitive. The third sector, existing in an 'interstitial' or 'limbo' world of civil society, is barely recognised by official institutions. These organisations are very active in some professional circles and most importantly have roots in some local communities, including among patriarchal clans and religious organisations. They are sometimes suspected, but rarely suppressed, by government. The fourth sector is 'the underground civil society' or 'the suppressed sector', which are usually accused of threatening political security or being involved in criminal offenses. What are easily identified as illegal are secret societies, radical political organisations, and religious cults.<sup>11</sup> Most Chinese ENGOS could be attributed to the former three categories and are more inclined to exhibit characteristics of the first and second sectors identified above.

In sum, China witnessed a long history of strong state and weak society during which time civil society was not completely stifled. Although Chinese civil society has enjoyed a kind of spring since 1980, the Chinese people are still accustomed to allowing a centralised government to take responsibility for

8 Judith Shapiro, *Mao's War against Nature: Politics and the Environment in Revolutionary China* (New York: Cambridge University Press, 2001).

9 Li Fan, *Silent Revolution*, 28.

10 He Baogang, *The Democratization of China* (London and New York: Routledge, 1996).

11 Gordon White, Jude A. Howell, and Shang Xiaoyuan, *In Search of Civil Society: Market Reform and Social Change in Contemporary China*, (Oxford: Clarendon Press, 1996), 29–37.

resolving all social problems, including most environmental issues. In turn, the Chinese government always looks forward to a cooperative or even obedient society. This perception has deeply influenced the trajectory of Chinese ENGOs.

## Environmental governance and the emergence of ENGOs in China

Given the powerful state, the emergence of ENGOs is not simply a spontaneous reaction by Chinese society toward a worsening environment, but also, most crucially, a reaction to central government environmental policies. One important reason is that the new Chinese government was hesitant to recognise that the socialist country had environmental problems—environmental problems were instead viewed as an evil of capitalist institutions. Environmental issues were also logically subordinate to other emergent national affairs, namely modernisation and rapid industrialisation, from the GLF onwards while dissent had been actively stamped down upon by the Chinese state since late 1950s. However, following a number of environmental events with catastrophic consequences, the massive modernisation movement undertaken in China has revealed major environmental challenges.

In March 1971, for example, public health officials reported that many of Beijing's citizens were poisoned after eating some bad-smelling fish. Premier Zhou Enlai (1898–1976) immediately ordered the relevant departments to investigate. Soon it was reported that the problematic fish came from Guanting Reservoir, one of Beijing's main sources of drinking water, and had been heavily contaminated by DDT and other toxic chemicals. The follow-up campaign to clean up the Reservoir and some other seriously polluted water bodies from Liaoning Province to Guangdong Province was testament to government's attempts to manage the environment.<sup>12</sup> With the uneasy truth of environmental problems being revealed by this and other instances of pollution, the State Council called the first national meeting for environmental protection in 1973. Environmental problems were officially accepted by the central government as part of its agenda. In an unprecedented move in the new 'Constitution of 1978', China declared that government should supervise both natural resource protection and pollution abatement. One year later, the 'Environmental Protection Law of the People's Republic of China' was promulgated by the National People's Congress and in the following decades, almost 20 acts or amendments were issued. All of these measures finally established a dominant role for government in environmental governance in China.

12 Mao Da, 'An Overview of the Green Movement in China', (forthcoming paper).

With the Reform and Opening-up policies of the 1980s, the Chinese government gradually welcomed ENGOs because they greatly supplemented the limited function of government in dealing with environmental affairs. It was particularly remarkable because resolving environmental problems demonstrated and could be used to justify that the new government was more capable than any previous one or social organisation in Chinese history.<sup>13</sup> As early as 1988, the State Environmental Protection Administration (SEPA), which is now the Ministry of Environmental Protection (MEP), separated from the Ministry of Urban-Rural Development to become an independent department. Soon, it developed into approximately 3,000 environmental protection bureaus (EPBs) at the provincial, municipal, and county levels. However, environmental governance was still inefficient because of two reasons. One was the country's overwhelming focus on economic development and growth of gross domestic product (GDP). Therefore, environmental protection was not a political priority and environmental bureaucrats were about the least influential within administration and among policymakers. The other reason was that China's bureaucratic system was increasingly sluggish to face emerging environmental problems. With environmental problems developing in almost every province, the complicated process of reporting, reviewing, and identifying was inefficient and wasted money. Some of these agencies even become 'protecting umbrellas' for polluters and environmental criminals. Realising the shortcomings of official institutions, some famous public figures started to advocate for the creation of ENGOs and to disseminate ideas of environmental protection from bottom to top.

Essentially three direct social factors promoted the emergence of ENGOs in China. The first derived from the decentralisation reforms which encouraged a more open atmosphere for public debate on environmental problems. In 1979, sponsored by SEPA, but open to all professional environmental scientists, the Chinese Society of Environmental Science (CSES) was founded in Beijing. It is a typical 'caged sector' of the Chinese civil society, but it created a framework wherein the public could openly discuss and express different ideas to authorities on environmental issues. In April 1994, the State Council declared that government officials were no longer permitted to take a leadership role in NGOs and that all NGOs should be registered with the Ministry of Civil Affairs as independent corporations. In 1995, only 30.4 per cent of NGOs' funding came from government. A 1998 central government document again required all

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13 Chairman Mao proudly declared that bilharzia, afflicting the Southern Chinese peasants for years, was eliminated in 1958, although the breaking out of this epidemic was partly because wet land was widely transformed to paddy field after 1949.

governmental cadres to avoid leadership of NGOs and announced the cessation of government funding for any NGO established after 1985.<sup>14</sup> These decisions stimulated a more independent genre of ENGOs.

A second driving force was international communication and exchange. In the 1980s, the Chinese government invited many environmental officials and experts from abroad, including those from international ENGOs. The first two organisations were the International Crane Foundation (ICF) and the World Wildlife Fund (now World Wide Fund for Nature, WWF). Their early work in China brought new ideas for establishing natural conservation and promoting civil society. The first Chinese ENGO, initiated by Liu Detian, a journalist for *Panjin Daily*, was directly under the influence of two experts sent by ICF and WWF respectively. In April 1991, Liu registered the 'Saunders Gull (*Larus Saundersi*) Conservation Society of Panjin City (SGCSP)' to protect this precious species and its habitat in Panjin region. 'It is the first time in my life to hear of the word "imminent danger" and "ecological net"', Liu said, 'the Canadian expert of ICF remind me Norman Bethune, the transnational work is amazing [sic].'<sup>15</sup> WWF in later years contributed greatly to environmental protection in China and remains one of China's most significant international ENGOs.

The third spark was a growing self-consciousness among specific individuals to protect the environment because of the visible loss of natural habitat, forests, rare species, and the degradation of arable land. For example, as early as in 1981, 17-year-old Xu Xiujuan formally dedicated her life to the protection and cultivation of the Red-crown Crane (*Grus japonensis*) in Zhalong Crane Nature Reserve, training for a year at the Northeast Forest University. However, Xu tragically drowned in the marsh in 1987 when searching for two lost cranes. She was quickly regarded as a hero of environmental protection and her death inspired many other naturalists and environmentalists to follow her passion. In a more emotional way, nature writers such as Xu Gang and Wu Dengming (1940–2013) also actively aroused people's common interest in protecting the 'wild' and other forms of environment through their writings. Wu also wrote survey reports, petitioned the government, and organised young fellows to spread the idea of environmental protection to local residents.<sup>16</sup> All these factors paved the way for the blossoming of ENGOs in the 1990s and early 2000s.

The case of 'The Friends of Nature (FON)' is undoubtedly representative of ENGOs in China in the early period of their formation. FON was formally launched in 1994 by several famous intellectuals such as Liang Congjie

14 Hong Dayong 洪大用, 'Shift and Continuity: The Transformation of the Chinese ENGOs [轉變與延續: 中國環保民間組織的轉型]', *Management World* [管理世界] 6 (2001): 59.

15 Xu Nan, 'The Life of the ENGOs in China', *Southern Weekend*, (8 October, 2009), no page. Norman Bethune was a doctor native in Canada who devoted his life to the Chinese medical service.

16 Mao Da, 'The Rise, Influence and Improvement of Environmental NGOs in China', (forthcoming paper).

(1932–2010), Yang Dongping, Liang Xiaoyan and Wang Lixiong, who were all professionals in the humanities or sciences. Of particular note is Liang's eminent family background—his grandfather, Liang Qichao (1873–1929) was an outstanding thinker and social reformer, and his parents were the most famous architects who were in charge of designing the national flag. Liang Congjie was worried about Chinese environmental problems from the early 1980s. When he worked as an editor for the magazine, *Encyclopedic Knowledge* [*Baike Zhishi*], an article on industrial pollution in the numerous township enterprises caught his attention. Following that, Liang selected more articles on environmental issues for his magazine. While Liang Xiaoyan, a young colleague of Liang Congjie, initiated another magazine, *The Intellectual*, he more frankly committed herself to looking for new ways to foster civil society in China and push social reform forward. They were more or less involved in the movement clamouring for social reform in the late 1980s, so they were courageous and sophisticated enough to seek government support. In the mid-1990s, all NGOs were officially registered and supervised by specific government departments. When SEPA refused to oversee FON, Liang used his occupation and political leverage, as a member of the National Political Consultative Conference of China, to successfully make FON affiliated with the China Cultural Collage (a semi-independent research institute of the time) and thereby gain it a legal identity.

The development of FON's work was never too radical because of its close association with the state. Since it was founded, the new organisation's activities were simply limited to convening the Second Green Talkfest and organising environmental photography exhibits.<sup>17</sup> In November 1994, Liang was invited by some foundations and international NGOs to the United States, where he received the first overseas grant towards FON's future projects. In 1995 and 1996 during the National Political Consultative Conference, Liang, with his colleagues, proposed relocating Capital Steel, one of China's biggest heavy industrial enterprises and a main source of Beijing's air pollution, to a suburban area. When Liang made the proposal, it was considered a challenge to government because Capital Steel was a state-owned company and one of the main taxpayers in Beijing. However, his proposal was finally realised in 2005 when officials ordered Capital Steel's relocation. Liang Congjie also wrote letters to Tony Blair, the former British Prime Minister, asking for the cessation of the *chiru* (Tibetan antelope, *Pantholopshodgsonii*) fur-trade in Britain, then its largest market. Blair quickly replied and soon urged constraints on the trade around the world.<sup>18</sup> All of these cases reflected how personal interest and international communication greatly shaped the early work of the ENGOS.

17 The first Green Talkfest was held in Beijing in 1993 before FON was established. The Talkfest had almost 50 participants, who later became FON's earliest members of FON.

18 Liang Congjie, 'Open Letter to Tony Blair, the Prime Minister of Britain', [www.grchina.com/gb/kekexili/allwordcare-2.htm](http://www.grchina.com/gb/kekexili/allwordcare-2.htm), accessed 20 July 2014.

Local-level ENGOs were also developing. For example, Wu Dengming, a famous nature writer, lived in Chongqing, the second-largest city along the Yangtze River, and turned to a more practical way to arouse public attention to the fate of this major river of China. He established the Chongqing Green Volunteer Association (CGV) and regularly organised volunteers to survey the river environment and to broadcast their suggestions to local communities. At the end of 1999, CGV organised volunteers to hike along the Yangtze River for 1,170 kilometres in 45 days. They passed through four provinces and more than 120 towns to spread the idea of environmental protection. CGV also held eight series of training courses for more than 600 local school teachers.<sup>19</sup> Yunnan and Guizhou provinces were also early hotspots of local Chinese ENGOs.<sup>20</sup> One reason is that these two provinces were both famous for their biodiversity and ethnic people who lived around China's last remaining piece of original tropical rainforest on its borders with Southeast Asia. Another reason is that they are not only far from Beijing, the political center, and so have not been developed by ambitious entrepreneurs from this region or coastal eastern China.

## Chinese ENGO activities

China's earliest ENGOs were most successful in the least politically sensitive area of public environmental education. With help from international NGOs and other influential NGOs, such as the China Youth Development Foundation, FON launched several popular environmental education projects. In May 2000, the 'Antelope Van' project was started and sought to protect western China's fragile ecology. Inspired by the German educational idea of mobile teaching, a cartoon image of an antelope covered the van, which was equipped with various teaching tools and materials for outdoor environmental education. The van could drive children to the nature reserves, enabling them to vividly encounter and understand the natural areas to be protected through games and personal experience. In less than a year, by April 2001, the van had visited 125 schools and brought environmental education to more than 10,000 pupils. By the end of 2002, nearly 100 media agencies, including CCTV and the National Geographic Channel, had reported on educational drive.

19 'CGV changed the public decision,' [www.green.org.cn/b\\_28\\_87\\_14\\_news.aspx](http://www.green.org.cn/b_28_87_14_news.aspx), accessed 5 November 2014. CGV's founding father, Wu Dengming, passed away in 2013.

20 For related studies, see, for example, Shu-min Huang, 'Lashihai: Changing environmental protection of an Alpine lake and wetland', in Ts'ui-jung Liu, ed., *Environmental History in East Asia: Interdisciplinary perspectives* (Abingdon and New York: Routledge, 2014), 156–168; Zhaoqing Han, 'Maize cultivation and its effect on rocky desertification: A spatial study of Guizhou province (1736–1949)', in *Environmental History in East Asia*, 243–258.



The Institute of Environment and Development (IED), founded in 1994 by sociologist Li Lailai, also focused on environmental research and aimed at providing reliable and practical environmental information for other social groups and the younger generations. IED sponsored two projects committed to playing a special role to strengthen the capacity of Chinese ENGOs. The first is a young ENGO practitioner training program, called Leadership for Environment and Development (LEAD). Even now, many core ENGO members had experience in LEAD. Another project sustains a computer server and provides free space for all ENGO supporters on the internet.

ENGOs also used various other methods to enhance their appeal. For example, in March 1996, Liao Xiaoyi and Li Hao, two long-time friends, established an ENGO, 'Global Village of Beijing (GVB)'.<sup>21</sup> Liao was a philosopher at the Chinese Academy of Social Sciences while Li, different from most pioneers of ENGOs in the 1990s, was an epidemiologist with a PhD from a German university. Her western scientific background and personal experience equipped Li with a better understanding of China's environmental crisis. Together, they mainly focused on making television documentaries and promoting public environmental awareness, such as by campaigns encouraging energy and water savings, as well as the need to recycle. It is valuable that GVB enthusiastically promotes environmental education and training for the 'left-behind' children whose parents work in cities far away from their hometowns.

Compared to environmental education, the political influence of Chinese ENGOs developed much more slowly. One unexpected reason was the changing nature of Chinese society in the 1990s. Since political reform was almost suspended after 1989, government prioritised economic development and it soon occupied the central position in public debates. It meant that Chinese society, which became politically muted in the wake of the later 1980s suppression, was less focused on any other issues except improving personal lives. Another reason for political weakness was rooted in ENGOs themselves. Most pioneers of national ENGOs were intellectuals or social elites who maintained close connections with various branches of government and so were reticent to involve themselves in sensitive issues. These people never lacked compassion but as elites, they found it hard to connect with grassroots sentiments. In contrast, the elites were skilful in utilising private connections to high-ranking officials to achieve environmental aims. For example, Liang Congjie was a good friend of Mou Guangfeng, a senior official of SEPA who helped Liang's career and finally drafted a proposal to one of the State Councillors, who pushed an official environmental doctrine by the State Council in 1997. Requiring that all levels of government should actively support

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21 Now the full name is Beijing Global Village Environmental Education Centre.

ENGOS' activities, the doctrine was considered the first officially supportive comment on the Chinese ENGOS in general.<sup>22</sup> Since the very beginning, then, circumstances have made ENGOS politically conservative.

In the early 2000s, the impact of ENGOS on government decision-making was still not outstanding, even while media pressure and professional suggestion had enlarged their influence. In 2000, the Lake Yangliu hydropower station project, in Sichuan province, attracted intense media criticism. In two months, over 180 news reports criticised the project because of its potential ecological impacts. The project was finally aborted by Zhang Xuezhong, the General Secretary of Sichuan Province. It was the first time a big official project was suspended through public pressure for environmental protection. One year later another huge debate erupted after the announcement of a project to construct a series of hydropower stations along Nujiang River (Salween River), an international river that crosses several nations apart from China. It involved actors, such as state-owned power companies, local governments, central departments, scientific workers, media and ENGOS, in a debate that was widely reported and which also attracted international attention, a sensitive factor that central government took into account when reaching its decision. The dispute was ended when Premier Wen Jiabao suspended the project in late 2003.

In the new millennium, the transformation of the Chinese attitudes towards life offered a great opportunity for the expansion of ENGOS and the latter soon became the leading force for improving environmental governance. It was widely recognised that polluted air, water, and food were threatened everyone, including top political leaders and millionaires. With the rocketing Chinese economy, demand for a better living environment and with it, health quality, became hot public issues. However, China's environment, especially in industrial cities and huge urban areas, was dramatically deteriorating. With the intensifying contradictions between economic development and environmental protection, a growing number of local ENGOS, with the help of local residents, endeavored to attain specific environmental objectives. In five years, the total number of ENGOS steadily grew and almost doubled beyond their number prior to 2003.<sup>23</sup>

As Yang Guobin has argued, the emergence of the Chinese ENGO was as a result of a combination of various forces wherein the internet played a significant role, most notably from 2003.<sup>24</sup> What particularly changed people's attitudes and their support of unfettered economic development was an unexpected

22 'The Life of the ENGOS in China', *Southern Weekend* (8 October 2009), no page.

23 It is recorded by [www.greengo.cn](http://www.greengo.cn) and [www.chinadevelopmentbrief.org](http://www.chinadevelopmentbrief.org) and tabled by Dr. Mao Da.

24 Yang Guobin, 'Environmental NGOs and Institutional Dynamics in China', *China Quarterly* 181 (2005): 47; 'The Co-evolution of the Internet and Civil Society in China', *Asian Survey* 43: 3 (2003): 411–412.

epidemic, the Severe Acute Respiratory Syndrome (SARS). To stop its rapid spread, people avoided public places while university students, the internet's earliest users, were not even allowed to go out of campus from April to July. People consequently relied more than ever on the internet to access the latest news. As a contagion the likes of which had not been faced for decades, SARS killed many medical workers and caused enormous anxieties about the ecological system.

When it was proven that the disease derived from the civet cat (*Pagumalarvata*), sometimes cooked in Guangdong Province, ENGOS quickly seized on the opportunity to raise a public debate on rethinking the relationships between human beings and animals. In May, the *Southern Weekend*, a newspaper based in Guangdong, but popular in the whole country, carried a large report that criticised the State Forestry Administration's (SFA) new doctrine suspending trade in wild animals and their products in China. It was considered too conservative, and most ENGOS argued for 'forbidding' rather than simply 'suspending' wild animal consumption. The report interviewed Liang Congjie, FON's well-known head, arguing that the best solution should be to revise the 'Law of the PRC on the Protection of Wildlife'. Several days later, *People's Daily*, the largest newspaper of the Communist Party, also reported that 38 ENGOS had jointly signed an agreement for protecting eco-diversity and anti-SARS.<sup>25</sup> Since then, environmental protection and wildlife conservation received unprecedented attention in public fora and the internet. In this way, ENGOS gained widespread public attention, especially among the less educated.

Some ENGOS even became active and stable participants in helping to formulate official policies. In the 2003 Nu Jiang River controversy, ENGOS had failed to push for a public hearing. However, they succeeded in another environmental controversy at the Yuanmingyuan Royal Park in 2005. The Park, located in a Beijing suburb and since 1949, a symbol of European imperialist aggression to China, is both a cultural and ecological heritage site. After visiting it, a Lanzhou University professor complained about park authorities lining the park's lakes with impermeable plastic film. Public criticism quickly followed and became a hot issue across the country. ENGOS successfully allied with reformists within SEPA and pushed for a public hearing. Seven ENGOS sent representatives to criticise park authorities' actions. Ultimately, the hearing overturned the findings of the first Environmental Impact Assessment (EIA) report on the project. At that time, most EIA reports in China were merely rubber stamps for such projects.

25 Peng Xiaohua 彭曉華 and Cong Zongliang 宗晨亮, 'Dance with Media: Media Mirror of the Indigenous Chinese ENGO with the Case Studies of the Friends of Nature [與媒體共舞: 以「自然之友」為例考察中國本土環境運動的媒體景象]', *Journalism and Communication* [新聞傳播] 4 (2012): 206.

The Yuanmingyuan hearing changed the EIA in China. Although this should have promoted optimism about Chinese ENGOs's influence on Chinese politics, further challenges remain.

## Challenges to Chinese ENGOs

According to a report by the All-China Environment Federation (ACEF), founded as the largest national ENGOs by SEPA in 2005, Chinese ENGOs were officially divided into four categories. The first is sponsored by government; the second is initiated by individuals; the third is organised by students; and the fourth is a branch of international ENGOs in mainland China.<sup>26</sup> This classification is similar to Jonathan Schwartz's, which identifies three major forms of Chinese ENGOs: (1) 'government organized non-governmental organization (GONGO)', (2) grass-roots-founded ENGOs, and (3) university-organised ENGOs.<sup>27</sup> It also reminds one of Gordon White's classifications of Chinese NGOs.<sup>28</sup> Except for some GONGOs, which are logically more conservative, most Chinese ENGOs were facing huge challenges.

The first challenge facing most ENGOs is their limited funding. According to the latest openly accessible material, 66.7 per cent of international ENGOs received more than 500,000 Yuan (about USD80,000), compared with 9.9 per cent for GONGO, and 4.9 per cent among grassroots ENGOs.<sup>29</sup> Although international ENGOs were financially wealthier and more stable, they were normally not allowed to collect money from Chinese citizens. According to 2008 official reports, only 26 per cent of ENGOs had stable financial resources while in some completely independent ENGOs (42.1 per cent of which were GONGOs and 36.8 per cent were university ENGOs), 59.6 per cent of funds came from their own members.<sup>30</sup> However, in respect of funding models, a noticeable event was the establishment in June 2004 of Alxa Society of Entrepreneurs and Ecological Association (SEE). SEE, created by more than 100 Chinese entrepreneurs, emphasised ecological health in the Alxa area of Inner Mongolia, and received support from other ENGOs. Given its wealthy sponsors, this is an ENGO that rarely worries about financial problems and is more flexible in its aims than almost any other ENGO in China. Every year, the SEE foundation awards an

26 All-China Environment Federation (ACEF), *The Findings Report on the Development of ENGOs in China*, 2006, [www.doc88.com/p-9751909379533.html](http://www.doc88.com/p-9751909379533.html), accessed 20 July 2014.

27 Jonathan Schwartz, 'Environmental NGOs in China: Roles and Limits', *Pacific Affairs* 177: 1 (2004): 28.

28 White et al., *In Search of Civil Society*, 29–37.

29 ACEF, 'The Findings Report on the Development of ENGOs in China', (2006): 62.

30 ACEF, 'Blue Paper of Environment Protection: The Findings Report on the Development of ENGOs in China [中國環保民組織發展狀況報告]', 2008, [wenku.baidu.com/view/dad061313968011ca30091el.html](http://wenku.baidu.com/view/dad061313968011ca30091el.html), accessed 20 July 2014.

environmental prize of one million RMB. However, SEE only encourages the most prominent environmentalists and remains the only ENGO of its type in China.

A second challenge is the low level of specialisation among ENGO staff. Research in 2008 reveals that 28.9 per cent of ENGOs had no specialised staff; 46.5 per cent, only sustained staff of fewer than five people. Some 80 per cent of branches of Chinese international ENGOs have fewer than 20 staff and 59.7 per cent of grassroots ENGOs had a staff of fewer than 10.<sup>31</sup> Deficiencies in scientific knowledge and a lack of professional guides dramatically impair ENGOs. For example, in November 2005, when Songhuajiang River pollution triggered a new wave of public concern with water pollution in China, ENGOs appeared to be silent in the face of this human-caused environmental disaster. The public sharply criticised ENGOs when a seminar held one month later exposed the main reason for their silence. Wang Yongchen, leader of Green Earth Volunteers (GEV), admitted that Chinese ENGOs did not have the capacity to get involved in some events which required expertise in economics, ecology, chemistry, and geology. Therefore, since 2005, more experts other than humanities and social science specialists have initiated organisations. For example, Aurora (Public Information Technology Center) was created by experts in database and GIS (geographic information science) technology. They have helped create several environmental databases based on specific ENGO requirements. Petroleum and Environment Network (established in March 2005) is another very specialised ENGO initiated by people familiar with this industry. Their projects include information distribution, justice in the oil economy, and safety of oil and gas shipment. While the situation improves, further cooperation is still needed because the most competitive experts and scientists are always absorbed by government organisations.

A third challenge is the lack of co-ordination among ENGOs. Firstly, the geographical distribution of ENGOs is very uneven. As ACEF's report of 2005 showed, Chinese ENGOs were mainly concentrated in three regions: the economically developed coastal region; areas along the Yangtze River; and frontier areas like Yunnan, Tibet, and Xinjiang. According to ACEF's second report in 2008, only Guangdong had emerged as a new ENGO area in the three years since their earlier report. Guangdong is far away from the political centre and enjoys a stronger tradition of civil society than other parts of China. Considering China's variety of landscapes, ecosystems, and climates, some local ENGOs prefer to pursue narrow-interest issues. Many young ENGOs leaders are also narrowly focusing on their own careers or the interests of their small circles, a sectarianism that either leads to unfair competition or apathy about

31 Xiao Gongqin, 'Civil Society and the Three Obstacles'.

each other's work.<sup>32</sup> In addition, extreme ENGOs or 'deep green groups' attract a lot of criticism from the public and other ENGOs. Many disputes centre on whether Chinese should use certain plants and animals, which are scarcely used in other countries for medicine and food. From 2012, some animal protection organisations have blocked the IPO attempt of Gui Zhen Tang, a medical company which regularly extracts bile from bears. These organisations greatly raised public consciousness of animal ethics. However, when extreme activists stopped trucks legally carrying dogs on the express road, they were widely criticised for their dangerous behaviour. When ENGOs interrupted the dog-meat festival in the city of Yulin, locals poured scorn on them, because of the traditional acceptance of eating dog meat in this region.

A fourth challenge is the isolation of ENGOs from genuine grassroots movements. Currently there are two conspicuous environmental movements successively happening in China; respectively, resistance to government projects to build chemical plants and rubbish incinerators. These issues belong to a wider civil rights movement because potential victims increasingly question arbitrary official decisions in supporting large polluting industries. For example, in 2007, in an anti-PX project demonstration in Xiamen (Amoy), in an unusual move, Fujian province called in more than 100,000 citizens concerned about potential environmental hazards, who appealed to remove the project from the city. The movement was widely noticed through the internet and similar events happened in a series of other cities, including Dalian, Qingdao, Ningbo, and Maomin, all famed for their amazing coastal environments. Accompanied by sometimes violent confrontations between protestors and local administration, most of these projects were finally aborted or transferred to other sites. Following these movements, there has been a few appeals for establishing a more transparent and institutionalised public system permitting investigation of the environmental impacts of projects. As Zhou Zhijia observed, '[c]itizen participation in the PX movement has merely revealed a rudimentary civility, and the functional absence of NGOs is an important element leading to this situation'.<sup>33</sup>

Although the scale is sometimes smaller, the tactic of open resistance is more frequently seen when it is directed against construction of rubbish incinerators. The earliest influential case happened in Panyu, a district of Guangzhou, in 2009. Concerned with toxic chemical pollution, local residents spontaneously appealed for the incinerators' removal, finally suing the relevant administration. One of the most recent cases took place in Yuhang, a district of the popular

32 Yu Jianfeng 余劍鋒, 'An Investigation and Review of the Culture of Contemporary Chinese Environmental Movement [中國環境運動文化的現狀分析和反思]', *China Development Brief* [中國發展簡報] (2012): 16.

33 Zhou Zhijia, 'Environmental Protection, Group Pressure or Interests Relatedness?', *Chinese Journal of Sociology* 31: 1 (2011): 1.

tourist destination, Hangzhou, in early 2014, and evolved into a large-scale riot. In all of these cases, ENGOs were neither major organisers nor participants. Although ENGO members contribute scientific data to judge EIA reports, all these events are essentially genuine grassroots movements.

As noted, ENGOs are cautious to stand in opposition to the government, and are instead content to push 'good governance' within the existing political system. The reason is simple: environmental events are no different from other civil protests, whether individual or collective, which openly challenge state authority and are easily accused of disrupting 'social stability'. The poison milk powder event of 2008 was unforgettable for many ENGOs, although it dramatically aroused public concern about food security and public fury against negligent administration. While the offending milk factory was shut down and relevant officials were dismissed, some lawyers who insisted on further punishment were also attacked. Therefore, although genuine grassroots environmental movements are increasing, the influence of ENGOs on them is still unpredictable.

## **Conclusion: Understanding the uniqueness of Chinese ENGOs**

The expansion of ENGOs over the past two decades has been one of the most conspicuous phenomena in the history of Chinese civil society. The birth and early development of Chinese ENGOs resulted from many factors: progressive political reform of government, defects of environmental governance, worry about environmental problems, increasing international interactions, and the efforts of influential elites. In recent years, changes in popular environmentalism, ENGO specialisation, the internet's rise and a still-deteriorating environment further boosted ENGO support. However, Chinese traditional culture and political institutions are still the leading factors that shape Chinese ENGOs. The so-called GONGOs, ENGOs sponsored by government, are still China's most powerful ENGO, although an increasing number of independent ENGOs are also developing.

Given the Chinese political system, official attitudes towards environmental problems always create opportunities for ENGOs. Although the 2005 Yuanmingyuan hearing was widely considered an achievement for ENGOs, it took place against a background of SEPA demonstrating unparalleled strictness towards EIA reports. SEPA terminated 30 building projects of power stations that amounted to more than 117.9 billion RMD of investment earlier



in that year.<sup>34</sup> In 2008, SEPA was upgraded to the Ministry of Environmental Protection (MEP) and became more powerful. In June 2014, it fined 19 power companies and heavy industry enterprises almost 70 million U.S. dollars. Many of these are state-owned companies that ENGOs have failed to challenge.<sup>35</sup> Another case further shows how powerful the state still is in constraining civil society. Registration of NGOs is still complicated. Although many provinces, such as Guangdong, do not require a supervisor for newly formed NGOs, informal methods of obstruction, including deliberate prolonging of the application process, is commonplace. Moreover, the Chinese government is unusually sensitive to ENGOs with an international background, so overseas registration of ENGOs in China is still not all that open. In addition, since the 1999 US bombing of the Chinese embassy in Yugoslavia, conservative Chinese nationalists have dismissed Western media criticism of Chinese domestic affairs, including environmental problems: to them, such criticism merely proves Western prejudice towards China and jealousy of its economic boom.

One should also not forget the impact of traditional political culture. As early as 1992, Deng Zhenglai, a famous sociologist and law researcher, suggested that Chinese civil society should not expose a zeal for politics too early, and should not be successors to the tradition of radical conflict between the grassroots and government that usually ended in bloody riots. It should be very cautious in finding a way to establish civil society from the bottom up.<sup>36</sup> Furthermore, Jiang Qing even asserted that China could never expect to build a civil society like that of the Western model because Chinese culture tends toward accepting 'a society with reasonable hierarchy and proper freedom for the individual'.<sup>37</sup> According to this line of argument, any development of civil society has to take into account Confucianism. Therefore, a critical issue for ENGOs might not be how to balance state power and civil society, but actually how to boost an effective bureaucratic system in China.

Compared with many radical human rights ENGOs that fail even to gain any public notice, ENGOs are very successful, since they choose a progressive way to pursue their aims. With the popular online name 'Basuo Fengyun', Luo Jianming—famous for his leading role in online resistance to a Panyu garbage incinerator in 2009—actively promoted recycling of rubbish and

34 '2005 The EPAs Storm: A Gambling should not Stop (2005環評風暴: 一場不該戛然而止的博弈)', *The Chinese Business* [中國經營報], 27 February 2005, [finance.sina.com.cn/g/20050227/12181387293.shtml](http://finance.sina.com.cn/g/20050227/12181387293.shtml), accessed 17 July 2014.

35 Available at: [china.haiwainet.cn/n/2014/0617/c345646-20750220.html](http://china.haiwainet.cn/n/2014/0617/c345646-20750220.html), accessed 20 July 2014.

36 Deng Zhenglai鄧正來and Jing Yuejin景躍進, 'Construct Chinese Civil Society [構建中國的市民社會]', *Chinese Social Sciences Quarterly* [中國社會科學季刊] 1 (1992): 58–68.

37 Jiang Qing蔣慶, 'Confucius Culture: An Rich Resource to Construct the Chinese Model of Civil Society [儒家文化: 建構中國式市民社會的深厚資源]', *Chinese Social Sciences Quarterly* [中國社會科學季刊] 3 (1992): 170–175.

sponsored a number of ENGOS. When he was awarded the SEE•TNC annual prize in 2011, he said: 'I did not care about politics and my neighbours until 2009 when I suddenly found government was not as arrogant as the stereotype in my mind. One should adopt a more proactive approach to government and look for a benign compromise with it'.<sup>38</sup>

All of these cases explain the unique experience of Chinese ENGOS. It is reasonable that Chinese ENGOS avoid involvement in street politics by grassroots movements, and it is effective that the meritocratic ENGOS prefer private connections to senior officials. Since environmental problems will be serious for a long time yet in China, there is hope that civil society will have a louder voice in the environmental movement and gain the support of more young students. Their organisations can conveniently and easily register under a university. Among such university ENGOS, Green Anhui, Green Longjiang, Green Camel Bell, and The Green Environmental Advisory Centre of Chongqing are four successful ones. Their advantage lies in stable student groups, sufficient back-up personnel, and good connections with university scholars. This is evident in the case of Fang Minghe, born in 1984, who founded Green Eyes (GE) as a high-school student in 2000, and soon became the youngest leader of any ENGO in China. These young people and their ENGOS, led with passion and talent, may speed up the expansion of ENGOS and even Chinese politics. However, the attitude of government towards civil society will decisively influence the destiny of China's ENGOS.

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38 'Luo Jianming: We Need a Rational Mode to Negotiate with Government in Resisting Garbage Incinerator', [news.qq.com/a/20110610/000788.htm](http://news.qq.com/a/20110610/000788.htm), accessed 1 October 2014.

Table 1: Indicative List of ENGOs Established in China, 1997–2002.

Area	Name	Founded	Founder	Registration	Working focuses
Beijing	Centre for Legal Assistance to Pollution Victims	October 1998	Prof. Wang Canfa (environmental law researcher)	Non-independent legal figure	Environmental law and environmental lawsuits
	South–North Institute for Sustainable Development	1998	Environmental and development researchers	Private non-enterprise organisation	Sustainable energy
	Beijing Human and Animals Environmental Education Centre	1997	Animal lovers	Private non-enterprise organisation	Animal rights
	Green Beijing	1998	Environmental Volunteers	Not registered	Environmental Education
	Green Web Alliance	1999	Environmental Volunteers	Not registered	Environmental information
	Green Star Volunteer Service on Waste Batteries	2001	Wang Zixin (expert on waste battery recycling)	Not registered	Waste battery and other household hazardous waste
	Echoing Steppe	2000	Environmental Volunteers	Not registered	Steppe in Inner Mongolia
	Ocean Protection Commune	2000	Yi Wuchen	Social organisation	Ocean environment
	Han Hai Sha	April 2002.	Volunteers of FON and Green Net Alliance	Social organisation	Environmental education and desertification
	Beijing Human and Animal Environmental Centre	1997	Animal protectors	Private non-enterprise organisation	Animal protection and animal rights
	Green Cross	December 2002	Environmental artist	Private non-enterprise organisation	Rural community, recycling
Tianjin	Green Friends in Tianjin	November 2000	Environmental volunteers	Social organisation	Local environment
Hebei	Green Friend Association	May 1999	Zhang Zhongmin (professor of journalism)	Social organisation	Environmental education
	Hengshui Earth Daughter Environmental Volunteers Association	October 2002	Environmental volunteers	Social organisation	Environmental education and recycling
	Greenhome Environmental Protection Centre (GEPC)	1998	Environmental volunteers	Private non-enterprise organisation	Local environmental improvement in the northwest part of Hebei
	Bird Lovers Association of Xibaipo, Pingshan	April 2002	Bird watchers	Social organisation	Bird protection

Area	Name	Founded	Founder	Registration	Working focuses
Inner Mongolia	Echo Ecology in Pasturing Area Research Centre of Inner Mongolia	December 2002	Social science researcher	Private non-enterprise organisation	Natural resources and rural community
	Chifeng Desert Green Project Institute	March 1999	Local researchers	Private non-enterprise organisation	Natural resources and desertification
Shandong	Linyi Entomological Institute	2000	Yang Tongjie (entomologist)	Unknown	Insects and agricultural ecology
Henan	Green Tian	May 2002	Tian Guirong (activist on waste batteries) and farmers	Social organisation	Environmental rights and recycling
Hubei	Green Han Jiang	2002	Yun Jianli (former government officer)	Social organisation	Protection of Hanjiang River
	Association for Wetland Conservation	May 2005	Photographers	Social organisation	Protection of wetlands
Jiangsu	Green Stone Environmental Action Network	September 2000	University students	Enterprise	Environmental education and information
	Friends of Green Environment	1998	Environmental volunteers	Social organisation	Environmental education and information
Shanghai	Grass-roots Community	2000	Grass-roots volunteers	Social organisation	Rural and urban communities, environmental education
Zhejiang	Green Zhejiang	January 2002	School teachers	Social organisation	Youth, environmental education
	Greeneyes China	January 2000	Fang Minghe (high school student)	Enterprise	Youth, animal protection, environmental education
	Hainan Ecological and Environmental Education Centre	July 2001	Environmental volunteers	Not registered	Environmental education

Area	Name	Founded	Founder	Registration	Working focuses
Yunnan	Green Watershed	2002	Environmental researchers	Private non-enterprise organisation	Environmental policy, water resources
	Zhaotong Volunteers Association to Protect Black-necked Cranes	December 1998	Environmental researchers	Social organisation	Bird protection, environmental education
	Yunnan EcoNetwork	January 2000	Chen Yongsong	Private non-enterprise organisation	Capacity building and resources conservation
	Shangri-La Folk Environment Protection Association	February 2002	Local residents	Social organisation	Natural resources, biodiversity, rural community
	Pesticide Eco-Alternatives Centre Yunnan China	2002	Agricultural scientists	Social organisation	Pesticide, environmental health
Sichuan	The Daba Mountains Academy for Biology and Poverty Problems	2001	Zhang Haoliang	Social organisation	Rural community and environment
	Green Student Organisation Society	June 2001	University students	Not registered	Environmental education, capacity building
	Green River	November 2000	Yang Xin (environmental photographer)	Social organisation	Environmental education, animal protection, biodiversity
Guizhou	Guizhou PRA	1998	Ren Xiaodong (university researcher)	Chose to not register	Rural community
Ningxia	Centre for the Environment and Poverty Alleviation in Ningxia	1998	Volunteers	Private non-enterprise organisation	Natural resources, rural community, environmental education
Gansu	Green Camel Volunteer Organisation	2002	Environmental volunteers	Unknown	Local environment

Source: [www.greengo.cn](http://www.greengo.cn), [www.chinadevelopmentbrief.org](http://www.chinadevelopmentbrief.org).<sup>39</sup>

39 The table was offered by Mao Da in 2012. It lists 39 ENGOs established between 1997 and 2002, nearly five times the number established in the six years between 1991 and 1996, and most of them are registered. Considering the difficulties of registration, there were many more ENGOs emerging in this period.



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# 'HUNGRY DRAGONS':<sup>1</sup> EXPANDING THE HORIZONS OF CHINESE ENVIRONMENTAL HISTORY—CANTONESE GOLD-MINERS IN COLONIAL NEW ZEALAND, 1860S–1920S

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## Abstract

Tens of thousands of Chinese seized on the opportunities presented by British imperialism to take advantage of resource frontiers opening up in places like Canada, Australia, and New Zealand. Utilising British legal apparatuses and financial systems, Chinese migrants grafted them, in varying ways, onto their own networks of expertise and environmental knowledge drawn from China and elsewhere.

This article brings to light neglected aspects of global, British imperial, and Chinese environmental histories. Just as Chinese environmental historians have overlooked the environmental history of overseas Chinese, so environmental historians of British settler colonies have likewise ignored Chinese. The article fills these historiographical gaps by examining the environmental impacts of Cantonese gold-miners in New Zealand, who adapted water technology from their homeland of Guangdong Province and from elsewhere, such as in California and Victoria, Australia. In New Zealand, Cantonese mining caused soil erosion, reduced timber supplies, displaced vegetation, and used up scant water resources, in addition to establishing environmental exchanges between parts of New Zealand and southern China. The article also argues that studying the environmental impacts of overseas Chinese can present new research on both Chinese environmental history and comparative global environmental history.

**Keywords:** Chinese environmental history, global environmental history, imperialism, British Empire, Cantonese, South China, New Zealand, gold-mining, environmental impacts, migration.

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1 *Tuapeka Times*, 8 September 1906, 3.



## Introduction

This article illustrates how the environmental history of overseas Chinese might help correct an ethnocentric bias in environmental historiography of the British Empire, especially of its settler colonies. With the exception of studies of Chinese in tropical colonies in activities such as tin-mining or agriculture,<sup>2</sup> environmental historians of British settler societies have largely ignored Chinese as agents of environmental change.<sup>3</sup> Instead, they have focused on how European labour and capital, supported by colonial states and their legal, bureaucratic, and military machinery, facilitated large-scale environmental transformation. This characterisation applies to scholarship right from the seminal work of Alfred Crosby, down to Thomas Dunlap and other more recent historians of empire—myself included.<sup>4</sup> It also applies to scholarship on New Zealand, case studies from which this article examines.<sup>5</sup>

Below, I argue for the need to acknowledge the role of Chinese finance and workers in New Zealand's environmental transformation, especially in Otago. Examining the environmental history of Chinese considerably enlarges our picture of environmental ideas, connections, and changes in New Zealand, by adding another group's views to those of European colonists and Māori. While some white colonists criticised Chinese miners and resented their presence on the gold-fields, this article shows that many others admired the specialised skills they offered, especially in building water-races, a task on which many dozens of Chinese were employed by Europeans. Some colonists also went into business partnerships with Chinese, engaging in enterprises that connected the environments of southern New Zealand and south China and which triggered environmental change in both locales.

2 Corey Ross, 'The Tin Frontier: Mining, Empire, and Environment in Southeast Asia, 1870s–1930s', *Environmental History* 19 (2014): 454–79; Jeyamalar Kathirithamby-Wells, *Nature and Nation: Forests and Development in Peninsular Malaysia* (Singapore: Singapore University Press, 2005).

3 For English-language works, see: Mark Elvin, *The Retreat of the Elephants: An Environmental History of China* (New Haven: Yale University Press, 2004); Mark Elvin and Ts'ui-jung Liu, eds., *Sediments of Time: Environment and Society in Chinese History* (Cambridge: Cambridge University Press, 1998); Robert B. Marks, *Tigers, Rice, Silk, & Silt: Environment and Economy in Late Imperial South China* (New York: Cambridge University Press, 1998); Ts'ui-jung Liu (ed.), *Environmental History in East Asia: Interdisciplinary Perspectives* (London and New York: Routledge, 2014).

4 Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (Cambridge: Cambridge University Press, 1986); 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); James Beattie, *Empire and Environmental Anxiety: Health, Science, Art and Conservation in South Asia and Australasia, 1800–1920* (Basingstoke: Palgrave Macmillan, 2011).

5 See *Environmental Histories of New Zealand*, ed. Pawson and Brooking, 1st ed. (Auckland: Oxford University Press, 2002); David Young, *Our Islands, Ourselves: A History of Conservation in New Zealand* (Dunedin: Otago University Press, 2004); Peter Holland, *Home in the Howling Wilderness: Settlers and the Environment in Southern New Zealand* (Auckland: Auckland University Press, 2013); Paul Star, 'New Zealand's Biota Barons: Ecological Transformation in Colonial New Zealand', *ENNZ: Environment and Nature in New Zealand* 6 (2011): 1–12.

Highlighting these stories invites environmental historians of China to examine the environmental impacts of Chinese overseas. As a way of accomplishing this, the article suggests that 'eco-cultural networks' might provide a useful framework for considering the human, material, and environmental connections initiated by Chinese mining. Eco-cultural networks 'refers to interlinked cultural formulations, material exchanges and ecological processes' stimulated by the search for new resources, such as gold, and recognises the 'simultaneous production of knowledge about environments with their exploitation under imperial regimes'. It shows how '[t]he exploitation of new resources' reconfigured human–nature relations, led to the mobilisation of new labour regimes, encouraged the development of facilities enabling overseas capital investment, and expanded communication networks and resulting knowledge exchanges, developments which connected different places, peoples, and environments.<sup>6</sup>

This article begins with an overview of the environmental history of New Zealand, then examines Chinese gold-miners and their environmental actions, views, and impacts in Otago, southern New Zealand. Next, it focuses on resource exchanges, mainly between southern New Zealand and south China, and touches on the environmental impacts of Chinese gold-miners from New Zealand returning to China. Finally, the work reflects on how an examination of the environmental history of overseas Chinese might help reconfigure China's environmental history. Given the author's existing work and the limitations of space, the present study only briefly discusses Chinese commercial market gardening, Chinese landscape views, and the impacts of returning Chinese in the Pearl River region.<sup>7</sup>

## New Zealand environmental transformation, 1300–1920s

New Zealand formally became part of the British Empire in 1840 after the Treaty of Waitangi was signed by many Māori chiefs and the British Crown. This treaty followed several decades of interaction among Māori, Europeans, and other groups. Beginning in the late eighteenth century, New Zealand, its resources, and wider environment gradually become incorporated into world markets. Vessels sought New Zealand spars, sealskins, and later whale products

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6 Beattie, Melillo, and O'Gorman, 'Eco-Cultural Networks and the British Empire', in *Eco-Cultural Networks and the British Empire*, 8–9. See, also: Beattie, O'Gorman, and Melillo, 'Rethinking the British Empire through Eco-Cultural Networks: Materialist-Cultural Environmental History, Relational Connections and Agency', *Environment & History* 20 (2014): 561–75.

7 Beattie, 'Eco-cultural networks'.

for international markets.<sup>8</sup> China was New Zealand's first major export market, and remained significant for over 30 years. Sealskins collected from southern New Zealand were commonly sent via ports in Australia to Canton, where they were in high demand for the making of fur coats for officials. For instance, in 1792 a small vessel visiting New Zealand sent 4,500 skins to China—this only hinted at the much larger volume of traffic that was to follow, a traffic largely controlled by Americans and carried by their vessels. By the 1830s, however, not only were most sealing colonies in precipitous decline, but also oversupply led to a massive drop in profits—factors which contributed to its end.<sup>9</sup> The gradual incorporation into world markets evidenced by the sealskin trade accelerated markedly with colonisation, and was participated in by Māori as well as European.<sup>10</sup>

New Zealand's formal colonisation signalled a shift from temporary European residence—often solely for purposes of resource extraction—to permanent European settlement. From 1861 to 1900, New Zealand received 223,000 migrants.<sup>11</sup> Colonists' ongoing desire for land, coupled with their seemingly limitless numbers, caused major ecological impacts in New Zealand, and had devastating cultural and health effects on Māori. Although for a time Māori also participated successfully in an overseas export economy, they endured major land losses from the 1850s. Environmental change accelerated as the shadow of the land passed from Māori to colonisers.<sup>12</sup>

8 Jim McAloon, 'Resource frontiers, settler capitalism and environmental change 1770–1860', in *Environmental Histories of New Zealand*, 1st ed., 52–68; C. J. Elder and M. F. Green, 'New Zealand and China', in *New Zealand and China: the papers of the twenty-first Foreign Policy School 1986*, ed. Ann Trotter (Dunedin: University of Otago, 1986), 16–63.

9 William Tai Yuen, *The Origins of China's Awareness of New Zealand, 1674–1911* (Auckland: New Zealand Asia Institute, The University of Auckland, 2005), 93–109; Ian W. G. Smith, *The New Zealand Sealing Industry* (Wellington: Department of Conservation, 2002).

10 McAloon, 'Resource frontiers'; Beattie, 'Plants, Animals and Environmental Transformation: Indian / New Zealand biological and landscape connections, 1830s–1890s', in *East India Companies and the Natural World 1600–1850*, ed. Vinita Damoradaran and Anna Winterbottom (Basingstoke: Palgrave Macmillan, 2014), 219–248; Beattie, 'Thomas McDonnell's Opium: Circulating Plants, Patronage and Power in Britain, China and New Zealand, 1830s–1850s', in *The Botany of Empire in the Long Eighteenth Century* (Dumbarton Oaks, forthcoming).

11 Donald Denoon and Philippa Mein-Smith with Marivic Wyndham, *A History of Australia, New Zealand and the Pacific* (Oxford and Malden: Blackwell, 2000), 87–88.

12 Richard Boast, *Buying the land, selling the land: governments and Māori land in the North Island* (Wellington: Victoria University Press, 2008); David V. Williams, 'Te kooti tango whenua': *The Native Land Court 1864–1909* (Wellington: Huia, 1999); Harry C. Evison, *The Long Dispute: Maori Land Rights and European Colonisation in Southern New Zealand* (Christchurch: Canterbury University Press, 1998).

The particular nature and extent of that passing reflected not just the colonising ideals of incoming Europeans, but also New Zealand's very particular ecology. On their arrival around 1300 CE, Polynesians found the three large islands teeming with birds and insects, but virtually no mammals. They named it Aotearoa, meaning 'Land of the Long White Cloud'. Māori introduced a handful of animals and tropical staples they brought from Polynesia. Thanks to their horticultural skills, they were able to grow several tropical varieties in the cooler and more temperate climate of New Zealand, but even their skills were unable to successfully nurture a great range of introduced Polynesian food crops in Murihuku, southern New Zealand. Māori also had a significant environmental impact on the plant and bird life of Aotearoa, driving some species to extinction and deforesting large swathes of the main islands' eastern coasts.<sup>13</sup>

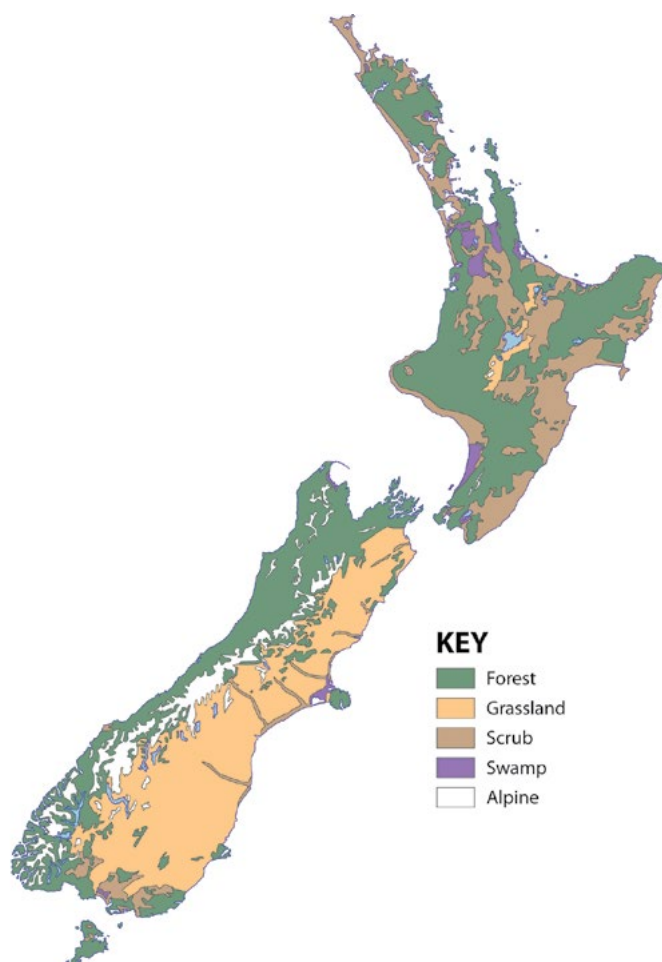
New Zealand's environmental transformation stepped up several gears following British colonisation, through introductions of more people, technology, and by opening it up to global markets. Māori also participated in aspects of this transformation. An estimated 30,000 species of introduced plants came following colonisation. Included among them were many undesirable introductions, whose ecological consequences were unanticipated and sometimes devastating. Following colonisation, introduced pasture replaced forests and swamps. And hoofed animals—sheep, horses, and cattle—were introduced into the islands for the first time, in addition to a host of other animals, and birds.<sup>14</sup> The area of native forest fell from around 80 per cent of the land-mass when Polynesians first arrived, to 50 per cent on the eve of European colonisation. By 1900, it was 25 per cent (Map 1 and Map 2).<sup>15</sup> The extent of pastureland increased markedly (Figure 1) along with numbers of domestic livestock. Following colonisation, New Zealand lost approximately 85 to 90 per cent of its wetlands. In places, native plants and bird life declined precipitously, some to the point of extinction.<sup>16</sup>

13 Matt McGlone, 'The Polynesian Settlement of New Zealand in Relation to Environmental and Biotic Changes', *New Zealand Journal of Ecology* 12 (1989): 115–29; *Te Taiao Māori and the Natural World* [ed. Jennifer Garlick, Basil Keane, and Tracey Borgfeldt] (Auckland: David Bateman, 2010).

14 Tom Brooking and Eric Pawson, *Seeds of Empire: The Environmental Transformation of New Zealand* (London: I. B. Tauris, 2010).

15 Michael Roche, 'The State as Conservationist', in *Environmental Histories of New Zealand*, 1st ed., 185.

16 For an overview of these changes, see *Making a New Land*, ed. Pawson and Brooking. Figure of loss of wetlands from: Geoff Park, 'Swamps which might doubtless easily be drained: swamp drainage and its impact on the indigenous', in *Environmental Histories of New Zealand*, 1st ed., 150.

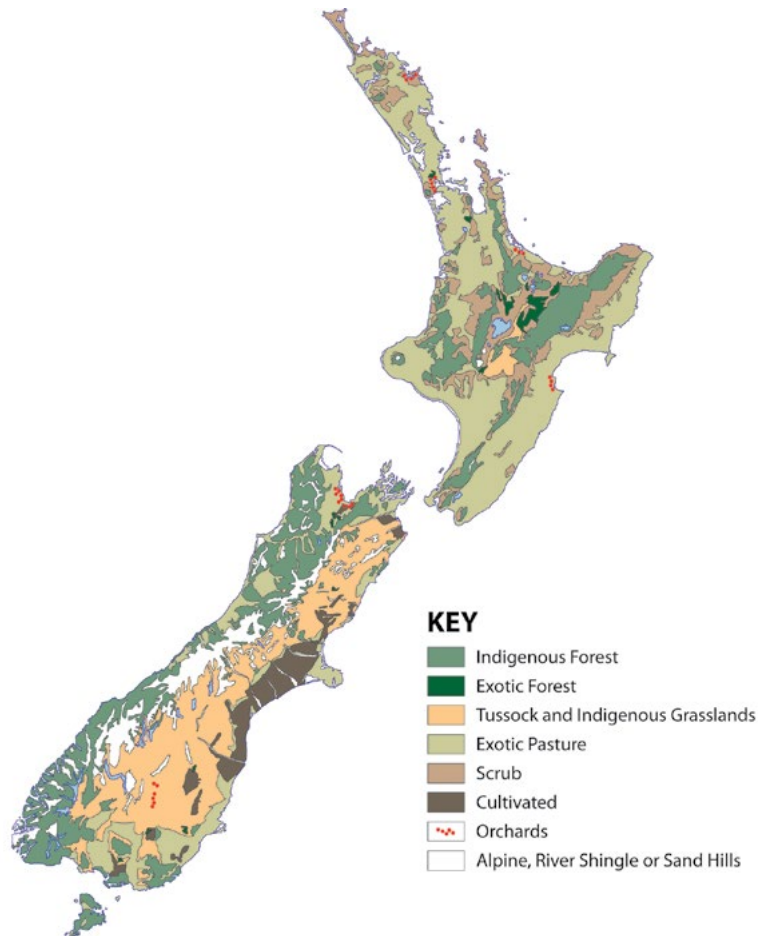


Map 1: New Zealand vegetation and land use, 1840.

Source: Based on: Kenneth B. Cumberland, 'A Century's Change: Natural to Cultural Vegetation in New Zealand', *Geographical Review* 31, no. 4 (October 1941): n. p.

Cycles of boom and bust dominated the colonial economy. Primary products sustained booming economies for a time, only to slump when overseas demand slackened off, or when a resource faced exhaustion. Wool production, and by the end of the nineteenth century, frozen meat and dairy products, drove environmental transformation and oiled the workings of colonial economies. This was accompanied by other forms of resource exploitation, including of timber, kauri gum, and gold.<sup>17</sup>

<sup>17</sup> See *Seeds of Empire*; McAloon, 'Resource Frontiers'.



Map 2: New Zealand vegetation and land use, 1940.

Source: Based on: Kenneth B. Cumberland, 'A Century's Change: Natural to Cultural Vegetation in New Zealand', *Geographical Review* 31, no. 4 (October 1941): n. p.

Traditionally this rapid and remarkably widespread environmental transformation has been depicted as something undertaken largely by white settlers, mostly from Britain—scholars are yet to adequately assess the impacts undertaken by Māori following colonisation. Yet, as this article demonstrates, from the 1860s Chinese also were responsible for considerable environmental changes in the islands, particularly in southern New Zealand. Chinese gold-miners diverted rivers, washed away hillsides, and, through their actions, caused deforestation and soil erosion. Chinese market gardeners introduced new plants into New Zealand, converted barren into productive land, and eventually supplied most settler towns with the bulk of their vegetables by the late nineteenth century. Chinese farm workers aided in the introduction of European pastures and animals and, as railway labourers, helped to develop

new bridgeheads of resource extraction. Through their access to capital, a few high earners who invested their profits in New Zealand—such as the merchants Choie Sew Hoy, Chew Chong, Chin Moon-Ting (James Chin Ting), and Chan Dah Chee—also helped to develop new industries or introduce new technologies that opened up new frontiers of resource exploitation with often significant environmental impacts.

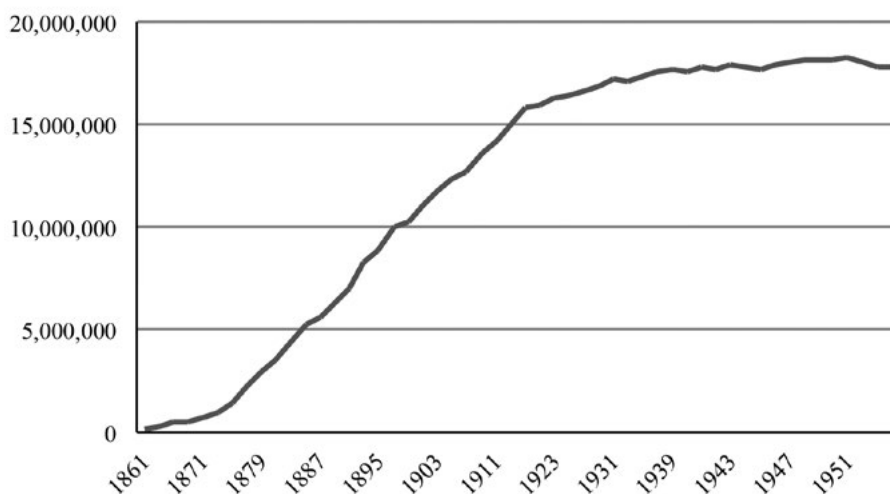


Figure 1: Thousands of acres of sown grass by year.

Source: 'Sown Grass', in *Agricultural and Pastoral Statistics of New Zealand: 1861–1954*, compiled by B. L. Evans (Wellington: Department of Statistics, 1956), A25.

## Chinese come to New Zealand: Gold-mining

From 1852 to 1876, New Zealand's semi-federalist provincial system of government gave provinces considerable powers and responsibilities, including over migration, for developing transport networks, and the like. In 1865, with men drifting away from the Otago gold-fields (opened in 1861), concerned provincial authorities invited Cantonese gold-miners in Australia to Otago (Map 3). Most settlers initially welcomed Chinese as hard-working men able to keep out of trouble and likely to return to China once they had made their money. Figure 2 summarises the patterns of Chinese immigration.





Map 3: Map of Otago Gold-fields.

Source: Henry Aitken Wise, 'Wise's new map of Otago: corrected from official surveys January, 1875' (Dunedin: H. Wise & Co., 1875), in Sir George Grey Special Collections, Auckland Libraries, NZ Map 6533.

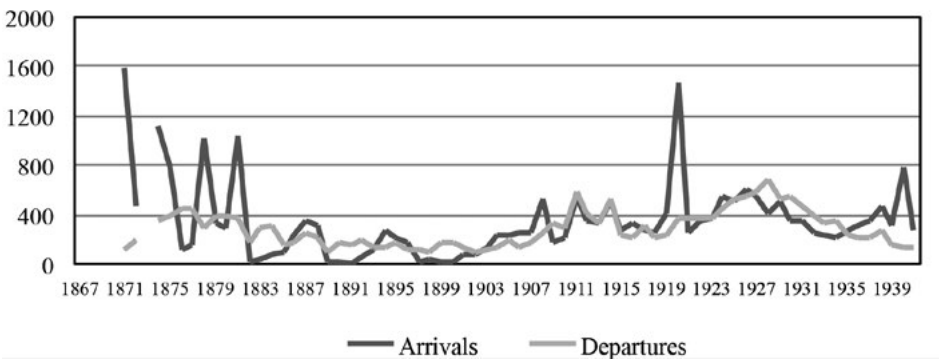


Figure 2: Chinese arrivals into, and Departures from, New Zealand, 1867–1941.

The gaps in the graph indicate gaps in sources. The table shows a stream of departures, which is typical of Cantonese sojournerism, but also points to a practice of chain migration that was not anticipated in the invitations to the Chinese to come, and which enabled the Cantonese to continue accruing capital to take home.

Source: Drawn from information supplied in 'Table 6—Chinese Departures and Arrivals in Otago', in James Ng, *Windows on a Chinese Past ...*, vol. 1 (Dunedin: Otago Heritage Books, 1993), 348.

Most arrivals in the 1860s came from the Australian colony of Victoria, mostly from Siyi (Four Districts, south-west of the city of Canton) and to a lesser extent Sanyi (Three Districts, closer to Canton). By the 1870s, miners came directly from China, especially from the Three Districts (mainly Panyu, north of Canton), and this group predominated among Chinese in New Zealand.<sup>18</sup> The ongoing dominance of Panyu men in the Colony from the 1870s is shown in the following figures for 1896: in that year, 67 per cent of Chinese in New Zealand came from Panyu; 17 per cent, Siyi; 2.5 per cent, Zengcheng; 3.5 per cent, Zhongshan (then Huengshan); 2 per cent, Dungguan. Only one man came from Fujian Province.<sup>19</sup>

In reaching New Zealand—which Chinese called New Gold Mountain (*Sun Gum Shan* in Cantonese, *Xin jinshan* in Pinyin, 新金山) to distinguish it from North America (Gold Mountain, 金山)—and then in proceeding to the goldfields, the Cantonese drew from their own extensive migrant networks. In places like New Zealand, they also made extensive and effective use of colonial financial systems and legal structures, including government policies making available land and other resources. In New Zealand, as elsewhere, nineteenth-century Chinese migrants from the Pearl River Delta ‘actively pursued the opportunities offered by the ever-quickening spread of capitalism in the form of thickening webs of international trade, steadily improving transportation and communications technology, and the ... job opportunities in colonial economies throughout the world’.<sup>20</sup>

Just as lineage networks tied together family and clan in China, so these structures—plus county groupings and native-place associations—operated beyond China’s territorial boundaries. These networks provided financial, organisational, and emotional support to overseas Chinese, facilitating everything from travel and accommodation to the carrying of letters and remittance money. Such associations shaped Cantonese work patterns and even movements in New Zealand.

Otago officials initially approached Victorian-based Chinese merchants—important interlocutors bridging the linguistic and cultural worlds of the Chinese and colonial—to see whether they would be interested in organising their kinsmen to work in Otago. As a result, mainly Siyi and Sanyi Chinese arrived. Siyi Chinese travelled inland on a route north of Dunedin, while Sanyi Cantonese travelled on a route south of Dunedin. Cantonese in New Zealand also worked mining claims along clan and county lines, just as they later operated market gardens and set up fruit and vegetable shops using these social

18 James Ng, *Windows on a Chinese Past: How the Cantonese goldseekers [sic] and their heirs settled in New Zealand*, vol. 1 (Dunedin: Otago Heritage Books, 1993).

19 Ng, *Windows*, 1:11.

20 Madeline Y. Hsu, *Dreaming of Gold, Dreaming of Home: Transnationalism and Migration between the United States and South China, 1882–1943* (Stanford: Stanford University Press, 2000), 2.

networks.<sup>21</sup> For example, in the nineteenth century, miners mostly from Panyu worked the gold-field of Round Hill, Otago. As market gardeners, Panyu men also predominated in the smaller North Island centres of Palmerston North and Wanganui—and in the South Island, in the Dunedin suburb of Kaikorai Valley. In contrast, by the early 1900s, many of Dunedin's market gardeners—and most of Wellington's 140 fruit sellers—came from Zengcheng County.<sup>22</sup> In environmental terms, these networks facilitated introductions into New Zealand of Chinese vegetables, flowers, and agricultural techniques, transfers kept up by ongoing exchanges of people and information.<sup>23</sup>

The mobility of Chinese is illustrated in the biographies of the some 3,500 Chinese in Otago collected by the Reverend Alexander Don (1857–1934).<sup>24</sup> I use the term 'trans-local' to describe the connections Chinese migration established, because, rather than operating at a national level, they functioned at a fundamentally local level (Map 4). This is illustrated in the potted biography of an unnamed Cantonese gold-miner, recorded in 1882, who part-owned a large mine in Round Hill. After three years in Singapore, the miner spent a further 15 in Mauritius before moving to New Zealand. When Don caught up with him, 'he had been in New Zealand twelve years. He speaks a little French, picked up at Mauritius, but like the English spoken by Chinese, it is a "pidgin"'.<sup>25</sup>

It was well known for Cantonese to travel from one Jin Shan country to another and among various centres of Chinese population in New Gold Mountain. Brothers or kin commonly joined family or friends in working mining claims, just as later they joined market-gardening or laundry businesses. Overseas Chinese tried to return home every few years for family reasons, including to get married, but only a very few brought Chinese women to New Zealand, while a handful married European women. Obviously, the ideal for the gold-miner would be to strike it lucky, and return home rich. But, for most, this never happened, and for those who struggled to make a living in New Gold Mountain, it appears that connections with their home gradually dissipated, owing to the

21 Ng, *Windows*, 1:11. On such migrant networks in a broader context, see Adam McKeown, *Chinese Migrant Networks and Cultural Change: Peru, Chicago, and Hawaii, 1900–1936*, 2nd ed. (Chicago: University of Chicago Press, 2001); McKeown, *Melancholy Order: Asian Migration and the Globalization of Borders* (New York: Columbia University Press, 2008); McKeown, 'Conceptualising Chinese Diasporas, 1842 to 1949', in *The Chinese Diaspora in the Pacific*, ed. Anthony Reid (Aldershot: Ashgate, 2008), 1–32.

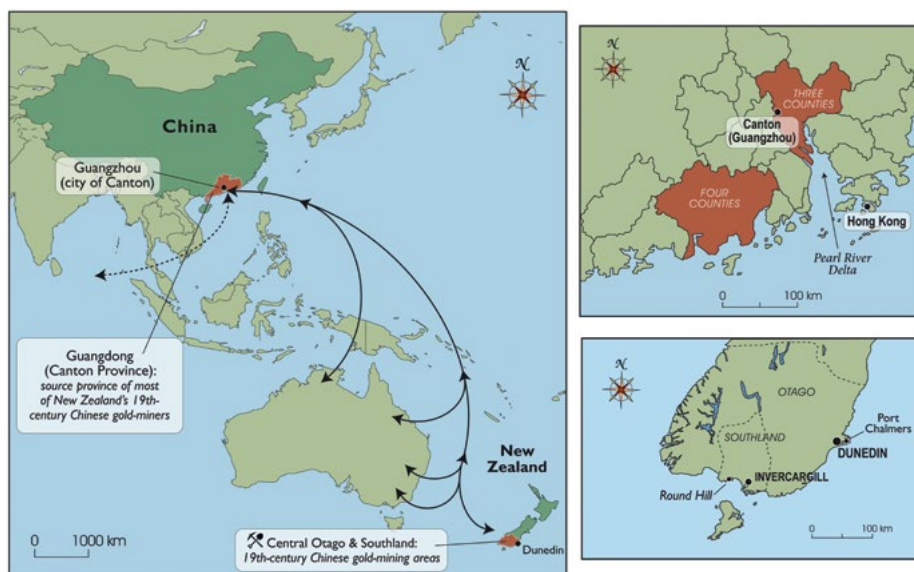
22 George McNeur, *Feeling the Way in the Canton Villages* (Dunedin: Otago Daily Times, 1902), 2.

23 On which, see Beattie, 'Empire of the Rhododendron'.

24 This is reproduced fully in James Ng, *Don's 'Roll of Chinese', Windows on a Chinese Past*, vol. 4 (Dunedin: Otago Heritage Books, 1993).

25 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 July 1882, 7.

shame of not having earned enough to send money back to family in China or even to permit their return home.<sup>26</sup> A lack of understanding among families in Canton of the hardships faced by their kin compounded problems.<sup>27</sup>



Map 4: The place of origin and rough route taken by Cantonese to southern New Zealand.

Source: Drawn from information supplied in primary source accounts of nineteenth-century Chinese migration.

## Gold-mining: Moving mountains and rivers

In the nineteenth century, most Chinese coming to New Zealand first arrived in Otago, even if they later moved into other areas. Otago's Chinese population peaked in 1871, at 3,715,<sup>28</sup> while New Zealand's Chinese population reached an officially recorded highpoint of 5,004 in 1881—a figure only surpassed after the Second World War. Historian James Ng, however, believes that, due to permanent departures and deaths, more Chinese came to New Zealand than censuses recorded—in fact, he believes as many as 8,000 Chinese may well have passed through New Zealand.<sup>29</sup>

26 See, for example, the following letter: Labelled in pencil, Chau Pak Ch'ung to [unidentified], 29 July 1889 in GAO/14, Canton Villages Mission—Staff Files—Rev GH McNeur, 1916–1919, 1984/0018, Presbyterian Archives of Aotearoa New Zealand. Translated by Sylvia Yuan.

27 Ng, *Windows*, vols. 1–4.

28 Select Committee, 1871, *Appendices to the Journal of the House of Representatives (AJHR)*, 23.

29 Ng, 'The Sojourner Experience,' in *Unfolding History, Evolving Identity*, ed. Manying Ip (Auckland: Auckland University Press, 2003), 14.

The Chinese worked in all of Otago's gold-fields, often on second-quality claims. And although they were in a minority as a whole in Otago, they came to dominate some fields for a time, such as Round Hill. Figure 3 outlines the changing character of the Chinese and European mining population. In 1871, for instance, Chinese constituted 25 per cent of Tuapeka's mining population. Although European and Chinese miners sometimes worked together, this was generally the exception rather than the norm. Most Chinese worked small claims of around two-to-five acres (0.8 to 2 hectares) in extent, involving anything from three-to-eight individuals, usually operating in clan and county groups. On these, the Chinese earned a reputation for methodically reworking abandoned European claims. Not only did Europeans keep the better claims, but the price of licences for better gold-yielding land was beyond the means of most Chinese.<sup>30</sup> For this reason, nearly all the Chinese were alluvial miners. Otago quartz reefs were few and too costly to operate (Table 1).

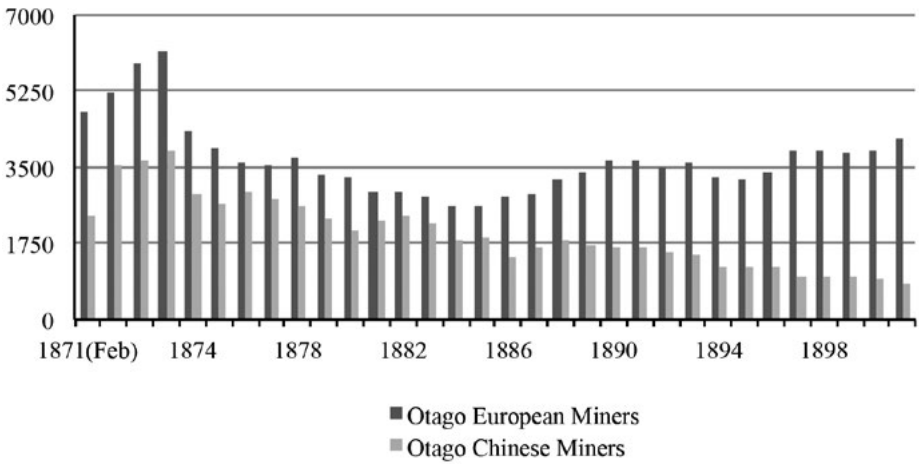


Figure 3: Otago's European and Chinese gold-mining population, 1871–1902.

Source: Drawn from information supplied in 'Table 1–Number of Chinese Goldminers in Otago', in Ng, *Windows*, 1:156.

Table 1: Numbers of Chinese and European miners involved in Alluvial and Quartz Mining in Otago, March 1877–March 1878.

Alluvial Miners		Quartz Miners	
European	Chinese	European	Chinese
3280	2585	435	35

Source: Table 9, *Appendices to the Journal of the House of Representatives* (AJHR), H4, 1878, 35.

30 Neville Ritchie, 'Archaeology and History of the Chinese in Southern New Zealand During the Nineteenth Century: A Study of Acculturation, Adaptation and Change' (PhD diss., University of Otago, 1986), 53–56.

Harnessing water was essential to gold-mining, but this resource was in especially short supply in Central Otago, where in some areas rainfall averaged as little as 500 millimetres a year. In summer, streams frequently ran dry, while in winter, water was locked up as ice—added to which, in winter, it was usually too cold to mine in the higher country. Other challenges arose from the paucity of wood in the largely treeless Central Otago and the region's rugged topography of ranges and basins. Unsurprisingly, two constant refrains in the mining newspapers were a lack of water and climatic extremes slowing, or entirely halting, mining activities.

Water-races were thus vital to mining. Water permitted sluicing and the removal of mining sludge; served as a source of drinking water; and, later, provided irrigation for horticulture and agriculture. Cantonese came from a culture steeped in thousands of years of experience in controlling water, albeit in a sub-tropical environment.<sup>31</sup> Despite climatic differences, the Chinese who came from Victoria to Otago, sometimes first via California, had become accustomed to building water-races in Gold Mountain and New Gold Mountain environments where water was scarce.<sup>32</sup> Some, like Choie Sew Hoy, came to Victoria and Otago with prior experience of California's extensive waterworks, and transferred or adapted technology from one field to another (see below).<sup>33</sup> The technology brought by Chinese into New Zealand included, for example, the Californian Pump. According to Christopher Davey, this resembled the Chinese Pump, but instead of a belt had slats and pins.<sup>34</sup> New Zealand historian of mining technology Nic MacArthur, in contrast, states that the wooden-paddled chain-pump was known as the Chinese Pump in California, but the Californian Pump in Australia and New Zealand.<sup>35</sup>

Whatever was the case, Chinese and Europeans made use of technology originating in California and Victoria—including hydraulic sluicing and hydraulic elevating. The latter—the process of forcing gold-bearing gravel upwards using high-pressure water—originated in California, and was extensively undertaken in New Zealand, including by Choie Sew Hoy and his son, Choie Kum Poy (see below).<sup>36</sup> In New Zealand, Cantonese miners, like their European counterparts, also utilised wing dams, either built of wood or stone,

31 Marks, *Tigers, Rice, Silk, & Silt*.

32 On Chinese miners in Australia, see: Sheng, 'Environmental Experiences', 115–19; Michael MacLellan Tracey, 'No Water—No Gold—Applied hydrology in nineteenth century gold mining', in *Proceedings of the Australian Mining History Association 1996 Conference*, ed. Ruth Kerr and Michael MacLellan Tracey (Canberra: Home Planet Design and Publishing, 1997), [www.heritagearchaeology.com.au/Water.htm](http://www.heritagearchaeology.com.au/Water.htm), accessed 21 February 2014.

33 For the biographies of other Cantonese who had been in California, see, for example: Alexander Don, *The Evangelist* 3, no. 9 (1 September 1871): 264; Alexander Don, *The Evangelist* 4, no. 9 (2 September 1872): 274.

34 Christopher Davey, 'The Origins of Victorian Mining Technology, 1851–1900', *The Artefact* 19 (1996): 54.

35 Nicol Allan MacArthur, 'Gold Rush and Gold Mining: A Technological Analysis of Gabriel's Gully and the Blue Spur, 1861–1891' (M.A. diss.: University of Otago, 2014), 39.

36 See, Andrew C. Isenberg, *Mining California: An Ecological History* (New York: Hill and Wang, 2005), 23–51.



or of both materials. Wing dams diverted 'a river's flow either against a bank so it could be broken down and worked', or dewatered 'one side of a creek bed so that the other side could be dry-worked'.<sup>37</sup> European and Chinese utilised the so-called Chinese Pump to accomplish this task as well. To my knowledge, no examples survive of this technology, save for a handful of images, including one of the first photographs of the Otago gold rush, of its use by Europeans, in Gabriel's Gully in 1862. The only one I am aware of depicting Cantonese in New Zealand using a Chinese Pump is Photo 1. In Nic MacArthur's opinion, 'the Chinese pump is the device in the far left centre of the image and we are looking at it end-on. It is being driven by a small waterwheel as shown by the small white race of water flowing from above it'.<sup>38</sup>



Photo 1: A very rare photograph showing Cantonese miners utilising a Chinese Pump. This is on the far left, in the centre of the image and is being driven by a small waterwheel.

Source: From: Herbert Deveril, 1840–1911: Chinese Gold Miners by the Side of the Tokomairiro River, Otago. Ref: PA7-46-19. Reproduced with permission from the Alexander Turnbull Library, Wellington, New Zealand.

In addition to this technology, water-races were essential to sluicing, while the more complex forms of hydraulic sluicing required a significant head of water to operate. A measure of the tenacity and difficulty involved in constructing a water-race comes from a description in 1870, originally reported in the *Lake Wakatipu Mail*, of a party of some 20 to 30 Chinese 'endeavouring to bring

37 Ritchie, 'Archaeology and History of the Chinese', 60.

38 I am indebted to Nic MacArthur for this information. The first image of Gabriel's Gully can be found at: F. A. Coxhead, Gabriel's Gully, 1862, in Hocken Collections Te Uare Taoka Hākena, file name: 1309\_01\_014A, scan number: S07-242c S10-175a.



to light the hidden treasures of the Arrowtown Flat', on the Wakatipu gold-field. They 'deserve every credit for the enterprising manner in which they have again set in to work the ground', wrote the correspondent.

Undaunted by the complete destruction of all of their works, the party again tackled the undertaking, but on an entirely different principle. Instead of having an open tail-race, liable to be filled up by almost any fresh [rush of water] which may occur, they are now bringing in one which no flood can affect. As the race is being cut, they are covering it in with large slabs of stone[;] this is again laid over with layers of grass and fern, and finally a deep and firm coating of earth over all. As the race is being cut in the bed-rock, and is already some hundreds of feet long, an idea may be formed of the labour and perseverance necessary to complete the work[.]

The writer ended by hoping 'their efforts will meet with the measure of success [which] they richly deserve'.<sup>39</sup>

Another measure of European esteem for Chinese water management was European employment of Chinese labourers, usually under Chinese contractors, to build water-races. For example, many Chinese were employed in constructing the 108-kilometre-long Mt. Ida Water Race in Central Otago, on the Mt. Ida Gold Field.<sup>40</sup> Europeans and Chinese also sometimes went into business together, as on the Port Water Race, on Round Hill Gold Field. Chinese contractors under Wy Kee laboured 14 months on this 22 kilometre water-race that snaked its way from George Creek, Longwood, to Round Hill (Map 5). Operated by a partnership of Wy Kee and Henry H. Port, the race (Photo 2) passed 'through heavy bush, containing much rata or iron wood'. A 'considerable portion of' it traversed rocky ground, 'necessitating the use of dynamite'. On its completion in 1889, the race was the 'largest in this district, being nearly 4ft wide on top, 3ft at bottom, and 2ft. 8in deep'. At this, Wy Kee gave 'a banquet in honour of the event'. Some '250 persons, including Europeans, were present, and from the hearty manner in which they partook of the hospitable spread served with no stinted hand one was convinced that those present did not seem to hold any anti-Chinese feelings towards Mr Wy Kee'.<sup>41</sup>

This celebration is perhaps surprising, given the developing anti-Chinese sentiment evident on Round Hill. Part of the reason for such animosity was that, as a newspaper noted in 1900, 'things were entirely in the hands of the Chinese: stores, hotel, mission church, water races, claims, and mining rights being principally controlled by them'—although, it should be noted, too, that most of the key water rights still belonged to Europeans.<sup>42</sup> In the decade between the

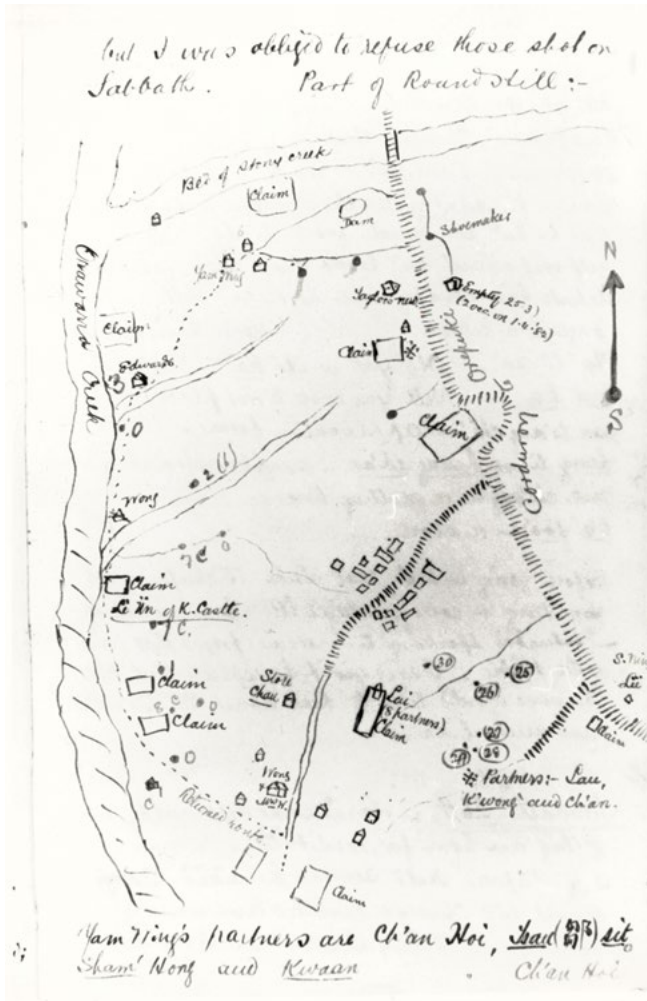
39 *Otago Witness*, 15 October 1870, 11.

40 Ng, *Windows*, 1:318.

41 *Otago Witness*, 18 April 1889, 12. Southland Province existed from 1861 until 1870, when, owing to financial difficulties, it once again became part of Otago Province.

42 *Otago Witness*, 31 May 1900, 20.

completion of Port's Water Race and 1900, control of water on Round Hill, and with it oversight of mining operations, shifted into European hands, largely due to the establishment of the European-owned Round Hill Mining Company, even if some Chinese might also have worked for this operation.<sup>43</sup>



Map 5: Sketch map of Round Hill, showing the many claims owned by the Chinese, the location of the township of 'Canton' (on the corduroy track going in the direction SSE to NNE), as well as the Ourawera Stream and Stony Creek.

Note the orientation of Canton on this map is taken to be NNE.

Source: Don's 1881 Diary, folio 9 (recto), private collection, reproduced with permission of owner.

43 On which, see Ng, *Windows*, 2:97–135. Also, D. Hamilton, 'Early Water Races in Central Otago' (paper presented at the 3rd Australasian Engineering Heritage Conference, Otago, Dunedin, November 22–25, 2009), [www.ipenz.org.nz/heritage/conference/papers/Hamilton\\_D.pdf](http://www.ipenz.org.nz/heritage/conference/papers/Hamilton_D.pdf), accessed 18 February 2014.



Photo 2: 'Port's Race' [Ourewera Goldmining Co. Ltd?].

Source: Round Hill, Goldmining, Hocken Library / Uare Taoko o Hākena, University of Otago, Dunedin, c/nE2086/29.

## Moving Mountains and Rivers: Mining's environmental impacts, 1870s–1880s

I have deliberately characterised this section and period 'Moving mountains and rivers', because these landforms and waterways were moving in two senses of the word: Chinese miners were literally shifting mountains of earth and realigning waterways at the same time as such landscapes were moving some Chinese to debate the nature of the environmental changes they were making.

As adduced in the discussion of the construction of water-races, gold-mining had far-reaching environmental impacts—on soil, geology, water, and vegetation.<sup>44</sup> At Round Hill in 1882, Don 'was forcibly struck with the change which man brings about when he puts his hand on plastic Nature. Once, no doubt, the

44 Randall Rohe, 'Mining's Impact on the Land', in *Green Versus Gold: Sources in Californian environmental history*, ed. Carolyn Merchant (Washington, D.C.: Island Press, 1998), 125–35.

valley of Stony Creek was as beautiful as any of its neighbours with its mossy banks and graceful fern[-]trees; now it is a chaos of boulders, upturned trees, and sludge'.<sup>45</sup>

Such a description is borne out by photographs of the area at the time. Photo 2, of Port's water-race, incidentally depicts the deforestation and sludge resulting from sluicing (in the background of the image is the aqueduct bringing water into the gold-field). Images of the town of 'Canton', at Round Hill (Photo 3) also illustrate sluicing's environmental effects, most notably in creating a large ridge, on which the Chinese settlement precariously sits.



Photo 3: 'Canton', Round Hill, 10 January 1903.

'The village consists of about thirty Chinese buildings,' including huts, 'stores and opium smoking and gambling-houses. The largest house, and the only two-storied one, is a tea shop or restaurant, and belongs to a Riverton firm'.<sup>46</sup>

Source: 'Canton', 'Icabod', Round Hill Goldmining, 1903, Hocken Library / Uare Taoko o Hākena, University of Otago, Dunedin, c/nE2407/16.

Round Hill was an exception among Otago's gold-fields in having plentiful wood supplies, as a result of its location in Longwood Forest. Although the trees of Longwood Forest provided building material and fuel vital to the gold-mining industry, they also impeded mining, and threatened life and limb. The winning of gold necessitated deforestation to enable miners to get at the precious ore underneath, while the timber also provided fuel and building material. For example, in 1882, Don testily noted in his diary, Round Hill Chinese busy cutting timber on the Sabbath,<sup>47</sup> while the *Southland Times* in 1888 recorded Chinese employing Europeans to cut and sledge firewood.<sup>48</sup> But mining in such

45 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 July 1882, 6.

46 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 July 1882, 6.

47 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 October 1882, 67.

48 *Southland Times*, 26 July 1888, 3.

a forested area created its own hazards. On 1 December 1883, Don records a 17-year-old Chinese miner, killed ‘while felling a tree’—sadly only one of several such fatalities resulting from similar ventures.<sup>49</sup>

The other gold-fields of Otago were characterised by a scarcity of a commodity vital to gold-mining, as an 1869 newspaper described:

In every branch of the pursuit [of gold-mining]—and there are many—timber is an essential requisite. Deep leads cannot be reached except by means of shafts and drives heavily slabbed [sic] with timber from the surface downwards; [gold] dredges are constructed of timber; the races which convey water for many miles are connected by means of fluming made of timber; quartz reefing could not be carried on, nor could bank sluicing, hill sluicing, or ground sluicing be made to pay, without the assistance of wooden appliances.<sup>50</sup>

Firewood also warmed miners during Otago’s cold and long winters.<sup>51</sup>

On all of the gold-fields except for Round Hill, then, mining ran into problems because of Otago’s relatively scant timber resources.<sup>52</sup> Centuries before European arrival, Māori had removed much of the forest of the east coast of the South Island (Map 1). This meant that miners in the Maniototo (Mt. Ida Gold Field) had to rely on timber milled at Hawkesbury Bush, north of Dunedin. ‘Miners in the valley of the Clutha, Manuherikia, and the Dunstan, have to depend upon the supply brought from Tapanui’, while those ‘in the upper valley of the Clutha, at Cromwell, Nevis, Arrow, and the Shotover, have to depend upon the Earnsclough bush at the very head of Lake Wakatipu.’<sup>53</sup> Baltic, North American, and Australian timbers were also imported for mining, and this trade is representative of how Chinese miners, like their European counterparts, contributed to creating timber demand in other parts of Otago—and the rest of the world—through gold-mining.

If forests and vegetation were removed for mining, then sluicing itself altered watercourses and polluted waterways. As on other gold-fields around the world, hydraulic sluicing in New Zealand considerably accelerated environmental change by enabling ‘a few miners to accomplish in weeks what formerly

49 Alexander Don, ‘Our Chinese Mission’, *The New Zealand Presbyterian*, 1 December 1883, 106. Note also, another death: Alexander Don, ‘Our Chinese Mission’, *The New Zealand Presbyterian*, 1 January 1884, 124.

50 *Otago Witness*, 18 September 1869, 2.

51 Otago holds the record for the coldest and hottest temperatures recorded in New Zealand. On its climate extremes, see Julian Kuzma, ‘The 1895 Snowstorm’, *ENNZ: Environment and Nature in New Zealand* 9, no. 1 (2014): 79–103; *Climate, Science, and Colonization: Histories from Australia and New Zealand*, ed. Beattie, O’Gorman and Matt Henry (New York: Palgrave Macmillan, 2014).

52 See Neil Clayton, ‘Settlers, politicians and scientists: Environmental anxiety in a New Zealand colony’, *ENNZ: Environment and Nature in New Zealand* 9, no. 1 (2014): 20–21, 29–39.

53 *Otago Witness*, 18 September 1869, 2.

required a hundred men months to do'.<sup>54</sup> For example, at Waikaia (then known as Switzers), on the Nokomai Gold Field, Central Otago, Sue Ting managed the Argyle Water Race Co., which had been bought from Europeans. In 1885, with great technical skill and at no small expense, Chinese extended it considerably into an adjacent gully at the cost of £1,500.<sup>55</sup> This necessitated diverting a creek from 21 kilometres away, and piping it cross a deep gully. In increasing and establishing a permanent water supply, 16 Chinese miners:

are now at work washing away a whole hill. Once the water has been brought to the ground and a tail race provided for its escape downwards, the work is easy. A long canvas hose comes over the face. The water discharged from the nozzle quickly eats away deep incisions below. The top ground falls down, and the whole lot is speedily washed down the race, the gold being caught in the various places provided for its reception. Just as we were watching the operations at one of the faces of the Argyle claim a fall came thundering down, containing probably a hundred cart loads of stuff, but this is nothing to what can be done, seeing that the faces are as much as 75 feet deep, and that the ground is simply drift without much cohesion.<sup>56</sup>

The Argyle Claim exhibited another 'ingenious [Chinese] contrivance' unfamiliar to European observers: this was the placement of boxes, about two feet wide, '[a]t intervals down the hill, and in a regular series of gradations'. They were covered with blanketing, over which the miners had placed 'a series of flexible transverse iron bars'. As the correspondent for the *Mataura Ensign* explained: 'The agitation of the material passing over these keeps them constantly vibrating, and the stuff below is thus not allowed to set, but is what is technically called kept alive.'<sup>57</sup> Like Round Hill, this area was worked primarily by men from Panyu and exhibited the environmental effects of removing hillsides. These included the removal of large volumes of topsoil and rocks, changes to river channels, and siltation of areas downstream.

Round Hill Chinese undertook significant sluicing and tunnelling, but, as noted, from about 1890, European interests, backed by greater capital enabling operations much larger in scale, increasingly took over the gold-field. In 1882, the *Otago Witness* noted how, through sluicing, 'a large amount of ground is worked by the Chinamen by tunnelling out the washdirt, and washing it in whatever drainage water they can get hold of. The bulk of the sludge goes down the Orawera [sic] Creek to Whakapatu Bay, the rest into Lake George'

54 Rohe, 'Mining's Impact on the Land,' 130.

55 Ng, *Windows*, 1:175, footnote 184c.

56 *Mataura Ensign*, 24 January 1888, 4.

57 *Mataura Ensign*, 24 January 1888, 4.



(Figure 2). As a result of mining, '[t]he whole of the Orawera [sic] flat is sludged up, and the creek itself has disappeared, there being only about [a] 50 feet fall in four miles'.<sup>58</sup>

Both Lake George/Uruwera and Whakapatu Bay suffered from the effects of pollution, the more so since miners also used quicksilver (mercury). In 1882, a reporter for the *Otago Witness* regretted mining's effects on Lake George, 'a pretty piece of water ... [whose] surface is generally dotted with black swan and wild duck'. 'It seems a pity', observed the author, 'that this lake should be destroyed [by this means], but I am afraid it is inevitable.'<sup>59</sup> Despite the author's fears, in 1888, another *Otago Witness* reporter noted that 'the primeval forest' that 'embosomed' the 91-hectare lake will 'soon, alas ... be the prey of the woodman's ruthless axe', indicating perhaps that the decline in quality of this water body had not been quite so dramatic as the earlier reporter had noted.<sup>60</sup> Nevertheless, recent scientific monitoring of the lake has revealed 'substantial sediment infilling of the lake bed' resulting from '[h]istorical gold mining activities in the lake's catchment'.<sup>61</sup>

Chinese expressed a variety of views on the environmental changes wrought by mining, and on the landscapes they encountered as miners. In walking with an unnamed Chinese miner from the township of Riverton to Round Hill in 1882, Don recorded that the two travellers passed through dense forest. Along the way, Don paused to observe the 'many fern tree gullies, and the banks covered with moss and ferns', and reflected that '[a]s population increases[,] the trees and scrub will, of course, decrease in quantity'. Don contrasted his attitude with that of the majority of Cantonese miners—for, as he perceived it, 'out of a hundred Chinese perhaps ninety-nine have not the slightest relish for the beauties which met us at every turn of this road'.<sup>62</sup> His comment, of course, could have been equally true of the attitudes of the majority of European miners.

Later that year, again at Round Hill, Don recorded an instance illustrating some miners' awareness of the environmental destruction they were causing. 'Tsaam' and 'Tsang' informed Don that while 'it would never do to dig for gold in China ... in New Zealand it mattered not, as it had only been "opened" for a few years.' This was, they explained, because 'there is no *fung shui* [sic] in New Zealand' since it 'is *tei wan* (of earthy nature?) while China is *t'in wan* [sic] (of heavenly nature?)'. In traditional China, *fengshui* provided a system and set of rituals

58 *Otago Witness*, 7 October 1882, 11.

59 *Otago Witness*, 7 October 1882, 11.

60 *Otago Witness*, 9 March 1888, 14.

61 Marc Schallenberg and David Kelly, *Ecological Condition of Six Shallow Southland Lakes*, Report No. 2198 (Nelson: Cawthron Institute, 2012), 1.

62 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 July 1882, 6.



for managing human–nature relations,<sup>63</sup> according to which, ‘land forms and bodies of water direct the flow of the universal *qi*, or “cosmic currents” in both propitious and inauspicious ways.’<sup>64</sup>

The opinion of some Chinese at Riverton, the largest settlement near the Round Hill diggings, contradicted the views of Tsaam and Tsang. ‘[O]wing to the arrangement of the hills and rivers about Riverton’, Chinese here believed that they enjoyed ‘good’ *fengshui*.<sup>65</sup> For those versed in its principles, Riverton, a town nestled amidst hills overlooking water, presented a very favourable situation indeed.<sup>66</sup> Chinese also regarded Dunedin’s Octagon as lucky because the number eight—corresponding to the Octagon’s number of sides—sounds similar to the character forming part of the word meaning ‘to prosper’ or ‘to grow wealthy’.<sup>67</sup> Another fascinating insight into attitudes towards environmental change is the opinion among some Cantonese who attributed ‘the increasing mildness of the Southland climate to the presence of Chinese in the country’, possibly a reference to the similar European view that cultivation and deforestation lessened rainfall and increased temperatures.<sup>68</sup> The environmental effects of Chinese mining operations, especially in their skilled use of water, caused considerable environmental impacts in Otago that elicited a variety of attitudes towards the Otago landscape and its modification.

## ‘Hungry dragons’:<sup>69</sup> The dredging boom and mining–agriculture tensions, late 1890s–1910s

By the late nineteenth century, many colonists were starting to question the environmental impacts of mining on agricultural land, especially following the dredging boom of the 1890s, which was started by the Chinese entrepreneur

63 I have struggled to find appropriate or even approximate terms for Chinese concepts of the non-human world. On the epistemological problems of translation of the term ‘nature’, see Robert P. Weller, *Discovering Nature: Globalization and Environmental Culture in China and Taiwan* (Cambridge: Cambridge University Press, 2006), 19–42. On wider issues of translated terms and concepts used in environmental history, see Beattie and Ts’ui-jung Liu, ‘Environment, Modernization and Development in East Asia: Perspectives from Environmental History’, *Environment, Modernization and Development in East Asia: Perspectives from Environmental History*, ed. Beattie and Liu (Basingstoke: Palgrave Macmillan, forthcoming), no pages.

64 Ole Bruun, ‘The Fengshui Resurgence in China: Conflicting Cosmologies Between State and Peasantry’, *China Journal* 36 (1996): 48.

65 Alexander Don, ‘Our Chinese Mission’, *The New Zealand Presbyterian*, 1 July 1882, 7.

66 For greater detail of such views, see: *Chinese Landscapes: The Village as Place*, ed. Ronald G. Knapp (Honolulu: University of Hawai’i Press, 1992); Evelyn Lip, *Feng Shui: Environments of Power: A Study of Chinese Architecture* (London: Academy, 1995).

67 On this, see Beattie, ‘Eco-cultural Networks’.

68 Alexander Don, ‘Our Chinese Mission’, *The New Zealand Presbyterian*, 1 September 1883, 47. On European ideas of climate change, see Beattie, *Empire and Environmental Anxiety*; on Chinese, Mark Elvin, ‘Who Was Responsible for the Weather? Moral Meteorology in Late Imperial China’, *Osiris*, 2nd ser., 13 (1998): 213–37.

69 *Tuapeka Times*, 8 September 1906, 3.

Choe Sew Hoy. Dredging revived a flagging gold-mining industry, but also accelerated the ecological and landscape impacts of mining. Moreover, it threatened the prevailing ideology of closer land settlement and the nascent fruit-growing industry in Central Otago.<sup>70</sup>

To contextualise these impacts, it is necessary to examine existing mining regulations, which magnified tensions between mining and agricultural interests. Gold-mining, notes historical geographer Terry Hearn, 'employed the law of capture to allow mining law, resolve disputes and collect taxes. These private water user rights differed sharply from private property rights, which included rights of possession, use, management, income, security, capital, transmission and absence of term'. Effectively, New Zealand's gold-mining regulations permitted miners to foul waterways and despoil agricultural land.<sup>71</sup> The later introduction of mining regulations in California and Victoria that required miners to restore and revegetate damaged agricultural land merely stoked debates on its necessity in New Zealand.<sup>72</sup>

Mining's merits versus agriculture were crystallised in an impassioned article that presented mining as an activity inimical to the welfare of the country. It also raised particular concerns about the increasing use of dredges, and their ability to dramatically transform landscapes. In 'Paying Too Much for the Golden Whistle' (1906), the author contrasts mining and agriculture.

Where the one aims at the extraction of the organic wealth of the soil by assisting the slow process of vital development, the other seeks for the inorganic material of divers kinds lying hidden in the bowels of the earth which may be made useful in maintaining the arts and crafts by which civilisation is supported and embellished. Primarily, agriculture seeks to produce food, clothing, and other comforts, while mining seeks to obtain the raw material from which is manufactured the machinery whose use furthers the production and exchange of the food, clothing, and other comforts of civilised life.<sup>73</sup>

Although mining might well represent the best use of poor quality land, a balance needed to be struck between mining and agricultural interests to ensure the Colony's long-term prosperity. Since New Zealand's soils were productive, the author argued, agricultural land should be protected from mining. Already, he continued, as a result of hydraulic sluicing and dredging, '[i]mmense masses

70 In response to agitation from increasing numbers of land-hungry settlers, a key manifesto of the Liberal Government (1891–1912) involved land nationalisation, the breaking up of the larger estates for closer settlement: Tom Brooking, *Lands for the People? The Highland Clearances and the Colonisation of New Zealand: A Biography of John McKenzie* (Dunedin: Otago University Press, 1996).

71 Terry Hearn, 'Mining the Quarry', in *Making a New Land*, 106–21 (quote at 108); and Bruun, 'Peasantry', *China Journal* 36 (1996): 48. See also, Susan Lawrence and Peter Davies, 'The Sludge Question: The Regulation of Mine Tailings in Nineteenth-Century Victoria', *Environment and History* 20 (2014): 385–410.

72 Hearn, 'Mining the Quarry', 109–10, 117; Isenberg, *Mining*, 23–51.

73 *Tuapeka Times*, 8 September 1906, 3.

of rich cultivable soil have been torn up and buried under heaps of worthless clay and gravel, and much good land on the banks of streams has been rendered temporarily valueless by deposits of raw sludge and silt'. Dredging, in particular, was responsible for converting 'many a smiling green field into a brown stony waste', into which 'the rude and harsh vegetation of gorse, broom, thistles, and ragwort' invade; only once they have 'loosen[ed] and suppl[ied] humus' to the soil, can they be cleared and an attempt made to bring cultivation to the area. By this means, the 'gnawing scoop of the dredge-bucket, and the vicious volleys from the hydraulic nozzle' have converted many 'splendid patches of fruitful land ... into utterly irreclaimable wildernesses'. The author likened a dredge's operation on the Island Block—located between Lawrence and Roxburgh along the Clutha River—to 'hungry dragons voraciously biting off huge chunks of this superb land'. Dredging removed 726,000 cubic yards of soil per year, effectively destroying the equivalent of '£36,000 worth of soil' annually 'in order to get £5,000 worth of gold'.<sup>74</sup>

The dredging boom was started by the Chinese entrepreneur, Choie Sew Hoy, with his second son, Choie Kum Poy (1867–1942). They modified existing mining technology to develop the first dredge in New Zealand whose protruding central ladder of buckets and shallow draught enabled it to work river beds, beaches, and flats. With modifications, the design became known as the New Zealand Gold Dredge, a prototype for gold and tin dredges around the world.<sup>75</sup>

Sew Hoy began two dredging companies in 1889; the first was a private company which changed into a public company that successfully worked out its claims before undergoing liquidation. This first one sparked the initial dredging boom. In 1889, Sew Hoy and his son also began another—the Nokomai Hydraulic Sluicing Company—that was a great success, operating under various names until 1943.<sup>76</sup>

For the second venture, which ushered in considerable environmental change in New Zealand and elsewhere, Sew Hoy made use of New Zealand financial systems, as well as expertise and environmental knowledge. He also utilised labour and capital from China, New Zealand, and other New Gold Mountain countries. For example, in 1889, Sew Hoy relied heavily on settler capital to publically float the Sew Hoy Big Beach Gold Mining Company—with a nominal capital of over £87,000, although subsequently revised to £72,000—as a means of taking over from the private Shotover Big Beach Gold Mining Company (mentioned above). After its successful float, Sew Hoy became director and

<sup>74</sup> *Tuapeka Times*, 8 September 1906, 3.

<sup>75</sup> Ng, *Windows*, 1:316.

<sup>76</sup> See Ng, *Windows*, 1:315–20; Terry Hearn and Ray Hargreaves, *The Speculator's Dream: Gold Dredging in Southern New Zealand* (Dunedin: Allied Press, 1985), 12; Ritchie, 'Archaeology and History of the Chinese', 59.

James Gore assumed the chair of the public company. It soon commissioned three large new dredges from a European firm in Christchurch, costing £11,000 in total. As a result of its large yields, the Company was among the first—if not the first—dredging company to seek public listing in New Zealand. Through inexperience in this process, however, it over-capitalised, and so paid poor dividends. Within only a few years, its dredges proved too small to mount the new machinery demanded by the need for ever more powerful dredges.<sup>77</sup>

The successor to this venture, the Nokomai Hydraulic Sluicing Company (Photo 4), yielded much higher returns for investors. It, too, relied on Chinese and European investment for funding, using European and Chinese mining engineers and workers to operate it. Investments from profits made from this, and Sew Hoy's many other enterprises, contributed to the development of other mining ventures, with further environmental impacts. Sew Hoy owned three short-lived quartz mines, again backed by European and Chinese capital, but using Chinese labour. He also controlled 175 hectares of river claims, developed a significant water-race running from Lauder Creek to Becks and, with P. Beer and R. Glenn, owned the Golden Stream Water Race Company, which supplied water to 'part of the Kyeburn Diggings'.<sup>78</sup>

In response to the dredging boom set off and sustained by Sew Hoy, government faced mounting pressure from agricultural interests and land-hungry settlers to regulate and restrict mining's damaging effects. Despite this pressure, government largely continued to support mining interests by introducing piecemeal legislation, none of which significantly restricted mining operations. For example, under Section 12 of the Mining Amendment Act of 1919, miners wishing to operate dredges had to first apply 'to the local Commissioner of Crown Lands for assessment of the agricultural value of the land, and ... to impose such conditions as were necessary "to prevent, so far as practicable, the destruction of the surface of the land or the rendering of it unfit for pastoral or agricultural purposes"'. Yet this legislation did not apply to freehold land. Nor did it provide the facility for reserving or protecting land destroyed by mining.<sup>79</sup> At the same time, government tried to placate private landowners. The Rivers Commission of 1900–01, established due to pressure from claimants, attempted to ascertain the nature of mining needs and, where appropriate, proclaim watercourses suitable for mining purposes. It also paid compensation to litigants whose land was affected by mining: by March 1907, the Commission had paid out £51,000 in compensation, an indication of the seriousness of mining's impacts on other land uses.<sup>80</sup>

77 Ng, *Windows*, 3:272–83.

78 Ng, *Windows*, 1:315–16.

79 Hearn, 'Mining the Quarry', 117–18.

80 Hearn, 'Mining the Quarry', 110.



Photo 4: 'Sew Hoy's Claim, Nokomai'.

Source: *Otago Witness*, 5 December 1900, 28.

Notwithstanding compensation payments, the Rivers Commission's findings and recommendations illustrate the extent of mining damage consequent on hydraulic sluicing and dredging, and stress officialdom's general disregard for mining's environmental effects. For example, contrary to extensive evidence reported in newspapers, the Commission disingenuously reported that '[i]n working the alluvial drifts by dredges in the beds of streams there is no likelihood of any damage being done to land held by settlers along the banks, as a dredge merely trenches up the gravel in the bed and deposits it again in nearly the same place'. Similarly, it casually noted that 'seeing that some of the principal rivers have been used as main channels to carry off the waste water and silt from gold-workings during the past thirty-nine years', it saw no need 'to recommend that the Clutha, Kawarau, Dunstan, Manuherikia, and Shag Rivers be proclaimed



watercourses into which tailings, debris, and waste water from mining claims may be discharged'.<sup>81</sup> It seemed politically sensible to keep quiet rather than to condone a dubious practice that was already well established.

That Chinese miners contributed to this pollution is in no doubt. As noted, Sew Hoy's investments and improvements in dredging technology substantially accelerated environmental change, as did the operations of Chinese miners engaged in more capital-intensive operations. Photo 5 illustrates the effects of Chinese sluicing and elevating on Spec Gully, near Naseby, on the Mt. Ida Gold Field. Note, especially, the deep gullying caused by the operations, including the removal of topsoil and underlying rock, as well as the diversion of water.



Photo 5: James Ng identifies the individuals as (left to right): Sue/Sew Hoy, G. H. McNeur, and Shum Bun.<sup>82</sup>

Source: 'Sluicing on the gold-field at Spec Gully in Naseby, shows miners and Rev. George H. McNeur'. McNeur Collection: Photographs of Chinese goldminers who worked in Otago and Southland gold-fields. Ref: 1/2-019157-F. Alexander Turnbull Library, Wellington, New Zealand.

<sup>81</sup> *AJHR*, H-21, vol. 1, 1901, 6.

<sup>82</sup> Ng, *Windows*, 1:246.

## Eco-cultural networks: Commodity and raw material exchanges

These examples of mining enterprises illustrate that Chinese were agents of environmental transformation, willing to contribute 'to the same urge to transform colonial nature into commodities' as colonists 'and, to varying degrees, Māori'.<sup>83</sup> Chinese miners seized the opportunities presented by New Zealand's shipping connections and availability of land. They utilised its legal apparatuses and financial systems, and grafted them, in varying ways, onto their own networks of expertise and knowledge drawn from China and elsewhere. This was as apparent on the scale of small, clan-based mining claims as it was in the large-scale operations of wealthy merchants like Choie Sew Hoy.

Like several other merchants, Sew Hoy's warehouses supplied gold-fields Chinese, and some Europeans, with goods from China and elsewhere. Merchants like Sew Hoy provided vital support to Chinese going to the gold-fields; in Sew Hoy's case, to men from Panyu. Their stores operated as bridgeheads into the interior for incoming Chinese. Merchants supplied goods and services, such as accommodation, loans, and advice to Chinese miners, as well as 'gambling and opium smoking ... cooked meals and alcohol, a meeting place and an informal "news exchange" ... and usually services such as interpreting and letter writing'.<sup>84</sup> They also often provided medical treatments, as well as ingredients for use in traditional medicines.<sup>85</sup> By the 1880s, there were at least 40 Chinese storekeepers.<sup>86</sup> Archaeological evidence—and advertisements from the time—demonstrate the local and international resource demand created by Chinese mining.

Chinese miners' resource demands had environmental impacts locally, nationally, and internationally. Overseas resource demand developed environmental exchanges and furthered environmental exploitation and investment in China and New Zealand, connections reinforced through the export of New Zealand natural products to China.<sup>87</sup> For example, Sew Hoy's investment in other mining operations and ventures brought further environmental impacts. Although Sew Hoy's business dealings were unusual, because of the large capital he had available and in the associations he developed with European investors, most

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83 Beattie, 'Eco-cultural Networks', 165.

84 Ritchie, 'Archaeology and History of the Chinese', 37.

85 Ng, *Windows*, 1:200–201; Beattie, 'Eco-cultural Networks', 161.

86 Ritchie, 'Archaeology and History of the Chinese', 34.

87 Beattie, Melillo, and O'Gorman, 'Introduction: Eco-Cultural Networks and the British Empire, 1837–1945', in *Eco-Cultural Networks*.



small-scale Chinese operations, even with relatively little capital and reliant on Chinese investment, created local and international resource demand, with resulting environmental impacts.

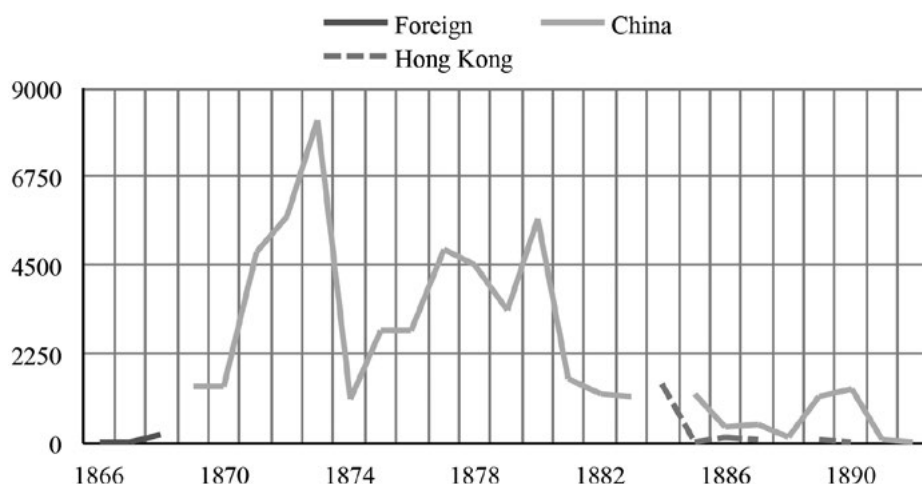


Figure 4: Gold exported from New Zealand to Hong Kong and China in ounces, 1866–1901.

Source: 'Table 7—Gold Exports to China', in Ng, *Windows*, 1:349.

It is as difficult to chart the specific domestic and overseas environmental impacts resulting from the demand for goods from New Zealand-based Chinese as it is to discern the associated services and labour flows which underpinned them. Such an undertaking requires investigation of resource chains associated with particular commodities, a process I have only just begun to untangle as part of research on a manuscript on which I am presently working.<sup>88</sup> Nevertheless, an outline of some of the goods consumed by Chinese miners in New Zealand offers a starting point for considering some of the interlinked environmental, social, and economic dimensions of Chinese migration.

Chinese imported much of their food and drink, and other daily items, including medicine, from their homeland and elsewhere. This included everything from rice (Figure 5)—mainly from Australia, India, Java, and from the 1880s, Japan and Hong Kong<sup>89</sup>—and ceramics, along with newspapers, writing tools, coins, and opium (Figure 6).<sup>90</sup> Among the Chinese, rice, as Don observed, 'is the stuff [sic] of life, and occupies greater prominence than any single dish among

88 At this stage a working title is *South China–New Zealand Environmental Connections: Market Gardening, Gold Mining and Guangdong's 'Guizhao' Landscapes*.

89 Ng, *Windows*, vol1, 355, note 29a. See also, E. O'Gorman, 'Experiments, Environments, and Networks: Commercial Rice Cultivation in South-Eastern Australia, 1900–1945', in *Eco-cultural Networks*, 233–62.

90 Ritchie, 'Archaeology and History of the Chinese', 155–710.

ourselves, being eaten at least twice and sometimes thrice a day'. Sometimes, it would also be accompanied by 'pork, cabbage, mutton, celery, onions, fish (fresh and preserved), pickles, turnips, fowl, potatoes, duck, &c. At a "small meal" sometimes only pastry is eaten'.<sup>91</sup> More commonly, however, miners in New Zealand ate simple meals of rice, often served with a small portion of meat or, more rarely, preserved fish.<sup>92</sup> Occasionally, more luxurious items were sold in Chinese warehouses. Don ate moon-cakes, presumably locally made.<sup>93</sup> At his Round Hill store, the *Otago Witness* reporter noted that its proprietor, Wong Young Wah, offered the reporter 'cum quots [sic], preserved plums, and other Chinese delicacies, which we find very grateful [pleasing] to our European palates'. The reporter also recorded some 'queer-looking objects' dangling from the roof, including 'deer's feet, dried serpents, and other indescribable atrocities', an illustration of the importance of imported items in Chinese traditional medicine.<sup>94</sup> Very rarely did Chinese use locally grown plants in preparing their medicines.<sup>95</sup>



Figure 5: Rice imports into New Zealand.

Source: 'Table 9—Rice Imports', in Ng, *Windows*, 1:350.

91 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 December 1882, 104.

92 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 October 1882, 66.

93 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 November 1884, 85.

94 *Otago Witness*, 9 March 1888, 4.

95 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 1 August 1882, 28.

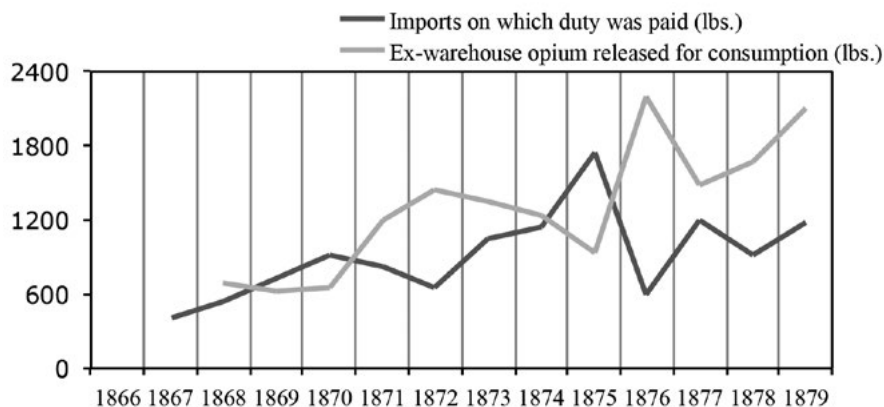


Figure 6: Opium imported into New Zealand, 1866–79.

Source: 'Table 10—Opium Imports', in Ng, *Windows*, 1:351.

Demand for perishables, such as hens and wild-fowl, pigs, and cattle, as well as eggs, bread, sugar, and flour was satisfied locally.<sup>96</sup> Most Chinese supplemented this diet with produce grown in a domestic vegetable garden or orchard. Indeed, among the gold seekers, the Chinese were unusual in that most miners had a garden—including even the poorest living in the most ramshackle of abodes (Photo 1.6).



Photo 6: Unidentified Chinese man and the Rev. Alexander Don outside a dwelling and vegetable garden in Waikaia (also known as Switzers).

Source: 'Chinese man and Reverend Alexander Don outside a dwelling in Waikaia'. McNeur Collection: Photographs of Chinese gold miners who worked in Otago and Southland gold-fields. Ref: 1/2-019146-F. Reproduced with the permission of Alexander Turnbull Library, Wellington, New Zealand.

<sup>96</sup> Ritchie, 'Archaeology and History of the Chinese'; A. Piper, 'Chinese Diet and Cultural Conservatism in Nineteenth-century southern New Zealand', *Australian Journal of Historical Archaeology* 6 (1988): 34–42.

In addition, Chinese introduced seeds and bulbs of plants familiar to them from their homeland, as well as growing vegetables commonly found in colonial New Zealand, especially potatoes. In 1883, for example, Don '[c]aught up with a man carefully carrying a stock of turnip seed grown in China; the seed, like all other Chinese productions, he considered immensely superior to the foreign article'.<sup>97</sup> Box-thorn is likely to have been cultivated by Chinese, who ate its leaves.<sup>98</sup> Bok Choy, and Pak Choi, as well as rhubarb, and chives, and bean sprouts were also commonly available.<sup>99</sup> Chinese grew vegetables eaten by Europeans—potatoes, peas, carrots, etc.—for their own table,<sup>100</sup> but appreciated aesthetic varieties too. At Round Hill, 'Banner of Joy' proudly showed Don his neighbour's rose bush.<sup>101</sup> Indeed, Chinese market gardeners were also probably the first to introduce several ornamentals from China into New Zealand. For example, in 1871, the gardener Wong Koo displayed 'Chinese Narcissus', possibly *Narcissus tazetta* var. *chinensis* (Chinese Sacred Lily or daffodil) at the Dunedin Horticultural Society, winning a special prize for them. This is the first recorded mention of the Chinese Sacred Lily in New Zealand.<sup>102</sup>

Many Chinese market gardeners entered—and won—horticultural and sometimes floricultural competitions run by Europeans. By the latter nineteenth century, they also supplied colonial towns with most of their vegetables.<sup>103</sup> The grudging respect accorded to Chinese miners by colonists applied equally to Chinese market gardeners:

There is no class of people on the face of the earth that can take more out of a half-acre of good soil than the Chinese—every inch of surface is brought into requisition and nothing is wasted. With all other conditions equal, John Chinaman will make more out of one acre than John Bull will out of double that area.<sup>104</sup>

As I have shown in much greater detail elsewhere, Chinese market gardening, just like Chinese mining, was an important source of environmental change in New Zealand, but an activity which also encouraged cultural and intellectual interactions otherwise prevented by linguistic and racial divisions. Chinese vegetable sellers, and later fruit shops, were a commonplace sight—and an integral part of the colonial economy. Market gardening and vegetable selling afforded Europeans an opportunity to judge and criticise Chinese, but at other

97 Alexander Don, 'Our Chinese Mission', *New Zealand Presbyterian*, 1 January 1883, 127.

98 Ng, *Windows*, 1:338, note 143g.

99 Ng, *Windows*, 1:341, notes 151a, 151b.

100 Beattie, 'Empire of the Rhododendron'.

101 Alexander Don, *New Zealand Presbyterian Chinese Mission: Twenty-first Inland Otago Tour, 1907–1908* (Dunedin: Otago Daily Times, 1908), 5.

102 Beattie, 'Eco-cultural Networks', n. p.

103 Beattie, 'Empire of the Rhododendron', 251–57.

104 *Tuapeka Times*, 7 August 1886, 2.

times a chance to praise their practices, share garden cultures, and foster economic transactions and cultural exchanges among them, and sometimes with Māori too.<sup>105</sup> Indeed, the employment of Māori in Chinese market gardens in northern New Zealand led to more permanent Chinese–Māori relations through intermarriage, to the outrage of some in colonial New Zealand.<sup>106</sup> On the Otago gold-fields, too, it is likely that the fresh vegetables supplied by Chinese market gardeners helped stave off scurvy.<sup>107</sup>

Chinese gold-fields stores, and restaurants, also catered to European customers. For example, at Cromwell, in 1881 Kum Good Wa described himself as a ‘Chinese Storekeeper and Fancy Goods Warehouseman’. He advertised ‘On Sale ... at Prices which will command a regular market, Teas, Sugars and General Groceries for English as well as Chinese customers’.<sup>108</sup> European storehouses also imported Chinese goods, as shown in the advertisement reproduced in Photo 7. Imports for a European market included Chinese tea, which remained very popular in early colonial New Zealand until a gradual shift towards the consumption of tea grown in Ceylon (Sri Lanka) and India from the 1850s, a trend also reflected across the British Empire.<sup>109</sup>

Aside from gold (Figure 4), vast quantities of New Zealand resources were also exported overseas. The entrepreneur Chew Chong (c. 1830–1920) amassed a fortune by exporting the edible tree fungus—*Auricularia polytricha* (Photo 8)—that grew in abundance in the North Island’s forests, particularly on rotting logs. Chew Chong collected the fungus from colonists and Māori, and, once dried, sent it to Dunedin for export to China—with some also being sent to New South Wales.<sup>110</sup> Most likely this operation took place in conjunction with a number of Chinese merchants, including Choie Sew Hoy—at the very least, Sew Hoy was involved in shipping the fungus, as was Chan Ah Chee (1851–1930, but

105 On the nineteenth century, see: Beattie, ‘Eco-Cultural Networks’; Beattie, ‘Empire of the Rhododendron’. On the twentieth century social interactions, see Lily Lee and Ruth Lam, *Sons of the Soil: Chinese Market Gardeners in New Zealand* (Pukekohe: Dominion Federation of New Zealand Chinese Commercial Growers Inc., 2012).

106 ‘Report of the Committee on the Employment of Maoris on Market Gardens’, *AJHR*, G-11, 1929, 5; J. B. J. Lee, *Jade Taniwha: Māori-Chinese Identity and Schooling in Aotearoa* (Auckland: Rautaki Ltd, 2007); M. Ip, *The Dragon & the Taniwha: Māori & Chinese in New Zealand* (Auckland: Auckland University Press, 2009); Jessica Heine, ‘Colonial Anxieties and the Construction of Identities: The Employment of Maori Women in Chinese Market Gardens, Auckland, 1929’ (M.A. diss., University of Waikato, 2006).

107 Ng, personal communication.

108 *Cromwell Argus*, 17 May 1881, cited in Ritchie, ‘Archaeology and History of the Chinese’, 36.

109 Melillo, ‘Empire in a Cup: Imagining Colonial Geographies through British Tea Consumption’, in *Eco-cultural Networks*, 68–91. Over the nineteenth century, New Zealand colonists remained avid tea drinkers, out-sipping all other colonial consumers per head of population in the 1860s and 1870s. Tony Ballantyne, ‘India in New Zealand: The Fault Lines of Colonial Culture’, in *India in New Zealand: Local Identities, Global Relations*, ed. Sekhar Bandyopadhyay (Dunedin: Otago University Press, 2010), 24–25.

110 No. 2. Mr. W. Townsend to Mr. W. Seed. (No. 8.) Custom House, New Plymouth, 15 March 1873, in ‘Exportation of Fungus to China (Correspondence Relative to)’, H-39, *AJHR*, 1873, 1.

commonly known as Ah Chee) in Auckland.<sup>111</sup> The fungus generated significant export revenue for Chew Chong and the others involved in the industry; from 1880 to 1920 New Zealand fungus exports totalled £401,551.<sup>112</sup>

**Sales by Auction.**

WEDNESDAY, OCTOBER 23,

**NEW SEASON TEAS,  
MATTING,  
PRESERVED GINGER,  
CHOWCHOW & GUMGNOTS,**

EX 'WAVERLEY,'

FROM CHINA DIRECT.

**STANNUS JONES**

Has received instructions from the Importers,  
Messrs. CRUTCHANK, SMART, & Co., to sell by  
public auction, at his Mart, Brunswick Build-  
ings, on Wednesday next, October 23rd, at  
11 o'clock,

**THE CARGO OF THE 'WAVERLEY,'**  
consisting of—

**M A T T I N G.**

'Waverley,' C. S. & Co. (in diamond)—  
100 rolls, 4-4, Red and White, each 40 yards  
50 ditto, 4-4, White, each 40 yards

T E A S.

'Waverley,' C. S. & Co. (in diamond)—

- 25 chests Finest Congou
- 50 ditto ditto ditto
- 75 ditto ditto ditto
- 25 ditto ditto ditto
- 75 half chests ditto ditto
- 150 ditto ditto ditto
- 150 ditto ditto ditto
- 100 ditto ditto ditto
- 35 ditto ditto ditto
- 15 ditto extra fine Souchong congou
- 5 ditto Gunpowder
- 5 ditto S.O. Pekoe
- 5 ditto Scented Tea Dust
- 200 boxes Finest Congou
- 200 ditto ditto ditto
- 150 ditto ditto ditto
- 50 ditto ditto ditto
- 20 ditto Extra Fine Souchong Congou
- 20 ditto Gunpowder
- 20 ditto S.O. Pekoe

TEA NUT OIL.

25 cases, each 4 tins Tea Nut Oil

PRESERVES.

- 10 cases Ginger, preserved, each 6 jars
- 10 ditto Chow Chow
- 10 ditto Comquots.

AS A SAMPLE OF CANTON PRODUCE—

- 5 boxes Chinese Tobacco
- 20 bags White Canton Sugar
- 40 ditto Canton Rice.

The Chinese Curiosities will be catalogued and on  
view at Hobson's Buildings, Sheridan-street, on and  
after Tuesday next, and will be sold there by auction,  
on Thursday, the 29th inst, at 12 o'clock.

Samples now on view at the Auction Mart, and  
Messrs. Crutchank, Smart, & Co.'s Stores, High-  
street.

TERMS:

Under £50, Cash; under £100, Approved Bills, at  
3 months; over that, Approved Bills at 3  
and 4 months from day of Sale.

Photo 7: Advertisement showing the popularity of varieties of Chinese tea among colonists.

Source: *New Zealand Herald*, 24 October 1868, 2.

111 Ng, *Windows*, 3;269.

112 *AJHR*, 1880–1920.





Photo 8: Specimens of New Zealand fungus.

Source: Supplement to the *Auckland Weekly News*, 22 August 1901, 11. Sir George Grey Special Collections, Auckland Libraries, AWNS-19010822-11-6.

Sew Hoy, Chew Chong, and Ah Chee were unusual among Chinese in that they chose to reinvest much of their profits into enterprises in New Zealand. Most of their countrymen instead sent money as remittances to China. Unlike the contribution of Chinese from South East Asia to their homeland, an overall picture of remittance payments sent from overseas Chinese in New Zealand to southern China is unavailable because of the paucity of sources. Based on what scattered evidence remains, James Ng has shown that of the relatively few recorded remittances from New Zealand, the largest amount was £22. Most were of a few pounds sterling only.<sup>113</sup>

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113 Ng, *Windows*, vol. 1, 345–356.



This reflected the fact that many Chinese were left stranded and indebted in New Zealand. For example, in a rare letter preserved from the nineteenth century, in 1889 Chau Pak Cheung 陈亚详 thanked the 'Honourable' issuer of the original loan for reducing his brother's debt to him and described his brother's situation in the following terms:

无奈亚恒从前做金，亦无银积聚。今又贫穷，未能如命奉回。而我又穷，亦无力代亚恒还账，料必亚恒不能回家矣。现下他身体亦已平安，暂寓本号。俟迟日寻得工做，有银定必送回。

Ya-Hang [?] was only a gold-miner, he had no savings, and is now living in poverty. He has not been able to return the money. And I am also poor and thus not in the position to repay the debt on his behalf. I guess that Ya-Hang will not be able to return home. Now his health is restored and lives at my shop temporarily. Once he finds a job and is able to make some savings, he shall repay the debt.<sup>114</sup>

Overseas Chinese provided an important source of revenue for particular districts of southern China—which became known as *qiaoxiang*, 'returners' villages'—the families of which were, by late Imperial and early Republican times, eagerly courted by government authorities desperate for foreign exchange.<sup>115</sup> Research on Chinese remittances indicates that such funds were used in a variety of ways, from the establishment of businesses, orphanages, and hospitals, to the refurbishment and erection of buildings, including ancestral halls, private residences, towers, and the like. Returning Chinese also spent their money on buildings and gardens, which often incorporated architectural or botanical elements from the places they had lived in overseas.

## Environmental changes in south China

The return of many overseas Chinese—or their remains (known as 'former men')—to their places of birth established ongoing trans-local environmental connections between south China and parts of New Zealand. At the same time, New Zealand missions to the Chinese from the late nineteenth century (as a result of the migration of Chinese to New Zealand) also set in motion new eco-cultural networks.

114 Alexander Don, 'Chinese Booklets, posters, etc', New Zealand Presbyterian Archives, Dunedin, 3/131.

115 *The Encyclopedia of the Chinese Overseas*, ed. Lynn Pan (Cambridge, MA: Harvard University Press, 1998), 18–23; Ta Chen, 'Livelihood', in *Homeland Ties and Agencies of Interaction*, ed. Hong Liu (vol. 4, *The Chinese Overseas*) (Abingdon: Routledge, 2006), 3–26 [originally published as Ta Chen, *Emigrant Communities in South China: A Study of Overseas Migration and its Influence* (New York: Institute of Pacific Relations, 1940)]; George L. Hicks, *Overseas Chinese Remittances from Southeast Asia, 1910–1940* (Singapore: Select Books, 1993); Hsu, *Dreaming of Gold, Dreaming of Home*.

The Canton Villages Mission (CVM) was established in 1898 by the Presbyterian Synod of Otago and Southland. The CVM built on Cantonese sojournourism, as illustrated by Don's remarks on revisiting the Pearl River Delta region in the late 1890s after an absence of some 17 years. At Nam-Kong (Mandarin, Nan He, or South River village), Don 'met a man who knows intimately the family of my first Chinese teacher, and another who lives a few doors from a man known in New Zealand for 14 years'.<sup>116</sup>

Remittances sent by Chinese in New Zealand, like those from elsewhere, helped to alter south China's landscapes. For example, at Shek Ma (Mandarin, Shi Ma, or Stone Horse village) Don recorded that the Chan Ancestral Hall had been built almost entirely using money collected by New Zealand Chinese.<sup>117</sup> Remittance money enabled improvements to, and investments in, existing property, as well as the purchase of new. For example, Don recorded that a 'Mr Kong' 'wants to make £200 here [New Zealand], when he will return to China, get married again, and buy a farm. Land will cost from 40 to 60 taels of silver per mau [*mu*] (£100 an acre), but 8 or 10 mau (1½ acres) is a large farm'.<sup>118</sup> Another example comes from the family of the historian James Ng. At Wing Loong (Toishan), several generations of chain migration enabled the family to buy land, build a tower (for security purposes), and educate the clan.

Some of the wealthy returnees even built houses in the 'Western style'. The Rev. George Hunter McNeur (1874–1953), of the CVM, recorded visiting a Chinese man, near Whitestone Mart, returned from Sydney, who had built a house 'as far as possible, in Western style'.<sup>119</sup> The Auckland merchant, Chan Ah Chee and his wife, Joong Chew Lee, retired in 1920 to a fashionable area of Canton. Their three-storey house at 19 Sai Street, Tung Shan, Canton (Mandarin, Dong Shan), set in extensive grounds of about two to three acres (0.6 to 1.2 hectares), had a 'Western room' in which Joong Chew Lee, 'would display western style art and pictures', as well as play the piano and sing hymns.<sup>120</sup> Like many other wealthy returning Chinese, Ah Chee constructed a garden at his mansion, although few details of it survive. Other returning Chinese developed gardens showing some of the designs and plants Chinese migrants had experienced while in Gold or New Gold Mountain.<sup>121</sup>

116 Alexander Don, *Under Six Flags: Being Notes on Chinese in Samoa, Hawaii, United States, British Columbia, Japan and China* (Dunedin: J. Wilkie & Co., 1898), 91.

117 Don, *Under Six Flags*, 91–92.

118 Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian*, 2 April 1883, 184.

119 George Hunter McNeur, *Feeling the Way in the Canton Villages* (Dunedin: Otago Daily Times, 1902), 33.

120 May Sai Louie [grand-daughter of Ah Chee], interview, 21 December 2007, Lily Lee, cited in Lee and Lamb, '陈达枝 Chan Dah Chee, 1851–1930', (unpublished research paper, 2009), 25–26.

121 Selia Jinhua Tan, Guangdong Qiaoxiang Culture Research Center, Wuyi University, Jiangmen, is undertaking pioneering work on the landscapes created by these returning Chinese. Also note, for example, Judith Brandel and Tina Turbeville, *Tiger Balm Gardens: A Chinese Billionaire's Fantasy Environments* (Hong Kong: Aw Boon Haw Foundation, 1998).

The repatriation to south China of the bodies of Cantonese who died in New Zealand represented a different kind of connection established between New Zealand and the districts around Guangzhou. The need to inter the remains of returning Chinese from New Zealand and other 'gold mountains', and to maintain the appropriate rituals of veneration, impacted on land-use practices in south China.<sup>122</sup> A mortuary temple and site near Upper Panyu's Shek Moon was maintained by Cantonese from Panyu and Hua districts, who had formed the Cheong Shing Tong, a burial society that also kept up a society house in Hong Kong for its members.<sup>123</sup>

Another dimension of the landscape changes initiated through New Zealand–Chinese migration was the CVM presence in Panyu, at Kong Chuen. The CVM established a network of churches as well as a hospital and theological college there, which led to a greater frequency of contacts between south China and southern New Zealand through the movement of people, the advent of mission work, and regular accounts in New Zealand of life there. For example, missionary interest in Panyu and its surroundings triggered articles and talks about Chinese garden practices and landscapes in New Zealand.<sup>124</sup> Indeed, some missionaries, like George McNeur, regarded an understanding of Chinese customs and practices, including its agricultural systems, as absolutely central in laying the groundwork for evangelisation. In his *The Missionary in Changing China*, McNeur claimed that South China's 'intensive system of cultivation which has been prevalent for so many centuries' was '[a]nother almost universal factor in the evolution of the Chinese brain'.<sup>125</sup> In addition to such written descriptions is the possible introduction of New Zealand plants into the missionary compound in Kong Chuen, which had formal pathways and gardens.<sup>126</sup>

## Chinese and British imperial environmental historiography

If the history of overseas Chinese in New Zealand contributes to growing scholarship highlighting the importance of non-state actors as agents of landscape change in the British Empire, then it also challenges the overwhelming attention given to Europeans as drivers of that environmental transformation. In 2011,

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122 Note, Elizabeth Kenworthy Teather, 'The Road Home: Repatriating Chinese Emigrants After Death', *New Zealand Geographer* 58, no. 1 (2002): 5–13.

123 Ng, *Windows*, 1:64–66.

124 Note, for example, the descriptions in Don, *Under Six Flags*, 96–97;

125 McNeur, *The Missionary in Changing China* (Dunedin: Foreign Missions Committee of the Presbyterian Church of New Zealand, 1935), 28.

126 Note images in William A. Mawson, *Canton Villages Mission of the Presbyterian Church of New Zealand* (Dunedin: Foreign Missions Committee, 1926), 49–50.

Paul Star coined the memorable phrase ‘biota barons’ to describe colonists who had played a disproportionate part in causing New Zealand ecological change.<sup>127</sup> He had in mind primarily Europeans. This article suggests the need to broaden his category to include Chinese—not just in studies of New Zealand environmental history, but also for those of other settler colonies and New World societies. This responds to Micah Muscolino’s suggestion that scholars need to situate Chinese environmental history within global trends.<sup>128</sup> For this article, this has meant examining the importance of trans-local case studies—mainly between Canton and Otago—in colonial environmental history.

Examining overseas Chinese environmental transformation in places like New Zealand has potential to shift scholarship on relations between China and the western world away from questions framed solely around opium and the unequal treaties. Asymmetries in power relations existed, of course, and in New Zealand legislative and social racism faced by Cantonese restricted their ability to migrate and access capital, as well as limiting other opportunities. Yet, alongside stories of China’s ‘one hundred years of humiliation’, through examination of the transformation of imperial environments, historians can recover something of the agency of Chinese in this troubled century and the next.<sup>129</sup> In addition, it has the potential to enrich scholarship on Chinese diaspora and migrant networks, which has ignored the environmental dimensions of migration.<sup>130</sup>

Paying attention to overseas Chinese environmental history can help place into stark relief the sometimes profound differences within China’s own environmental history. Notably, it can stress the need to recognise China’s environmental heterogeneity and, as Robert B. Marks and Mark Elving among others have noted, the existence of major environmental sub-regions in China and the role of different hinterlands in creating them.<sup>131</sup> As Marks showed in *Tigers, Rice, Silt, & Silk*, post-sixteenth century overseas contact coupled with the activities of overseas Chinese in South East Asia fundamentally shaped

127 Star, ‘New Zealand’s Biota Barons’.

128 Micah Muscolino, ‘Global Dimensions of Modern China’s Environmental History’, *World History Connected* 6 (2009): 31 paragraphs, [www.historycooperative.org/journals/whc/6.1/muscolino.html](http://www.historycooperative.org/journals/whc/6.1/muscolino.html), accessed 19 January 2012.

129 See: Beattie, ‘Chinese Ghosts in a New Zealand Landscape: Environmental Change and Perception among Cantonese in Otago and Europeans in Canton, 1860s–1930s’ (draft MS).

130 Most studies of the Chinese diaspora examine self-help societies and political organisations, as well as business and migration networks, and issues of identity formation and racism. McKeown, *Melancholy Order*; Keir Reeves, Lionel Frost, and Charles Fahey, ‘Integrating the historiography of the nineteenth-century gold rushes’, *Australian Economic History Review* 50 (2010): 111–28; Reeves, ‘Tracking the Dragon Down Under: Chinese Cultural Connections in Gold Rush Australia and Aotearoa, New Zealand’, *Graduate Journal of Asia-Pacific Studies* 5 (2005), 41–66.

131 Robert B. Marks, *China, Its Environment and History* (New York: Rowman & Littlefield, 2012); Elvin, *Retreat of the Elephants*.

Guangzhou and Fujian's environmental histories. This article demonstrates that nineteenth-century Cantonese access to southern Pacific capital and resources also contributed to environmental change near Guangzhou.<sup>132</sup>

Several fruitful areas of comparison are also opened up through studying Cantonese-New Zealand exchanges. For example, did environmental change by overseas Chinese in Gold Mountain and New Gold Mountain represent the same drive to exploit China's 'internal' frontiers as was evident in late Qing Mongolia, Manchuria, and Yunnan? Was private capital—as utilised by overseas Chinese in Gold Mountain and New Gold Mountain—or state direction (Xinjiang) of Chinese entrepreneurs the best means of ensuring the success of such operations, and which had the greater environmental impacts? For example, in contrast to earlier policies, the late nineteenth-century Chinese state encouraged gold-mining near Tacheng, Xinjiang<sup>133</sup> as a means of pacifying and securing a marginal region. Did this changing opinion on Xinjiang gold-mining shift official attitudes towards Chinese gold-miners overseas, too?

In this period, as scholars such as Peter Lavelle and Joseph Lawson are demonstrating, the model of Euro-American imperialism and resource development received widespread, if not always accurate, reporting among officials tasked with settling China's frontiers.<sup>134</sup> The irony was it was the likes of the overseas Chinese more than the scholar elite who not only knew more about, but also implemented and sometimes introduced and adapted Western technology in new territories in the British Empire and elsewhere. This points to the lack of knowledge transfer in China across social classes as well as over geographical boundaries, from north China to south China. Each group had different sources of information: scholar officials commonly gained much knowledge about the outside world from Japan,<sup>135</sup> while overseas Chinese gained this directly, from the countries in which they were living.

Finally, the article's focus on the environmental dimensions of gold-mining highlights a strangely neglected, yet significant, dimension of New Zealand's environmental historiography. From 1850 to 1908, New Zealand provided three per cent of the world's gold production.<sup>136</sup> In the 1860s, gold was New Zealand's

132 Marks, *Tigers, Rice, Silt, & Silk*.

133 Judd Kinzley, 'Turning Prospectors into Settlers: Gold, Immigrant Miners and the Settlement of the Frontier in Late Qing Xinjiang,' in Sherman Cochran and Paul G. Pickowicz, eds., *China on the Margins* (Ithaca: Cornell University East Asia Series, 2010), 17–41.

134 Peter Lavelle, 'The aesthetics and politics of Chinese horticulture in late Qing borderlands,' in *Environmental History in East Asia: Interdisciplinary Perspectives*, ed. Ts'ui-jung Liu (London: Routledge, 2014), 213–42; Joseph Lawson, 'The Chinese State and Agriculture in an Age of Global Empires, 1880–1949,' in *Eco-Cultural Networks*, 44–67.

135 Lawson, 'The Chinese State and Agriculture', 50–55.

136 Bateman *New Zealand Historical Atlas/ Ko Papatuanuku e Takoto Nei* (Auckland: David Bateman and Department of Internal Affairs, 1997), plate 44.

main source of export revenue. For example, in the 1860s, '[s]ome £21 million worth of gold enriched Otago'.<sup>137</sup> Even after this period, it enjoyed periods of economic significance, notably during the dredging boom of the 1890s.<sup>138</sup> Yet despite its economic, social, and environmental importance, gold-mining's history has been largely subsumed by a dominant scholarly focus on pastoralism and small-scale farming. Industrial mechanisation and the accumulation of the necessary capital, especially following hydraulic mining and dredging, points to a similar situation as that in California, in which, as Andrew C. Isenberg has noted, 'the intervention in the form of steam and hydraulic engineering stabilised and ordered a dynamic system' that attracted 'further investment capital'.<sup>139</sup>

## Conclusion

Especially in Otago, Chinese gold-miners had significant environmental impacts. Their activities altered hydraulic regimes and caused soil erosion. They reduced timber supplies, displaced vegetation, and diverted scant water supplies. In developing these new resources, Chinese miners seized opportunities presented by the Colony's shipping connections. They took advantage of its legal apparatuses and financial systems, and incorporated them into their own networks of expertise and knowledge, labour, and capital drawn from China and elsewhere. Through their access to Chinese and New Zealand capital and labour, a few high-earning Chinese, such as Sew Hoy, invested profits in the Colony, by developing new industries and opening up new frontiers of resource exploitation.

Their activities, impacting on environments in south China and elsewhere, need to be included in environmental histories of both settler societies and China itself. The story of the overseas Chinese can add a global comparative dimension to Chinese environmental history and significantly enrich regional understandings of that country's environmental diversity. Finally, this article supports Christine Meisner Rosen's argument for the 'urgent importance of engaging in research that integrates business and environmental history',<sup>140</sup> by stressing the environmental dimensions of Chinese business activities.

137 Erik Olssen, *A History of Otago* (Dunedin: John McIndoe, 1984), 66.

138 See Graph 4: Composition of exports, 1861–1976 (by value) in Geoffrey W. Rice, ed., *The Oxford History of New Zealand*, second ed. (Auckland: Oxford University Press, 1981), 597.

139 Isenberg, *Mining*, 21.

140 Christine Meisner Rosen, 'The Business–Environment Connection', *Environmental History* 10, 1 (2005): 77.

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# (RE)INTERPRETING EXOTIC PLANTATION FORESTRY IN 1920S NEW ZEALAND

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## Abstract

Environmental historians who have contributed to the understanding of 'eco-nationalism' in New Zealand and within the sub-area of forest history have shown how deforestation produced a preservationist impulse and an exotic afforestation response to timber famine. My own work, in partial contrast, has tended to explore the largely unsuccessful efforts at indigenous forest management for production in the nineteenth century as well as suggesting that the large-scale afforestation boom of the 1920s and 1930s was a departure from the anticipated direction of state efforts when the Forests Department was established in 1919. Previously I have argued that the New Zealand State Forest Service under its first director L. M. Ellis initially favoured an orthodox state forestry model anchored on sustained-yield management of indigenous forests, and only later turned to large-scale exotic plantations, in order to forestall a projected timber famine by 1965, and to buy time to enable the mechanisms for regenerating indigenous forests to be understood. This paper looks more closely at Ellis' initial statements about the role of plantation forestry and suggests that a partial change of interpretation is needed.

Keywords: state forestry, historical geography, environmental history, afforestation, New Zealand.

## Introduction

This article grows out of some of the differences in, emphasis on, and interpretations of New Zealand's forest history that exist in the publications of New Zealand historians and my own writing as an historical geographer working in the field typically labelled 'environmental history'. This mostly rests on the significance of scientific forestry and of exotic afforestation in New Zealand in

the 1920s. Previously I have argued that L. M. Ellis,<sup>1</sup> as first Director of Forests in New Zealand (1920–28), initially favoured an orthodox state forestry model anchored on sustained-yield management of indigenous forests, and only later turned to large-scale exotic plantations, in order to forestall a projected timber famine by 1965, and to buy time to enable the mechanisms for regenerating indigenous forests to be understood.<sup>2</sup> This interpretation has tended to be set aside by local environmental historians, who instead draw more direct connections between nineteenth-century private tree-planting and large-scale exotic afforestation in the 1930s and downplay the role of professional foresters in forest conservation.

In this paper I take the opportunity to reflect on these differences in a broader context and then look more closely than previously at Ellis' pre-New Zealand forestry influences and his initial statements about the role of plantation forestry in New Zealand in order to reassess whether it was the great departure from his professional training that I have previously asserted it to be.<sup>3</sup> A later section then offers a counterfactual assessment of the direction of forestry in New Zealand had Ellis not been appointed. I conclude by suggesting a small but not insignificant repositioning over interpreting the course of deforestation, tree-planting, and forestry in New Zealand from the late nineteenth to the mid-twentieth century.

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1 Ellis tended to sign himself as 'MacIntosh', which was sometime rendered as 'MacKintosh' in the press, but official documents suggest 'McIntosh' is legally correct and it is what he was hired under when he came to New Zealand. This latter point shaped the variation of the spelling I adopted for his entry in the *Dictionary of New Zealand Biography*. I can avoid this complication in the text by referring to him as L. M. Ellis, but McKelvey has tended to favour MacIntosh. Ellis' writings cited later in the paper have the spelling used on the actual document.

2 Michael Roche, 'The New Zealand Timber Economy 1840 to 1935', *Journal of Historical Geography* 16 (1990): 295–313; Michael Roche, 'The State as Conservationist, 1920–60: "Wise use" of forests, lands and water', in *Environmental Histories of New Zealand*, ed. Tom Brooking and Eric Pawson (Melbourne: Oxford University Press, 2002), 183–99.

3 This paper was originally presented in a session on forest histories at the New Zealand Historical Association conference held at the University of Otago in Dunedin in November 2013. As such, it preceded the publication of the *Making a New Land: Environmental Histories of New Zealand* by a few days. Some of the points raised in the closing chapter of that book address issues that are raised herein. For these reasons and because I have attempted a revisionist interpretation of some of my own work, I have left portions of the text in the first person, rather than creating a veneer of detachment by changing it to the third person and retro-fitting it to take *Making a New Land* into account.

## Historical geography and environmental history

Anglophone historical geographers can trace the recognisable origins of their sub-disciplinary specialism in geography at least back to the nineteenth century. One part of this intellectual heritage, shared with geography more generally, involved the study of the relationship between people and environment. Encountering US environmental history in the 1990s, historical geographers, myself included, were struck by the enthusiasm that these scholars brought to their endeavours and the extent to which many seemed to be unaware of historical geography's considerable and comparatively long-standing endeavours in related fields. Something of this combination of interest and indignation was captured in papers by leading UK, Australian and US historical geographers on the relationship between environmental history and historical geography.<sup>4</sup> More recently and in a more conciliatory vein, R. M. Wilson, in the US context, has written of 'environmental historical geography' and a shared use of narrative by historical geographers and environmental historians.<sup>5</sup> Meanwhile, M. V. Melosi has suggested that environmental historians have some 'generalized affection for geography' but also posed the question of whether any intellectual convergence between historical geography and environmental history is 'by blood or by marriage'.<sup>6</sup>

Some of my work has been described as environmental history and on other occasions I have been labelled as an environmental historian. In the latter instance this was a friendly enough invitation to attach myself to another group of scholars working on past environments. My own response has typically been to identify myself as an historical geographer, reasoning that I do not have to cease to be an historical geographer in order to do historical environmental research and that my initial exposure to geography means that the sorts of questions I ask are not the same as those posed by historians. For me, environmental history has two partially overlapping configurations, one as a subset of academic history and the other as an interdisciplinary arena in which are gathered historical geographers, historians, other historically inclined social scientists, and various paleo-oriented earth scientists.

4 Michael Williams, 'The Relations of Environmental History and Historical Geography', *Journal of Historical Geography* 20 (1994): 3–21; Joseph Powell, 'Historical geography and environmental history: an Australian interface', *Journal of Historical Geography* 22 (1996): 253–73; Craig Colten, 'Historical geography and Environmental history', *Geographical Review* 88 (1998): iii–iv.

5 R. M. Wilson, 'The past and future of environmental historical geographies', *Journal of Historical Geography* 43 (2014): 160–63.

6 M. V. Melosi, 'Environmental history and historical geography: an (often) excellent relationship?', *Journal of Historical Geography* 43 (2014): 163–67.

Although the emphasis has changed over time, my historical geography writing, compared to the New Zealand environmental historians, has been a little more obviously theoretically informed. Though still largely based on narrative, it typically has a stronger concern for space and place (though less so than many human geographers with respect to space), and recently at least, has focused on shorter spans of time, mainly in the twentieth century. Importantly—and this imposes limits—it has also tended to concentrate on the role of state institutions and been particularly concerned with forests and land use. New Zealand environmental historians grounded in academic history might be contrasted as working on a wider suite of topics, though still largely ‘rural’, across larger time periods and displaying a greater interest in the attitudes, values, and activities of settler civil society.

But while as researchers we can bedeck ourselves with disciplinary badges, being located in New Zealand is to recognise that you are at a distance from the major clusters of researchers working in cognate areas. Indeed, in New Zealand there is only a comparatively small number of researchers even in the more expansive-style environmental history described above. Of course with distance and small numbers comes a certain freedom to select what to engage with from mainstream historical geography and environmental history. To what extent are my historical geography concerns grounded on fundamental subdisciplinary intellectual building blocks; or, are they more an assemblage of disciplinary predilections that are as much a matter of personal taste? This is a particular problem where you are dealing with small numbers of researchers and find yourself endeavouring to make a case that the historical geographers do it ‘this way’ and the environmental historians do it ‘that way’. Research conducted along disciplinary lines can also reach out to bordering areas. For instance, in a different context I contrasted ‘historical’ and ‘geographical’ approaches to the study of World War I soldier settlement, while noting that this was not entirely a matter of disciplinary boundaries; some historians produced richly geographical accounts, and vice versa.<sup>7</sup> The same applies to research into forest history internationally, where some environmental historians from academic history backgrounds have published in historical geography journals.<sup>8</sup>

7 Michael Roche, ‘World War One British Empire discharged soldier settlement in comparative focus’, *History Compass* 9 (2011): 1–15.

8 Greg Barton, ‘Empire forestry and the origins of environmentalism’, *Journal of Historical Geography* 27 (2001): 529–22; Brett Bennett and Frederick Kruger, ‘Ecology, forestry and the debate over exotic trees in South Africa’, *Journal of Historical Geography* 42 (2014): 100–109.

## Empire forestry and New Zealand

Although there is now a small New Zealand secondary environmental history literature about forests and forestry, it is useful to position local developments against a broader forest history backdrop. This can be done in a comparative fashion as well as in British imperial terms, although some aspects fall beyond these bounds and might be described under a 'global' heading. In comparative terms, New Zealand and Australia can be usefully studied. Both have similarly timed histories as settler societies, though their forest endowments were quite different, with New Zealand having a higher percentage of forest cover when European settlement commenced. The forests themselves contrasted in numerous ways, but one distinction of economic importance was the preponderance of indigenous soft woods in New Zealand and hardwoods in Australia, around which a reciprocal trade emerged. In both these countries, the expansion of colonial land settlement had priority as a land use. Initial views about inexhaustible forests gave way to timber famine concerns by the late nineteenth century. This story is also one shared to some extent by the United States and Canada. In both Australia and New Zealand, private tree-planting efforts identified the potential of a number of exotic species, and state afforestation efforts commenced in the late nineteenth century. Large-scale exotic plantation of forestry also became a feature of South Africa, but on a different politico-economic trajectory to Australia and New Zealand.

To adopt an imperial focus involves considering how and when forestry knowledge, officers, and materials all circulated around the Empire, especially from the 1870s to the 1930s. Forestry in British India to varying degrees formed the backdrop. A Madras forestry officer was brought to New Zealand in 1876 to advise on the setting up of a forestry department. Later, in the early twentieth century, Nancy-, Oxford-, and Edinburgh-trained foresters completed careers that took them through various parts of the Empire, including Australia and New Zealand. Although the first scientific forestry connections were between India and New Zealand, where German and French ideas and practices were used to illustrate the possibilities of forestry, progress was limited until the early twentieth century. This was still the case when colonial forester David Hutchins, who trained at Nancy and worked briefly in India before spending the rest of his career in southern Africa, visited New Zealand in 1915 to report on New Zealand forests.<sup>9</sup> In southern Africa, Hutchins made his reputation through exotic afforestation. In still comparatively well-forested New Zealand,

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9 Michael Roche, 'Colonial Forestry at its Limits: The Latter Day Career of Sir David Hutchins in New Zealand 1915–1920', *Environment and History* 16 (2010): 431–54.

he instead devoted his attention to another part of the foresters' land management portfolio, in advocating demarcation of indigenous forests and their long-term sustained-yield management.

A backdrop to New Zealand debates were the differing interpretations of forestry in nineteenth-century British India, where, for some environmental historians, forestry was a set of imported and imposed French and German practices. The countervailing position is that state forestry in India emerged more distinctively out of exposure to local conditions and circumstances.<sup>10</sup> Still further complicating the scene, for instance, is political scientist James Scott, who in *Seeing Like a State* outlines the emergence of scientific forestry in eighteenth-century Prussia and Saxony, paying close attention to how revenue and timber volume produced a particular emphasis whereby natural forests were managed until they came close to being plantations. His more expansive point was one of how a strong focus on a small number of factors made possible a high degree of control and manipulation, a point he extended to the late twentieth century state's control over broader areas such as urban planning, rural settlement, and agriculture. While Scott is clear that his forestry vignette is a metaphor for how state bureaucracies operate, his acknowledgement that 'the history of scientific forestry is important in its own right' has been perhaps too readily overlooked.<sup>11</sup> A consequence is that what for Scott was a parable and a metaphor, for some has been read as a history of German forestry, where forestry is inevitably understood as plantation-based.

Other influences and incidents were more global; for instance, *Pinus radiata*, a native of California where it is known as Monterey Pine, attracted attention in Australia and New Zealand in the aftermath of the mid-nineteenth century gold-rush era as a candidate for large-scale afforestation efforts. Subsequently, large areas were also planted in South Africa. Appreciating that exotic tree-planting efforts extend back to the nineteenth century makes it all too easy, but misleading, to conflate scientific forestry with exotic plantations in New Zealand. In other locales, as Brett Bennett demonstrates, there is further scope for actually looking more closely at production plantations as only part of the lexicon of scientific state forestry.<sup>12</sup>

10 Cf. Greg Barton, 'Empire forestry and the origins of environmentalism', *Journal of Historical Geography* 27 (2001): 529–22 and Ravi Rajan, *Modernizing Nature: Forestry and Eco-Development 1800–1950* (Oxford: Oxford University Press, 2006).

11 James C. Scott, *Seeing like a State* (New Haven: Yale University Press, 1998), 11.

12 Brett Bennett, 'The origins of timber plantations in India', *Agricultural History Review* 62 (2014): 98–118.



## New Zealand forestry historiography

New Zealand's forest history can be interpreted with an emphasis on local initiatives, for instance with regard to the development of a preservationist sentiment or early tree-planting efforts, or else positioned within a wider framework of the expansion of British imperial forestry, which itself was slow to reach the white settler colonies of Australia and New Zealand; or pursued with an eye to local–global connections. While New Zealand on the eve of large-scale European settlement in 1840 was in percentage terms more forested than many other lands of overseas European settlement, it followed a similar trajectory of giving primacy to agricultural and pastoral land uses. Initial beliefs in the inexhaustibility of forest resources, as elsewhere, gave way within two generations to concerns about a coming timber famine. The range of introduced tree species and their growth rates attracted early attention and were distinguishing features of the New Zealand context. In New Zealand, as in Australia, forestry experts from British India advised on the implementation of scientific state forestry, on lines ultimately derived from French and German forestry practices mediated via India, albeit that little materialised out of these early efforts.<sup>13</sup> The successful establishment of forestry departments in Australia and New Zealand had to wait until the first decades of the twentieth century, by which time appointments, such as L. M. Ellis and F. E. Hutchinson in New Zealand and Harold Swain in Queensland, meant that ideas from North American forestry science were also incorporated into local practices.<sup>14</sup> But for most commentators, the distinguishing feature of forestry in New Zealand by the 1930s was, put simply, the establishment of large-scale exotic plantations.

New Zealand historians specialising in environmental history, understandably enough, have tended to see their topic entirely as a 'distinct sub-discipline of history' and have focused in some detail on the nineteenth century and the decades up to about 1920.<sup>15</sup> They have directed attention to environmental anxiety and to the wider relationship between climate and settlement that can usefully add to present-day debates about global warming.<sup>16</sup> Their major

13 Graeme Wynn, 'Pioneers, politicians and the conservation of forests in early New Zealand', *Journal of Historical Geography* 5 (1979): 171–88.

14 Michael Roche, 'Latter day 'imperial career': L. M. Ellis—a Canadian forester in Australia and New Zealand, 1920–1941', *ENNZ: Environment and Nature in New Zealand* 4 (2009): 58–77; Greg Barton and Brett Bennett, 'Edward Harold Fulcher Swain's vision of forest modernity', *Intellectual History Review* 21 (2011): 135–50.

15 James Beattie, 'Recent Directions in the Environmental Historiography of the British Empire', *History Compass* 10 (2012): 129.

16 James Beattie, 'Environmental Anxiety in New Zealand, 1840–1941: Climate Change, Soil Erosion, Sand Drift, Flooding and Forest Conservation', *Environment and History* 9 (2003): 379–92; James Beattie, 'Climate Change, Forest Conservation and Science: A Case Study of New Zealand, 1840–1920', *History of Meteorology* 5 (2009): 1–18, [www.meteohistory.org/2009historyofmeteorology5/1beattie.pdf](http://www.meteohistory.org/2009historyofmeteorology5/1beattie.pdf).

emphasis has been on the wanton destruction of the forest in the course of European settlement. This theme can be further divided. There has been research into the preservationist response to extensive and rapid deforestation. Associated with this is scrutiny of the links between indigenous flora and fauna, and a sense of colonial difference giving rise to the emergence of senses of identity.<sup>17</sup> Other work has tracked the felling to exhaustion of forest remnants, but, by and large, historians have tended to pursue the settler response to a looming timber famine in the form of exotic tree-planting.<sup>18</sup>

Environmental historians have, however, paid some attention to the Royal Commission on Forestry of 1913. Paul Star suggests that its report ‘condemned native forest not to total destruction but to non-production status’ whereas ‘until this time, the European conservationist trend had been towards indigenous production and integration with exotic production and exotic methods’.<sup>19</sup> James Beattie and Paul Star also venture that the Royal Commission added weight to timber famine concerns so that ‘to many foresters, it was therefore logical to meet future timber needs through extensive planting of exotics—and of *Pinus radiata* in particular—rather than of natives’.<sup>20</sup> In contrast, historical geographers Graeme Wynn and I have tended to examine legislative efforts, the role of the state, and attempts to implement schemes for the management of indigenous forests by professional foresters.<sup>21</sup> Anticipating by a decade elements of this present exercise, Wynn has also reappraised the role he originally attributed to G. P. Marsh’s ideas in *Man and Nature* in leading to the passage of the New Zealand Forests Act of 1874, now giving more weight to local actors.<sup>22</sup> Beattie’s *Empire and Environmental Anxiety: Health, Science, Art and*

17 Ross Galbreath, ‘Displacement, conservation and customary use of native plants and animals in New Zealand’, *New Zealand Journal of History* 36 (2002): 36–50; Paul Star, ‘Native Bird Protection, National Identity and the Rise of Preservation in New Zealand to 1914’, *New Zealand Journal of History* 36 (2002): 123–36.

18 Paul Star, ‘“Doomed Timber”: Towards an environmental history of Seaward Forest’, in *Landscape/Community: Perspectives from New Zealand History*, ed. Tony Ballantyne and Judy Bennett (Dunedin: University of Otago Press, 2005), 17–29; Paul Star, ‘Tree Planting in Colonial Canterbury, 1850–1890’, *Environment and History* 14 (2008): 563–82; Paul Star, ‘New Zealand’s Biota Barons: Ecological Transformation in Colonial New Zealand’, *EHNNZ: Environment and Nature in New Zealand* 6 (2011): 1–12; Paul Star, ‘The contribution of Henry Matthews to tree culture in New Zealand 1896 to 1909’, in *Australia’s Ever-changing Forests VI: Proceedings of the Eighth National Conference on Australian Forest History*, ed. Brett J. Stubbs, Jane Lennon, Alison Specht, and John Taylor (East Lismore, NSW: Tankard Books, 2012).

19 Paul Star, ‘Native forest and the rise of preservation in New Zealand (1903–1913)’, *Environment and History* 8 (2002): 289.

20 James Beattie and Paul Star, ‘State forest conservation and the New Zealand landscape: Origins and influences, 1850–1914’, in *Landscape/Community: Perspectives from New Zealand History*, ed. Tony Ballantyne and Judy Bennett (Dunedin: University of Otago Press, 2005), 40.

21 Graeme Wynn, ‘Conservation and Society in Late Nineteenth-Century New Zealand’, *New Zealand Journal of History* 11 (1977): 124–36; Graeme Wynn, ‘Pioneers, politicians and the conservation of forests in early New Zealand’, *Journal of Historical Geography* 5 (1979): 171–88; Graeme Wynn, ‘Destruction under the Guise of Improvement? The Forest 1840–1920’, in *Environmental Histories of New Zealand*, ed. Tom Brooking and Eric Pawson (Melbourne: Oxford University Press, 2002), 100–116.

22 Graeme Wynn, ‘On Heroes, Hero-worship, and the Heroic in Environmental history’, *Environment and History* 10 (2004): 133–51.

*Conservation in South Asia and Australasia, 1800–1920* does, however, further concern itself with forestry professionals and indigenous forests in an imperial context.<sup>23</sup>

In 2002, the editors of *Environmental Histories of New Zealand*, Eric Pawson and Tom Brooking, observed that they were overtly combining historical and geographical approaches, further noting that the volume contained a wide range of disciplines.<sup>24</sup> These distinctions between history and geography with respect to environmental history have become further blurred, for instance, in portions of Beattie's *Empire and Environmental Anxiety*.<sup>25</sup>

The temporal span of the work of the historians has been comparatively broad. This has advantages in terms of understanding longer-term trends. There are, however, implications in the choice of 1914 and/or 1920 as cut-off points for much of this research, particularly in terms of how to link tree-planting in the nineteenth century to the expansive plantations created by the state and companies in the 1920s and 1930s. On this point our interpretations differ. Elsewhere, I have suggested that by using 1914 as a break point, Beattie and Star in 'State Forest Conservation and the New Zealand Landscape' draw too direct a connection between the Royal Commission's recommendations for increasing state afforestation and the large-scale exotic plantation forests of the later twentieth century.<sup>26</sup> In so doing, pivotal episodes are lost sight of, including the efforts of the eminent colonial forester David Hutchins to promote sustained-yield management of indigenous forests from 1915 to 1920. Ellis initially shared this focus as Director of Forests, which continued in the efforts of the New Zealand Forest Service in the 1940s to 1960s and culminated in the ill-fated beech scheme of the 1970s, later to reappear when the State Owned Enterprise (SOE) Timberlands West Coast proposed to resurrect sustained-yield beech forestry, but which was finally politically terminated in 1999. Little of this sequence of events, I would suggest, flows from nineteenth-century tree-planting efforts.<sup>27</sup>

On a number of occasions I have argued that paying close attention to tree-planting and identifying forestry as exotic plantation forestry is to misread the situation. Instead, I have suggested, the importance to professional forestry of sustained-yield management of natural forests in the nineteenth and early twentieth centuries needs to be kept to the fore. It was a core part of Ellis' 1920

23 James Beattie, *Empire and Environmental Anxiety: Health, Science, Art and Conservation in South Asia and Australasia, 1800–1920* (Basingstoke: Palgrave Macmillan, 2011).

24 Eric Pawson and Tom Brooking, 'Preface', in *Environmental Histories of New Zealand* (Melbourne: Oxford University Press, 2002), xii.

25 Beattie, *Empire and Environmental Anxiety*.

26 Roche, 'Colonial Forestry at its Limits'.

27 Roche, 'The New Zealand Timber Economy 1840 to 1935'.

report on forest conditions in New Zealand and amongst the principal tasks he outlined for the newly established State Forest Service in 1921.<sup>28</sup> It was also a point made vigorously and repeatedly by David Hutchins in opposition to popular and political enthusiasm for tree-planting as a solution to future timber needs, during his residence in New Zealand from 1915 to his death in 1920.<sup>29</sup>

The examination of New Zealand as a singular case, as opposed to placing New Zealand in some larger context, represents two contrasting research strategies, both of which have a valid place. Some of the published writing on the forest preservation theme in New Zealand seems to adopt the former approach, while my more recent efforts in terms of colonial forestry represent the other strategy. Links between forest preservation and nationhood in late nineteenth and early twentieth century New Zealand are deftly addressed by Paul Star and Lynne Lochhead in their chapter in *Environmental Histories of New Zealand*, while I have more closely considered the manner in which professional foresters spread across Australia and New Zealand in the early twentieth century.<sup>30</sup> That said, it is not simply a case of historians undertaking detailed New Zealand-focused work and geographers working on a larger canvas; for instance, my *Forest Policy in New Zealand: An Historical Geography 1840–1919* tends to focus, largely though not entirely, on the local, while Beattie's *Empire and Environmental Anxiety* places forest conservation within a French, German, Scottish and British imperial context.<sup>31</sup>

Since there is now, and has for some time been, some distance and differences between my own viewpoint and that of the historians interested in environmental history, I have decided to revisit some of my own assumptions and interpretations about forest history in New Zealand, especially as they seem to have limited purchase with environmental historians. More specifically, this involves in detail at the place of afforestation in Ellis' early statements about state forestry in New Zealand, especially the period from 1920 to 1925.

28 *Appendices to the Journals of the House of Representatives* [hereafter *AJHR*], C3A (Wellington: Government Printer, 1920).

29 Roche, 'Colonial Forestry at its Limits'.

30 Paul Star and Lynne Lochhead, 'Children of the Burnt Bush: New Zealanders and the Indigenous Remnant, 1880–1930', in *Environmental Histories of New Zealand* ed. Eric Pawson and Tom Brooking (Melbourne: Oxford University Press, 2002), 119–35; Michael Roche, 'Forestry as imperial career: New Zealand as the end and edge of empire in the 1920s–40s', *New Zealand Geographer* 68 (2012): 201–10.

31 Michael Roche, *Forest Policy in New Zealand: An Historical Geography 1840–1919* (Palmerston North: Dunmore, 1987); Beattie, *Empire and Environmental Anxiety*.

## Ellis appointed as first Director of Forests, 1919

A protracted series of largely behind-the-scenes manoeuvres in which farmer–politician Sir James Wilson and Lands Department official E. Phillips Turner figured prominently, in conjunction with a public discourse in which the Royal Commission on Forestry of 1913 was prominent, paved the way for state forestry in New Zealand. Official and popular writings by the eminent colonial forester David Hutchins reinforced the case. Collectively these efforts led to the decision to appoint a professionally trained forester to head a forests department that was administratively separate from the Lands Department and responsible for both indigenous forests and exotic plantations.<sup>32</sup> World War I delayed any progress, but in 1919 the position, along with that of Chief Inspector, was advertised in the United Kingdom. There were nineteen applicants for the Director’s position, from which the London-based appointments committee—comprising Lord Lovat (a Scottish estate owner, a member of the Interim Forestry Commission, and later chairman of the British Forestry Commission (1919–27), R. L. Robinson, an Australian Rhodes Scholar and Oxford forestry graduate (1909), who was later technical commissioner and eventually long-time chairman of the British Forestry Commission, and A. G. Herbert (a New Zealand High Commission secretary—decided to shortlist only two men, L. M. Ellis and A. A. Dunbar Brander.

Ellis (1887–1941) at the time was an Advisory Forestry Officer for the Board of Agriculture in Scotland as part of the Interim Forestry Commission, forerunner of the Forestry Commission. During World War I, he had served in France as a Captain in the Canadian Forestry Corps. Earlier, he had graduated with a BSc in forestry from the University of Toronto, where the department was headed by the influential Bernhard Fernow. Subsequently Ellis was employed by the forestry department of Canadian Pacific Railways until he enlisted in 1916.<sup>33</sup>

Brander (1877–1953) was a Deputy Conservator of Forests in the Imperial Forest Service based in the Central Provinces of British India. He had graduated near the top of his class at the Royal Indian Engineering College at Cooper’s Hill, the forestry section of which was headed by Dr William Schlich, an ex-Inspector General of Forests in India. Thereafter, Brander completed the standard practical courses in French and German forests. With twenty years of forestry service in

32 Roche, ‘The New Zealand Timber Economy 1840 to 1935’; Michael Roche, ‘McIntosh Ellis 1887–1941’, *Dictionary of New Zealand Biography*, vol. 4 (Auckland: Auckland University Press, 1998): 157–58; Michael Roche, ‘The Royal Commission on Forestry 1913 viewed from 2013’, *NZ Journal of Forestry* 58 (2013): 7–11; Michael Roche, ‘Edward Phillips Turner: The Development of a “Forest Consciousness” in New Zealand 1890s to 1930s’, *A forest conscienceness: proceedings 6th National Conference of the Australian Forest History Society Inc., 12–17 September 2004, August, Western Australia*, ed. Mike Calver (Rotterdam: Millpress, 2005), 143–53.

33 Michael Roche, ‘Latter day “imperial career”’.

India, including special expertise with working plans, he had been advised on health grounds to seek employment in a temperate climate. Brander had applied to the Interim Forestry Commission and for the Director's position in New Zealand with strong supporting references, including one from the Inspector General of Forests for India which attested to his technical ability.<sup>34</sup> His longer-term reputation rested though on his book on wild animals of central India.<sup>35</sup>

At all events, Brander was unable to delay his return to India until after the interviews, and the panel of Lovat, Robinson, and High Commissioner Thomas MacKenzie were of the view that Ellis was 'excellently fitted for the position'.<sup>36</sup> In his application, Ellis stressed that he would be able to solve the 'forest problems' in New Zealand: this was a declaration of professional as well as personal confidence. These forest problems, he described in terms of forest utilisation, stabilisation of forest industries, 'forest renewal on unproductive lands', the raising of a national forest consciousness, improved forest revenues, tax reform for private forestry, forest land classification, and research.<sup>37</sup> Indeed, the imprint of this list was evident in the forest policy directions he identified in 1920 (see below). Regarding themselves as expert natural resource managers, foresters such as Ellis shared some core professional values and skills, and advocated similar solutions to forestry problems. Thus, the extent to which the New Zealand environment, both social and biophysical, reshaped his forestry thinking is pertinent to some wider understanding of imperial forestry in the inter-war period.<sup>38</sup>

## French forestry's impression on Ellis

During World War I, Ellis served in France with the Canadian Forestry Corps, and this first-hand exposure to long-established French forestry measures strengthened his appreciation of certain forestry principles and practices. These included the authority of French forestry officials even during wartime to control harvesting levels; the mixed farm and forest landscapes that matched land quality with land use, and which included populations of deer; and the realisation that French foresters played a wider role than just supplying

34 Archibald Brander, *Working plan for the forests of the Bnajar Valley Reserve, [South]-Mandla Forest Division, Northern Circle, Central Provinces, for the period 1904–1935* (Allahabad: Pioneer Press, 1906); Archibald Alexander Dunbar Brander, Application for Director of Forests, F W1921 1, Archives New Zealand, Wellington.

35 Archibald Brander, *Wild Animals in Central India* (London: Arnold, 1923).

36 Thomas McKenzie to William Massey, 18 November 1918, SSC 5/15597, Archives New Zealand, Wellington.

37 L. M. Ellis, 17 November 1919, SSC 5/15597, Archives New Zealand, Wellington.

38 Roche, 'Forestry as imperial careerism'.

wood from state forests.<sup>39</sup> As New Zealand forester Peter McKelvey later noted: 'It would have been a most insensitive forester who failed to appreciate the technical and aesthetic qualities in the managed beech forests of Normandy'.<sup>40</sup> Ellis admired the sustained-yield practices of French forestry, and in McKelvey's view, Ellis' proposals of 1920 for a 'new [New Zealand] Forest Service was based on exemplars which included the French system'.<sup>41</sup> My own somewhat dissenting view is that Schlich's Anglo-German forestry ideas were at least as important in the choices Ellis finally put forward.

The point on which McKelvey and I agree is that sustained-yield management and multiple use of forests was at the core of Ellis' vision for the new forest department. Ellis would have been introduced to these ideas earlier, during his professional training under Fernow at Toronto, but he would not have seen them in mature application until he reached France. McKelvey also makes the point that timber scarcity concerns had underpinned initial German and French forestry practice in the seventeenth and eighteenth centuries, but that these ideas did not transfer that well to North America in the later nineteenth century, with the result that 'at the embryonic stage of American forestry [there] was too much emphasis on timber production without sufficient consideration of the costs involved', and that aesthetic forest conservation was overlooked.<sup>42</sup> I agree about the selective transmission of forestry practices to New Zealand, while noting that Bennett has added to the complexity of the situation by posing questions about what 'French' or 'German' forestry actually meant in nineteenth-century British India.<sup>43</sup> In my opinion, McKelvey underplays the sudden concurrent appearance in the late nineteenth century in North America, Australia, and New Zealand of deep concern about a timber famine.<sup>44</sup>

## Forestry in Great Britain—its impact on Ellis

After demobilisation, Ellis took a position as an Advisory Forestry Officer with the Scottish Board of Agriculture. Forestry in Britain was acknowledged, particularly in the aftermath of World War I, as lagging far behind that of France

39 John Jeannery, 'The Impact of World War I on French Timber Resources', *Journal of Forest History* 22 (1978): 226–27.

40 Peter McKelvey, 'L. MacIntosh Ellis in France', *New Zealand Journal of Forestry* 34 (1989): 15.

41 McKelvey, 'L. MacIntosh Ellis in France', 16.

42 McKelvey, 'L. MacIntosh Ellis in France', 17.

43 Brett Bennett, 'A Network approach to the Origins of Forestry Education in India, 1855–1885', in *Science and Empire: Knowledge and Networks of Science across the British Empire, 1800–1970*, ed. Brett Bennett and J. Hodge (Basingstoke: Palgrave Macmillan, 2011), 68–88.

44 Michael Roche, 'Pests, Pines and Fires: Large Scale Plantation Forestry in New Zealand, 1897–1955', in *Comparing Apples, Oranges, and Cotton: Environmental Histories of the Global Plantation*, ed. Frank Uekötter (Frankfurt: Campus, 2014), 167–94.



and Germany. I have not previously posed the question of what Ellis might have absorbed from his rather brief employment with the Board of Agriculture for Scotland, and in retrospect ought to have, for arguably it had an impact on his thinking about the future course of forestry in New Zealand. But in some other ways it does not: New Zealand, for instance, never adopted a Forestry Commission administrative structure. In my defence, I would observe that James' *History of English Forestry*, which I drew on at the time, while containing a useful and concise summary of events leading to the Forests Act of 1919 and the establishment of a Forestry Commission for the United Kingdom, as well as its efforts to develop private and state afforestation and timber production, and the difficulties encountered along the way, including a near-merger with the Ministry of Agriculture in 1924, does not include any details about the proposed scale of afforestation.<sup>45</sup> The inability of Britain to provide for its own timber needs had been driven home during World War I. Varied responses took the form of a somewhat administratively independent Forestry Commission, the organisation of Empire Forestry Conferences from 1920 to co-ordinate an empire-wide forestry policy, the establishment of an Empire Forestry Association, which published the *Empire Forestry Journal* (1922–46; thereafter the *Empire Forestry Review* until 1962), and the establishment of an Imperial Forestry Institute at Oxford University in 1924.<sup>46</sup>

The Acland Committee established the longer-term goal of creating timber supplies in the United Kingdom sufficient to meet war-time requirements for three years. Translated into planting targets, this equated to the state afforesting '1,770,000 acres of land previously unplanted (of which 1,180,000 acres)<sup>47</sup> should be planted in 40 years [an average of 29,500 acres p. a.], and the whole in 80 years'.<sup>48</sup> In addition to this, three million acres of private forests would need to be retained and managed more productively. The Acland report also proposed land purchases of 22,000 acres per year to provide most of the land for planting.<sup>49</sup> Although the planting programme did not fully eventuate, and took place after Ellis had arrived in New Zealand, access to Forestry Commission reports would have kept him apprised of its progress, and he heard first-hand Robinson's account of it at the Empire Forestry Conference in Ottawa in 1923. The scale of the British Forestry Commission plans can be compared to the more modest response the Royal Commission on Forestry in New Zealand of 1913 to

45 N. D. James, *A History of English Forestry* (Oxford: Blackwell, 1981).

46 Joseph Powell, 'Dominion over Palm and Pine: the British Empire Forestry Conferences 1920–1947', *Journal of Historical Geography* 33 (2007): 852–77.

47 1 acre is approximately 0.4047 hectares.

48 Forestry Commission, *First Annual Report of the Forestry Commissioners* (London: His Majesty's Stationery Office, 1920).

49 Forestry Commission, *Sixth Annual Report of the Forestry Commissioners* (London: His Majesty's Stationery Office, 1925).

a projected timber famine by 1943.<sup>50</sup> The latter recommended a new annual planting target of only 6,415 acres, this still being an increase of two and a half times the 1911–12 annual planting of 2,566 acres.

To what extent was the trajectory of the British Forestry Commission a model for Ellis when it came to afforestation? This is a question I have not previously addressed. The significance of a commission rather than ministry/department model was also lost on me at the time. I now think it is reasonable to believe that the Forestry Commission's proposed large-scale and long-term afforestation plans lodged at the back of Ellis' mind as a legitimate strategy.

## Ellis in New Zealand

Ellis' first task on arrival in New Zealand was to familiarise himself with local conditions and then to prepare a report which discussed the possible administrative structure of the department, the necessary legislative basis for forestry, and future steps. Thereafter, Ellis in 1920 listed the main thrust of forest policy in New Zealand under the following headings:

1. A simple forest act
2. A forest service
3. A forest development fund for development and demarcation
4. A progressive timber sales policy
5. Adequate facilities for technical education
6. State co-operation in private tree-growing
7. Administration of scenic reserves, national parks, and forested Crown land by the forest service
8. A forest products laboratory
9. A survey and inventory of the forest soils of New Zealand
10. An economic survey of the timber industry and timber-using industries
11. Administration of fish, bird, and game resources by the forest service.<sup>51</sup>

Of these, numbers 7 and 11 were never achieved by the State Forest Service or its successor the New Zealand Forest Service (1949–87), which also points to the importance of the somewhat separate preservationist themes studied by environmental historians in New Zealand. Number six would also seem to have been influenced by Ellis' prior experience in the United Kingdom.

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50 *AJHR*, C12, 1913.

51 *AJHR*, C3A, 1920.

Previously, I have argued that Ellis gave central space to his timber famine calculations, and that his other initiatives make greater sense when clustered around this prediction of the Dominion being unable to meet its timber requirements by 1965.<sup>52</sup> Initial work on indigenous growth rates and regeneration pointed to problems in this area as well. Even so, I argued, Ellis' early responses were quite in keeping with prevailing forestry canons of sustained-yield management of natural forests.

He initially proposed afforestation as part of a suite of forestry initiatives to supply regional timber needs. The acreage planted by the State Forest Service amounted to 1,381 (1921), 3,408 (1922), 2,862 (1923), 7,207 (1924), and 11,051 (1925); that is, the Royal Commission on Forestry's recommended planting target was not reached until 1924. Writing to *The Gum Tree*, the magazine of the Australian Forestry League, in 1924 Ellis referred to lifting annual planting rates from 7,400 acres to 9,000–10,000 acres p. a. 'with the establishment in a year of two of a 20 thousand acre planting programme per year'.<sup>53</sup> In responding to Ellis' statement about plantation forestry in New Zealand at the 1923 Empire Forestry Conference, R. L. Robinson observed that afforestation 'operations in the United Kingdom approach pretty closely those described by Mr Ellis, except the conditions in New Zealand appear to be easier'.<sup>54</sup> This linking of the United Kingdom and New Zealand tends to reinforce the interpretation that the former offered a partial model for Ellis.

But, after 1925, Ellis mapped out a new pathway for exotic afforestation in New Zealand. Against the backdrop of timber famine, reinforced by the results of the National Forest Inventory of 1921–23, problems in finding the key to unlock the problems of indigenous regeneration, the speed of growth achieved by various exotic tree species, and—critically—the availability of areas of flat Crown land not wanted for agriculture, Ellis unveiled in 1925 a bold new planting scheme of 300,000 acres within 10 years (though at an average of 30,000 acres p. a. it was still of the same order of magnitude as Acland had proposed for the United Kingdom). This I have previously interpreted as a calculated risk, whereby Ellis, in keeping with his daring nature, responded expansively and beyond the narrower confines of his professional training to propose such an expansive planting boom.<sup>55</sup> Now, I would seek to qualify somewhat this position.

52 Roche, 'The New Zealand Timber Economy 1840 to 1935', 304.

53 L. MacIntosh Ellis, 'Forestry in New Zealand', *The Gum Tree* 8 (1924): 19.

54 Ronald L. Robinson, 'Great Britain', in *Second British Empire Forestry Conference 1923 Proceedings and Resolutions with Brief Descriptions of Tours* (Ottawa: F. A. Acland, Printer to the King, 1927), 129.

55 Roche, 'Latter day "imperial careering"'.

## Ellis' early views about afforestation in New Zealand

Ellis vigorously promoted the case for state forestry in print, but more usually through addresses before a range of sometimes sceptical farming interest-groups. Afforestation was not his initial concern—rather it was the bigger issue of a coming timber famine. Shortly after his arrival, Ellis addressed the A. & P. Conference and led off by praising the afforestation effort:

Nowhere else in the world will be found such a magnificent mass of man-made forests. It is a wonderful achievement, and one that every citizen might well be proud of, and should see, for it represents sustained effort and great faith. To the Lands and Survey administration of the government is due to a large extent the credit for the formation of the great forest aggregation.<sup>56</sup>

He then turned to the pressing problems of world timber supply and the need for New Zealand to solve this problem or risk being dependent on imports, then passed on to the more politically challenging areas of the provisional state forests (areas Sir Francis Bell had recently removed from availability as a matter of course for land settlement), to protection forestry, and to improved efficiency in the sawmilling industry (which might have resulted in increased timber prices, as the State Forest Service charged more for milling rights). He couched his arguments in terms of the 'effective utilisation of all land areas' and emphasised that forestry was not in competition with other land uses, though the demarcation line between the two 'was not fixed and immobile'.<sup>57</sup> But, at this point, as far as afforestation effort was concerned, he restricted himself considerably to the view that co-operative profit-sharing arrangements would underpin future individual private and local-body planting, and that a more equitable system of forest taxation (citing American precepts) would encourage individual afforestation. The British Forestry Commission, it is worth remembering, also envisaged that local authorities and private plantings in the 1920–30 period would amount to 110,000 acres, or 73 per cent of the land afforested by the state.<sup>58</sup>

In 1921, writing for a farming audience, Ellis argued that the 'primary objective' of government forest policy was continuity of timber supply at reasonable prices, and the protection and utilisation of forests. Inches Campbell Walker, a short-lived appointee as Conservator of Forests in New Zealand in the 1870s, had

56 L. MacIntosh Ellis, 'Forestry', in *New Zealand Forestry League Annual Report and Proceedings* (Wellington: New Zealand Forestry League, 1920), 15.

57 Ellis, 'Forestry', 17.

58 Forestry Commission, *First Annual Report of the Forestry Commissioners* (London: His Majesty's Stationery Office, 1920), 15.

made virtually the same remarks.<sup>59</sup> However, while giving centre stage to the protection of 'indigenous forest capital', Ellis did venture that state plantations ought to produce 10 per cent of his predicted thousand million superficial foot<sup>60</sup> timber consumption within a generation, of which private indigenous forests, as well as wood-lots and imports, would constitute 30 per cent.<sup>61</sup>

From almost his first acquaintance with New Zealand he was also prepared to relax some of his ideas about forestry practice:

[i]t is generally accepted in professional circles that timber-growing is the proper function of the State, but in New Zealand an exception may be made to this general rule. The extraordinarily long growing seasons and the remarkably sustained performance of many exotic trees result in really wonderful returns. Where else in the world are better wood-yields obtained than here, where from 75,000 to 200,000 superficial feet are secured for a thirty-year rotation of *Pinus insignis*?<sup>62</sup>

Thus, beyond the efforts of the state, private tree-growing was, in his view, 'a sound and remunerative business'.<sup>63</sup> Indeed, he regarded the private sector as having an important role in satisfying future timber demand, which he put at '150,000 to 200,000 acres of plantations'.<sup>64</sup> But, his next sentences, in the light of subsequent events, are especially interesting: 'is it possible to induce the establishment of this big cumulative area within a generation? It is well worth trying for'.<sup>65</sup> To achieve this goal, the State Forest Service would need to provide demonstration areas, education, instruction, and inexpensive growing stock.

In 1922, he still advocated 'creating a self-supporting timber supply basis by the reasons utilisation of our God-given forest resources', though he did see a place for 'the dedication to Tree-farming of all forest-bearing Crown lands chiefly valuable for forestry'.<sup>66</sup> In addressing the New Zealand Forestry League, an elite, special-interest group that had agitated for the creation of a separate forest department, he spoke of protection and production forestry, a state planting effort of about 3,000 acres p. a., and efforts to encourage private tree-planting.

59 Inches Campbell Walker, 'On State Forestry: Its Aim and Object', *Transactions and Proceedings of the New Zealand Institute* 9 (1877): 187–203.

60 One superficial foot (colloquially termed a 'super foot') was a board the equivalent of 12" x 12" x 1" and equal to 0.0236 cubic metres. In North America the term 'board foot' was used instead of superficial foot.

61 L. MacIntosh Ellis, 'Forestry in New Zealand', *NZ Journal of Agriculture* 22 (1921): 88.

62 Ellis, 'Forestry in New Zealand', 88. At this time *Pinus radiata* was still termed *Pinus insignis* in New Zealand.

63 Ellis, 'Forestry in New Zealand', 89.

64 Ellis, 'Forestry in New Zealand', 89.

65 Ellis, 'Forestry in New Zealand', 89.

66 L. McIntosh Ellis, 'Forestry Facts', *The Forest Magazine* [New Zealand] 1 (1922): 6.

At this point, prior to the availability of the results of the National Forest Inventory, the main emphasis was still on effective control and management of indigenous forests.

In 1924, before the conference of the New Zealand Farmers' Union, Ellis summarised progress in state forestry in New Zealand by reference to the tasks he had outlined in 1920. He also spoke on changes to land tax recommended by the Royal Commission on Land and Income Tax which would stimulate private afforestation. More important, though not overstated, was his announcement of summary data from the National [indigenous] Forest Inventory which confirmed that annual consumption was in excess of the 'annual growth increment' and would result in exhaustion in 35 to 40 years (1959–64).<sup>67</sup>

But at some point around 1924–25 Ellis changed tack, now putting more energy into afforestation; in a special interview for *New Zealand Life* entitled 'New Zealand—The Timber Farm of Australasia', he extolled, with unintended hyperbole, the 'ideal soils of the great "Inland Empire" of the pumice lands', the speed and volume of wood growth, low fire risk, and wider market possibilities—thinking especially of Australia, perhaps informed by his attendance at the 1923 Empire Forestry Conference.<sup>68</sup> It is of note that at this point, he was still advocating not only *Pinus radiata*, but also Ponderosa Pine, Corsican Pine, Douglas Fir, redwoods, other unspecified pines, and *Macrocarpa* as species for use in afforestation. He also admitted to a new influence on his thinking:

[w]ith the possible successful establishment of a pulp and paper industry a new market for coniferous softwood intermediate fellings will be available. I was recently informed by the best of paper making authority that that day is near at hand.<sup>69</sup>

The individual in question was William Adamson, representative of the British paper-making machinery firm Walmsley & Co. On a visit to Australia and New Zealand, Adamson fired Ellis with the possibilities of growing plantation forests in New Zealand for a future pulp and paper industry; remember that at this time it was unknown if *Pinus radiata* would be suitable for papermaking. Thereafter, Ellis, while not disavowing the centrality of sustained-yield management of indigenous forests and the role of protection forestry, became more interested in the extended possibilities of exotic afforestation work in New Zealand. This included the afforestation of formerly cut-over forest and, significantly, other lands not suitable for agriculture.

67 L. McIntosh, Ellis, 'State Forestry in New Zealand', *New Zealand Life and Forest Magazine* 3 (1924): 9.

68 L. MacIntosh Ellis, 'New Zealand—The Timber farm of Australasia', *New Zealand Life* 4 (1925): 7.

69 Ellis, 'New Zealand—The Timber farm of Australasia', 7.

## 1925: A 300,000-acre planting boom announced

In 1925, in reviewing five years' State Forest Service activity, Ellis struck a very positive note, but did acknowledge that kauri was nearly exhausted, that kahikatea would last twenty years, and rimu supplies about 40 years.<sup>70</sup> On the basis of some quite detailed calculations about future timber consumption, he predicted 'virgin softwood resources would be exhausted by 1965–70'.<sup>71</sup> To some extent this was an admission of defeat over sustained-yield management of the indigenous forests, though elsewhere Ellis suggested it was a matter of searching for the key to natural regeneration and of using plantations as a source of timber until the former was understood and incorporated into State Forest Service indigenous forest management practices. But his response was undoubtedly bold: 'at present [1925] there are 63,000 acres of State plantations. *It is recommended that this area be increased to 300,000, formation to be completed by the year 1935*' [original italics].<sup>72</sup> If evenly distributed across the 10-year period, this amounted to 30,000 acres p. a., or three times the amount of planting that Ellis had previously contemplated.

Ellis was planning a threefold increase in the annual planting rate, but this self-assurance was not entirely without foundation. The efforts of nineteenth-century tree-planting enthusiasts, and the more systematic efforts of the Forestry Branch of the Lands Department (1897–1919) which established 63,000 acres of state plantation, had shown that *Pinus radiata* grew very rapidly in New Zealand and was suitable for other than just fruit crates, as was originally thought. Ellis also had the example of some afforestation companies planting in the central North Island after 1923, even though he remained sceptical about some of their claimed growth rates and harvest predictions. He asked the Conservator of Forests for Auckland to provide him with detailed information about the new afforestation companies set up after 1924, asking that 'immediate action' be taken against 'extravagant statements'.<sup>73</sup> The State Forest Service had also managed to markedly reduce the cost of establishing plantations from £8 to £9 per acre to less than £2 by 1923.<sup>74</sup> This point was important as it overcame one of the classic reservations of foresters, such as Schlich, about placing too much emphasis on exotic afforestation. *Pinus radiata* seed was readily procurable, and likewise, crucially, there was flat Crown land available that was easy to plant and not sought after for pastoral farming, in the form of the cobalt-deficient

70 AJHR, C3, 1925, 7.

71 AJHR, C3, 1925, 7.

72 AJHR, C3, 1925, 7.

73 Ellis to Conservator of Forests, Auckland, 23 July 1924. Private Afforestation companies – General 1924–1929. BAAX A457 1124 b 29/1/0/ Part II, Archives New Zealand, Auckland.

74 AJHR, C3, 1925, 5.



‘bush-sick’ lands of the central North Island. One consequence of this was the concentration of planting effort at Kaingaroa State Forest, which grew to 329,065 acres gross area by 1934, and comprised 55.1 per cent of state plantations.<sup>75</sup>

Some sense of the extent to which Ellis was departing from mainstream forestry tenets can be gauged from the reaction of foresters in New Zealand (and Australia) for the Empire Forestry Conference in 1928. The delegates from across the Empire toured the country in October—Ellis had resigned in March. The Report of the Committee on New Zealand stressed the importance of ‘extending silvicultural research’ in indigenous forests while noting the lack of forward planning as far as exotics were concerned past 1935.<sup>76</sup> The latter was required to ‘provide a regular series of age classes and ensure the working of the plantations on a sustained yield basis’.<sup>77</sup> Furthermore, it was ‘obvious that thinnings are urgently required’ and that these might ultimately be used for pulpwood.<sup>78</sup> There was also concern over insect or fungal damage, and the threat posed by fire.

Ellis eventually informally suggested a five million-acre plantation estate—being the amount of forest-bearing land not suitable for pastoral farming. His announcement of an expanded planting effort in 1925, while much smaller still, represented a new scale and direction for the State Forest Service, one that was the source of some criticism from foresters, who inspected the state forests in the course of the Empire Forestry Conference in 1928. This is the important point of difference between the environmental historians and me. Even if it appeared at a national level that the State Forest Service was just following along the lines suggested by amateur tree-planters since the nineteenth century, this was not actually the case; indigenous forest management came back onto the political agenda from 1915 to 1925. Thereafter, the afforestation initiative, particularly as *Pinus radiata* became the dominant tree species, was one that departed somewhat from the European forestry script.

## Another appointee as director of forestry: A counterfactual forestry narrative

Ellis was both a colourful personality and a compelling advocate who brought a particular bundle of professional forestry training and experience to bear in New Zealand (some of which he later modified in the light of local experience,

<sup>75</sup> AJHR, C3, 1934, 6.

<sup>76</sup> Empire Forestry Conference, *Summary Report, Resolutions and Reports of Committees*. Appendix 3, *New Zealand* (Canberra: H. J. Green, Government Printer, 1928), 35.

<sup>77</sup> Empire Forestry Conference, *Summary Report, Resolutions and Reports of Committees*, 36.

<sup>78</sup> Empire Forestry Conference, *Summary Report, Resolutions and Reports of Committees*, 36.

for instance over forest grazing and forest game). If he had not been appointed but instead the other short-listed candidate Dunbar Brander had taken up the position, what might forestry in New Zealand have looked like? The following paragraphs identify a possible trajectory for forestry in New Zealand with Brander as Director of Forests.<sup>79</sup> Even if Brander had not accepted the position, it seems likely that, with any interview process being held by the New Zealand High Commissioner in London assisted by the British Forestry Commission staff, an alternative successful appointee would most likely have been in the classic British colonial forestry type. Thus, a forester would typically have graduated BA, DipFor (Oxon.) and have done a finishing tour of German or French forests, before joining one of the colonial forest services, most likely in India, and working up the ranks to conservator.

As Director of Forests in New Zealand his report on forest conditions in New Zealand would have been similar in many respects to Ellis', but with some differences in emphasis.<sup>80</sup> For instance, he might have favoured a Forestry Commission administrative model, one that Ellis also considered, but set aside. This had been adopted in Victoria and New South Wales, but while a committee of independent expert natural resource managers making decisions about allowable cuts in the national interest without regard to political expediency rested well with the colonial forestry mentality, it did not play out so well in settler states, such as Victoria. A frustrated Owen Jones departed in 1925 after five years as chair of the Victorian Forestry Commission to join New Zealand Perpetual Forests, while in Western Australia, even in the absence of a commission structure, the autocratic and inflexible Conservator of Forests, C. E. Lane Poole, clashed so badly with politicians that he resigned his position.<sup>81</sup> In any case in New Zealand, Phillips Turner, virtually the sole advocate for forestry within the public service, was a long-serving bureaucrat who by temperament and outlook would have favoured the departmental model for forestry. Sir Francis Bell, the Commissioner of—the present day equivalent of Minister for—State Forests also preferred the departmental model and the unusual arrangement imposed on Ellis, whereby he was Director of Forests on a three-year renewable contract responsible to the Cabinet and not part of the permanent public service, with a Secretary of Forestry, a position filled by Phillips Turner, as

79 Archibald Dunbar Brander retired as Conservator of Forests in the Central Provinces of India in 1923. Thereafter he took over as factor of the Pitgaveny estate, Scotland, which had passed to his elder brother. This involved the management of forests and plantations, but marked the end of his time as a professional forester. His *Wild Animals in Central India* went through a number of editions and he continued to make shorter contributions to the *Journal of the Bombay Natural History Society* into the late 1920s. Dunbar Brander shares a chapter with his brother James in Michael Brander's *The Big Game Hunters* (New York: St Martin's Press, 1988).

80 Mary Sutherland was the first woman forestry graduate in the British Empire in 1916.

81 John Dargavel, *The Zealous Conservator: A Life of Charles Lane Poole* (Crawley, WA: University of Western Australia Press, 2008).

the administrative 'head'. This model would doubtless have remained in place, regardless of appointee. It was, however, still an administrative model supported by Sir William Schlich, the doyen of imperial forestry.

In some areas Director 'X' would probably not have matched the quality of Ellis' solutions, for instance regarding fire control.<sup>82</sup> In other respects, the emphasis would have been different. Director 'X' would arguably have:

- been less dramatic in defining a timber famine by 1965
- used the 1913 Royal Commission on Forestry's revised planting targets, and those of the British Forestry Commission, to propose a more limited planting programme to be undertaken over a much longer period of time
- continued planting a wide range of exotic timber species
- persisted with departmental efforts to grow indigenous timber trees in plantations (French foresters were planting on two hundred-plus year rotations)
- have regarded thinning and pruning as an essential part of the creation of the plantation forest estate (thus also creating options for a small-scale local industry based on posts, poles, and firewood)
- have thought in terms of timber demand and persisted with the idea of regional timber supply forests, especially in treeless regions (something Ellis moved away from after 1925)
- have looked at replanting suitable areas of cut-over indigenous forest with indigenous timber trees
- have interplanted exotic timber trees in some indigenous production forests
- have not concentrated so much of the planting effort on the Kaingaroa plains
- have given more attention to attempting to implement sustained-yield management of indigenous forests
- have promoted the small core of professionally trained foresters in due course to senior administrative positions
- have supported university forestry education in New Zealand (as did Ellis).

The last two are not unimportant considerations. A. D. McGavock, the Director of Forests (1932–38), a shrewd public servant but without any professional qualifications, was hostile to the proposition that there was any need for forestry graduates in the State Forest Service—this set-back for forestry may have been avoided. This also poses the question of whether A. R. Entrican, who was a dominant figure in the forestry sector as Director of Forests 1939–61, and an

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82 Helen Beaglehole, *Fire in the Hills: A History of Rural Fire-fighting in New Zealand* (Christchurch: Canterbury University Press, 2012).

Ellis appointee, would ever have been employed as Forest Engineer in 1921 by Director 'X'. With an ounce of luck Director 'X' may also have favoured one site and the flawed, underfunded two-school model born of provincial jealousies inherent in the University of New Zealand system might have been avoided—but probably not, such was the provincial division among the university colleges.<sup>83</sup>

What would this have meant for the appearance of forestry in New Zealand? Arguably the down-stream significance would have been considerable. For instance, the pulp and paper industry would likely have developed earlier as an entirely private-sector initiative on the part of Whakatane Board Mills Ltd. and New Zealand Forest Products. The state plantations would have been more widely distributed and have contained a much wider range of exotic species that supported smaller regional sawmilling industries. It follows that there would have been a much smaller Kaingaroa Forest for the state to sell off the cutting rights to in the 1990s. Timber famine concerns may have reappeared in the immediate post-war period when the tensions between timber for housing and the sustained-yield targets would still have been compromised. It is also likely that a conflict between foresters and environmentalists would have gained expression sooner, possibly before World War II. The Waipoua kauri forest controversy was a defeat for sustained-yield forestry in 1949; this alternative scenario envisages earlier efforts by the foresters to achieve regeneration of indigenous forests and implement sustained-yield management. This might have seen a much earlier attempt to implement sustained-yield management of beech forests on the West Coast. It may also have produced larger-scale experiments of limited success in the remaining podocarp forests. The impetus that the Waipoua forest campaign generated could have escalated into a contest over the remaining indigenous forest. A political solution would have been especially vexed if the New Zealand Forest Service had not, by this time in this alternative scenario, planted sufficient exotic timber to meet domestic needs.

## Conclusion

I would still cling to my earlier position that Ellis during his time as Director of Forests believed in the place of the state in the production and protection of forests and, in the long term, the provision of forest products, whereby sustained-yield management of natural forests remained central. The 300,000-acre planting boom was a bold measure, initially intended to allay timber famine fears and provide time for the natural regeneration of indigenous forests to be understood, though I would now concede the idea of large-scale afforestation

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83 Michael Roche and John Dargavel, 'Imperial Ethos, Dominions Reality: Forestry Education in New Zealand and Australia, 1910–1965', *Environment and History* 14 (2008), 523–43.

was not so far outside the forestry canons as I had earlier believed (viz. the example of the British Forestry Commission), albeit on a reduced scale and over a longer time span, and with a different rationale. That said, Ellis was able to push ahead with such a grand afforestation project because suitable Crown land was available and crucially because the cost of planting per acre had been hugely reduced, which was a departure from the situation in Great Britain, thus also overcoming one of the orthodox forestry objections to large-scale afforestation. It was not plantation forestry per se, but the large planting target to be achieved in a decade that was especially notable. That so much of the planting effort took place at Kaingaroa, which was originally conceived to reach only 80,000 acres but expanded to 145,963 acres by 1930 is also worthy of attention.<sup>84</sup> Also significant was the large-scale planting of *Pinus radiata* rather than a familiar European or North American plantation forest species. That it was then unknown whether *Pinus radiata* was really suitable for papermaking was also in keeping with Ellis' confidence. Ellis, incidentally, was fully aware of the difficulties he was bequeathing to a subsequent generation of foresters by not having a full age-class distribution, but considered that it would be difficult to maintain political support for a 30-plus-year planting regime. If the indigenous forests had readily regenerated and been amenable to sustained-yield management, Ellis would still have been fascinated by the possibilities of large-scale afforestation in New Zealand, because trees grew so well and so quickly across the country, land was available, and there were new long-term possibilities for a wood export industry. The speed of growth particularly attracted his attention as it made forestry an investment option within an individual's lifetime—though he was thinking of farmers and small wood-lot owners, and not company plantations—but long-term thinking, indigenous regeneration, and sustained yield would have remained central to his views.

The situation where secondary literature is now sufficient to allow revisionist questions to be posed about the environmental history of New Zealand is to be welcomed. My interpretation of state forestry in the first half of the twentieth century has differed from that of the historians Beattie and Star. This has prompted me here to reinterrogate some source material. In conclusion, this leads me to continue to argue that the historians' jump from nineteenth-century tree-planting to twentieth-century afforestation underplays the commitment of foresters to sustained-yield management of indigenous forests, albeit in a form that was to be thwarted in many ways.

But on the other hand, I would now acknowledge that Ellis' 1920–25 afforestation work used techniques and approaches similar to that of the United Kingdom, and was favourably commented on by Forestry Commission officials.

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84 AJHR, C3, 1930, 5.

Ellis' motivation for, and planning of, the 300,000-acre planting boom of 1925–34 also departed more from the forestry canon than I had previously appreciated, indicated by the reaction of the Empire foresters in 1928. Furthermore, Ellis also developed a personal enthusiasm for exotic afforestation that was notable for its scale and championing of the unproven *Pinus radiata*. But he actually departed from New Zealand only three years into his planting programme, which was taken to completion by his successors Phillips Turner and McGavock, neither of whom was a professionally trained forester. Depression tree-planting schemes also meant it exceeded the original target by around 25 per cent.

To some extent, my distance from the historians is a classic 'splitters' versus 'lumpers' argument; here the environmental historians are conscious of continuities, whereas my own position has been one that emphasises the discontinuity between older-style forest preservation as conservation and scientific state forestry, introduced to New Zealand by a new group of professionally trained expert natural resource managers in the 1910s and 1920s. Added to this is the situation where Beattie would likely position himself as an historian of the nineteenth century, whereas my own interests have swung rather towards the first decades of the twentieth century. One consequence of this is that the transition years from the end of the 'long nineteenth century' to the 'short' twentieth century, which are particularly important ones for forestry in New Zealand, can fall somewhat between the grasp of both of us.

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# THOMAS POTTS AND THE FOREST QUESTION: CONSERVATION AND DEVELOPMENT IN NEW ZEALAND IN THE 1860S

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## Abstract

Environmental historians need to differentiate between the origin of forest concerns on one hand, and the structuring of legislative responses on the other. The former began at the local level and resulted mostly in tree-planting in the first instance. The latter developed later, and drew not only on local realities, but also on American or European precedents. In New Zealand in the 1860s, concern for the native environment was primarily an aspect of concern for colonial development, and conservation of native forests was primarily a counterpoint to exotic tree-planting.

The advent of native forest conservation in the Colony has been traced back to a demand made in 1868 by Thomas Potts, that government consider 'the present condition of the forests'. This article closely examines the situation in the province where Potts lived, in the decade before the New Zealand Forests Act of 1874, to find out what sparked this kind of initiative. The American George Perkins Marsh's thinking, together with Australian legislative precedents, are confirmed as key external influences upon how concern about forests and conservation was framed, but in essence this concern was a local response to ongoing change in a local environment. What Potts and others expressed in the 1860s was grounded in what they themselves experienced: forest and fire, waste and shortage, development and opportunity.

By the 1870s, Potts doubted the effectiveness of legislative solutions and his response to timber shortage focused more on exotic tree-planting than on saving existing forest. This article affirms the importance, in a New Zealand context, of considering exotic plantation alongside native forest conservation. Turning to the broader picture, the evidence presented suggests that both local determinants and exotic tree-planting have been understudied by environmental historians, while aspects of conservation more readily associable with environmentalism and preservation may have been overstressed.

**Keywords:** conservation, tree-planting, colonial development, Thomas Potts, colonial New Zealand.



## Introduction

Something without precedent in New Zealand occurred in Parliament on 7 October 1868. Thomas Potts, the Member of the House of Representatives (MHR) for Mount Herbert in Canterbury, moved: 'That it is desirable Government should take steps to ascertain the present condition of the forests of the Colony, with a view to their better conservation'.<sup>1</sup> This event is sometimes described as though it ushered in conservation in New Zealand, starting a chain of events which resulted in the protection of a considerable remnant of the natural environment.<sup>2</sup> Clearly, however, Potts' motion did not just come into his head on that October day. This paper examines the influences before 1868 which worked upon him, and which were familiar enough to other MHRs for his motion on 'the present condition of the forests' to pass. Taking the examination a little further, to 1870, we can better assess whether Potts' outlook in the 1860s really reflected some kind of proto-environmentalism.

In recent decades, environmental historians (particularly in America) have unpicked the history of conservation. Along the way, the meanings of the words 'conservation', 'environmentalism', and 'natural', all used in the above paragraph, have been fiercely debated. Since the publication in 1995 of William Cronon's article on 'The Trouble with Wilderness' in a collection engaged in 'rethinking the human place in nature', we have even come to view nature as a human construct, and to consider natural environments only natural in so far as they are less unnatural than consciously built environments.<sup>3</sup> In common with all of his generation of European-born pioneers, Potts did not think in these terms and under-appreciated the extent of changes that indigenous people (Māori, in this case) had effected on their surroundings. He still described the New Zealand 'environment' (a word whose meaning has become equally subject to rapid change) in terms of its *natural* history, as a 'slumbering wilderness', only awakening in the nineteenth century from 'the silent trance of ages'.<sup>4</sup>

1 *New Zealand Parliamentary Debates (NZPD)* 7 October 1868: 188.

2 See, for instance, Simon Nathan, 'Conservation: A History: Voices in the Wilderness, 1769–1907', *Te Ara: The Encyclopedia of New Zealand*, updated 13 July 2012, [www.TeAra.govt.nz/en/conservation-a-history/page-3](http://www.TeAra.govt.nz/en/conservation-a-history/page-3); David Young, *Our Islands, Our Selves: A History of Conservation in New Zealand* (Dunedin: University of Otago Press, 2004), 72–77.

3 William Cronon, 'The Trouble with Wilderness, or, Getting Back to the Wrong Nature', *Uncommon Ground: Rethinking the Human Place in Nature* (New York: W.W. Norton, 1995), 69–90.

4 T. H. Potts, 'Out in the Open: A Budget of Scraps of Natural History', *New Zealand Country Journal* 2 (1878): 139. For the actual extent of pre-European Maori impact, see Atholl Anderson, 'A Fragile Plenty: Pre-European Maori and the New Zealand Environment', in *Making a New Land: Environmental Histories of New Zealand*, new ed., ed. Eric Pawson and Tom Brooking (Dunedin: Otago University Press, 2013), 35–51.

In 1989, Roderick Nash underlined ‘the qualitative difference between “environmentalism”, as it emerged in the 1960s, and what used to be called “conservation”’.<sup>5</sup> He saw the new ‘environmentalism’ as an ethical approach to nature, while the old ‘conservation’, as it was understood by the American forester Gifford Pinchot in the 1900s (and by Potts in the 1860s), had demonstrated an economic approach. If this insight is accepted, the difficulties inherent in identifying nineteenth-century conservationists as proto-environmentalists become more apparent, since it implies that these pioneers beat two very different tunes at the same time. Yet, as an examination of Potts’ motives will suggest, an early conservationist would not have viewed ethical and economic approaches to the natural environment as two opposing poles. Nineteenth-century conservation aimed to reduce waste by being ‘economical’ in the use of natural resources, and this was, arguably, profoundly ethical.

In the context of New Zealand environmental history at least, an attempt has been made to distinguish between ‘conservation’, which encourages ‘wise use’ or ‘sustainable management’ of protected indigenous ecosystems, and ‘preservation’, which implies their immunity from any direct utilisation, whether felling individual trees or harvesting limited numbers of native birds or animals.<sup>6</sup> In New Zealand after the early 1870s—that is, beyond where this study ends—the idea of conservation was increasingly overlaid with glimmers of this concept of preservation. Potts was in the vanguard in this respect, but he has further significance because we have good evidence of how his attitude to forests changed. Over a period of 34 years (1854–88) we are able to plot, through his example, the origin and development of a preservationist approach. This article provides a fresh look at what sparked that process, and at part of the picture—exotic tree-planting—which has been under-studied since the emphasis has been on those aspects of conservation more readily associable with environmentalism and preservation.

New Zealand’s forest history was first examined in this light in an article published by the Canadian historical geographer Graeme Wynn in 1977, which focused on the parliamentary debate in 1874 on Premier Julius Vogel’s New Zealand Forests Bill. According to Wynn, supporters of the bill ‘accepted the evidence of man’s deleterious impact on nature in America and Europe’ and Vogel’s perspective ‘recognised the ecological and long-term benefits of conservation’. Wynn devoted only one paragraph to the debate on New Zealand’s forests

5 Roderick Frazier Nash, *The Rights of Nature: A History of Environmental Ethics* (Madison: University of Wisconsin Press, 1989), 8.

6 Paul Star, ‘Native Forest and the Rise of Preservation in New Zealand (1903–1913)’, *Environment and History* 8, no. 3 (August 2002): 276. This differentiation also has its difficulties, not least because the two words are often treated as synonymous: for instance, since 1987 responsibility for the preservation of New Zealand’s indigenous ecosystems has rested with what is called the Department of Conservation.

before 1874, prompted by ‘the urgings of a handful of settlers’, including Potts, and concluded that this ‘was more effective in revealing the limited sympathy for restraint and resource conservation in this pioneering society than it was in achieving action to temper ecological disturbance’.<sup>7</sup>

There are various points to raise about the kind of analysis initiated by Wynn. Firstly, it was clearly not enough to deal with precedents for Vogel’s bill in a mere sentence or two—another historical geographer, Michael Roche, duly provided much more of this background.<sup>8</sup> Secondly, New Zealand’s forest history needed firmer placing within an international context—and work by James Beattie and other environmental historians has since started to fill this gap.<sup>9</sup> Thirdly, to consider opinions and forestry legislation from this period in such ecological terms seems a problematic, and potentially misleading, approach, given that the very term ‘oecologie’ (or oecology or ecology) was only coined in German in 1866, did not appear in English until 1875, and is first found in a New Zealand publication in 1899.<sup>10</sup>

Wynn stated that the American ‘George Perkins Marsh’s recently published and prescient evaluation of man’s destructive impact on his environment’<sup>11</sup> influenced Potts and a few New Zealand settlers in the late 1860s, which is certainly true, but what needs to be established is the place that this study, and other overseas influences, occupied in the creation of a New Zealand approach to forest conservation. It is with this in mind that the present paper looks at a much fuller range of influences that were at work upon Potts during the 1860s, several years before Vogel, most notably, turned his attention to the matter. While the significance of Marsh and of Australian precedents is confirmed, greater stress is given to the local context. This paper affirms the importance of considering together exotic tree plantations and native forest, the drive to develop and concern for the environment.

7 Graeme Wynn, ‘Conservation and Society in Late Nineteenth-Century New Zealand’, *New Zealand Journal of History* 11, no. 2 (1977): 136, 133 and 125.

8 Michael Roche, *Forest Policy in New Zealand: An Historical Geography, 1840–1919* (Palmerston North: Dunmore Press, 1987); Michael Roche, *History of New Zealand Forestry* (Wellington: GP Books, 1990).

9 James Beattie and Paul Star, ‘Global Networks and Local Environments: Forest Conservation in New Zealand, 1850s–1920s’, *British Scholar* 3, nos. 1–2 (September 2010): 191–218; James Beattie, *Empire and Environmental Anxiety: Health, Science, Art and Conservation in South Asia and Australasia, 1800–1920* (Basingstoke: Palgrave Macmillan, 2011).

10 Leonard Cockayne, ‘A Sketch of the Plant Geography of the Waimakariri River Basin, Considered Chiefly from an Oecological Point of View’, *Transactions of the New Zealand Institute* 32 (1899): 95–136.

11 Wynn, ‘Conservation and Society’, 125.

There was no typical New Zealand province: Canterbury, where Potts lived, was in fact unusual in having so limited a forest resource. While Otago was also short of timber, in most other places it was abundant.<sup>12</sup> Nor was Potts typical of his generation, although he did respond to events that other early European settlers also experienced. His importance lies in the unusual amount of thought he gave to the environmental context of settlement, with much of what he wrote and said, in addition to records of what he did, surviving. It is, therefore, rewarding to try to see things through his eyes. From this launching point, we can consider more generally what other European settlers in New Zealand made of, and wished to make of, their new country.

Thomas Henry Potts—to give a few biographical details—was born in London in 1824 and as a young man lived on his country estate near Croydon in Surrey, with its 100 acres (40 hectares) of fields and woodland. At the age of 30 he sold the estate and the family's gun-making business and sailed for Canterbury, New Zealand. Here he established Hakatere, a cattle and sheep station by the upper Rangitata River, which at its peak covered 81,000 acres (33,000 hectares). Others managed Hakatere for him, while he, his wife, and their 13 children resided within easier reach of Christchurch: near Lyttelton, on a freehold property of about 600 acres (250 hectares). From this base, Potts served both on the Canterbury Provincial Council and (as already mentioned) in New Zealand's House of Representatives. Increasingly, however, his home, his family, and his garden, along with his natural history interests and his writing, took centre stage. By the time of his death, in 1888, he had written close to 100 articles and one book, *Out in the Open* (1882), which was the first substantial volume of natural history published in New Zealand.<sup>13</sup>

## Canterbury's development

When Canterbury Association settlers, such as Potts, approached their destination in the 1850s, their first views were of a landscape distinctly different from most of the area they were to settle. To the east of the entrance to Lyttelton Harbour were the mouths of Port Levy and Pigeon Bay, with the hills of Banks Peninsula rising steeply above them. These parts of the Peninsula were hilly and heavily forested. They promised an extensive supply of timber, but limited flattish land suitable for arable farming. In contrast, the vastly larger expanse

12 Canterbury and Otago provinces, as first defined, included extensive forests on the western side of the South Island. However, this timber resource was not readily accessible from the eastern side where most human settlement occurred, and beyond which Canterbury and Otago's boundaries did not extend once Westland gained full provincial status in 1873.

13 For a photograph of Potts, and further biographical details, see Paul Star, 'Tree Planting in Canterbury, New Zealand, 1850–1910', *Environment and History* 14, no. 4 (November 2008): 563–82.

of the Canterbury Plains was mostly flat and without trees. The early years of the Canterbury settlement saw no lack of land convertible to agriculture, but there were soon problems in sourcing sufficient timber for the province's development.

Having sailed into the harbour and to the port of Lyttelton—which, given the nature of the steep terrain immediately behind it, could never become a large town—the settlers hastened to climb the Port Hills to view the land beyond. This strenuous walk was no doubt undertaken by Henry Phillips (Potts' father-in-law) soon after he arrived in Lyttelton with his family, on one of the first four ships sent out by the Canterbury Association, in December 1850. The same ground would have been covered, using the Bridle Path, by Potts when he arrived with his wife and their first three children, in 1854. Potts recalled in 1887 that,

[t]he summit attained, with a very short walk an excellent view of the great plain was obtained, the universal brown tussock chequered here and there with large dark patches, the woods of magnificent trees which now have been swept away these many years.<sup>14</sup>

By 1854 Lyttelton had a population of about 800. Christchurch had fewer people—about 600—but geography determined that the future of the colony depended upon the expansion of this 'rather dreary little village', described by one historian as looking then 'more like an offshoot of the Wild West than of the home counties'.<sup>15</sup> As the population increased and more settlers moved out to Christchurch and its hinterland, it became imperative to somehow improve the flow of people and goods between Christchurch and the port at Lyttelton.

The solution was to build a railway and tunnel through the Port Hills. This was risky, since it depended on the latest geological knowledge and engineering expertise, and financially on a high level of debt. The initial decision to proceed was made by the members (MPCs) of the second Canterbury Provincial Council when they passed the Railway Bill in April 1860. This approved a proposal initiated and subsequently masterminded by the head of Canterbury's government: the superintendent, William Sefton Moorhouse.<sup>16</sup>

By this time Potts was well known. As a large runholder, he could afford to serve as an MPC in Christchurch along with 25 other gentlemen, and he was a supporter of the tunnel project.<sup>17</sup> He had reason to be, since many of his

14 'Old Times', *Canterbury Times*, 18 November 1887, 25.

15 G. C. Hensley in *A History of Canterbury*, vol. 2, *General History, 1854–76, and Cultural Aspects, 1850–1950*, ed. W. J. Gardner (Christchurch: Whitcombe and Tombs, 1971), 5.

16 See W. H. Scotter, 'Moorhouse and the Tunnel Contract, 1857–63', in *A History of Canterbury*, vol. 2, ed. Gardner, 77–104.

17 *Lyttelton Times*, 25 April 1860.

interests, like those of his constituents in Port Victoria (Lyttelton Harbour), required a journey from the Lyttelton side of the Port Hills to Christchurch. Since early in 1858 he and his large family had lived in Governor's Bay, on the shores of Lyttelton Harbour, in a substantial house and property bought from his friend and mentor, Moorhouse.<sup>18</sup>

As an MPC, Potts was one of those who, in May 1861, approved Moorhouse's choice of a Melbourne firm to take over the contract to construct the Lyttelton to Christchurch railway, including the tunnel. The previous contract had turned sour when the first firm involved sought to raise their price, but the new contract, with Holmes and Co., still committed Canterbury to borrowing £240,500.<sup>19</sup> Since the future of the colony depended on the venture's success, once the new contract was signed there was a very strong incentive to shield Holmes and Co. against any impediment to their completion of the task.

Once the Provincial Superintendent turned the first sod, work started on the railway and tunnel in July.<sup>20</sup> Fifteen months later, his wife Jane was at the Heathcote (the northern or Christchurch) end of the tunnel for a further ceremony, laying the first stone of the tunnel arch.<sup>21</sup> By then, Holmes' navvies had removed rock from as far as 400 yards (365 metres) into the Port Hills on both sides, but a further 2,038 yards (1,864 metres) still needed boring. The tunnel was not completed until five years later, in 1867. In 1862, the brickwork had just been started, using bricks 'burnt in the valley and at Pigeon Bay' on Banks Peninsula. Pigeon Bay was also the anticipated source of timber for the project, including railway sleepers.

Potts sailed from Lyttelton for England in March 1862 and did not return until January 1863,<sup>22</sup> so he missed the Heathcote ceremony. He needed to tie up the loose ends of his financial affairs, but at least one attraction also drew Potts back to England at this time. He had been deeply impressed by the Great Exhibition of 1851; he was now able to visit London's International Exhibition, which ran from May to November 1862.

The 1862 exhibition included a New Zealand Court, in which merino wool from Canterbury featured prominently. By this time wool had become the province's 'staple article of production and exportation'.<sup>23</sup> Perhaps the exhibits which most struck Potts, however, were 'some splendid articles of furniture made of kauri

18 T. H. Potts, *Diary*, 20 February 1858.

19 *Lyttelton Times*, 18 May 1861.

20 *Lyttelton Times*, 20 July 1861.

21 *Lyttelton Times*, 1 October 1862.

22 *Lyttelton Times*, 8 March 1862 and 10 January 1863.

23 *Lyttelton Times*, 8 February 1862.

wood sent from Auckland', which were 'very highly valued indeed'.<sup>24</sup> Nelson province, more immediately north of Canterbury, also displayed 'samples of furniture made from native woods, the very names of which would make the fortune of advertising upholsterers. Red manuka chairs, totara couches, and ti-tree tables ... ought really to create a new sensation'.<sup>25</sup>

Canterbury province possessed no kauri (*Agathis australis*), but there were workable and durable woods among the podocarp species, such as totara (*Podocarpus totara*), so well established on Banks Peninsula. Decades later, Potts was still reflecting on the 'specimens of carving which ... enriched and ornamented the New Zealand Court' and lamenting the wood-carving industry centred on a school of design which 'might have been [but never was] the fate of such an eligible spot as Akaroa', the Peninsula's largest settlement.<sup>26</sup>

## The fires of 1863

After attending the exhibition, Potts returned from England on 7 January 1863 with an enhanced appreciation of the value of the Peninsula's forests, visible from his windows. Ten days later, young James Hay was having problems moving his father's cattle away from scrub on their property in Pigeon Bay. To drive them out, he set fire to the 'wild Maori grass', which was 'as high as the knees and just as dry as powder'. Things got out of control, and the fire spread into the forest on adjoining properties and thence across much of Banks Peninsula, where it continued to burn for months. In particular, fire had reached the edge of George Holmes' Craigforth estate, a mile away, by early February and burnt through a great deal of his bush. Some of the totara trees destroyed were 'six feet thick'. By the time fire got down to Holmes' house, on 12 February, an estimated 500 acres (200 hectares) had been burnt over, containing about six million feet of timber.<sup>27</sup>

In a Supreme Court hearing in August 1863, Holmes sought damages from Ebenezer Hay (as the father of James) for the loss of his timber. Holmes' lawyer, William Travers, ably represented that the fire on his client's land had resulted from James Hay's actions, rather than from any other fires started in the same period. Witnesses for the defence spoke of fires in the Mount Fitzgerald, Port Levy, and Little River areas at the time, for it was common practice to

24 T. H. Potts, 7 October 1868, *NZPD* 14 (1868): 188.

25 *Lyttelton Times*, 7 May 1862.

26 T. H. Potts, 'Out in the Open', *New Zealand Country Journal* 10, no. 2 (1 March 1886): 89.

27 *Lyttelton Times*, 22 September 1863. Timber measurements are notoriously difficult to deal with. It is unclear here whether the speaker (George Marshall) meant six million super (board) feet (14,160 cubic metres) or six million running (lineal or linear) feet (2,044,800 metres).



carry out clearances or to induce nutritious new growth of grass by means of burn-offs. Since farmers saw their future in terms of pasture rather than native forest, the chance of a burn-off becoming a bush fire was not the most important consideration. Never before, however, had the settlers on Banks Peninsula witnessed fires as extensive as those of 1863. The jury decided for the plaintiff, and Mr. Justice Gresson ordered Ebenezer Hay to pay Holmes £3,000 in damages.<sup>28</sup>

This was no ordinary court case. Its significance lay in the magnitude of the damages awarded and the nature of the property that had been damaged: these were points made when the case was recalled in Parliament in 1868. Furthermore, the people involved were significant. The Hay family had been in Canterbury for 20 years, as part of the small influx of Scots who arrived in advance of the major Canterbury Association settlement of 1850. Ebenezer Hay and Captain Sinclair had brought William Deans to Canterbury in their boat in February 1843, then their own families three months later.

While the Deans chose to live at Riccarton Bush on the plains, the Sinclairs and Hays settled on the forested slopes of Pigeon Bay. In 1850, much of the timber to build the new town of Lyttelton, including the totara piles for the jetty, was sourced from the Hays' property in Pigeon Bay.<sup>29</sup> Although the Hays as a family returned to prosperity after 1863 (and still farm in the Bay today), Gresson's ruling broke their patriarch. The sum of £3,000 was a very large one to lose. Hay unsuccessfully appealed against the judgement in October 1863.<sup>30</sup> In November, returning to Lyttelton over the Bridle Path after visiting his solicitor in Christchurch, he fell down a bluff to his death.<sup>31</sup>

Shortly before the fires, the Hay's neighbours, the Sinclairs, had sold out to George Holmes and moved to Vancouver. The *Lyttelton Times*, reporting this on 29 October 1862, recognised its significance at once:

[t]he inhabitants of Banks Peninsula may be congratulated upon the purchase of the estate of Craigforth in Pigeon Bay by Messrs Holmes and Co, the contractors for the tunnel and railway, who are about to immediately establish two powerful saw mills in the forest, which covers a very large area of land of many hundreds of acres ... [this is] a fresh guarantee of the bona fide intentions of the railway contractors to complete the great undertaking they have in hand[.]<sup>32</sup>

28 *Lyttelton Times*, 26 September 1863.

29 Gordon Ogilvie, *Banks Peninsula: Cradle of Canterbury*, 3rd ed. (Christchurch: Phillips and King, 2007), 85–98.

30 *Lyttelton Times*, 8 October 1863.

31 *Lyttelton Times*, 5 December 1863.

32 *Lyttelton Times*, 29 October 1862.

The destruction, three months later, of a sizeable proportion of the timber Holmes had intended to mill—both directly for use on the railway, and indirectly to sell to others to help his cash flow—was not just a blow to him; it must also have threatened to stall, for a second time, the building of the Lyttelton to Christchurch railway and tunnel. The decision to award substantial damages to Holmes ensured that the project was not delayed by any unexpected dip in Holmes' capital.

But it was not just money that was scarce and had been lost; it was also, irretrievably, timber. Yet enough remained on Holmes' land for the main project in hand, since by 1868 'the thirty miles [48.3 km] of railway already constructed in Canterbury was derived from that single forest'. This was stated by Holmes' lawyer, Travers, who, like Potts, became a proponent of native forest conservation.<sup>33</sup>

Unlike Travers, Potts appears to have had no direct involvement in the case of *Holmes v. Hay*, though as one of the MPCs who had authorised the railway contract with Holmes and Co he must have been particularly anxious for the success of Holmes' venture. A year later, Potts was a member of the special jury of 12 at the Supreme Court hearing, again heard by Gresson, which considered the case of *Marshall v. (James) Hay*. George Marshall was another landowner in Pigeon Bay whose forests were destroyed in the 1863 fires, and a similar range of evidence was presented to that in the Holmes case. This time, however, the jury was not convinced that the damage to Marshall's forest could be clearly linked to the fire originally lit by James Hay, so Marshall received no recompense.<sup>34</sup> One can only wonder if the jurors felt that the Hays had been punished enough already, or perhaps that Marshall's solvency was less important than Holmes'.

For Potts, the whole sequence of events had a significance which only grew with time. He, like Travers, referred in 1868 to the Pigeon Bay fire as one of 'a most destructive character', adding that 'he had often seen Banks' Peninsula covered for weeks together, with thick and lurid smoke'.<sup>35</sup> The evidence of a tragic waste was there before his eyes, but it was less clear how it could be prevented.

33 W. T. L. Travers, 7 October 1868, *NZPD* 14 (1868): 191.

34 *The Press*, 20 September 1863; *Lyttelton Times*, 21 September 1863.

35 T. H. Potts, 7 October 1868, *NZPD* 14 (1868): 189.

## Approaches to timber shortage

Given the continuing and accelerating need for timber in Canterbury, together with the rapid depletion of the province's remaining native forest, a worrying situation lay ahead. Settlers alert to it envisioned three quite distinct ways in which the problem of a timber shortage could be alleviated.

Firstly, timber might be imported from elsewhere, but this was a costly solution for a young colony short of ready cash. It was a makeshift approach, already relied upon for a large proportion of Canterbury's needs. Potts would have been well aware of both the demand for and supply of timber imported from other provinces or other countries. Montgomery, Todhunter and Co., for instance, imported 29,000 feet (68.44 cubic metres) of timber from Wellington, which arrived at the Heathcote River on 12 January 1863, just before Pigeon Bay began to burn. The firm sold not only totara from elsewhere in New Zealand and kauri from Auckland, but also American shelving and Tasmanian palings.<sup>36</sup> In all, between 5 and 19 January, 61,500 feet (145.14 cubic metres) of timber from Banks Peninsula (shipped from Akaroa) reached Christchurch, while 102,000 feet (250.72 cubic metres) was shipped from Wellington to the same destination.<sup>37</sup>

As a second approach to the shortage, more trees could be planted, which might have provided a solution if only they had grown fast enough. I discuss this later. Thirdly, it might have been possible to have exercised greater control over the exploitation of native forests. This would have ensured not only a less wasteful consumption of those trees removed, but also conservation of some areas, so that at least some native timber would have remained available in the long term. Conservation, in the nineteenth-century usage of the word, implied a measured and (arguably) rational utilisation of forests, but not their complete preservation against every kind of exploitation. It is for his early promotion of the conservation of New Zealand's forests, together with his later steps towards more recent ideas of preservation, that Potts is most remembered.

## Native forest conservation in Canterbury before 1868

Ever since his arrival in Canterbury, the wastage of the forest resource had upset Potts. He was not alone in this. Indeed, his father-in-law condemned it at a Colonists' Committee meeting in January 1851, just three weeks after his arrival

<sup>36</sup> *The Press*, 21 June 1862.

<sup>37</sup> *Lyttelton Times*, 21 January 1863. These figures do not include 2,090 'pieces' of timber, and 2,000 palings arriving at the Heathcote River from Picton on 19 January.

in New Zealand, when he addressed 'the subject of indiscriminate licences granted by the [Canterbury] Association for cutting timber and complained that the purchasers of land were injuriously affected by it'.<sup>38</sup> In 1856, Potts had watched with some concern as men took timber and firewood near Phillips's Rockwood Station at Hororata, about 50 miles (30 kilometres) west of Christchurch. He thought it would 'destroy much of the ornamental character of Rockwood, not so much on account of the gap left by the trees they throw, as by the effect of these gaps on the bush remaining'.<sup>39</sup>

An article in the *Lyttelton Times* in 1857 also protested against licensed timber-getting on reserved land, which caused 'great ... injury to public property'.<sup>40</sup> Due to the difficulty of enforcing timber licensing regulations, none were in fact issued for Banks Peninsula from the mid-1850s until 1864, control being attempted instead through the creation of 'timber reserves' or 'bush reserves' on Crown land, adjacent to existing sawmills, where the exploitation (and ultimately the exhaustion) of the resource could in theory be monitored. Timber licensing again became available from 1864, and again proved unsatisfactory, leading to its abandonment as a management technique throughout Canterbury in 1870.<sup>41</sup>

Many years later, Potts recalled his dismay at the wasteful utilisation of the 'magnificent timber on the Port Hills' that he had witnessed. He often found totara stripped of its bark for use as 'the roofing of a wretched hut', causing the ruination of the tree itself. It was, he said, a wish

to point out the mischief occasioned by this destructive usage that led [me] to a fruitless interview with a Provincial Secretary [John Ollivier] some thirty years ago. It took but a few minutes to discover the unprofitableness of this proceeding; with the utmost urbanity of demeanour, the worthy official showed that he neither knew nor cared a rap about the matter. The expensive system of timber-cutting without efficient supervision, remained unchecked.<sup>42</sup>

This was written in 1887, indicating that Potts first actively (but unsuccessfully) sought more effective forest conservation in the late 1850s.

As the bush fires of 1863 burnt their way across Banks Peninsula's forests, the question of how to conserve the remaining forest gained greater urgency for Potts. He was not, however, an MPC at the time, so did not participate in the Council session which opened in September 1863. This was just a few days

38 Henry Phillips in Minutes Book, Society of Canterbury Colonists, 1850–52, Christchurch Public Library, z Arch 16 (n. p.).

39 T. H. Potts, Diary, 25 July 1856.

40 *Lyttelton Times*, 25 February 1857.

41 For further details of timber legislation in Canterbury during this period, see Roche, *History of New Zealand Forestry*, 74–83.

42 T. H. Potts, 'Old Times', *Canterbury Times*, 2 December 1887, 28.

before the case of *Marshall v. Hay* was heard in the Supreme Court, when every member knew that ‘a great quantity of timber ... had been injured by the late fires’.<sup>43</sup> Getting straight down to business, the Council discussed a Bush Fires Bill (passed the following day) which ‘provided that any person setting fire to any grass, fern, scrub, etc, should be fined not less than forty shillings’, a provision which Ollivier denounced as ‘unnecessary’.<sup>44</sup>

Potts resumed his duties as an MPC in 1866, continuing to serve until the abolition of the provincial governments in 1876, but there is nothing to suggest that he brought his concern about forests to the Council’s attention in the late sixties. From 1866 to 1870, however, he was also regularly in Wellington as MHR for Mount Herbert (Banks Peninsula), which enabled him to raise the issue at the national level in 1868. If forest conservation was necessary and could be achieved through legislation, this was the more important audience to convince.

In 1860s Britain, there was a burgeoning concern with the supply of resources needed to fuel and support the nation’s industrialisation and development. This at least equalled a parallel anxiety about the effect of such rapidly expanding extraction and production upon the environment in which people lived.<sup>45</sup> For Britain’s ongoing industrial revolution, the supply of coal appeared crucial, and in 1865, for the first time, its long-term availability was brought into question.<sup>46</sup> In that year, the English economist William Stanley Jevons published his influential enquiry ‘concerning the progress of the nation and the probable exhaustion of our coal-mines’.<sup>47</sup>

Jevons’ arguments were detailed in the Christchurch newspaper, *The Press*, in April 1866. Potts (though not Travers) was in the House of Representatives in Wellington by October 1866 when the Premier, Edward Stafford, recorded the completion of geologist James Hector’s ‘report on the Coal Fields of the Colony for the Imperial Government, who wished for information on Colonial Coal Fields, in consequence of Mr Jevons’ observations on the exhaustion of the coal fields of England’. It is plausible that British anxieties about coal helped both

43 J. G. Fyfe, MHR for Port Victoria, reported in *Lyttelton Times*, 16 September, 1863.

44 *The Press*, 16 September 1863.

45 Beattie, *Empire and Environmental Anxiety*, 11, briefly summarises the ‘origins of environmental anxiety’, while James Winter, *Secure from Rash Assault: Sustaining the Victorian Environment* (Berkeley: University of California Press, 1999) provides details of the British response.

46 See Andreas Malm, ‘Fleeing the Flowing Commons: Robert Thom, Water Reservoir Schemes, and the Shift to Steam Power in Early Nineteenth-Century Britain’, *Environmental History* 19 (2014): 55–77, on why coal became crucial to Britain’s industrial development. Nuno Luis Madureira, in ‘The Anxiety of Abundance: William Stanley Jevons and Coal Scarcity in the Nineteenth Century’, *Environment and History* 18 (2012): 395–421, claims (page 421) that ‘[c]ore themes in ecological thinking, such as the exhaustion of natural resources, the rebound effect and the limits to economic growth, came out into the open through discussion of the coal question’.

47 W. S. Jevons, *The Coal Question: An Enquiry Concerning the Progress of the Nation and the Probable Exhaustion of our Coal-Mines* (London: Macmillan, 1865).

Hector and Potts towards more careful consideration of the future supply of New Zealand's principal fuel source (as well as its main construction material); that is, of wood.<sup>48</sup> It is much more evident, however, that the views of American and Australian thinkers exerted a strong influence, since they applied specifically to timber and to the situation faced by similar pioneering communities.

## The influence of G. P. Marsh

More than five years after they had witnessed the bush fires of 1863 on Banks Peninsula, Potts and Travers (both MHRs in 1868) referred to them while debating 'the forests of the colony'. Introducing his motion on the 'present condition' of forests, Potts said he 'had waited with patience to see if some steps would be taken to preserve the forests which were the admiration of every visitor to New Zealand; and he considered it was quite time that some action should be taken in the matter'.<sup>49</sup>

From the years between 1863 and 1868, two factors stand out which, I believe, crystallised his thoughts and prompted him to call for action. He mentioned both in his speech in 1868. The first was his study of material presented in *Man and Nature* by George Perkins Marsh, though precisely when Potts read this book I do not know. The second was his knowledge of forest legislation in the Australian colony of Victoria. Taken together, these factors placed what was happening to Canterbury's forests within an international and an intellectual context which Potts had previously seen but dimly.

In his 1868 speech, Potts also quoted two early scientific visitors to New Zealand: Ernst Dieffenbach, an 'official of the New Zealand Company' who was in the North Island from 1839 to 1841, and geologist Ferdinand von Hochstetter, in the north and in Nelson province between 1857 and 1859.<sup>50</sup> Like Potts, these men had seen forests 'ransacked and ravaged with fire and sword' in which 'a melancholy scene of waste and destruction presented itself', but neither got much further than their expressions of alarm.

48 'The Duration of our Supply of Coal', *The Press*, 18 April 1866, 2; *Wellington Independent*, 4 October 1866, 5. I know of no explicit juxtaposition of Britain's coal demands and New Zealand's timber demands prior to an optimistic piece about 'Using Up the World's Products' in the *Bruce Herald*, 10 September 1886, 5.

49 T. H. Potts, 7 October 1868, *NZPD* (1868): 188.

50 James Braund analysed the origins of Hochstetter's interest in forest conservation in 'The Geologist and the Ravaged Kauri Forest: Ferdinand von Hochstetter as an Environmental Commentator' (paper presented at the New Zealand Historical Association Conference, University of Otago, Dunedin, 20 November 2013). See also James Braund, ed., *Ferdinand Hochstetter and the Contribution of German-Speaking Scientists to New Zealand Natural History in the Nineteenth Century* (Frankfurt: Peter Lang, 2012).

Marsh went well beyond this. He had spent much of his first 60 years in Vermont, during which time the state's forest cover was reduced from three-quarters to one quarter of its original area. Marsh was a lawyer and politician, but also a sheep farmer and timber dealer, so 'had occasion both to observe and to feel the evils resulting from an injudicious system of managing woodlands'.<sup>51</sup> There are clearly parallels between Marsh's experience in Vermont and Potts' experience in Canterbury a generation later.

When, aged 60, Marsh moved to Italy, he combined his duties as American ambassador with wide-ranging scholastic pursuits. This enabled him to place the environmental degradation of Vermont alongside examples of similar events in classical times and in modern Europe. In turn, this resulted in the insights that appeared in *Man and Nature*.

David Lowenthal has called this work 'one of the nineteenth century's two seminal books on the subject its title denoted', the other being Charles Darwin's *On the Origin of Species* (1859). *Man and Nature* was published in New York in May 1864, and over 1,000 copies sold in a few months.<sup>52</sup> It received a lengthy review in an Australian newspaper, the *Sydney Empire*, in August 1864.<sup>53</sup> Shorter notices in the *Nelson Examiner* in September and the *New Zealand Herald* in November<sup>54</sup> did little more than quote Marsh's stated intention:

to indicate the character and, approximately, the extent of the changes produced by human action in the physical condition of the globe we inhabit; to point out the dangers of imprudence, and the necessity of caution in all operations which, on a large scale, interfere with the spontaneous arrangement of the organic or the inorganic world; to suggest the possibility or importance of the restoration of disturbed harmonies, and the material improvement of waste and exhausted regions[.]<sup>55</sup>

These ideas evidently took some time to digest. I have found no further mention of *Man and Nature* in Australian newspapers until June 1866, when the *Brisbane Courier* reprinted an article from the *New York Post* on 'the effect of stripping a country of trees'.<sup>56</sup> A second New Zealand review appeared in the *Otago Daily Times* in April 1866, but said nothing about conservation and mirrored none of Marsh's concern about 'the dangers of imprudence'. Rather, the reviewer found occasion to display a kind of colonial mindset that was fairly standard in the 1860s:

51 David Lowenthal, *George Perkins Marsh: Prophet of Conservation* (Seattle: University of Washington Press, 2000), 273.

52 Lowenthal, *George Perkins Marsh*, 305, 302.

53 *The Empire*, 25 August 1864.

54 *Nelson Examiner*, 6 September 1864; *New Zealand Herald*, 7 November 1864.

55 Marsh, *Man and Nature*, iii.

56 *Brisbane Courier*, 15 June 1866. This article then also surfaced in three other Australian papers.



[t]he country is to make [that is, to be made]—the growth of centuries has to be cleared and supplanted by vegetation of another kind. In place of the primeval forest, fields of corn are to be raised. In lieu of ferns and mosses, pastures are to be prepared ... Such is the mission of colonists ... The earth has to be subdued, and rendered subservient to human will ... The tangled bush must then give place to the hedge-row and the road, and to plants and animals producing material for food or manufacture.<sup>57</sup>

Both Marsh and Potts would have subscribed to this vision up to a point, and, indeed, they both pursued it. It was the consequences of its pursuit, when untempered, that troubled them.

*Man and Nature*, by collating evidence from throughout the world of the environmental effects of deforestation, painted a broad canvas within which local observers, such as Potts in Canterbury, could place their own experiences and better understand them. By providing such strong evidence that increases in instances of flooding and drought were often the consequence of forest clearance, Marsh supplied lobbyists with a further reason, above and beyond the prospect of timber shortages, for a more measured and restrained approach to the exploitation of remaining forests.

In his 1868 speech, Potts made specific reference to Marsh's evidence from the French Alps, which demonstrated 'the varied influence of the forests, as shelter, on temperature, on humidity, on floods, on the flow of springs; and his arrangement of facts proves the removal of forests to be the primary cause of excessive inundations'. Turning then to his local knowledge, Potts surmised a similar cause for changes to water flow in the Hutt Valley near Wellington, and he anticipated a similar scenario with forest destruction in Westland.

Later in the debate, Travers, another early reader of *Man and Nature*, described floods that followed disforestation in the Rhône Valley in France, then opined that 'the floods of the Waimakariri and other rivers had been enormously increased by the indiscriminate burning of the timber at the head of those streams'.<sup>58</sup> He also made detailed reference to Marsh's writings in his much-quoted first lecture 'on the changes effected on the natural features of a country by the sudden introduction of civilised races', delivered in Wellington a year later in August 1869.<sup>59</sup>

57 *Otago Daily Times*, 6 April 1866.

58 W. T. L. Travers, 7 October 1868, *NZPD* 14 (1868): 191. In terms of a more general 'environmental anxiety', Canterbury residents had plenty to worry about in 1868. A strong 'earthquake wave' was experienced at Lyttelton in August. The Waimakariri River, which had burst its banks and caused severe flooding in Christchurch in December 1865, again caused 'disastrous floods' in March 1868. Attempted solutions centred on earth moving, though tree-planting along the embankments was considered helpful. *Lyttelton Times*, 17 August, 4 March, and 10 January 1868.

59 *Wellington Independent*, 10 August 1869. Potts was in Wellington at the time, so was probably in the audience.

## Forest conservation in Victoria and Otago

Charles O'Neill, MHR for the Otago gold-fields, who also supported Potts' motion in 1868, may or may not have read Marsh by then, but he had certainly read the report of the board appointed in August 1867 in Victoria (Australia), 'to report on the best means of securing the permanency of the State forests of that Colony'. The examples O'Neill quoted from the Victorian report had all been described beforehand in *Man and Nature*: the effects of forest destruction in the French Alps, but also in Spain, Palestine, and North Africa, and the 'aridity ... subdued through tree-planting in the Lands [near Bordeaux] and in Algeria'.<sup>60</sup>

In the House of Representatives at least, Potts was never verbose. In contrast to O'Neill's lengthy quotations from the Victorian report, Potts merely stated that: 'The mischievous results from the cutting down of forests in a wholesale manner [have] called for the attention of the Legislature of Victoria'.<sup>61</sup> It is, however, clear from his letters to the *Lyttelton Times* in January and February 1869 that Potts studied this document with care and was much influenced by it.<sup>62</sup>

Victoria's chief mining surveyor and its Secretary for Mines were both on the board of five, which completed its report in February 1868. It was designed, in part, to address 'the necessity for permanent provision for a continuous supply of timber for mining purposes'. It is quite understandable that O'Neill, who represented the largely treeless Otago gold-fields district in New Zealand's House of Representatives, had a copy of the report forwarded to him by Victoria's Minister of Mines.<sup>63</sup> The roads to conservation taken by O'Neill (at first mostly concerned about the shortage of timber props for mining operations) and by Potts (who saw the 1865 West Coast gold rush as an unwelcome distraction from the serious business of colonisation) were quite different, but their destination was the same.

The Melbourne *Argus*, in welcoming the Victorian report, commented that

[e]xtensive as our forests still are, they cannot last long unless effectual regulations for preserving them in certain districts be established. Discernment and forethought in the employment of the axe cannot of course be looked for among the early colonists of a new country, but we have now reached a stage in our colonial career when it becomes absolutely necessary to set aside particular tracts of woodland for our future timber supply.<sup>64</sup>

60 Charles O'Neill, 7 October 1868, *NZPD* 14 (1868): 191–92, George P. Marsh, *Man and Nature, or, Physical Geography as Modified by Human Action* (New York: Charles Scribner, 1864), 279, 370, 512.

61 T. H. Potts, 7 October 1868, *NZPD* 14 (1868): 188.

62 *Lyttelton Times*, 26 January 1869, 23 February 1869.

63 *Argus*, 16 August 1867; Charles O'Neill, 7 October 1868, *NZPD* 14 (1868): 191.

64 *Argus*, 22 February 1868.

This thinking was essentially the same as that which prompted Potts' motion in New Zealand eight months later. It provided both the precedent he needed and a blueprint for what might be done. In addition to the creation of plantations, the report recommended abolition of the existing system of timber licensing within state forest reserves. Commissioners, it said, should be appointed to enforce rigorous new regulations to 'prevent within such reserves the felling of trees under a certain size, ... compel the removal of the hewn timber within a reasonable time, ... [and] prevent the destruction of trees for sake of the bark only'.<sup>65</sup>

When speaking in 1868, Potts made no reference to similar Otago proposals. It was left to two Otago MHRs, Donald Reid and Julius Vogel, to bring their province into the picture. Reid, in particular, recalled the narrow defeat of resolutions brought before the Otago Provincial Council earlier that year by William Mosley, which would have promoted the 'management and conservation' of 'public bush reserves' in Otago.<sup>66</sup> Potts, in talking with his fellow MHRs in Wellington, would have learnt all about Mosley's and other initiatives. In particular, there are similarities between the forestry concerns of Potts in Canterbury and those of William Murison, MHR for Waikouaiti (in Otago) from 1866 to 1868.

In November 1867, Otago's government became aware of recent initiatives taken by the Board of Agriculture in Victoria. In response, they approached the officials of their province's agricultural societies (including Murison) for ideas on boards, model farms, and what 'new productions' might be encouraged.<sup>67</sup> Murison, leaping at this opportunity to propose anything else of a 'similar nature', referred to the timber shortage in Otago and the need for tree-planting. He unfavourably compared his province's response to that of Canterbury, where 'neighbours vie with each other in promoting the art of sylviculture'. He also noted recent accounts of 'the improvidence of many European nations, in not replacing the forests which have been felled in time past'. For Otago, he suggested not only 'The preservation of the public bush reserves' but also that 'Land laid down in forest by private individuals might be exempted from taxation ... Reserves of land might be made for planting out ultimately in forest ... [and] land might be given on condition that it should be planted out with trees'.<sup>68</sup>

One would think that calls for forest legislation in Otago, which paralleled and sometimes preceded those in Canterbury, might have influenced Potts' thinking at least as much as the Victorian proposals. Canterbury and Otago, after all, were neighbouring provinces, both with populations affected by the dearth of timber

65 *Argus*, 22 February 1868.

66 Roche, *History of New Zealand Forestry*, 67–68.

67 *Otago Daily Times*, 31 March 1868.

68 *Otago Daily Times*, 1 April 1868. Murison again pushed for 'the planting and conservation of forests' at an Otago Acclimatisation Society meeting in 1870: *Otago Daily Times*, 11 March 1870.

to the east of the Southern Alps. In general, however, Victorian conservation efforts appear to have influenced Canterbury's and Otago's actions far more than the New Zealand provinces influenced each other.

There was one mention of the Canterbury Bush Fires Bill of 1863 in the *Southland Times*, but I have found none in Dunedin newspapers. In the following year, faced with their own fires, members of Otago's Provincial Council passed a Bush Fires Bill in May. This was noted in the *Christchurch Press*, but there is no indication that Otago was inspired by the Canterbury precedent. When Otago's provincial secretary introduced their bill, he unapologetically called it 'a copy of an Act existing in Victoria', minus certain clauses.<sup>69</sup>

## Response to Potts' motion

Once the House of Representatives in Wellington had agreed to Potts' motion of 1868, Hector was instructed to gather information on 'the present condition of the forests'. As the head of New Zealand's Geological Survey and Director of the Colonial Museum, he was considered the best state employee for the job. Hector duly sent a questionnaire to provincial superintendents and their officials: [h]ow much forest was there in your area before settlement, he asked, and how much is left? How much remains as Crown land? Has most been destroyed on Crown land or on freehold, and how has it been destroyed? Is it being felled by the holders of bush licences, or is the destruction more by accidental fires and grazing cattle? Has the destruction of forests led to floods or droughts? Do you think bush reserves are a good thing, or is forest better conserved when it is freehold? If the system of bush licences leads to waste, how can forests be better managed so they provide timber but are not destroyed?<sup>70</sup> The responses, which were strikingly diverse, provide a panoramic view of opinions on native forests at the time.<sup>71</sup>

Take the question of bush reserves and bush licences. Cyrus Davie, the Chief Surveyor of Canterbury, thought 'bush licenses are not advisable ... They give men the right to go anywhere ... and to cut and destroy any quantity of timber. Having no permanent interest in the soil, they look only to the present, and often destroy as much valuable timber as they bring into the market'.<sup>72</sup> Southland's Commissioner of Crown Lands, Walter Pearson, however, thought the licensed

69 *Southland Times*, 27 October 1863; *Otago Witness*, 7 May 1864; *The Press*, 12 April 1864; *Otago Daily Times*, 12 April 1864.

70 Questions paraphrased from *Appendices to the Journals of the House of Representatives (AJHR)*, D22, 1869, 3.

71 *AJHR*, D22, 1869, 4–16.

72 'Correspondence Relative to the Present Condition of the Forests of New Zealand', *AJHR*, D22, 1869: 9.

cutting of timber in government reserves could continue, but would need to be closely overseen by rangers if it was to promote conservation. Similarly Otago's Commissioner, John Turnbull Thomson, wanted government 'to appoint and pay Forest Wardens for the purpose of marking out the area to each licensee, no other area to be granted till the allotment is completely cleared of stems and branches'. It was 'the leaving of the branches', he said, 'that creates the great havoc during fires'.<sup>73</sup>

Thomas Brunner, the Chief Surveyor of Nelson province, saw reserves in a different light. While reserves had originated from a desire (unfulfilled) to control the utilisation of their timber, he saw newer environmental arguments for them, prefiguring the 'climatic forest conservancy' proposed for New Zealand in 1877 by Inches Campbell Walker, and the 'climate reserves' introduced under Vogel's State Forests Act of 1885.<sup>74</sup> Brunner thought 'the tops of many of the mountain ranges should be reserved on either side for a certain distance from their summit[s], and also that reserves should be made at the source of all rivers and streams'. Brunner envisioned what he called 'actual reserves', in which no timber would be cut.

Davie had no such a vision. 'We have now brought the fire into these forests', he wrote, 'and I believe it will be utterly impossible to preserve the remaining forests for any length of time'. He was certain that 'forests should be allowed to pass into freehold, as the only chance of their ultimate preservation'. Davie lived in an area already largely denuded of native forest and, like many Canterbury men, could see little future for what was left. Yet it was perhaps precisely because the timber shortage was so evident in their province, and the area of remaining forest so clearly finite, that a handful of Cantabrians (notably Potts and, by the 1890s, Leonard Cockayne and Henry Ell) were so alert to the need for its protection.<sup>75</sup>

Potts must have been encouraged when both the parliamentary debate of 1868 and the resulting questionnaire elicited several expressions of concern in line with his own. There were, however, no further parliamentary outcomes during his last year in the House of Representatives. At one point, while reminding the House that he 'had seen the whole [of Banks] Peninsula covered with one mass

73 Paul Star, 'T. H. Potts and the Origins of Conservation in New Zealand (1850–1890)' (M.A. diss., University of Otago, 1991), 77.

74 Roche, *History of New Zealand Forestry*, 91, 94.

75 Catherine Knight, 'Creating a Pastoral World through Fire: Manawatu, 1870–1910', *Journal of New Zealand Studies*, n. s., 16 (2013): 100–22, suggests that the regions most supportive of conservation had fewer forests, plus a greater number of 'wealthier immigrants from more highly educated backgrounds' (page 116) able to appreciate and promote conservation. Canterbury, and Potts, fit the bill.

of smoke', he bemoaned the lack of progress since the publication of Hector's report. He feared there were now 'only two places in that locality [i. e. Banks Peninsula] where there was timber left that was worth preserving'.<sup>76</sup>

After 1870, Potts could no longer directly push for parliamentary action, though O'Neill, now MHR for Thames (another gold-fields seat), remained in the House and maintained the pressure for conservation until upstaged by Vogel.<sup>77</sup> National legislation in support of forest conservation finally resulted in 1874, six years after Potts' motion.<sup>78</sup>

In addition to the remarks already quoted, Davie also opined that 'legislation should lead rather to the encouragement of the new plantations than to the very doubtful attempt to preserve the old forests'. In the history of New Zealand conservation, Potts' motion is highlighted and approved; at the same time, the scepticism expressed by men like Davie is either ignored or condemned. But Potts himself increasingly doubted the effectiveness of any legislative cures. By the 1870s, his response to timber shortage no longer centred on political actions to save native forests. He still valued the forest, but he focused more on the potential for exotic tree-planting—as already stressed by Davie, among others.

By the end of the 1860s, three ways to promote tree-planting had been expressed. Firstly, legislation might encourage private individuals to plant trees. Secondly, government could organise the distribution of seeds and seedlings suitable for planting, primarily, by private individuals. Thirdly, government could take the bull by the horns and plant trees in its own 'public plantations'.

Looking mostly at the Canterbury picture in which Potts most persistently figured, I further differentiate two criss-crossing trails: one series of actions directly promoted legislation to encourage tree-planting, but there was also a wider-ranging push to support the colonial economy through development of 'local manufactures'. To Potts' way of thinking, conserved native forest and planted exotics would both foster future industry.

<sup>76</sup> T. H. Potts, *NZPD*, 15 July 1870, 472.

<sup>77</sup> Stephen Utick, *Captain Charles, Engineer of Charity: The Remarkable Life of Charles Gordon O'Neill* (Sydney: Allen and Unwin, 2008), contains little about O'Neill's support of forest conservation.

<sup>78</sup> For details of O'Neill's unsuccessful efforts in 1872 and 1873, the withdrawal of Donald McLean's Conservation of Forests bill in 1873, and the successful passage of a modified New Zealand Forests Act (introduced by Vogel) in 1874, see Roche, *Forest Policy in New Zealand*, 73–80, and Roche, *History of New Zealand Forestry*, 83–88.

## Local industry

In order to develop, nineteenth-century New Zealand required both local industry and overseas income. By increasing the availability of resources and locally manufactured goods within the colony, the need to import essential items (such as building timber and furniture) was reduced. In addition, if a surplus of resources or goods could be exported overseas, this would provide income for colonials to import those essentials and luxuries, such as railway engines and cotton goods, which there was little or no prospect of producing locally.

As noted, Canterbury never had enough native forest to countenance the large-scale export of native timber. In the 1850s, the province's ability to purchase depended on the merino wool clip. Potts, like the majority of MPCs, was a runholder and sheep-farmer. It was economically unhealthy, however, for a colony to have all its eggs in one basket. The situation was relieved by the discovery of gold in 1864 on the South Island's West Coast (then still part of Canterbury), but workable gold was a finite resource, and thoughtful settlers sought longer term sources of income.

Various ways forward were imaginable. Indigenous primary products with export potential, if plentiful, could be exported in a raw or semi-processed state. Or both indigenous and exotic species might become raw materials for colonial industries, producing processed goods. Such goods would certainly reduce the need for, and expense of, imports from Britain; in time they might also become export items. Or again, experimentation with introduced stock and plants could produce further raw materials for the British market, in addition to the existing export of wool.

By the early years of the twentieth century it had become clear that sheep (by then the source of both wool *and* meat exports) would continue to be the mainstay of Canterbury's economy, as for New Zealand as a whole. For settlers in the 1860s, however, there could be no certainty about how exports would develop, nor what new mineral resources might be found, nor when the population would grow large enough to support local industries by providing labour and increasing local demand. The only certainty was the wisdom of exploring all options.

Potts supported all these approaches. His interest in trees—which, in one form or other, could boost both overseas income and local industry—operated within his wider concern for the colony's development and its future health. To nineteenth-century New Zealanders in general, the native species with most export potential was harakeke (*Phormium tenax*). The very name used by European settlers for this plant—flax—emphasised the value of its fibre as a raw material, for in Britain, this word traditionally referred to the northern



plant (*Linum usitatissimum*) from which linen was manufactured. As noted in 1823, however, 'the native [New Zealand] flax-plant ... is by no means like the flax or hemp plants of England'.<sup>79</sup> Already by the 1830s, New Zealand flax was being processed in London and promoted as the best resource for making sails and ropes for the British navy: it would see 'Neptune new rigg'd'.<sup>80</sup> By 1868, one of the many flax-dressing businesses was located at Halswell on the edge of Christchurch, employing 'forty men and boys constantly'.<sup>81</sup>

Potts in 1869 considered that 'if the spirited endeavour ... to establish a new export in the article of dressed flax, meets with success, we may expect very considerable attention will be paid to developing this new industry'. Since this meant 'most of the wild flax that is easily accessible will soon be used up', he looked forward to plantations of flax. Potts suggested that Canterbury's provincial gardener, John Armstrong, undertake 'experiments in the culture of flax ... showing how to obtain the best quality of fibre, the proper time and age for cutting, probable yield, &c.'<sup>82</sup>—and this proposal was acted on.<sup>83</sup> In 1870, when the government set up a Flax Commission under the ubiquitous Hector, Potts became its Canterbury representative.

When Potts thought about the flax or any other industry, his mind often also turned to wood. Thus, immediately after describing flax's potential to the Canterbury Provincial Council in 1869, Potts also thought that, through Armstrong, 'sample logs of the furniture woods of the province might be collected and forwarded to the English agent, with particulars of the average obtainable size of such timber, as would be likely to be appreciated by manufacturers of ornamental furniture'. He considered, further, that 'the forests would furnish bark for dyeing and tanning purposes, the lichens covering the trees might in all probability possess dyeing qualities[;] resinous gums exuded from the Dammara and Panax, and ... vegetable oil had been expressed from titoki [*Alectryon excelsus*]'.<sup>84</sup>

All these local manufactures would have utilised native resources, but by the 1850s Britain's imperial record included numerous examples of species with resource potential which had been shifted not only from Britain to the colonies, but also between colonies. Thoughts, therefore, did not focus on what grew naturally in New Zealand so much as on what else might grow there. Sericulture

79 W. Ellis, *Polynesian Researches ... in the South Sea Islands*, vol. 1 (London: Fisher, Son & Jackson, 1829), 27.

80 M. J. J. Donlan, *Phormium Tenax, or Neptune New Rigg'd: Statement of Facts Relative to Experiments Made upon Phormium tenax or New Zealand Flax* (London: W. Glindon, 1833).

81 J. S. Williams in Canterbury Provincial Council, 2 December 1868, as reported in *Lyttelton Times*, 3 December 1868.

82 T. H. Potts, 'Flax Culture', letter to the editor, *Lyttelton Times*, 8 February 1869.

83 *Lyttelton Times*, 18 February 1869.

84 T. H. Potts, 7 October 1868, *NZPD* 14 (1868): 188.

(the raising of silkworms for the production of raw silk) was perhaps the first exotic industry to which Potts gave thought. In 1853, the year before he left England for New Zealand, he sent ahead a Wardian case of white mulberry seedlings, their leaves being the food that silkworms eat. These were planted on Potts' behalf in Lyttelton.<sup>85</sup> Two years later, Potts transplanted them to his garden at Valehead, near Rockwood.<sup>86</sup> A decade later still, the Canterbury Acclimatisation Society received silk worms from Sydney and distributed them among interested members such as himself.<sup>87</sup>

Sugar beet and cloth production, like sericulture, became perennial candidates for local industries for both the New Zealand and Australian colonies. As an MPC in December 1868, Potts successfully moved that 'the Government be requested to offer premiums for tweed cloths, blankets, and beetroot sugar manufactured within the province'.<sup>88</sup> This time Potts noted not only a successful Victorian cloth industry, but also the Otago Provincial Council's recent offer of premiums for local cloth and sugar beet production.<sup>89</sup> He had himself just received a package of tweeds (presumably locally produced) from Nelson.<sup>90</sup>

## Private tree-planting

A national initiative followed in 1870 when a parliamentary joint committee, which included Potts, O'Neill, and Travers among its members, spent a few days in July gathering ideas on possible 'colonial industries'. In the resulting report, the first six recommendations all related to the exploitation of New Zealand's mineral resources, drawing on information from their star witness: Hector.

There was also, however, a recommendation that 'persons planting timber trees upon unsold Crown lands should ... be secured in the freehold of the country so planted out, either by pre-emptive right of purchase or by free gift'.<sup>91</sup> This would have given government a role in encouraging tree-planting, but no direct involvement. In this respect, it matched other recommendations in the report with regard to sericulture and sugar beet, and for free passage to New Zealand for Welshmen and Yorkshiremen versed in cloth manufacture.

85 *The Press*, 18 June 1870.

86 T. H. Potts, *Diary*, 17 September 1855.

87 *Star*, 18 June 1870.

88 *Lyttelton Times*, 3 December 1868.

89 *The Press*, 3 December 1868. Six months later Canterbury's government had also advertised premiums, but no other action followed. *The Press*, 21 May 1869.

90 'Shipping', *Lyttelton Times*, 11 November 1868.

91 'Report of the Joint Committee on Colonial Industries', *AJHR*, F-1 (1870).

Years earlier, in 1856, John Hall had promoted private plantation at the provincial level.<sup>92</sup> This precipitated the Planting of Forest Trees Ordinance of 1858, 'to encourage and promote the planting of Forest Trees on Rural Sections in the Province of Canterbury'. The ordinance sought to ensure that, if a tenant planted more than 50 timber trees on a 10-acre (4.05 hectare) or larger section, he could cut them down or transplant them prior to the expiry of his lease, or else arrange for their mandatory purchase at an agreed price by his landlord.<sup>93</sup>

This was a removal of obstacles more than the provision of incentives. Given proper registration, Hall thought tenants would no longer feel discouraged from proceeding with plantations. Whether this had any tangible result is unknown, but clearly it was not enough. Five years later, in 1863, an anonymous correspondent of the *Lyttelton Times* still found that 'want of timber is the greatest of all our necessities, and one not likely to be mitigated for a considerable time'.<sup>94</sup> Nevertheless, no further legislation to encourage planting, other than the development of Hagley Park in central Christchurch, was passed by the Council in the 1860s.

One attempt was made, however, during a Council meeting in October 1869 at which Potts was present. On this occasion, John Evans 'Yankee' Brown, MPC, proposed tree-planting encouragement policies along American lines. He thought there should be a 10 per cent discount on the rates for every acre of land planted and protected. His motion was withdrawn at the request of Hall, who I suspect already had a new proposal in mind and did not want Brown muddying the waters.<sup>95</sup>

Hall proved to be a more consistent and persuasive politician than Brown or Potts ever was. In 1871, he introduced a Canterbury Forest Trees Bill in the House of Representatives in Wellington. It transmogrified into the Forest Trees Planting Encouragement Act of the same year, which granted two acres of free land to any settler who had planted one acre of their land in forest trees. Thus, Hall's dogged support of private plantation—promoted at the provincial and national level, and on his own sheep station—eventually ensured that this approach received a significant trial through the 1870s and 1880s.<sup>96</sup> Furthermore, South Australia's Tree Planting Encouragement Act of 1873 was directly modelled on the New Zealand precedent, illustrating that not all innovative policies crossed the Tasman Sea in an easterly direction.<sup>97</sup>

92 *Lyttelton Times*, 26 April 1856.

93 The Ordinances of the Canterbury Provincial Council Session 10, October to December 1858.

94 *Lyttelton Times*, 3 June 1863.

95 *The Press*, 21 October 1869.

96 For further detail, see Star, 'Tree Planting in Canterbury'.

97 Beattie, *Empire and Environmental Anxiety*, 166–67.

In the event, Hall's measure proved inadequate to stimulate the volume of timber production required in New Zealand's rapidly expanding economy. That left the way clear for more direct government involvement in forestry, including state planting, as legislated for by Vogel in 1874. I note here only that, while Vogel's support of forestry development from 1873 onwards is well known, little attention has been given by historians to the earlier efforts made by Hall (a later Premier) and to the approach he pioneered.<sup>98</sup>

## Organising supply

Potts did not personally take advantage of the terms of the tree-planting encouragement acts: He was planting trees anyway. He had fruit trees growing in Valehead before his move to Governor's Bay in 1858; by 1863 his cherry crabs were prize-winners at the Christchurch Horticultural Show and a string of such prizes followed.<sup>99</sup> These were fruit-growing and horticultural endeavours, but he was equally involved in all aspects of silviculture, including tree-planting.

Potts disputed popular beliefs that native trees were hard to transplant or establish outside forest conditions, but he agreed that in general they were too slow-growing to be suitable for timber plantations. This is not to say that he had no interest in growing them: indeed, in September 1870 he spoke 'on the cultivation of some species of native trees and shrubs' to the Wellington Philosophical Society, summarising what he and his gardener had learned 'from the experience of several years'.<sup>100</sup> But it was almost a given at the time that tree-planting initiatives would relate to the planting of exotics, not natives.

There was a sequential enthusiasm for different exotic species during the 1850s and 1860s, which Potts himself recorded:

Of necessity willows and poplars, a case of Hobson's choice, were the first loves of the tree-growers ... They soon had their day, as a few seedling gum trees

98 The biographies of both men deal only briefly with their tree-planting and forestry interests. See Jean Garner, *By His Own Merits: Sir John Hall—Pioneer, Pastoralist and Premier* (Hororata: Dryden Press, 1995), 67–68 and 128–29, and Raewyn Dalziel, *Julius Vogel: Business Politician* (Auckland: Auckland University Press, 1986).

99 *Lyttelton Times*, 4 March 1863.

100 T. H. Potts and William Gray, 'On the Cultivation of Some Species of Native Trees and Shrubs', *Transactions of the New Zealand Institute* 3 (1870): 181–202. They noted (page 181) 'a prejudice against planting native shrubs, from the supposed difficulty attending their successful treatment'. Most early settlers accepted, as Darwinian scientists of the day theorised, that the displacement of native trees by (supposedly) superior 'northern' species was inevitable. Dr Arthur Purchas gave a classic expression of this view before the Auckland Institute in 1874: '[s]ome of the New Zealand trees might be preserved, but many of them could not resist the advances of civilization, and, like the native birds, would in time almost entirely vanish. It was a natural result, and they must not bemoan it, but rather make preparations for filling their place with trees that would live and bear cultivation'. *Proceedings of the New Zealand Institute* 7 (1874): 519–20.

showed such extraordinary vigour and rapidity of growth that they induced a fashion to sow seeds of Australian trees ... The desire of cultivating Australian species in turn gave way before the furore for growing Californian conifers[.]<sup>101</sup>

Potts planted Australian blue gum (*Eucalyptus globulus*) at Governor's Bay in the late 1850s, but by July 1865 his attention had turned to *Pinus ponderosa*, from western North America.<sup>102</sup>

In 1866, Potts launched into a diverse tree-planting programme, mostly involving pines (he had 18 different species of these by 1870), but also cedars and cypresses. He regularly assessed their growth, tabulating and publishing results until 1885, by which time he had conclusively shown that, under local conditions, Monterey pine (now known as *Pinus radiata*) grew the fastest.<sup>103</sup> This was a conscious and conscientious attempt to ascertain which trees held greatest potential for future timber supply in Canterbury.

Potts was also associated with tree-planting ventures in Christchurch's domain (which became its botanic garden) and neighbouring Hagley Park, which were government-funded activities on public land. The origins of the Hagley Park plantings can be traced back to 1858 when Richard Harman MPC, at a Council meeting attended by Potts, had £200 set aside to plant out a portion of the Park. Harman opined that private planting was insufficient, 'considering that one of the special and most objectionable features of the country was want of timber'.<sup>104</sup> The development of the Park that followed, however, was pursued more for its amenity value.

Operations in the Park at this time should not be underestimated. By 1864, the nursery of Enoch Barker, the provincial government gardener, was four acres (1.6 hectares) in extent:

From this nursery the whole of the domain, which comprises about fifty-nine acres [24 ha], is supplied with the young stock planted in the latter. In one bed are five thousand varieties of native shrubs and trees. In another are layers of birch and lime ... Ten thousand oak plants, one thousand Spanish chestnuts, and a very large number of elms, box, and laurels are planted here, and in due time will be removed to their destined place in the public plantation. Twenty-five thousand young plants have already been placed there, forty thousand remaining in the nursery.<sup>105</sup>

101 T. H. Potts, 'Old Times', *Canterbury Times*, 2 December 1887, 28; 9 December 1887, 28.

102 Potts, Diary, 15 May 1865 and 6 July 1865.

103 See T. H. Potts, 'Through a Young Plantation', *New Zealand Country Journal* 2 (1878): 390–97 and 3 (1879): 34–38; T. H. Potts, 'Measurements of Some Coniferous Trees Planted in 1866 in Ohinitahi, Canterbury', *New Zealand Country Journal* 9 (1885): 477.

104 *Lyttelton Times*, 6 November 1858.

105 *Lyttelton Times*, 15 October 1864. See also 'Citizen' on 'Government Plantations' in *Lyttelton Times*, 19 April 1864, 18 April 1860, and 16 November 1861.

In 1864, the annual vote was £1,196 for 'public plantation'.<sup>106</sup> The Provincial Council provided similar annual sums for public plantations on either side of 1869, when Potts commented on how such operations could be refocused and extended. Planting therefore continued without reflection on how it might have addressed Canterbury's timber shortage. Opposing the public plantation vote in 1871, a member of the new city council argued that 'there were a number of streets wanting forming and repairs, and he thought it was far better to have useful works carried out in preference to ornamentation'.<sup>107</sup>

Public planting in Christchurch, at least of this kind, was well ahead of anything in Wellington, but the situation in New Zealand's capital city was reformed by the Botanic Garden of Wellington Act of September 1869. Canterbury MHRs Potts and Travers were among those who spoke up for the Act, which paved the way for Hector (as its Director) to make the garden serve New Zealand's forestry needs. Hector had recently received a collection of the seeds of 200 species from the Royal Botanic Gardens at Kew in London, and now he had somewhere to propagate them. Thereafter, Wellington's botanic garden became the centre of a network of tree-planting endeavours that operated throughout the colony.<sup>108</sup>

This network built upon the more ad hoc exchange of seeds and seedlings, largely between private individuals, which already existed. In 1868, for instance, Edward Richardson of Albury Park in Canterbury wrote to Professor Martin Kellogg of San Francisco for some *Pinus radiata* seed, which I suspect was the source of some of the *radiata* seedlings that Potts planted. Certainly Potts was the middleman in 1871 when he arranged for the transfer of seedlings from Richardson in Albury to Hector in Wellington; and in due course Kellogg became the principal supplier of Californian conifer seed to the New Zealand government.<sup>109</sup>

In 1870, while answering the Committee on Colonial Industries' questions about gold, coal, and sericulture, Hector also addressed the subject of timber supply. O'Neill asked him if steps should be taken 'for the conservation of the existing forests' and he replied (as O'Neill or Potts themselves would have) that 'the rapid destruction of the native forests I consider to be most wasteful, and as having the effect of rapidly reducing the natural resources of the country'.<sup>110</sup>

106 *The Press*, 14 September 1864. A similar amount went to the Acclimatisation Society to introduce exotic birds and fish.

107 *The Press*, 4 April 1871.

108 Winsome Shepherd and Walter Cook, *The Botanic Garden, Wellington: A New Zealand History, 1840–1987* (Wellington: Millwood Press, 1988), 25.

109 Shepherd and Cook, *The Botanic Garden, Wellington*, 123–24.

110 'Report of the Joint Committee on Colonial Industries', *AJHR* (1870) Session I, F-1, 10.

His principal line, however, was that ‘the subject of the immediate planting of large portions of the Colony, from which the natural forest has been denuded, with the most profitable class of introduced trees is one of the most important in this Colony’. His emphasis lay not with ‘land laws encouragement’, nor with some new kind of public plantation such as Potts had proposed a few months earlier. Rather, Hector wanted the government to ‘provide machinery for the distribution at a moderate price of the best varieties of trees’. These would be ‘raised from seed on a large scale, and distributed when they have reached the proper time for transplanting’. The committee’s recommendations did not reflect this piece of advice from Hector, but his comments referred to a procedure upon which, as we have seen, he had already spent government funds.<sup>111</sup>

## Public plantations

Potts wanted government action to go further. Just as he envisaged flax plantations supplementing naturally growing flax, so Potts saw a need for timber trees grown in plantations to supplement the timber supply from native forests. With trees, as with flax, he felt that government should play its part through research and education, and provision of incentives and publicity. In the case of trees, however, Potts went significantly beyond most his contemporaries in the 1860s, in arguing that government should not only encourage individual landowners to plant them, but also should itself plant trees.

Potts first wrote to the *Lyttelton Times* about plantations in January 1869, a month before his letter on ‘flax culture’. His January letter, headed ‘local manufactures’, similarly combined discussion of ‘two important matters, affecting the good of the province’. Firstly, he sought to hurry along the provincial government’s initiation of local manufactures.<sup>112</sup> Secondly, Potts mooted his idea of public plantations, planted with timber trees to replace those destroyed in bush fires. Having opposed the issuing of timber cutting licences as wasteful, he welcomed the decision to issue no more. But he wanted government to

go a step further and devote a certain proportion of the amount realised from the sale of timber land for the purpose of public plantations. We yearly devote a sum of money for public plantations for the ornamentation of the chief town of the province. Let us take into consideration use, as well as ornament, and extend our operations. There are many localities where extensive plantations would provide a great climatic benefit, and it does not require any very long journey across the plains of Canterbury to appreciate the value of this provision for the future supply of valuable timber.

<sup>111</sup> Shepherd and Cook, *The Botanic Garden, Wellington*, 95–98.

<sup>112</sup> *Lyttelton Times*, 26 January 1869.



As when putting his ideas on forest conservation to the House of Representatives a few months earlier, he recommended the Victorian government's forestry report for further information on the subject.

Potts acknowledged that public plantations already existed, in the form of the ornamental trees planted in Hagley Park and elsewhere. But what he was now suggesting was quite different, as he explained in a further letter to the *Lyttelton Times*.<sup>113</sup> He envisaged not only 'special reserves for plantations of useful forest timber', but also 'planting on portions of the reserves that are at present set aside for educational and other public purposes'.

He pointed out that public plantations would help Canterbury's balance of payments, given that 'the wood of various kinds we have imported must during several years have amounted to a very large annual outgoing'. He then adopted a more moral tone: through planting trees, he said, we acted as 'faithful stewards, looking to the future well-being of the community'. He envisaged gains not only in terms of timber supply but also in terms of climate.<sup>114</sup> As Peter Holland points out, flooding was a major concern of Canterbury residents in the 1860s.<sup>115</sup>

Potts further suggested that osier willows planted in 'marshy swamp' would supply 'material for basket-ware, hoops, etc, its bark furnishing a good proportion of tannin, as well as enabling our chemists to extract from it the crystallisable principle salicin, which like the sulphate of quinine, arrests the progress of fever'. He had earlier stressed the potential value of native trees for furniture-making. Now he was saying that exotic trees in public plantations might stimulate other industries.

In the context of New Zealand in 1869, Potts' call for this new kind of public plantation was quite radical. Consider the response it elicited from a long-standing friend, Mark Stoddart. He similarly wanted

plantations to supply [i. e. make up for] the waste and destruction that has been going on in the natural forests of our province, and, likewise, with a view to ameliorate the rather hard and shelterless features of our climate. I fully concur with him [Potts] in the necessity that something should be done in that direction.

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113 *Lyttelton Times*, 23 February 1869.

114 Potts enlarged upon the idea of 'climatic benefits' by quoting directly from the Victorian report: forest trees changed the climate 'by modifying extremes of temperature, and increasing the humidity of air, by causing a more continuous rainfall in districts that are now subject to long and excessive droughts ... The vegetable mould formed by the decomposition of leaves and wood not only enriches the surface soil, but causes it to become much more absorbent, and, from its spongy nature, to retain a large portion of the rainfall that would otherwise drain away by percolation at great depths, or flow off rapidly by surface channels. It is chiefly due to this last that in dense forests heavy rains do not cause such violent floods as in open country'. *Lyttelton Times*, 23 February 1869.

115 Peter Holland, *Home in the Howling Wilderness: Settlers and the Environment in Southern New Zealand* (Auckland: Auckland University Press, 2013), 71–75.

But, before going into the subject of public plantations—which is surrounded with many practical drawbacks and difficulties, besides the important one of expense—I would, with all diffidence, make a few suggestions as to planting, and urge them upon freehold proprietors, with whom the planting movement should begin.<sup>116</sup>

The idea of public plantations was ideologically challenging: it went against early Victorian preferences, still strongly held in 1869, for a laissez-faire approach, private enterprise wherever possible, and minimal government. A leader in the *Otago Daily Times* three months later agreed that ‘wise and liberal legislation might greatly promote ... the planting of timber trees’; however, it was ‘no part of the proper business of the Government to undertake such work itself’.<sup>117</sup> Public plantations were no more than a pipe dream at the time, whereas private plantations were already being created by Potts and dozens of other landowners.

## Discussion

The situation changed after 1870, as population increased and colonial development accelerated. The limitations of policies encouraging private tree-planting (and towards other forms of private enterprise) became evident. Private tree-planting and its promotion characterised early efforts to involve government in the forest question; by the end of the century, however, public plantation (along with native forest conservation) had become a key feature of the government’s forest policy.<sup>118</sup>

Looking at New Zealand in the 1860s and into the 1870s, I also find good cause to stress local concerns and the tree-planting response. And certainly, among those who claimed a reward under the Tree Planting Encouragement Acts were many men who (unlike Potts) never showed a parallel interest in native forests or their conservation. But there is perhaps a need to better differentiate between the origins of forestry concerns on the one hand, and the structuring of legislative responses on the other. The former began at the local level and resulted mostly in tree-planting in the first instance. The latter developed later, and drew not only on local realities but also on European precedents, sometimes through an Indian filter. In the case of New Zealand, there was often also an Australian filter, since Victoria in particular had already begun the adaptation of European

116 *Lyttelton Times*, 2 March 1869.

117 Review of *Transactions of the New Zealand Institute*, vol. 1, in *Otago Daily Times*, 13 July 1869.

118 Paul Star, ‘Henry Matthews’ Contribution to Tree Culture in New Zealand from 1896 to 1909’, in *Australia’s Ever-Changing Forests*, vol. 6, *Proceedings of the Eighth National Conference on Australian Forest History*, ed. Brett J. Stubbs, Jane Lennon, Alison Specht, and John Taylor (Canberra: Australian Forest History Society, 2012), 201–24.

ideas to colonial contexts. Potts, in the 1860s, was one of the first to bring this range of responses to bear on the local situation in Canterbury and elsewhere in New Zealand.

The historical study of New Zealand's forest legislation remains patchy and is still dominated by Michael Roche's research, done over 30 years ago.<sup>119</sup> More recently, James Beattie has placed the New Zealand evidence within a broader, and primarily British imperial, context, though with German influences as an aside.<sup>120</sup> The present paper, by looking exclusively at forestry concerns in the 1860s, and especially at those of Potts in Canterbury, has concentrated on one small part of this overall picture. A couple of absences are worth mentioning.

Absent, firstly, has been the suggestion for New Zealand to have a Board of Woods and Forests and a Conservator of Forests, as was put forward by William Lauder Lindsay after his visit to Otago of 1861–62.<sup>121</sup> This has not been mentioned because I have found no evidence that Potts had heard of the man or his writings. Even in Otago, there seems to have been little awareness or interest in Lindsay's forestry proposals during the nineteenth century. I have referred to Otago Provincial Council discussions on bush reserves of 1868, for Potts and others outside Otago knew of these. But I believe that Canterbury and Otago responses at this time, rather than being symbiotic, were independently derived from Victorian developments.

Absent, secondly, is any mention of forestry practices in British India. There were certainly old India hands in New Zealand in the 1860s with knowledge of the Indian forest service. Beattie has instanced two Canterbury men: John Cracroft Wilson, who arrived at Lyttelton two weeks before Potts in 1854, and De Renzie James Brett, who arrived in 1865.<sup>122</sup> 'Nabob' Wilson served with Potts both as an MPC and an MHR and shared many interests with him, but, for all that, there is nothing in Potts' remarks suggesting he had much awareness of Indian forestry, or that it influenced his thought in the 1860s. I do, however, refer to the influence on Potts and others of George Perkins Marsh.

Environmental historians debate whether the origins of conservation are more meaningfully traced back to the influence of *Man and Nature* or (as Richard Grove would have it) to the concerns of imperial servants in India and elsewhere

119 Presented, most notably, in Roche, *History of New Zealand Forestry*.

120 Beattie, *Empire and Environmental Anxiety*, 143–48.

121 W. L. Lindsay, *The Place and Power of Natural History in Colonization, with Special Reference to Otago* (Dunedin: YMCA, 1862); W. L. Lindsay, 'On the Conservation of Forests in New Zealand', *Journal of Botany British and Foreign* 6 (1868): 38–46. See also James Beattie, 'Scottish Environmentalism and the "Improvement" of Nineteenth-Century New Zealand', in *Landscape/Community: Perspectives from New Zealand*, ed. Tony Ballantyne and Judith A. Bennett (Dunedin: University of Otago Press, 2005), 43–56.

122 See James Beattie, 'Making Home, Making Identity: Asian Garden Making in New Zealand, 1850s–1930s', *Studies in the History of Gardens and Designed Landscapes* 31, no. 2 (2011): 139–59.

in the British Empire.<sup>123</sup> My research confirms the influence of Marsh in New Zealand by the 1860s, but it was only in the 1870s (and then powerfully so) that Indian practice began to affect the country's forest legislation and its ideas of conservation.

Graeme Wynn, whom I referred to in my introduction, published a second article on New Zealand forest history in 1979. As with his first article, this concentrated on the New Zealand Forest Act of 1874, but it also looked a little harder at precedent events and at settlers like Potts, Travers, and O'Neill. 'Through the work of this well-informed and essentially conservative minority in the pioneering population of the colony', Wynn wrote, 'ideas emerging from the experience of environmental exploitation and ecological disturbance elsewhere were superimposed upon the primal encounter between man and the land in New Zealand'.<sup>124</sup> In a third article by Wynn, published 25 years later, he wondered if his early work had overstressed the role of *Man and Nature* in informing these settlers, when in fact 'New Zealanders might have built their understanding, at least in part, on grounds other than Marsh'.<sup>125</sup>

By closer tracking of the situation in Canterbury in the 1860s, we can now better see precisely what was superimposed on what, and the order in which this occurred. In my analysis, Victorian legislation and Marsh's book were the key external influences that structured the concern about forests and conservation that Potts, most notably, felt.<sup>126</sup> They provided the syntax, but the substance was a local response to ongoing change in a local environment. What Potts and others expressed in the 1860s was based in the first instance upon what they themselves experienced: that is, upon forest and fire, waste and shortage, development and opportunity.

Looked at this way, it is not incorrect to view Potts' motion of 1868 and his views at the time on native forest conservation as proto-environmentalism. It can, however, be restricting. What I have wanted to show through a case study

123 Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (Cambridge: Cambridge University Press, 1995).

124 Graeme Wynn, 'Pioneers, Politicians and the Conservation of Forests in Early New Zealand', *Journal of Historical Geography* 5, no. 2 (1979): 187.

125 Graeme Wynn, "'On Heroes, Hero-Worship, and the Heroic" in Environmental History', *Environment and History* 10 (2004): 144.

126 The other overseas influences noted in 2004 by Wynn relate to the 1870s, several years after the impact of Marsh's work in New Zealand had begun. In my assessment, they strengthened Marsh's case, but they were taken on board later and were, essentially, supplementary evidence to that which Marsh had already provided. Nelson engineer Arthur Dobson's article 'On the Destruction of Shingle-Bearing Rivers', *Transactions of the New Zealand Institute* 4 (1871): 153–57, as Wynn indicated in 2004, fuses Marsh's ideas, Dobson's own experience and 'local understanding of the processes involved', as already interpreted by 'his German-trained brother-in-law, geologist and explorer Julius von Haast'. The Dobson, Haast, and Potts families were very close—Arthur Dobson's brothers later married two of Potts' daughters—and no doubt they shared insights about the local environment gained both from their own observation and by the application of ideas culled from what they read.

of Canterbury province is that, at least in the 1860s, concern for the native environment was primarily an aspect of concern for colonial development, and that conservation of native forests was primarily a counterpoint to exotic tree-planting. There are major differences between the priorities of nineteenth-century actors and twenty-first-century analysts of their ideas and actions. Nineteenth-century perspectives need to be identified and understood before any selective plucking of evidence for the origins of modern conservation.

Fuller understanding of the complexity of concerns about the wastage of native forests in the 1860s may help us to situate New Zealand's present, and ongoing, ambivalence towards conservation and growth. Study of this particular decade is, more certainly, a necessary backdrop to the examination of changes later in the nineteenth century. The years between 1870 and 1900 witnessed not only the state's growing sense of responsibility for native forest conservation and exotic timber production, but also a distinct shift in settler responses to native forests.<sup>127</sup> I hope in a subsequent paper to show how, in the remaining two decades before his death in 1888, Potts' actions and writings continued to reflect, and contributed to, these changes.

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127 Star, 'Native Forest and the Rise of Preservation in New Zealand'.