

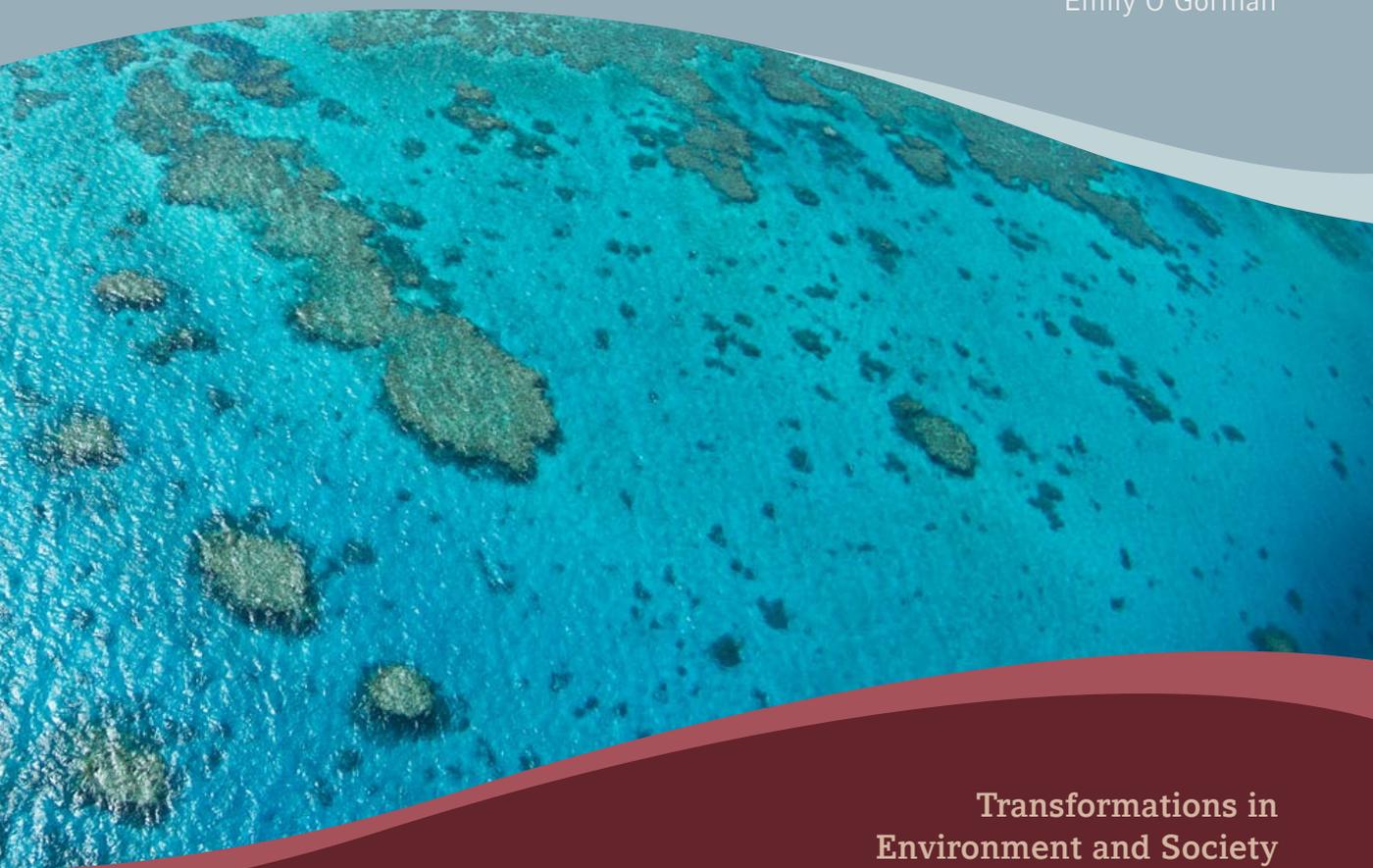


VISIONS OF AUSTRALIA

Environments
in History

Edited by

Christof Mauch
Ruth Morgan
Emily O’Gorman



Transformations in
Environment and Society

2017 / 2

RCC Perspectives: Transformations in Environment and Society is an open-access publication that exists to record and reflect the activities of the Rachel Carson Center for Environment and Society. The journal provides a forum for examining the interrelationship between environmental and social changes and is designed to inspire new perspectives on humanity and the wider world. *RCC Perspectives* aims to bridge the gap between scholarly and non-scholarly audiences and encourage international dialogue.

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Introduction: Envisioning Australia

People have been shaping Australian environments dramatically for more than 50,000 years: First, Indigenous people altered the continent’s ecology, especially through their use of fire; then, a second wave of colonisation, led by the British—often dated to the arrival of the First Fleet in 1788—wrought another set of ecological changes. Over the last 220 years, these changes have been guided by competing environmental visions and practices that have transformed both the lands and the livelihoods of Aboriginal people and of non-indigenous settlers.

The European powers who later saw in *terra Australis* a blank slate on which they could project their dreams of a New World, as well as an island prison for Britain’s outcasts, had ignored the continent until the late eighteenth century. But sailors from southern Sulawesi (now Indonesia)—the Macassans—were attracted to the coastal resources of Australia from perhaps as early as the sixteenth century. They travelled south to harvest the continent’s wealth of sea cucumbers, marine vertebrates that the Macassans called “trepang.” With their catch, these fishers drew the land and its peoples into a network of trade that spanned the Pacific Ocean to the markets and kitchens of China, where trepang (*hǎi shēn*) were prized for their taste and medicinal value.

The Macassans also traded with the continent’s Indigenous inhabitants, which fostered lasting alliances and relationships between these peoples. The wider recognition of these cross-cultural exchanges and their legacies asserts the historic agency of Indigenous peoples and rejects the argument of cultural stasis that long supported colonial dispossession. For example, Australian Aboriginal people are now well known for the careful management of their country, for sophisticated irrigation practices,

The essays in this volume are drawn from a symposium held on the lands of the Wattmattageal clan of the Darug nation at Macquarie University, Sydney, in February 2016, titled “Foreign Bodies, Intimate Ecologies: Transformations in Environmental History.” The editors are grateful for the endeavours of their fellow symposium conveners Alessandro Antonello and Cameron Muir. The symposium was only possible with the generous support of the Department of Geography and Planning, Macquarie University; the Faculty of Arts, Monash University; the Centre for Environmental History, The Australian National University; the International Water History Association; the Sydney Environment Institute, University of Sydney; and the Rachel Carson Center for Environment and Society, LMU Munich. Finally, the editors thank Katie Ritson for her invaluable editorial work in preparing this volume. The articles in this volume have undergone peer-to-peer review.

for their ability to farm eels, for bringing wild yams into gardens, and of course for intricate fire regimes, used to promote certain plants and animals such as kangaroos. These practices were developed over many generations and were negotiated via responsibilities to kin and ancestral beings.

This ancient island-continent, long isolated from other lands, proved a reluctant partner in the realization of European visions. Its expansive deserts, its fiery forests, its “boom and bust” weather, its delicate soils, all were stubborn adversaries for those newcomers who hoped for an antipodean agrarian idyll. The dreamers persevered, however, and by the end of the nineteenth century, they had effected a vast ecological and cultural transformation of the continent south of the Tropic of Capricorn.

The speed of the ecological changes wrought since European colonisation was unrivalled in both the Old World and the New. What elsewhere had taken generations of adaptation and adjustment was imposed in dramatic fashion as European newcomers encountered a land that environmental writer and historian Eric Rolls described as “more a new planet than a new continent.” The descendants of an ancient culture of land stewardship have seen their country transformed: Australia, which has more endemic flora and fauna than any other nation, has had the highest mammal extinction rate in the world since 1788 and lost nearly 40 per cent of its forests.

Fundamental to the settler vision of possessing the continent and its natural resources was the dispossession of its Indigenous peoples. This was true for both Australia and New Zealand. Conflicts between local Indigenous peoples (Australian Aboriginal peoples and New Zealand Maori) and British or Irish colonists, who would be followed by immigrants from China, escalated in the nineteenth century as the colonial hunger for land and fodder drove pastoralists inland. The Anglo desire to establish privately held farms (“stations”) for raising cattle and sheep clashed with the ethic of Indigenous peoples, which centred on access to land and the sharing of its resources.

In Australia, colonising projects were enabled not only by the denial of existing sets of laws and land boundaries, but also by government-supported massacres, programs of assimilation, and waves of deadly diseases. While Aboriginal peoples fought back, the onslaught of European colonisation was such that it is a testimony to their extraordinary resilience that they withstood this toll. This truth is an unsettling cornerstone of

the nation's foundation. Settler Australia has come at an unfathomable cost to the First Australians and their country.

Settler possession of the continent was simultaneously achieved through the intensive cultivation and exploitation of its lands, waters, and minerals. For settlers and sojourners alike, fulfilling their dreams of enrichment was contingent on the demands of capitalists and imperialists, whose own visions hungered for coal, gold, timber, wool, and wheat. Extracting these resources from the continent's unfamiliar climes demanded endurance and hard labour. Settler *belonging*, however, could not be won simply through toil. Belonging—a sense of place—demanded stories that could transplant their foreign cultures into Australian soils. These stories needed to be told and retold to themselves and to each other in order to take root and to flower. The Mallee Man, a labourer who worked the dry eucalypt shrublands and woodlands across southern Australia, became an icon: a white worker forged by the sinews of his labour; a man who honed the earth, while the earth honed him.

Visions and histories of Australian environments are distinct from those in other places. In the United States it seems, visions of exceptionalism—of a continent settled by free yeoman farmers, whom Thomas Jefferson regarded as the “chosen people of God” and who stood in sharp contrast to the factory workers of Europe—have long dominated the historical imagination. American environmental historians have challenged the national celebration of the economic conquest of “wilderness” and the fulfilment of Manifest Destiny that drove the settler expansion across the continent. Australian histories, however, have focused more on human bodies, on working men, and on settler stories of a land hard won. The environmental impacts of urban and industrial change—long the preoccupation of Europeans—only began to concern Australian environmental historians about a decade ago, even though most Australians now live in urban areas.

Although more than 90 per cent of the population resides in the nation's cities, Australians still tend to identify their continent with “the bush.” This “bush,” regardless of the kind of vegetation, refers to the more sparsely inhabited regions on the map and is most often associated with the continent's inland areas. Despite the seemingly distinct spheres of the Australian city and the bush, these spaces are bound both materially and intellectually. Urban scribes planted the nation firmly in the bush, seeing in the wide brown land a wellspring for their visions of Australia and its settler peoples. Many of

the stories that settler Australians told themselves were narrated through photography, paintings, and poetry. These tended to be intimate stories of harsh landscapes and vulnerable livelihoods, a depiction that recent writers and artists have tried to turn on its head to portray delicate landscapes deeply altered through exploitative, extractive industries. While the works of some of these writers and artists brought certain Australian stories to national prominence—from the poetry of Henry Lawson and “Banjo” Patterson, and the paintings of the Heidelberg School artists in the late nineteenth century, to the writing of Judith Wright, who became deeply involved in the twentieth-century environment movement—this collection brings some lesser-known stories to light for the first time.

This collection reminds us that histories and visions of the environment articulate, and are contingent on, *The More-Than-Human World*, and this is the subject of the first section of the volume. For instance, when the British arrived in Australia to establish the penal colony of New South Wales, they brought animals with them on their ships. Their presence on the continent has shaped livelihoods and landscapes, ecologies and cultures. Likewise, the aquatic world—from oysters to coral reefs—has played, and will continue to play, a significant role in Australian and Australasian environments and identities into the future. In the section *Identifying with Place*, contributors explore the ways that landscapes were often employed to imagine different futures of the Australian continent and how Australia, as isolated as it may appear, was ecologically and culturally connected across the seas. The articles in *Valuing Nature* discuss conflicting ideas and competing visions of Australian environments and natural resources, while the two photo essays in *Seeing Australia: Local and Global Perspectives* interrogate the role of the lens in our relationships with the environment locally as well as globally. They show how attentiveness to what is visible can help to form intimate bonds with specific places, while throwing others into the shadows. The final article by Tom Griffiths, a leading figure in the field, situates this collection within a broader historiography of Australian environmental history. Together, our contributors reveal not only how competing visions have shaped the continent’s ecologies, but also how the continent has shaped visions, lives, and livelihoods for many generations—and will do so for many more generations yet to come.

More-Than-Human Worlds

Jodi Frawley

Oyster Culture in the Estuary Worlds of Southern Queensland

Oysters—*Saccostrea* sp.—once lived in abundance in the complex of estuaries between Moreton Bay and Wide Bay in southern Queensland. Until the 1890s, these estuaries were thick with intertidal and subtidal oysters. As the cities and towns of Queensland grew from the 1860s, locals demanded more oysters from the fledgling oyster fishery. A lover of oysters could buy these Queensland foodstuffs as close as Maryborough or Brisbane or as far away as Sydney and Melbourne. This early trade between 1860 and 1900 saw the destruction of largely self-sustaining populations of oysters. As settlers scrambled to sustain this industry, fishing communities moved from being oyster harvesters to oyster farmers. This change required the introduction of oyster culture technologies. Here, I trace the ways that the culture technologies of Aboriginal, European, North American, and Chinese people combined to create new oyster ecologies in these systems. While this shows the adaptation of older techniques to new circumstances, these changes were not without consequences to the estuary life of southern Queensland.

The southern Queensland estuaries nest between the Great Barrier Reef to the north and the Northern Rivers region, formed through ancient volcanic activity, to the south. These were embayment estuaries, where fresh water from the rivers poured into the large salty bays that were partially sheltered from the ocean swells by barrier islands. There were four ocean-facing sand islands: Stradbroke, Moreton, Bribie, and Fraser. In between the islands and the mainland, the bays were dotted with further islands large and small. Some were ephemeral, shifting with the tides, while others sunk deep roots into the bay, taking on the illusion of permanence. Cyclones, although once infrequent this far south, have been known to tear these islands apart. In 1896, a tropical storm created the islands of South Stradbroke and North Stradbroke when it ripped a new passage through the narrow southern end of the old island. Sometimes, smaller sand islands in the bays disappeared altogether. Although each island's estuary had its distinct ecologies, with both subtle and substantial differences, for those people engaging in oyster fishing in the nineteenth century, these systems were parts of an interconnected whole.

Today, fisheries scientists declare oysters to be keystone species in estuaries. That is, these species act as an anchor to ecosystems and food webs that grow around them. In

nineteenth-century Queensland, oysters provided a number of critical services to their systems. Born free-moving animals, oysters become spat when they attach to substrate material. In both intertidal and subtidal areas, the best substrate for oysters is the older oyster shells anchored together as reefs. In principle, oyster reefs form in the same way as coral reefs: as older animals die, new animals grow on the residual matter. For coral, the skeletal limestone remains of individuals compound into solid structures to house new animals. For oysters, the new animals anchoring onto old shell eventually build enough layers to create large, three-dimensional assemblages. Like coral reefs, oyster reefs are home to a range of other plants and animals. In addition to being food for some species, they are especially important as shelter for juvenile fish and shellfish of the estuary. Additionally, oysters play an important role in filtering the sediment from upstream in southern Queensland rivers. They extract micronutrients for themselves and remove the detritus from the water columns, contributing to the water quality of each estuary.

Local Aboriginal people left huge middens of oysters and other shellfish all over this region. Archaeologists date the earliest remains in these middens to 3–4,000 years ago, although Aboriginal people contest this date, arguing that their occupation was from the beginnings of time. The Dandrabin-Gorenpul peoples of Quandamooka deployed a range of strategies to ensure that subtidal oysters were plentiful in Moreton Bay. They carefully monitored the oyster reefs, translocating young oysters to enhance growth and introducing spent shells to build new substrate. Meanwhile in Wide Bay, the Butchulla people of the Great Sandy Strait focused their stewardship on the intertidal oysters. The colonial war of dispossession, particularly violent in Queensland, left fewer Aboriginal people to steward the oysters. Even so, it is clear that wherever possible these methods of Aboriginal stewardship continued after the first wave of the colonial violence eased in 1860. In 1891, Edward Boulton, the Harbour Master and Fisheries Inspector for Wide Bay, observed oysters being taken from the reefs, separated into groups of three or four for cultivation, and moved to the grass banks and mud flats around the area. Wherever possible, Aboriginal people have stayed in their traditional estuary lands, working in this industry from this period right through to the present. A systematic analysis of their contribution, and what it meant in terms of surviving colonisation, has yet to be undertaken.

Over the course of the late nineteenth century, the Queensland colonial government introduced an aggressive immigration policy to boost its social and economic prospects.

In Maryborough, for example, the closest city to Wide Bay, over 10,000 new settlers arrived between 1870 and 1880. Of these, 3,000 migrated from Germany. Some of them were fishing people escaping the collapse of the fisheries in the Wadden Sea. The community at German Creek in the Great Sandy Strait, for example, secured oyster leases for the Strait from 1886. At least three oyster bars were in operation in Maryborough, in addition to seafood sold on the docks off the fishing boats from Wide Bay. For new arrivals, fish and seafood, including oysters, was a familiar food source in these new urban environments.

The first settler groups to move into the estuaries from the 1860s were not interested in the stewardship of oysters. They were only intent on extracting as many oysters as possible from any given place to reap a financial reward. To meet the growing demand in the cities, oysterers travelled along the coast to find the fattest oysters. While oyster fishers hand-picked oysters from the mudflat areas, they also harvested the reefs by dredging from small boats. In the intertidal area, this entailed breaking the reefs apart with a steel spike to allow oysters to be bagged into 120-dozen lots for market. In the deeper water, fishers dragged a wire-dredging basket along the estuary bed, destroying the reefs as they went. Using these methods, fishers worked oyster reefs for approximately three years, taking off every animal, before moving to the next spot in the estuary. They called this “skinning” the reef, replicating a stage in the processing of terrestrial animals for meat. Oysterers expected that reefs would regrow naturally and that, after a period of time, they would be able to come back to the reefs and start again. To their surprise, they found that once destroyed in this manner, the reefs did not grow back.

This story of decline was not unique to Queensland estuaries: it echoed the destruction perpetrated in New South Wales and across the globe in New York and Chesapeake Bay, and in France, Scotland, and Ireland. Faced with the decline in oysters in this Queensland region, oysterers turned to oyster cultures from abroad to stabilise quantities of oysters for market. In each of these places, governments, scientists, entrepreneurs, and speculators had devised different methods of oyster culture. In Australia, however, a tiny mudworm directed the kind of methods adapted for local estuaries.

Mudworms, *Polydora* sp., like oysters, are also estuary creatures; they co-exist with oysters all over the world. Mudworms co-habit with oysters, boring into the interior shell, collecting sediment courtesy of the filtering from its host, and then secreting a muddy

substance into their shared space. Oysters rebel against these living arrangements by expending energy trying to oust their tenants. Individual oysters end up stunted, and when consumers open these shells, the odour of mudworm excrement assails their senses. Ordinarily, in nineteenth-century estuaries, mudworms caused negligible damage to oysters. From 1880, settlers noticed more depleted oysters in their catch; a problem for people making a living out of the sale of oysters for food. There are two views on why this happened. One blames an invasive species event, making the mudworm from New Zealand responsible for the damage to oysters in these estuaries; the other considers the broader changes to the river ecologies and subsequent sediment loads as a result of land practices associated with Australian colonial capitalism. Either way, the explosion of mudworm populations quelled the oyster trade, with the first mass occurrence in Queensland recorded in Coomera River in 1895, and the subsequent collapse in most of Moreton Bay in 1898.

In 1890, the New South Wales colonial government enlisted zoologist Thomas Whitelegge to investigate mudworms. He observed that oysters from the intertidal area had a lower incidence of mudworm infestations than those from deeper water. After a series of experiments, he showed that mudworms did not like the periods of drying in sunlight at low tide that oysters easily tolerated. This was a fortuitous outcome for oyster fishing, as harvesting from depleted reefs became secondary to the “laying down” of oysters in the intertidal zone. Oysterers shifted their practices from extraction by collection to the invasive processes of oyster farming. The mudworm moved the industry towards an artificial means of growing oysters.

As the destruction of self-sustaining oyster stocks also affected other fisheries in the world, it is not surprising that the migrant populations in the Queensland estuaries experimented with culture technologies with which they were already familiar. All introduced culture technologies focused on collecting free-flowing oyster larvae as it settled and attached itself to estuary substrate, thus becoming oyster spat. When oysters spawned as the water temperature rose, millions of young oysters floated free in the spring seas. Northern hemisphere oyster farmers concentrated on introducing artificial substrate to collect oyster spat. In Italy, they tied bundles of sticks, called fascines, together and hung them in the centre of low-flow lakes. In France, they used tiles laid out in specially made ponds called *claires*. In the United Kingdom, oysterers placed rocks and old shell into oyster areas to expand the oyster growth. In Chesapeake Bay,

Americans combined these European techniques to best effect in their conditions, while in Japan, where culture was already thousands of years old, oysterers strung old shells from bamboo rafts at regular intervals to catch spat. In China, bamboo sticks were carefully placed where oyster larvae settled, sometimes in the intertidal area and sometimes in the subtidal area. Australian oysterers trialled each of these techniques and modified them to the new oyster ecologies of the southern Queensland estuaries.

The oysterers of these southern Queensland estuaries, along with those in New South Wales, tackled these multiple challenges—mudworm, destroyed oyster reefs, and changed river systems—by turning to a techno-fix. Like their northern hemisphere counterparts, they concentrated on collecting the oyster spat; that is, intervening in the life cycle of the animal to increase the population size in captivity. They incorporated Whitelegge's scientific observation by restricting oyster culture to the intertidal area to reduce mudworm numbers. However, in the Queensland estuaries, as elsewhere in Australia, these innovators also used observations of their own. Oysters attached to the intertidal mangroves, and this became a blueprint for what was to come.

One of the simplest methods of collecting oyster spat was the use of fascines. In Europe, this method was used in low-flow lakes. In Australia, oysterers laid fascines along the foreshore. Similarly, two styles were borrowed from China: sticks were built into tents and anchored into the mud flats, or sticks were placed deep into the mud, but in a diagonal pattern that pressed all the sticks together. The tent formation, in particular, mimics the mangrove structures found all over southern Queensland. As with the fascines, the constructions ensured the bundles were anchored against the tide. The advantage of the Chinese method was a larger surface area for the oyster spat—fascines placed directly on the ground lost at least one quarter of their surface area. In both cases, oysterers aimed to provide enough weight with their constructions to withstand southern Queensland tidal flow. Then the oysterers waited for the spat to attach as the weather warmed in the spring months.

Oysterers mobilised a second phase of this kind of oyster culture once the spat attached. Whether with fascines or tents or diagonal arrangements, each stick, with its brood of animals, was individually placed into the intertidal area. From 1889 on, the Queensland government regulated the intertidal areas of these embayment estuaries with oyster leases. Settlers filled acres of these intertidal areas with cultured oysters, concentrating

especially on the perfectly suited mudflats around the barrier and inner bay islands. The deep sticky mud, which regularly caught out unknowing settlers, took each stick and held it steady as the tide came and went each day. The oysters grew, and the mudworm died. Oysterers harvested these areas at the end of a three-year period. They pulled each stick at high tide into the small agile punts that worked all over the bays. At high tide, the mud released her bounty. In the low tide, the drier mud held fast. Fishers knocked each stick, heavy with mature oysters, against the gunwale of the boat, so that the oysters fell and young hands bagged them for market. They then threw the sticks back into the estuary.

All along the eastern Australian coastline, wherever oysterers introduced these methods, they needed a steady supply of timber for the oyster sticks. Whereas bamboo was the timber of choice in China, in Australia mangroves took their place. Australia has 41 species of mangrove; oysterers favoured the black mangroves, *Aegiceras corniculatum*, a water-durable timber evolved to live in brackish water. Harvesters cut the black mangroves down to uniform four- to six-foot-long sticks for use in fascines and tent formations. These sticks survived in the water for around three years before they started to break down, which was fortunately the same time required for oyster maturation; oysterers took advantage of this biological decay. Dealing in mangrove sticks became an important trade in itself. By looking at the export trade records for one river, the Richmond River in northern New South Wales, conservation manager Patrick Dwyer estimates that three million mangrove sticks left that estuary by the 1920s, desecrating the mangrove forests for up to 20 kilometres along the riverbanks. No such historical study is available for the oyster farming areas of southern Queensland. But like the oyster trade's impact on oyster reefs before them, oyster culture devastated part of the estuary ecology, here, mangrove forests.

Oysters are found all over the world. Their briny flavour and their accessibility on the foreshores of most estuaries have made them favourites of coastal peoples on many different continents. As population numbers rose, particularly in cities, during the nineteenth century, self-sustaining oysters became a thing of the past. Settlers replicated this problem in the embayment estuaries of southern Queensland, quickly depleting stocks of abundant oysters. In their wake, oysterers heralded oyster culture as the answer to this environmental problem and adapted spat collection technologies from the northern hemisphere to local ecological conditions. These adaptations reflect the many

different technological skills of the people who lived in the estuaries, reflecting knowledge from Indigenous Australia, England, France, Scotland, Ireland, Japan, or China. Oysterers created new ecologies that demanded the constant presence of oyster people, while guaranteeing the loss of some estuary flora and fauna. Such was the devastation by the 1920s that oysterers looked to new technologies to replace the mangrove stick culture. But that is another story.

Further Reading:

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Nancy Cushing

Animal Mobilities and the Founding of New South Wales

We sailed from the Cape of Good Hope on the 12th of November 1787 . . . [having] provided ourselves with every Article, necessary for the forming a civilized Colony, Live Stock, consisting of Bulls, Cows, Horses Mares, Colts, Sheep, Hogs, Goats Fowls and other living Creatures by Pairs. . . . Thus Equipped, each Ship like another Noah's Ark, away we steered for Botany Bay, and after a tolerably pleasant Voyage of 10 Weeks & 2 Days Governour Phillip, had the Satisfaction to see the whole of his little Fleet safe at Anchor in the said Bay.

– George Worgan, 1788¹

In these few lines from a letter to his brother, surgeon George Worgan provided an account of what had in fact been a gruelling crossing of the Southern Ocean. This was the third and final leg of the eight-month journey by what came to be known in Australia as the First Fleet: 11 ships carrying convicts and their keepers to found the British colony of New South Wales. In contrast with most historians of the venture, but reflecting the priorities of the day, Worgan foregrounded the presence of non-human animals on the ships of the First Fleet. His comparison with the biblical Noah's ark shows his awareness of the importance of these animals to the success of this colonising venture. Just as Noah's pairs of animals were to ensure that the human order could be reestablished after the great flood, the First Fleet animals were to be the progenitors of animals which would allow British life to be transplanted onto a new continent. Drawing upon the journals kept by Worgan and other ships' surgeons, officers of the marines, and seamen on this voyage, this essay will explore the implications of the long distance mobility forced on these animals, focusing on its effect on the relative status of humans and other animals.

The voyage of the First Fleet provides a valuable opportunity to study human-animal relations because ships are one of the “unfamiliar and precarious places” where “intimate and corporeal connections between humans and animals”² can change the usual hierarchies and power relations. The animals had an elevated status while in transit because of their intended role at their destination. Based on observations made during the exploration

1 George Bouchier Worgan, Letter written to his brother Richard Worgan, 12–18 June 1788, State Library of New South Wales' Mitchell Library, Safe 1/114.

2 Jonathan Peyton, “‘A Strange Enough Way’: An Embodied Natural History of Experience, Animals, and Food on the Teslin Trail,” *Geoforum* 58 (2015): 15.

of the east coast of Australia by Lieutenant James Cook in 1770,³ the planners of the expedition knew that the animals of New South Wales were very different from those around which British society had developed. In order to succeed at settling this unfamiliar place, populations of non-human co-colonisers would have to be established, as had occurred as Europeans moved into the Americas and Africa. The First Fleet animals were not purchased to be eaten on board, or as live exports to be sold for consumption at the journey's end. Nor were they cargo, like the salted meat stowed in the holds of the store-ships, packed into casks to be doled out as rations in the colony. Rather than "livestock," a term which draws attention to the animal as a living embodiment of a certain monetary value, the food, fibre, fertilizer, transport, and power they would provide for the colony in the short term, and their capacity over time to form the foundation of an entire economy made them priceless. Given this central importance to the venture, the safe passage of the domestic animals on the First Fleet was a high priority, and their needs were ranked as equal to and in some cases greater than those of their human travelling companions.

The privileging of animal wellbeing over that of humans was clear in the planning and conduct of the First Fleet. Decisions made based on the welfare of the animals added both to the costs of the voyage and to the discomfort of the human travellers. Some small domestic animals, including sheep, pigs, rabbits, dogs, and cats were carried from Britain, and more were purchased at Santa Cruz and Rio de Janeiro for use on the voyage, but most of the foundational stock for New South Wales was purchased in the Dutch Cape Colony, shortening the duration of their journey to one quarter of that endured by their human shipmates. Even so, at two and a half months, this was a longer voyage than animals had had to withstand when they were drafted to assist in the European colonisation of the Americas and Africa. The decision to minimise the animals' journeying meant that the British colonists had to adapt to varieties of animals which seemed peculiar and deficient to them, including unruly Cape cattle, with their wide horns removed for the journey, and fat-tailed sheep with hair instead of wool.⁴

3 Cook described the kangaroo, for example, as somewhat like a very large jerboa but bearing no resemblance to any European animal he had seen. James Cook, *James Cook's Journal of Remarkable Occurrences Aboard His Majesty's Bark Endeavour, 1768–1771*, National Library of Australia, <http://nla.gov.au/nla.cs-ss-jrnl-cook-17700714>.

4 The exact numbers of animals purchased by Phillip on behalf of the government were: 4 mares, 1 stallion, and 3 colts who travelled together on *Lady Penrhyn*; 6 cows, a bull, and a calf loaded onto the *Sirius*; and 120 sheep, 4 goats, 28 hogs, and a large number of fowl shared between the *Sirius* and the *Fishbourne*, *Borrowdale*, and *Friendship* store-ships (*The Journal of Philip Gidley King, Lieutenant, R.N. 1787–1790* (Sydney: Australian Documents Library, 1980), 22). The number of goats and hogs comes from Hunter's journal. His estimate of the number of sheep as 44, also recorded by Marine Officer Watkin Tench, is taken as more reliable than that provided in Phillip's journal, which was assembled after the fact. The additional animals purchased by the officers for their own use during the voyage and for breeding in New South Wales were less closely accounted for than the government herds.

The loading of these Cape animals caused considerable disruption on the already congested ships. There was not much space to share, with the vessels ranging in size from the flagship *Sirius*, at 33 metres long and 10 metres wide, to the *Supply*, just 21 metres long and 8 metres wide, already carrying 1,500 people and assorted domestic animals, plus an unknown number of free-living animals ranging from rats to lice. On the *Sirius*, master's mate Daniel Southwell said that the new additions "lumbered the ship and crowded out the passengers, one of whose decks they now occupied."⁵ The guns were removed from the ship's main deck to enable the carpenters to build stalls, pigsties, and other enclosures. *Sirius* then had to depart from Cape Town without observing the usual courtesy of firing a salute, a rather delicate breach of protocol.

Special provisions made for the animals affected all of the human voyagers, but especially the convicts. Once at sea, everyone on the Fleet was put on rations of just 3 pints (1.4 litres) of water per day in order to ensure there was enough for the livestock. Animals travelled on the upper decks, to which convicts were only admitted at specific times of the day, in fixed numbers and under strict supervision. In some cases, manure seeped through the decking onto the convicts below. Convicts were also moved between ships to accommodate the animals. A group of convict women was taken off the *Friendship* at the Cape to make space for 30 sheep. Thomas Kelly, whose qualifications included having been convicted of horse stealing at York, was moved from the *Alexander* to the *Lady Penrhyn* specifically to look after the horses. Meeting the needs of the animals meant impinging on the resources used by lower-ranking humans.

Even given their favoured status, animals suffered greatly on the voyage. Many of the threats to their wellbeing were linked directly with movement. While travelling the vast distance between continents, pushed along by the winds of "the roaring forties" (the band of strong westerly winds found in the Southern Ocean between 40 and 50 degrees latitude), their immediate freedom of movement was restricted by stalls and enclosures. Although these partitions were intended to protect them from the rolling and bucking of the ships, and from the sea water which periodically swept the decks, they could readily become a hazard. On New Year's Day, the chicken coops on the *Lady Penrhyn* gave way in a storm and smashed the goat house to pieces, laming its inhabitants. After two months at sea, Captain John Hunter reported that the cattle were

5 John White, *Journal of a Voyage to New South Wales*, ed. Alec Chisholm (Sydney: Angus and Robertson, 1962), 242, note 1.

weak and badly bruised from being knocked off their feet by the violent rolling of the *Sirius* and regretted that the ship was so poorly fitted out for them. The idea of further limiting their movement by supporting them in slings, as was often done when shipping horses over shorter distance, was rejected out of concern that this immobilisation would lead to a greater loss of strength.

Anxiety over the welfare of the animals with whom their future fortunes were entangled resulted in regular, although terse, references to them by those who kept journals on the voyage. Surgeon Arthur Bowes Smyth's account contains a catalogue of animal death caused by ill health and misfortune on the *Lady Penrhyn*: "9 fowls found dead this mornng.; last Hen Pigeon overboard & drowned; one of the Cape Sheep died of the Cold; a fine Kidd frighten'd overboard & drowned." All of the writers worried about the loss of vigour and life amongst their more-than-human shipmates, but they lacked the knowledge and resources to do anything about it. Looking for somewhere to place blame, they struck out, accusing the Dutch colonists at the Cape of being rogues who had sold them diseased stock and poor quality hay, even of poisoning the animals. They urged the ships on and prayed for fair winds to bring them to Botany Bay as quickly as possible. So eager were they to protect the lives of the animals that a risky stopover to collect fodder on the unknown coastline of Van Diemen's Land was contemplated.

One of the diarists allowed his emotional investment in the animals more free expression than most. This was Marine Second Lieutenant Ralph Clark, best known in Australian historiography for furnishing feminist historian Anne Summers with half of her memorable title, *Damned Whores and God's Police* (1975). True to form, Clark welcomed the replacement of convict women with sheep on the *Friendship*, anticipating that the sheep would make "much more Agreeable Ship mates." He expressed far more empathy for the sheep than for the women, noting on several occasions his wish that the journey would be over for the sake of the poor sheep. He wrote movingly of one ewe who was too weak to give birth to twin lambs and had to have them pulled lifeless from her body.

All were elated when they finally reached Botany Bay by 20 January 1788. The precious animals were provided with fresh grass, but kept on board for another 10 days after arrival in Botany Bay while a site for the settlement was selected and space was created for them on the land of the Gadigal people at Sydney Cove. Taking stock after



Figure 1: Animal imports continued with colonisation, including this breed of cattle from Bengal in India. Source: JW Lewin, Launceston, 1809, Mitchell Library, State Library of NSW, PXD 388 v. 2 no. 6.

three months in the colony, the commissariat tallied their meagre numbers: fewer than 10 horses, cattle, and rabbits; 29 sheep; and 19 goats. Pigs were the most numerous introduced mammals at 74, by then including litters of colonial-born piglets. Turkeys, geese, ducks, and chickens numbered almost 300.⁶ Although confined behind fences and kept under watch, within a few months the cattle had decided to continue their journeying and made their way to the rich grasslands along the Nepean River near present day Camden, some 60 kilometres from Sydney Cove. Their self-directed mobility allowed them to prosper, possibly herded by the Muringong people, having built their numbers to 60 when they were rediscovered in 1795. Like many other early settlers, they were accorded naming rights to the land they had personally occupied and it became known as the Cowpastures, until their home was granted to controversial pastoral pioneer John Macarthur who renamed it Camden Park in 1806. Over the next century, goats, horses, pigs, and rabbits also established free-living populations, affecting vast areas of the continent through their unceasing mobility.

⁶ Arthur Phillip, *The Voyage of Governor Phillip to Botany Bay* [1789] (Sydney: University of Sydney Library, 2003), Chapter 11.

The First Fleet was the first of thousands of voyages made to Australia during the colonial period. Many of those ships carried domestic livestock. The Cape of Good Hope continued as a source of animals, as did other established colonies in the region, including those in India and in the Dutch East India Company's strongholds in what is now Indonesia. By the early nineteenth century, more animals were being carried all the way from Britain to the Australian colonies, and the stocks which had been established in the first Australasian colony were themselves being shipped to new areas of settlement elsewhere on the continent, in New Zealand, and later in the French colony of New Caledonia. Setting aside some pedigree breeding stock, few of these animals had the degree of care invested in them that those on the First Fleet had enjoyed. When Australia shifted from a net importer of live animals to an exporter in the mid-nineteenth century, welfare standards plummeted, leading ultimately to the current controversies over the live animal export trade.⁷

This essay has explored the more-than-human entanglements of the final leg of the voyage of Australia's First Fleet through the lens of animal mobilities. Worgan described the voyage as "tolerably pleasant" but for the livestock, this was far from accurate. Even with the efforts made to preserve their life and health, all had suffered from the shock of the transition to shipboard conditions, a lack of food and water, and the physical strain of the constant movement on rough seas. Despite the losses, the priority given to the animals was significant. Their importance to the colonial project challenged what was then seen as a natural order, directing resources, attention, and even emotion preferentially to them not as livestock but as co-colonisers. Mobility temporarily blurred the familiar hierarchy between humans and other animals.

7 Nancy Cushing, "'Few Commodities are More Hazardous': Australian Live Animal Export, 1788–1880," *Environment and History*, forthcoming.

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Karen Twigg

An Unruly Neighbour: Wimmera Ryegrass¹

Weeds, like European settlers, arrived in the temperate regions of Australasia and the Americas as opportunistic colonisers. Weed seed hid in stock feed, lurked in clothing, or clung to the bodies of livestock. Roads and railways hastened their spread and newly cleared land promoted the distribution of wind-borne seed. Pre-adapted to flourish in disturbed soil in competition with crops, many weeds found conditions in the new lands very much to their liking. The predators and pathogens that had kept their numbers within bounds in their homeland frequently did not exist, nor did many of their natural competitors. As native plants were uprooted in favour of European crops, and capitalist markets pushed farmers towards monocultures, there was an accompanying explosion of weeds that has continued into the present.

The very subjectivity of the term “weed” offers fertile ground for the environmental historian. While weeds often share “weedy” characteristics, such as a propensity to flourish in disturbed ground and to produce vast numbers of seeds that are readily dispersed and germinate rapidly, the label we give such plants is highly dependent on time, place, and circumstance. The following parable of Wimmera ryegrass offers a case in point. Farmers routinely classify plants as weeds (useless) and crops/pasture (useful), but Wimmera ryegrass has confounded such categories. It has been the focus of vitriol when it appears in a wheat crop, but relief when it feeds hungry stock. Originally planted as a pasture grass, Wimmera ryegrass flourishes in the wheat-dominated, dryland cropping belt of southern Australia, a region of roughly twenty-five million hectares characterised by a Mediterranean-style climate. Vigorous, succulent, competitive, and vastly adaptable, Wimmera ryegrass has shaped farming practice in this region in a way equalled by few other plants. In more recent times, its agility has compelled farmers and scientists alike to pay greater attention to its biology and ecology, learning to limit its spread by “thinking like a weed” rather than by dousing it with herbicide.

1 This work was supported by an Australian Government Research Training Program Scholarship. I would like to thank Bill Twigg, Professor Katie Holmes, and Professor Andrea Gaynor for valuable comments on earlier drafts. “Unruly neighbour” is a term used by Clinton Evans in his book *The War on Weeds in the Prairie West: An Environmental History* (Calgary: University of Calgary Press, 2002), 177.

Pasture

Wimmera ryegrass is an annual grass capable of growing to almost one metre in height. Its thin green leaves have a distinctive purple-reddish tinge at the nodes and at the base of the plant. Flowers form in spring on long spikelets and the clouds of pollen they release cause hay fever sufferers to reach for their tissues. Underground it produces a network of fine roots, adept at pulling moisture and nutrients from the soil. Its presence in Australia was “discovered” in 1918 by Hubert Mullet, Chief Field Officer with the Victorian Department of Agriculture, after he noticed an unfamiliar grass growing on several farms in the Wimmera, the state’s western cropping region. Despite low rainfall, the grass was thriving and Mullet’s interest was immediately aroused, since the absence of reliable forage pastures had long concerned Australian agriculturalists.



Figure 1:
Wimmera ryegrass
plant with roots.
Source: Bill Twigg

The government botanist identified the grass as *Lolium subulatum* (commonly designated *Lolium rigidum*), a native of the Mediterranean and one of eight species of ryegrass grouped under the genus *Lolium*. Mullet gave it the local name of Wimmera ryegrass. On its home territory in the Mediterranean, *Lolium rigidum* grew sedately, apparently prompting little notice. In the Wimmera, the ryegrass had originated from seed imported and distributed by a farmer, but in both South Australia and New South Wales immigrant seeds had already found a tentative foothold and naturalised.

Mullet published the results of his investigations in the Victorian *Journal of Agriculture* in 1919. Wimmera ryegrass held the potential to be “a ‘paragon’ among grasses,” Mullet believed, since its vigorous growth promised to double the number of sheep a farm could carry; the seed and dry stems provided feed in summer; and it reproduced itself from seed, precluding the need for re-sowing. Nevertheless, he was also aware it might transform into “one of the worst of pests” since the extent to which it might compete with wheat remained untested, and he cautioned wheat growers to “watch it carefully.”

Mullet's article was widely reported and prompted intense interest. Subsequent trials at government research stations proved that Wimmera ryegrass could flourish in variable soil types and climates. Individual farmers, particularly those who saw sheep as a key strand of profitable wheat farming, embraced Wimmera ryegrass. Nevertheless, it was not until the postwar years that Wimmera ryegrass emerged as a permanent inhabitant of most cropping farms. Legume pastures, such as subterranean clover and medics, began to be rotated with cereal (the ley farming system), adding much-needed nitrogen to the soil and prompting a dramatic increase in wheat yields and grain protein. Between 1945 and 1965, the area devoted to ley pastures increased threefold and Wimmera ryegrass—described as the farmer's "old friend"—was widely sown with legumes to create a healthy pasture mix. At the same time, booming prices for wool and lamb placed a high premium on nutritious stock feed, and Wimmera ryegrass was celebrated for its role in helping farmers to expand their sheep flocks. While ryegrass forced farmers to spend additional time on the tractor in order to extirpate ryegrass before sowing, the contribution it made to the farm's bank balance was seen to justify the extra effort.

Pasture and Weed

Mullet had worried about the "controllability" of Wimmera ryegrass but these fears seemed scarcely entertained in the 1950s. In the following decade, farmers reacted with shock, therefore, when ryegrass broke bounds and bolted, refusing to be confined to one particular phase of the farming cycle but flowing out in an unruly surge of green to invade wheat crops. Oral history informants testify to this abrupt transformation. In the past, farmers who were diligent in working their paddocks before sowing were almost invariably rewarded with a "clean" crop. Now suddenly it seemed they couldn't work the ground fast enough, and as soon as tractors had passed over one portion of a paddock, new ryegrass seedlings sprouted in their wake.

There was a perception that the behaviour of ryegrass had changed. It was in fact the reverse; farming techniques had altered and ryegrass had promptly responded. The introduction of legume pastures had replenished soil previously depleted by bare fallowing and overgrazing, and in the process had effectively created a new ecosystem, allowing Wimmera ryegrass (and indeed a host of other weeds) to grow and seed more abundantly. Mechanisation also played a role: the escalating numbers of tractors permitted

paddocks to be worked more easily and frequently—to the delight of ryegrass seeds that germinated rapidly in disturbed soil. The new-style headers also took longer to separate and expel harvest residues, allowing ryegrass seeds that were caught up in the chaff to hitch a ride and be distributed freely across a paddock.

Ambiguity came to define Wimmera ryegrass during this period. Designated a weed one year and a pasture the next—depending on whether a paddock was used for cropping or grazing—it sat uneasily on the border of wild and domestic. The introduction of early herbicides had little effect, since the status of Wimmera ryegrass as a grassy cousin of wheat protected it from chemicals such as 2,4-D, designed to target broad-leaved weeds but offer no threat to grasses. Indeed, by removing many of rye’s competitors such as wild mustard, 2,4-D may even have assisted its spread. Eventually, the introduction of glyphosate and pre-emergent herbicides, such as trifluralin in the 1970s, gave farmers back a measure of control. Used in conjunction with cultivation, these herbicides appeared to allow the unruly nature of Wimmera ryegrass to be reined in, creating the illusion that it could be corralled into a particular phase, allowed loose only where and when it was needed.

Weed

The widespread adoption of no-till—a method of farming that allowed crops to be sown with minimum soil disturbance—meant that this situation changed in the early years of the twenty-first century. While no-till methods improved soil structure and moisture retention, the new focus on continuous cropping as well as falling prices for wool largely squeezed sheep out of Australia’s southern cropping belt. Shearing sheds and sheep-proof fences fell into disrepair, and alternating crops of wheat, barley, canola, lentils, and field peas replaced fallow and pasture.

The absence of sheep meant that Wimmera ryegrass (now known more typically as “annual ryegrass” in Australia) lost a valuable ally and its status as “weed” became increasingly absolute.² Farmers without sheep or pasture no longer had any reason to be charitable and their “old friend” was rapidly reimagined as an outlaw. The nimbleness of Wimmera ryegrass in evading herbicides also strengthened its outlaw reputation,

² In Australia, annual ryegrass denotes *Lolium rigidum* (or Wimmera ryegrass). In the United States, Canada, and the United Kingdom, however, the term annual ryegrass is more typically used to describe another species of ryegrass, *Lolium multiflorum*.

the sheer scale of its geographic spread, as well as the genetic diversity of its seeds, increasing the likelihood of natural resistance. The first stands of herbicide-resistant Wimmera ryegrass were encountered in southern Australia in 1982, and since then the incidence of resistant populations has multiplied. Periodic surveys in Western Australia have attempted to monitor this growth, the most recent survey finding that 95 per cent of Wimmera ryegrass stands are resistant to one or more herbicides.

The ubiquity of herbicide use across the globe has imposed an intense selection pressure on all sorts of weeds. Wimmera ryegrass, however, boasts resistance to 11 different herbicide modes of action—more than any other plant on the planet.³ A troublesome weed in parts of Western Europe, the Middle East, and South America, Wimmera ryegrass is now considered the most significant grass weed of the Australian southern cropping belt.

Ironically perhaps, this has prompted a greater sensitivity to the ecology and biology of Wimmera ryegrass and led to a plethora of research projects and papers. While herbicides arguably encourage a “one size fits all” mindset, with each herbicide mode of action designed to kill many weed species, the need for a non-chemical response has encouraged scientists to reframe Wimmera ryegrass (and indeed other weeds) as a “plant” with particular physiologies and growth patterns that might be usefully manipulated if only they are understood.

A New Paradigm?

Roy Harrington, a Western Australian farmer, is an expert on weed seeds. Since 2005 he has been on a mission to destroy them. “I tried everything, from cooking, cremating, and catching weed seeds,” he recalled before eventually deciding that smashing them presented the most effective method.⁴ Modifying a cage mill previously used to crush coal into dust to make barbecue briquettes, Ray worked with the Australian Herbicide Resistance Initiative based at the University of Western Australia to develop his idea.

3 I. Heap, “Global Summary: Herbicide Resistant Weeds by Species and Site of Action,” *The International Survey of Herbicide Resistant Weeds*, updated 17 February 2017. <http://www.weedscience.com/> (Accessed 20 February 2017).

4 “Harrington Seed Destructor,” *Weed Smart*. <http://www.weedsmart.org.au/harrington-seed-destroyer/> (Accessed 14 August 2016).

A prototype “weed destructor,” towed behind a harvester to catch and macerate the seed-rich residue it expelled, was tested on Wimmera ryegrass. It proved a success—although a small proportion of the seeds remained viable—and the first commercial “Harrington Weed Destructor” was released for sale in 2014, soon followed by an integrated harvester model.

Self-consciously described as “a new paradigm for global agriculture,” the Harrington Weed Destructor is part of a suite of measures aimed at intercepting weed seeds before they reach the relative safety of the soil, including collecting harvest residue in chaff carts, burning the residue in narrow windrows, or compressing it in bales for stock feed.⁵ Based on an impressive body of research, these strategies aim to exploit the identified “biological weaknesses” of Wimmera ryegrass and other vigorous weeds such as wild radish; in particular their propensity to retain rather than shed their seed at maturity.

Such research rested on but also encouraged a new appreciation of the distinctive qualities of Wimmera ryegrass and especially its seeds. Wimmera ryegrass seeds are flat, straw-coloured, around 4 mm in length, and so light they are easily transported by wind, water, and animals. They seem deceptively fragile. Yet despite the spraying, squashing, burning, cutting, and zapping to which they have been exposed in recent years, they continue to persist. The reason owes a great deal not just to the seeds’ genetic diversity, but to their extraordinary numbers. A dense stand of ryegrass with access to plentiful moisture can produce up to 45,000 seeds per square metre. If it is harvested for sale as pasture seed for sheep farmers, it can yield a tonne of seed per hectare.

While a growing stand of Wimmera ryegrass offers an easily visible target for control, it is the hidden seed bank that represents the plant’s secret weapon. Despite efforts to extirpate the seed before it reaches the ground, its sheer quantity ensures that some always finds its way into the soil. Once there the seed has another trick up its sleeve: variable dormancy. In Mediterranean-style climates, dormancy has evolved as a protective mechanism to stop seeds from germinating after unexpected summer rains when it would be too hot for them to survive. Most ryegrass seedlings germinate after the first autumn rains, but some seedlings (those with increased dormancy) spring up across the growing season. It is an impressive evasive tactic, allowing Wimmera ryegrass to dodge

5 Michael Walsh, Peter Newman, and Stephen Powles, “Targeting Weed Seeds In-Crop: A New Weed Control Paradigm for Global Agriculture,” *Weed Technology* 27, no. 3 (2013): 431–6.

pre-sowing weed control and survive to replenish the seed bank. Ryegrass's dexterity has increased even further under continuous cropping, with larger numbers of ryegrass seed inclined to lie low, even in the face of early rain, only choosing to emerge when the pre-planting regime of tillage or herbicide spraying has been completed.

While there is growing knowledge, and perhaps respect, for Wimmera ryegrass's exceptional adaptability, farmers face the daily challenge of living with this plant. "Integrated weed management" has become a buzzword, but choosing where, when, and which weed control strategy to use is complicated, and the only thing that is certain is that ryegrass will eventually kick over the traces again. The Harrington Weed Destructor might restrain it for a time, but will Wimmera ryegrass respond with earlier flowering or seed shedding plants? The consensus is, "Probably."

In the brave new world of the future, sophisticated agricultural robots—or agbots—are envisaged and indeed prototypes are already in operation. Agbots have the capacity to trawl up and down a paddock, day and night, using sensors to target weeds. Such weed control might include microwave technology, paving the way, as one researcher has suggested, for herbicides to be phased out and for the broad acre production of organic grain to become financially feasible. Will weeds such as Wimmera ryegrass cooperate in such a vision, however? Current research into microwave technology has focused on Wimmera ryegrass as its test plant. While initial tests have yielded success on moist seed, five times the level of radiation is needed to vanquish dry ryegrass seed, limiting the economical viability of the technology. Like the other forces that have been arrayed against it, Wimmera ryegrass appears set to also defy this new weed control strategy.

Conclusion

Wimmera ryegrass offers a potent illustration of evolution in action. While seemingly reliant on human behaviour for its existence, and exquisitely responsive to changes in the agricultural environment, it has also remained outside human control, its adaptations frequently forcing farmers and scientists alike to play "catch-up." When I interviewed wheat farmer Bruce Godwin, he recalled the great promise Wimmera ryegrass seemed to hold when it was first sown in his district. His final comment, however, was, "Everyone wishes now they had never brought the blessed stuff in. It's wonderful feed but knocks your wheat

around like nobody's business." Although Bruce's reflections convey something of the changing human responses to this plant—from cherished pasture to reviled weed—the story of Wimmera ryegrass defies simple binaries of good and bad, suggesting instead that in the process of seeking knowledge about such a plant we are just as likely to learn more about ourselves and the unintended consequences of our own farming practices. Rather than “friend” or “outlaw,” Wimmera ryegrass might be better understood as “unruly neighbour,” with control measures resting on respect for its unique adaptability.

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Identifying with Place

Katie Holmes

Making Masculinity: Land, Body, Image in Australia's Mallee Country¹

The relationship between masculinity and the environment is an area to which sociologists and cultural geographers have been more attentive than historians. But understanding the gendered identities of men plays an important part in helping us think through the ways in which they shaped and were shaped by the environments in which they lived and laboured. This is particularly true in rural contexts. The entangled relationships between men's bodies, animals, machines, and the land they worked are in turn connected to broader understandings about nationhood, settlement, and the Judeo-Christian imperative to subdue the wilderness. In Australia these ideas developed in tandem with modernity and one of the most ubiquitous ways of capturing the change: the camera.

In this paper I explore these ideas through a selection of photographs taken by Bill Boyd, a young man living on his family's farm near Sea Lake in the Victorian Mallee in the 1920s (figure 1). Bill was 19 when he began taking photos using a mail-ordered Kodak camera. He bought it with money earned from rabbit catching and, captivated by the technology, taught himself how to take, develop and print his photos. The farm's four-foot square grain-stripper doubled as his dark-room—surely a first—and Bill became a prolific recorder of Mallee life. The modern technology of the camera stands in sharp contrast to the subject of Bill's photographs: a pre-industrial world, where machinery was horse-powered, physical labour was unrelenting and exacting, and daily life was devoid of luxury or even ordinary comforts.²

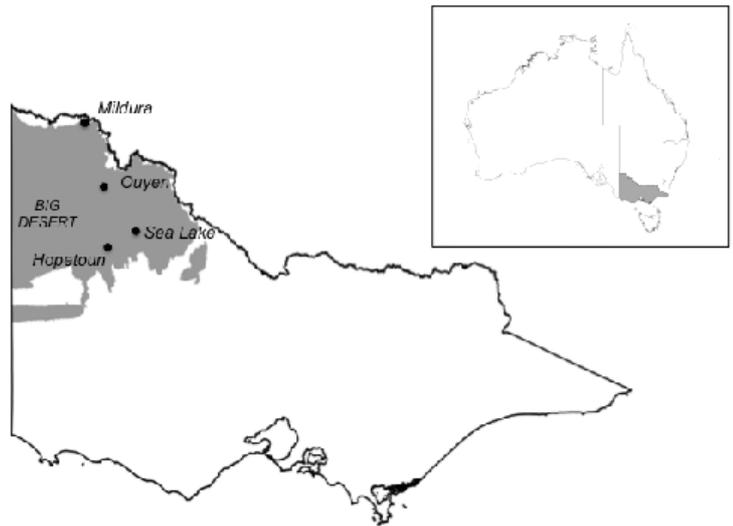


Figure 1:
Map of the Victorian
Mallee. Courtesy of
Andrew Butt.

- 1 Special thanks to Liz Conor and Tasha Weir for their helpful suggestions on this paper and to the Melbourne Life Writers group for their critical engagement with it.
- 2 All photographs in this essay are taken from the Bill Boyd Photographic Collection, Museums Victoria. Photographer: William (Bill) Boyd.

The 4.5 million hectares of the Victorian Mallee comprises about one fifth of the state's total land mass. It is mostly flat, sandy country, the legacy of the land's ancient inundation by the sea during the Paleozoic age. Summers in the Mallee are hot and dry, winter rainfall is modest, and droughts are recurrent. The Victorian Mallee is part of a broader mallee ecosystem that encompasses disparate parts of South Australia, Western Australia, and New South Wales. Prior to European clearing, the mallee lands in Victoria were once a forest of the unique *Eucalyptus dumosa*, or mallee as the original owners called it. The mallee tree can reach five to eight metres in height, and have up to six stems growing from lignotubers—a woody root crown containing starch and moisture—under or just above the ground. Indigenous people used these lignotubers as a water source in an otherwise predominantly dry landscape. From the earliest European descriptions of the area, the landscape was portrayed as actively hostile to European incursion. In spite of this, intensive European settlement of the Mallee began in the 1880s. Bill Boyd's family was amongst the second wave of settlers to the Mallee when his father took a lease on a 360-acre block in 1912.

In the late nineteenth century, the development of specific technological inventions designed to enable the relatively cheap and efficient clearing of the mallee, namely the "Mallee roller" and the stump-jump plough, helped fuel a fantasy that the Mallee could be "tamed." But the realities of droughts, the absence of a reliable water supply, and the nutrient-poor soil proved insurmountable obstacles to many would-be farmers. A distinct Mallee identity was attributed to those who stayed and persevered. The Mallee-made man was shaped by the landscape and the climate; by the work he did and the privations he endured; by stiff work, failure, success, monotony, heat, and rain. While many of his characteristics were exaggerated features of the nation-making pioneers who battled hardship to triumph over a hostile land, he was endowed with further qualities that were seen as products of the distinctive Mallee environment and the work he performed there. The key features of this were clearing the land, battling with Mallee roots ("scrubbing"), the sowing and harvesting of wheat, and coping with drought. Mallee farming required "wise judgement, great foresight, boundless financial and physical resources, and infinite adaptability."³

3 *Mildura Cultivator*, 6 January 1912, 4.

The 1920s was a decade of intensive settlement in the Mallee. The Australian government was keen to populate the interior and through the Empire Settlement Scheme and the Soldier Settlement Scheme leased small blocks of newly released farmland to returned servicemen. No deposit was required, leaseholders were exempt from payments for three years, and cash advances were charged at lower interest rates than the government paid to borrow money. Settlers needed to demonstrate “improvements” to be eligible to continue the leasehold arrangement: clearing, fencing, digging dams, building a house. The activities of clearing, scrubbing, sowing, and harvesting progressed apace.

As the Mallee became peopled with white settlers, Bill Boyd set out to document their presence and their labour. He was an astute observer. There are many images of families and children, sporting and community events, but particularly striking is his careful documentation of men at work and at leisure. The images are a paean of praise to Mallee masculinity. The masculinity being recorded and created here is one of an intense relationship between men, their animals, machines, and the landscape they inhabited. While there are elements of a “frontier-pastoral picture of masculinity—good tough men growing from a tough, remote, rural environment,”⁴ the men’s engagement with agriculture and with the closer settlement project reflects a different understanding of masculinity. These were family men growing the civilizing food of wheat. But their families only enter the frame in portraits or when firmly attached to the domestic sphere. In Boyd’s images, women are completely excluded from the working fraternity of Mallee men who engaged in a shared endeavour to transform the mallee scrub into productive fields of wheat. In this, Boyd’s images also speak to a broader legend of the nation-making pioneers—the settlers who battled a hostile environment to ultimately triumph over nature.⁵

Boyd’s images naturalised white men’s relationship with the land, with farming, and with animals. It was an embodied relationship, reflected and created through the photograph. The images reinforced several understandings of Mallee masculinity: that men had power and control over the natural environment; that men not women worked the land and operated farm machinery; and, by implication, men’s rather than women’s labour was central to the nation-making activity of agricultural settlement.

4 Raewyn Connell, “Country/City Men,” in *Country Boys: Masculinity and Rural Life*, ed. Hugh Campbell, Michael Bell, and Margaret Finny (London: Penn State University Press, 2006), 258.

5 J. B. Hirst, “The Pioneer Legend,” *Historical Studies* 18, no. 71 (1978), 316–37.



Figure 2:
Mallee scrub with
cleared track 1921.

Clearing was one of the key activities of Mallee settlers. Figure 2 depicts a newly grubbed road through the mallee scrub, with Bill's bike leant against a tree to provide a sense of scale. The initial work of clearing this scrub, or "rolling down the mallee," is depicted in figure 3. Bill's father used a team of bullocks and a Mallee roller to flatten the mallee bush. The foregrounded machinery, constructed from a tree stump, is crude, but it was devastating in its power. From a vantage point of power and mastery, Bill Boyd senior surveys the trees, now reduced to sticks on the ground. The Mallee would be subdued, and stockwhip in hand, the bullocks controlled. The work of clearing is repeatedly referred to in descriptions of Mallee men; it was a defining

activity of settlement and mastery. But such control was transitory. The distinctive nature of the mallee tree made clearing difficult and protracted. Roots that were not cleared, or "grubbed," would continue to sprout. This too was the work of men and boys, as another image of Boyd's father and younger brother at work slashing mallee roots as



Figure 3:
Bill Boyd senior
"rolling" the mallee

they grew amidst a crop of wheat, suggests. In time the mallee root would be used as a metaphor for the men and women of the Mallee: “tough, resilient, drought resistant and able to spring forth with new growth when times are good.”⁶



Figure 4:
Ploughing with a
stump-jump plough

Sociological work on rural masculinity suggests that its quintessential features position men as dominating nature and conquering the landscape. “Good” farmers tame the elements to produce crops and manage livestock. They overcome nature’s vagaries and uncertainties.⁷ In the Mallee, as in rural areas across the world, the introduction of technology was men’s business, aiding and abetting the physical work for which they were responsible. Men harnessed their horses to the plough, and to the harrow, stripper, and harvester (figure 4). While other versions of Australian rural masculinity stressed the need for excellent horsemanship, early Mallee farmers needed to be skilled at managing a team of horses and in “the manly art” of ploughing.⁸ Man, horse, and machine became harnessed to the ambition of controlling nature, transforming the land, and making the nation. As the *Ouyen Mail* put it in 1922: “Look at that team slowly swinging ahead of the gang-plough or the drill! Why, right here is a moving picture of the making of a nation. The Mallee is a

6 Culture Victoria, entry in “Women on Farms Gathering, Swan Hill, 1995,” accessed 30 August 2016, <http://www.cv.vic.gov.au/stories/land-and-ecology/women-on-farms-1/icons-mallee-root-grumpy-cap-stone-women-on-farms-gathering-swan-hill-1995/>.

7 Jo Little, “Embodiment and Rural Masculinity,” in *Country Boys*, 189.

8 Catharine Anne Wilson, “The Manly Art: Plowing, Plowing Matches, and Rural Masculinity in Ontario, 1800–1930,” *The Canadian Historical Review* 95, no.2, (2014), 172.



Figure 5:
The Boyd's wagon at
Nyarrin

big study in the story of Australian development.”⁹ Boyd’s farmers look comfortable and relaxed with their machines and their animals. Mostly the horses are photographed from behind, reinforcing the power of their bodies and the skill of the men who drove them. The images naturalised and celebrated the relationship between men, land, and machine and the transformational work they enacted. As mechanisation entered the Mallee, the power of the tractor became an extension of the man at its wheel.

Labour shaped men’s bodies in particular ways. Mallee men were wiry and fit. They developed broad shoulders and strong backs. Boyd’s images of men carting and stacking bags of wheat focus on this physical prowess, on what a male body can effect (figure 5). Wheat lumpers walk the plank, circus-like, to stack the wheat one bag at a time. Boyd captures the drama of this spectacle, men with muscle-bulging strength, so focused on a task that they don’t even lift their eyes to the camera. His images celebrate this masculinity at work and the bodies it builds. As Raewyn Connell argues, “The materiality of male bodies matters.”¹⁰ This is an earned masculinity, its status is not in dispute.

9 *Ouyen Mail*, 12 July 1922.

10 Raewyn Connell, *The Men and the Boys* (Cambridge: Polity Press, 2000), 59.



Figure 6:
Harvest home

The physical strength of the men in Boyd's images conveys more than just the nature of their labour; it suggests their capability to work this land, their readiness to confront its challenges.

Boyd's men at leisure display a similar confidence. The pre-modern, arcadian feel of figure 6 depicts a fraternity of working men celebrating the "harvest-home." They share a homosocial space, a sense of connection and ease borne from shared endeavour. The wicker basket contains a demijohn of beer that they may have already opened. The frayed clothing and the worn boots of the central reclining man, Harold Down, hint at the poverty to which most of these men were accustomed. In another photograph, not reproduced here, Harold Down is also pictured standing in front of his stripper, his Turneresque haystack, and next season's seed. His stance is confident, alone, proud of the produce he has extracted from this otherwise featureless landscape.

A gendered and racial apartheid is evident in Boyd's images. While there are many images of women, they are always attached in some way to the domestic sphere. The broader Mallee landscape was the place for men and masculine activity. Women and children enter this space to take morning tea to the working men. Theirs is a walk-on role and they are never photographed working the land. We know from oral and written evidence, however, that women and girls did sometimes work alongside



Figure 7:
John & Wally Holt

his disability is unknown, but his stance and gaze lack the direct confidence of his father's, standing on the left of the photo. In 1921, the year before this photo was taken, Wally's mother Mary wrote to the Closer Settlement Board of spending 13 years "struggling with droughts and bad years we have wourked [sic] the land hard the whole family of us has to work and both I and my husband is not young people and the work as ruined our health we never go away for a rest never no money to waste . . ."

The Holts were not alone. The poet John Shaw Neilson's family took up a selection in the Mallee in 1895. His autobiography provides a rare insight into the physical and mental toll that work in the Mallee exacted. The Neilson family was desperately poor and frequently worked as scrub clearers for money. A repeated thumb injury ultimately led Neilson to a breakdown. He spent five weeks in hospital and it was 18 months before he could work again. It became something of a pattern for Neilson. His brothers fared no better. One brother developed "dry pleurisy" which they attributed to the heavy axe work he had undertaken as a teenager. In 1915 another brother also had a nervous breakdown, caused, the family believed, by "the strenuous life he had been leading. The

their husbands and brothers in the fields and sometimes managed blocks on their own. The racial divide in Boyd's images is as stark as the gendered one. Aboriginal people, the traditional owners of the land, are not depicted in Boyd's images; the non-white men in Boyd's photos are almost exclusively photos of the Singh family and relatives, residents it seems, of the nearby town of Sea Lake. They feature in portraits, or within a town setting, and are never shown working the land, highlighting the highly racialised space of the Mallee.

Another of the gaps in Boyd's images of men at work in the Mallee is the terrible toll it could take on their bodies. Figure 7 is the only one that depicts a man with any physical disability; Wally Holt, standing on the right, holds a crutch. He had a "gammy leg." The cause of

hard work and worry brought about by the drought.”¹¹ Two sisters died of TB. In the postwar period, returned servicemen, many of them carrying physical and psychological injuries, joined the ranks of those struggling against the odds as they took up blocks under the government’s “soldier settlement” scheme. As the 1925 Royal Commission on Soldier Settlement observed: their war disabilities left hundreds of settlers “struggling to cope with work beyond their powers.”¹²

Boyd’s images celebrate the transformational impact of the labour of Mallee men. If he saw the impact on their health he looked away, just as he failed to capture women’s presence in the landscape. He did, however, produce some images of the emerging environmental impact of men’s labour. In one photograph he depicts a mallee tree, its roots exposed by the searing north winds that carried away the sandy soil once held in place by forests of mallee trees. As clearing continued, and over-cropping and over-cultivation became common, the dust storms became more frequent—a rolling black cloud that would plunge the land into darkness. The land became as exhausted and appeared as care-worn as the men—and women—who worked it.

In 1933 the *Horsham Times* celebrated the fiftieth anniversary of the opening of the Mallee for closer settlement. It documented the trials and tribulations involved in the taming of this wilderness: “With its huge production today and its wonderful future in embryo, the Mallee heritage stands as a country handed to us by the brave men who made its conquest.” This was the masculinity Boyd’s images revered: white Mallee men making their mark, shaping the landscape and environment into a vision of production and control. In subsequent decades, this undertaking intensified, interrupted only by some severe droughts that exposed the environmental limits of the land and the physical and financial resources of those who worked it. The idea of the Mallees as an environment that breeds resilience and is unmatched for toughness still resonates. It remains a gendered, racialised landscape, although today the hard physical labour of earlier years has been replaced by more technical and sedentary work inside air-conditioned tractors, the scale and power of which dwarfs their occupants. As in Boyd’s time, few women can be found at the wheel, but their work in managing farm

11 John Shaw Neilson, *The Autobiography of John Shaw Neilson* (Canberra: National Library of Australia, 1978), 85.

12 Quoted in Marilyn Lake, *The Limits of Hope: Soldier Settlement in Victoria, 1915–1935* (Melbourne: Oxford University Press, 1985), 60–1. See also the contribution by Ruth Ford in this volume.

and household activities and finances enables many a Mallee man to fill the shoes of the men who walked before him.

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Jayne Regan

Irrigation Nation or Pacific Partner? Visions for Postwar Australia

Historian Paul Sutter argues that American environmental historians have neglected the “history of interwar environmental thought and politics.” According to Sutter, scholarship on the earlier Progressive-Era conservation efforts and the later green environmental movement has overshadowed what came in between, so that there exists no “interpretive definition” of the period. The same could be said for the Australian context, where environmental historians have shown greatest interest in the colonial period (from 1788 to Australia’s Federation in 1901), and in the years since the advent of modern environmental movements in the 1970s. The culmination of international political and economic crises in the first half of the twentieth century has contributed to this neglect; interest in these major events has sidelined historical treatment of environmental thought, although one notable exception is Warwick Frost’s 2004 article “Australia Unlimited? Environmental Debate in the Age of Catastrophe, 1910–1939.”

In this essay I offer an initial intervention into this understudied period. I introduce William Hatfield and Flexmore Hudson, two Australian literary figures who wrote evocatively and passionately about the Australian environment in the 1930s and 1940s. Both men were politicised during the 1930s and, to differing degrees, took up left-wing politics in response to the international climate of crisis. I am particularly interested in the way that the interwar years, as well as the war unfolding across the 1940s, shaped their environmental visions for postwar Australia. While the political atmosphere of the Australian 1940s was characterised by optimistic plans for postwar social and economic reconstruction, Hatfield and Hudson demonstrate that the environment played a part in these imaginings. Hatfield and Hudson held vastly different environmental visions for postwar Australia, but, considered together, their work demonstrates that Australian environmental thought and debate flourished, despite, and perhaps even because of, the major political and economic events of the 1930s and 1940s.

Looking Inland

William Hatfield was born in Nottingham, England in 1892 and travelled to Australia at the age of nineteen. Upon his arrival he immediately set out for the interior of the country in search of work. Over the next twenty years Hatfield did a variety of itinerant work, particularly in the northern regions of South Australia, the Northern Territory, and in northern and western Queensland; he was a stockman on large inland sheep and cattle stations, a deckhand, an accountant for shipping and mining companies, and sometimes made a living from kangaroo shooting and dingo trapping. During the 1930s and 1940s, Hatfield produced several popular novels based loosely on his experiences and adventures in remote areas of Australia. In 1931, he undertook the first of several long-distance car journeys, sponsored by the English Hillman Motor Car Company and Shell Petrol Company, which enabled him to build up a journalistic career. These trips, during which Hatfield tested cars and his masculinity against inland and northern Australia, featured heavily in his autobiographical and travel books *Australia through the Windscreen* (1936) and *I Find Australia* (1937). Also in these two books, Hatfield began to offer criticism of the environmental damage done to inland Australia since white colonisation. He was particularly concerned about deforestation and soil erosion, which he attributed to poor agricultural and pastoral practices. In 1944, Hatfield, by now identifying as a Communist, published the nonfictional work *Australia Reclaimed*, where he outlined his postwar vision of Australia as a socialist state. Integral to his plan was the irrigation of the inland in order to correct environmental damage and enable more intensive agricultural settlement.

Ambitious engineering proposals to irrigate and populate inland Australia, often inspired by hydrological schemes undertaken in arid regions of the United States and the Soviet Union, were widespread in the first half of the twentieth century. E. J. Brady's 1918 book, *Australia Unlimited*, argued for the almost infinite potential for agricultural development in Australia's inland; Brady hoped to disprove what he called Australia's "'Desert' Myth," and advocated closer settlement of semi-arid regions of the country. In the late 1930s, engineer J. J. C. Bradfield, well known for his involvement in the design and construction of the Sydney Harbour Bridge, proposed a scheme to dam and divert the rivers of North Queensland so that they would flow into the often dry rivers of western Queensland, rather than out to sea. Bradfield argued that this additional water would permanently alter the climate of the inland. Popular adventure novelist

Ion Idriess advocated Bradfield's Scheme in his 1941 book *The Great Boomerang*. The Bradfield Scheme gained currency during World War Two as fears mounted about the potential for Asian invasion of Australia's sparsely populated north, but was never seriously considered by the Australian federal government.

Like Bradfield and Idriess, Hatfield believed that with major dam construction and river diversion, large amounts of water could be directed into irrigating arid Australia, enabling more intensive farming and a much greater inland population. Hatfield pro-

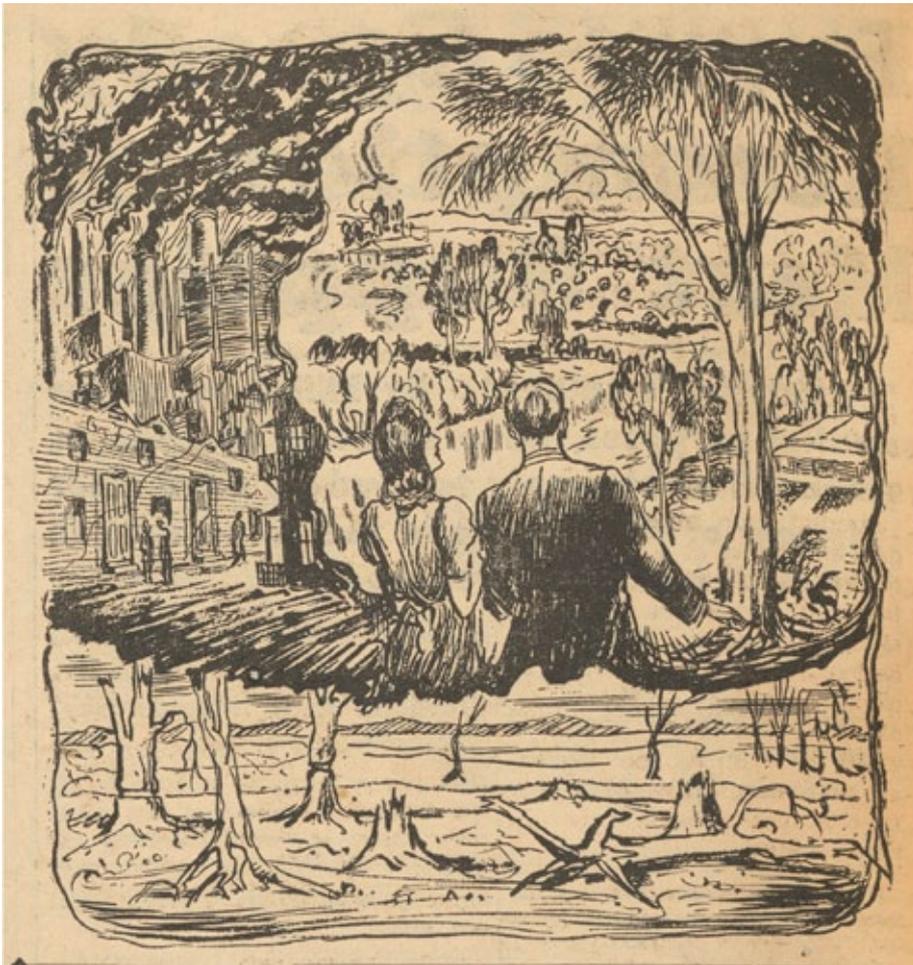


Figure 1: In this illustration of Hatfield's vision, the destruction of trees (along the bottom) and a Victorian city dominated by factory pollution (top left), is being replaced by the image of a young Australian couple admiring a well-watered and densely vegetated agricultural scene. George Farwell, "William Hatfield Sees," *Tribune* (Sydney), 26 October 1944, 4. National Library of Australia, <http://nla.gov.au/nla.news-article208689648>.

posed that such a project would provide work for returned soldiers and believed that technologies developed during war could be repurposed for inland construction, rather than destruction. An “army” of Australians could be put to work “reconquering the enemy Nature” in Australia’s remote regions. Though sometimes framed as a battle, at other times Hatfield imagined his plan to be one of rehabilitation and restoration. In part, Hatfield aimed to restore arid and tropic environments to their pre-colonisation state, and reverse damage done through deforestation and soil erosion. He argued that “nature’s methods must be copied to restore it to that state in which we found it.” Even when emphasising restoration, Hatfield’s vision for a densely populated inland would in reality have involved enormous environmental transformation.

Through damming “every little creek,” Hatfield imagined a future where “complete river-control” would mean the inland could support closer settlement; he believed that the vast pastoral stations of the inland should be divided up so that large numbers of Australians, and potentially immigrants from all over the world, would have the chance to farm. Hatfield argued that residence away from large cities would be morally, physically, and financially beneficial for the population, yet he still imagined that these new inland settlements would be decidedly modern, built with “science and industry” in mind, and “free from smoke and dirt” in order that “a new generation can be raised with the best chance of physical fitness, mental alertness, moral stability, and aesthetic appreciation.” Hatfield’s postwar vision emphasised national and individual strength and virility, garnered at least in part from residency in the Australian inland. This was a clear rejection of the densely populated, industrial cities of the Old World, often associated with physical and moral degeneracy, and even blamed for the political and social upheavals of the early to mid-twentieth century.

From today’s perspective, much of Hatfield’s environmental vision might seem quite contradictory; sometimes he wanted to rehabilitate nature and at other times to conquer it, and his emphasis on the restoration of pre-colonial landscapes collided with his very twentieth-century desire to see science and technology transform the inland into a densely populated patchwork of small farms, dotted with clean and technologically advanced towns. Yet the belief that human intervention in nature could be beneficial for both the human and natural world was commonly held in this period. Hatfield advocated large-scale environmental engineering, even continental transformation, in order to promote a new social, economic, and environmental order in Australia’s

postwar years, and to avoid the social, political, and economic turmoil that had so far plagued the twentieth century. The environmental imagination of the poet, editor, and school teacher Flexmore Hudson, though influenced by the same international climate of crisis, was remarkably different.

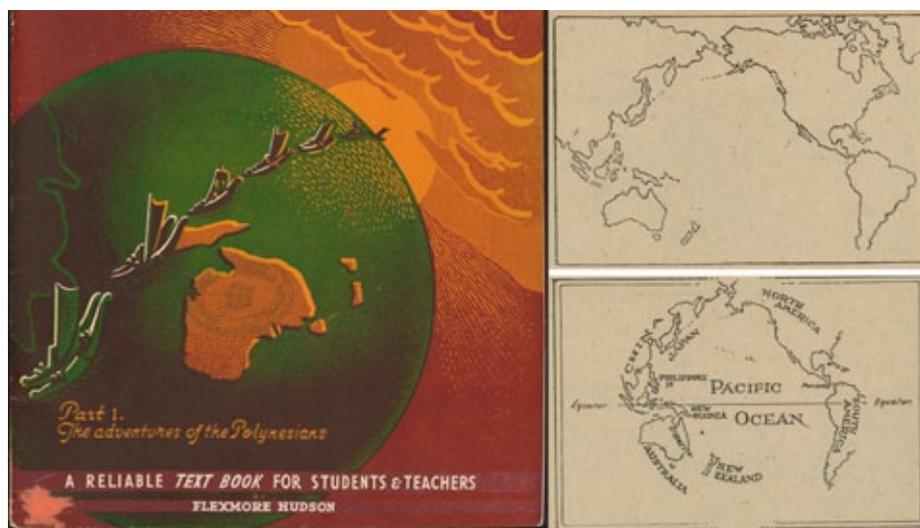
Looking Out to Sea

Flexmore Hudson was born in 1913 at Charters Towers, Queensland. He trained at Adelaide Teachers' College and attended Adelaide University for a short time, but did not finish his arts degree. Between 1936 and 1945 Hudson taught in a handful of small schools in rural South Australia, which inspired him to produce a range of environmentally sensitive poetry. Like Hatfield, Hudson launched his literary career, primarily as a poet and editor, during the 1930s, as the Great Depression, the rise of fascism, and the threat of another major world conflict politicised many writers. Hudson was attracted to left-wing politics, though, unlike Hatfield, never committed to Communism. Rather, his literary output suggests a socialist interest in the concept of "world-mindedness," which grew in popularity throughout the 1940s. World-minded thinkers sought, particularly through an emphasis on wide reading, to promote a greater understanding of other cultures, people, and humanity as a whole. They set themselves in opposition to racism, war, limited reading habits, and narrow nationalism. World-mindedness grew out of, and was a reaction against, the social and political upheavals of the first half of the twentieth century, and was particularly appealing in the wake of World War Two and the devastating results of National Socialism and racism.

Though primarily a poet, financial difficulties led Hudson to write a comic for children in 1947. "Discovery," which appeared in the pages of *Pacific Pictorial Comic*, was particularly concerned with educating Australian and New Zealand school children about the human history of the Pacific Ocean, and promoting understanding and peaceful relationships between people of all races; goals clearly in accord with world-mindedness. By the time Hudson's final instalment was published in issue six of *Pacific Pictorial Comic* (1947–1948), the comic had covered Indian migration, Polynesian exploration, Easter Island history, and some Spanish exploration of South America. Within both the text and illustrations of "Discovery" there is a concerted effort to displace Europe as the primary context of Australian history. The maps and images

used to introduce the region all focus on the Pacific; Europe does not appear on any. Australian history is told around a geographic feature, the Pacific Ocean, rather than emphasising European exploration. Though the project was never completed, “Discovery” was an attempt to produce a world history, or at least a regional history, for school children that presented Australia as a Pacific nation rather than a European one. In sympathy with Hudson’s Pacific focus, Frank Clune’s 1945 book *Pacific Parade*, a series of short sketches based on his travels in the Pacific, argued that “the biggest war in history made us ‘Pacific-minded.’” World war had prompted a geographic reimagining of Australia’s place in the world.

Figure 2: Various images from “Discovery” demonstrate the way that Hudson emphasised the Pacific Ocean as the geographic heart of Australian history. Left: Flexmore Hudson, *Discovery: The Adventures of the Polynesians* (Adelaide: Lush Studios, 1948). Top and bottom right: Flexmore Hudson, “Discovery,” in *Pacific Pictorial Comic* (Adelaide: Lush Studios, 1947). Images courtesy of the National Library of Australia.



Hudson’s world-mindedness did not, however, preclude poetic engagement with local environments. In fact, Hudson explicitly stated that he valued the “exact and intimate observation of nature.” His poetry often celebrated simple scenes on South Australian beaches, and the flora and fauna that inhabited the arid landscape of rural towns in which he lived. Hudson’s environmental sensibility is best demonstrated in an excerpt from his 1943 poem “With the First Soft Rain”:

That strutting magpie joins us, that shadow, ants on the wall,
the saltbush, trees, the wire-weed, and the larvae of the
borer-beetle sapping the life of the gum.

So long as I can know the earth, I shall never feel alone;
for there, I know, not only is my spirit
but *all* men's spirits;
and they are in mine, and I am in theirs . . .

Here on a saltbush plain I lie in the sun:

Nearly seven million other Australians are warmed by that sun
—They squint in its glare, love it, find it beautiful; so do
Papuan, Thibetans, Javanese, Chinese, Germans, Rus-
sians, Eskimoes—they shout and wave harpoons as it
rises over the ice; fruit-pickers of the Amazon and the
Congo, emerging from the dark gloom, are glad of its
light and warmth.

. . .

The sun, and the stars that will chill this plain to-night,
the moon that will climb the black hills,
are links with all humanity.

Hudson evokes the South Australian rural landscape with which he was so familiar, yet demonstrates that such environmental specificity did not have to be parochial; in fact, environmental localism was crucial to Hudson's brand of world-mindedness, and diverse global cultures were essential to his evocation of Australian rurality. The physical environment, the sun, earth, and even the life on a South Australian saltbush plain seem to offer both spiritual and ecological connections between people the world over. Hudson's technique of listing environmental features, animals, and various groups of people has a levelling effect; all seem to have an equal right to the earth. This poem was clearly a plea for peace at the height of World War Two. Both "Discovery" and Hudson's poetry demonstrate the way he used geography and environment to argue for an intellectual reorientation in postwar Australia, one which might secure lasting international peace.

Competing Environmental Visions

Hatfield was anxious about the continent's perceived environmental shortcomings, heightened during World War Two as fears mounted over the possibility of invasion; he advocated continental-scale engineering projects in order to drastically alter the environmental, and therefore social, fabric of the country. Though Hatfield's vision for inland Australia was never realised, in the decades following World War Two there remained enthusiasm, particularly among state and federal politicians, for large-scale hydro-engineering projects; the Snowy River Hydro-Electric Scheme (1949–1972) and the Ord River Irrigation Scheme (1959–) demonstrate the postwar eagerness for environmental transformation.

Hudson's less aggressive approach revolved around education and intellectualism; as a poet and school teacher he hoped to inspire a world-minded and environmentally sensitive outlook in others. Interest in world-mindedness reached a peak in the immediate postwar years, but popular enthusiasm waned as a result of the conservative Cold War climate. While there was greater continuity between Hatfield's vision and popular environmental thought in the postwar decades, Hudson's embryonic ecological sensibility might be understood as an early step towards the environmental movements of the late twentieth century.

Despite remoteness from the hub of calamity in Europe, international events influenced the way the Australian environment was imagined, and, conversely, writers frequently employed the landscape as an arena to explore the societal ruptures that preoccupied them. Like many fellow writers and intellectuals, both men were attracted to left-wing politics in response to the political turmoil of the period, and, like many in the broader Australian community, both held somewhat utopian hopes for postwar Australia. Hatfield's water-dreaming and Hudson's world-mindedness offer just two examples of the way in which Australian culture and environment were jointly reimagined in response to the major political and social upheavals of the early to mid-twentieth century.

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James Beattie

Dragons Abroad: Chinese Migration and Environmental Change in Australasia¹

The Australasian Mining Boom

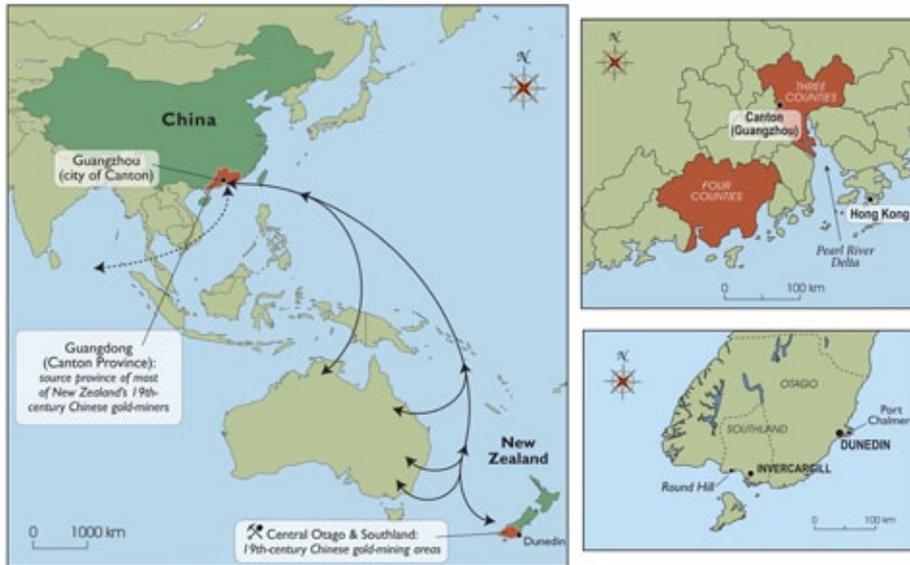


Figure 1: Simplified map of the migration route of southern Chinese goldminers to Australasia. (This does not include return, internal, or further overseas migration.) Mapmaker: Tracy Porter. Copyright: James Beattie.

From the mid-nineteenth century, millions of Chinese left their homeland for the Americas, Asia, Australasia, and Eurasia. Gold first attracted Chinese to North America. From there, many typically followed a path from California to eastern Australia, and then to southern New Zealand, and from there to other goldfields (figure 1). Between times, they commonly returned to their homes in southern China, encouraging other family members to join them. At their height, there were as many as 42,000 Chinese in Victoria by 1859,

¹ This article draws from my previously published work, listed in the Further Reading section at the end. I thank the support of a grant provided by the vice-chancellor of the University of Waikato, Professor Neil Quigley, which contributed towards the costs of research for this article. I also thank a conference grant from the University of Waikato Faculty of Arts and Social Sciences for enabling me to present this paper at *Foreign Bodies, Intimate Ecologies: Transformations in Environmental History*, Macquarie University, 10–13 February 2016. Finally, I thank the support and encouragement of Emily O’Gorman, Ruth Morgan, Alessandro Antonello, Christof Mauch, Robert B. Marks, Eugene N. Anderson, Duncan M. Campbell, James Ng, Ryan Tucker Jones, and the help of Sarah-Mae Berry, University of Waikato, Jamie Mackay, Ministry for Culture and Heritage, New Zealand, and Brenda Black, Rachel Carson Center, Munich.

25,000 in Queensland in the 1870s, and 5,000 in early 1880s New Zealand, most in the South Island province of Otago. Chinese made up 25 per cent of the main goldfields population in Australasia, but were a much greater proportion on some goldfields.

After coming to Australasia, Chinese moved into other industries and professions, such as market gardening and agricultural labouring. Chinese travelled as free, bonded, or indentured labourers, and although at a geographical distance from China, they operated as members of a single family unit, sending home remittances from overseas.

As goldminers, Chinese engaged in highly labour-intensive but low-capitalised ventures that especially suited the first phase of alluvial mining in Australasia. In this phase, gold could be obtained cheaply and relatively easily using simple tools. Later, some Chinese participated in hydraulic sluicing and even quartz mining, which required much greater capital than alluvial mining.

Chinese goldmining, like that undertaken by European miners, contributed to large-scale and local environmental changes, from waterway pollution and soil erosion, to ecosystem loss and geological change. In terms of water engineering, Chinese miners constructed dams to divert a river's flow so as to dewater an area they wanted to mine, or to harness water's power to cut away banks and hillocks. Control of water was also vital in the next phase of mining. To provide a sufficient head of water for hydraulic sluicing, Chinese miners often built sophisticated water-races—which they called “water dragons”—to bring water from tens of kilometres away. These interventions had palpable environmental impacts (figure 2).

Chinese sluicing and tunnelling in the Otago Goldfield of Round Hill, New Zealand, “sludged up” Ourawera Creek, causing it to disappear entirely. Silt, debris, and pollution from mining flowed into nearby Lake George/Uruwera and Whakapatu Bay. A contemporary regretted that 91-hectare Lake George, “a pretty piece of water...which skirts one end of it[,] its surface is generally dotted with black swan and wild duck...should be destroyed [by this means], but I am afraid it is inevitable.”²

2 Randall Rohe, “Mining’s Impact on the Land,” in *Green Versus Gold: Sources in Californian Environmental History*, ed. Carolyn Merchant (Washington, DC: Island Press, 1998), 130.



Figure 2: Historian James Ng identifies the individuals as (left to right): Sue/Sew Hoy, G. H. McNeur, and Shum Bun. "Sluicing on the gold-field at Spec Gully in Nas-eby," shows miners and Rev. George H. McNeur, McNeur Collection: Photographs of Chinese goldminers who worked in Otago and Southland goldfields, Alexander Turnbull Library, Wellington, New Zealand, Ref: 1/2-019157-F.

The Argyle Water-Race Co. at Waikaia (then known as Switzers), on the Nokomai Gold Field in Central Otago, sourced water from a creek 21 kilometres away, using pipes and a viaduct to cross very difficult terrain. The objective of the water-race was to provide a head of water sufficient to enable hydraulic sluicing. With a new water supply now available, a newspaper described 16 Chinese miners

... 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 load 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.³

³ *Mataura Ensign*, 24 January 1888, 4.

As illustrated above, hydraulic sluicing considerably accelerated environmental change by enabling “a few miners to accomplish in weeks what formerly required a hundred men months to do.”⁴

Technology Adaptation and Environmental Change

In Australasia, Chinese miners adapted technology from their homeland, as well as from Europe and North America. For example, in Victoria, Australia, Chinese miners utilised much longer sluicing boxes than Europeans to enable them to obtain very small grains of gold. Sometimes, in Victoria, they also used bamboo to convey water. Another popular device many Chinese in Australasia utilised for dewatering an area or for bringing in water for irrigation was the so-called Chinese or Californian Pump. This could be driven by water or by pedalling (a Chinese pump differed only from a Californian in being made entirely from wood⁵).

Chinese entrepreneur Choie Sew Hoy (c. 1836–1901) introduced and adapted Euro-American and Chinese technology to New Zealand. With his second son, he developed an innovative dredge that was subsequently modified and used elsewhere around the world.

The Sew Hoy dredge’s protruding central ladder of buckets and shallow draught enabled it to work riverbeds, beaches, and flats. This design ushered in a dredging boom in 1890s New Zealand that brought considerable environmental changes to river courses and sparked legal battles between mining and agricultural interests. Like the hydraulic sluice, this technological innovation—effectively a mobile gold-processing plant—dramatically accelerated the efficiency and the surface area of land that could be worked, with corresponding environmental impacts.

A contemporary in 1906 criticised the “gnawing scoop of the dredge-bucket, and the vicious volleys of the hydraulic nozzle” for converting 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, Otago—to “hungry dragons voraciously biting off huge chunks of this superb land.”

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

5 R. Brough Smith, *The Gold Fields and Mineral Districts of Victoria* (London: Trübner and Co., 1869), 607.

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.”⁶

Although relatively short-lived, the mining booms in Victoria and Otago have left a lasting legacy of environmental disturbance, altered landscapes, and hydrological change. Indeed, a recent survey by Australian archaeologists Susan Lawrence and Peter Davies shows that in Victoria, mining—both by Europeans and Chinese—transformed the very hydrology of that state.⁷

Post-mining Environmental Introductions and Impacts

Once the alluvial mining boom ended and they could no longer easily obtain gold, many Chinese moved into other industries, to other goldfields, or returned home. One of the most important of the industries adopted by Chinese immigrants in Australasia was market gardening.

On the goldfields, the fresh produce provided to miners by Chinese market gardeners probably contributed to staving off the worst effects of poor diets, such as scurvy. Later, Chinese market gardeners provided urban Australasia with much of its fresh produce in the nineteenth century (figure 3).



Figure 3: Chinese market gardens in Arrowtown, Otago, New Zealand. Chinese market gardeners came to dominate the industry in late-nineteenth-century New Zealand, as they also did in Australasia, and to a lesser extent California. Hocken Library/Uare Taoko o Hākena, University of Otago, Dunedin, New Zealand, P2002-053 (scan number S12-279a).

A European observer visiting a market garden in Gympie, Queensland, in 1868 recorded a Chinese market garden with

⁶ *Tuapeka Times*, 8 September 1906, 3.

⁷ See the contribution by Susan Lawrence and Peter Davies in this volume, 71-9.

... splendid beds of cabbage, broccoli [sic], turnips, Chinese turnips—a white cuneiform root, softer and juicier than the common white turnip, with a peculiar flavour, but not at all unpalatable—and almost every vegetable to be found in the colony, with cucumbers, English and American pumpkins, and several varieties of melons.⁸

Nor did Chinese grow only vegetables. Central Otago market gardener and orchardist Lye Bow relied upon two water-races to irrigate 1,200 apple trees in 1894. Nine years later, in addition to apple trees, he was growing 1,000 apricot trees, as well as 200 peach and 200 greengage plum trees.

Chinese also raised seeds and bulbs familiar to them from their homeland. Indeed, Chinese likely introduced Bok Choy, or Pak Choi, as well as bean sprouts and several other vegetables into Australasia. Chinese market gardeners were also probably the first to introduce several ornamentals from China into New Zealand, such as that recorded as “Chinese Narcissus” possibly *Narcissus tazetta var. chinensis* (Chinese Sacred Lily or daffodil).

Figure 4:
As indentured or free labour, many Chinese worked throughout the Pacific, including in the phosphate industry. Phosphates were vital to the development of Australasia’s dairy and sheep industry. “Railway wagons being loaded with phosphate deposits, Makatea Island, French Polynesia.” Creator unknown: Albums of photographs, chiefly relating to phosphate mining at Makatea Island, French Polynesia, Alexander Turnbull Library, Wellington, New Zealand, PA1-o-322-08.



In many other ways, too, Chinese workers contributed to the “opening up” of new resources in Australasia. Chinese plantation workers in northern Queensland contributed to regional settlement—they transformed environments through deforestation, while plantation monocultures simplified ecologies. Chinese merchants also pioneered particular in-

8 E. Thorne, *The Queen of the Colonies; or, Queensland as I Knew It* (London: Sampson Low, Marston, Searle, & Rivington, 1876), 117. I thank Dr. Jodi Frawley for bringing this book to my attention.

dustries, such as Queensland's banana trade. And Chinese navvies worked in many difficult places on a variety of back-breaking projects. They helped to build Australasia's railway network. They provided the labour force to mine phosphates on Banaba (Ocean) Island and Nauru, as well as other Pacific islands (figure 4). Banaba and Nauru provided phosphates vital to the Australasian, as well as British, agricultural industries, and were first incorporated into the Anglo-Australasian sphere by the Pacific Phosphate Company.⁹ Some Chinese also specialised in other industries, such as fishing in the colony of Victoria, tobacco

growing (for a time) in Central Otago, and, in the case of Chew Chong (c. 1830–1920), dairy farming in Taranaki Province, New Zealand (figures 5 and 6).



Figure 5: Many Chinese made their names as merchants. Chew Chong (c. 1830–1920) earned his money exporting dried fungus (*Auricularia polytricha*) from New Zealand to China. He then pioneered the dairy industry in Taranaki Province, New Zealand. William Andrews Collis, Chew Chong's General Store, New Plymouth (c. 1875), collection of Puke Ariki, New Plymouth, New Zealand, PHO2002-406.

Figure 6: An illustration of the impacts of converting forest to dairy farms. Unknown photographer, "Dairy Farm on Auroa Road, South Taranaki (1890)," Collection of Puke Ariki, New Plymouth, New Zealand, PHO2008-267.

Environmental Attitudes

Another intriguing dimension of Chinese environmental history in Australasia is Chinese environmental views and belief systems. Southern Chinese usually found Australasian environments very different from their subtropical home. Evidence suggests that some situated their settlements and dwellings, and framed environments and environmental change in Australasia, around principles of *fengshui* (風水, literally "wind and water").

⁹ After World War I, Nauru became a mandated territory, with Australia as trustee, and Britain and New Zealand as the other co-trustees. Gregory T. Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (Cambridge: Cambridge University Press, 2013).

This was a complex yet highly practical system and set of practices designed for managing human-nature relations. Developed over thousands of years in China, *fengshui* recognised that *qi* (energy) flowed through all things, and that efficaciously situated buildings and graves could maximise its effects for individuals and groups.

Chinese recognised that some places in Australasia had good *fengshui*. Chinese commented that Riverton, Otago, presented a very favourable situation, since the town was nestled at a convergence of hills overlooking water. Others used the ideas of *fengshui* to justify moving. One Chinese labourer explained that he preferred to live in Cromwell, Otago, where “the great river [Clutha] is at my door with high hills beyond and around,” than to work in Dunedin with “only the backyard fence to look at.” He explained that he would rather be living in Cromwell “without the £30.”¹⁰

Death rituals and ancestor worship brought Australasian landscapes into China’s cosmological space, too; they connected the deceased’s spirit with others of the lineage just as they brought together the living Chinese communities in Australasia and Canton. For example, miners at Mareburn, Otago, believed that the spirit of a fellow miner had “gone home.” As another miner explained, his spirit travelled to China “quicker than the steamer—quick as thought.”¹¹ Miners also described the ghosts of friends or relatives from China appearing to them in New Zealand.

Conclusion

As miners and merchants, as gardeners, navvies, and farmers, Chinese migrants to nineteenth-century Australasia did much to change environments, while at the same time introducing new ways of viewing nature.

A focus on Chinese environmental activities in Australasia helps to correct an ethnocentric bias evident in Australasian environmental historiography, which has largely ignored this group and instead has examined the activities of Europeans and, to a lesser extent, indigenous peoples and environmental change. It also highlights the appropriateness of a translocal rather than a transnational approach in considering this topic,

10 Alexander Don, *Christian Outlook*, May 1908, 13.

11 Alexander Don, *Nineteenth Inland Otago Tour, 1905-1906* (Dunedin: Otago Daily Times, 1906), 45.

since nineteenth-century connections operated at multiple local levels, rather than at a national level or involving formal governmental interactions. Finally, this article underlines the need for environmental historians of China to think beyond the confines of the modern nation state of China in writing history.

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Valuing Natures

Susan Lawrence and Peter Davies

Liquid Asset: Water in Victorian Gold Mining

The Australian colony of Victoria hosted one of the world's great gold rushes during the nineteenth century. Gold was discovered in central Victoria in 1851, only three years after the Californian rush, and the colony's gold output rivalled that of California for the rest of the century, producing 2,300 tonnes of gold by 1914. There remain many untold stories of gold mining in Victoria, but perhaps one of the most surprising is the intimate relationship between gold mining and water supply. As an industry, gold mining depended on steady and abundant supplies of clean water, yet Victoria is a relatively dry region in the driest inhabited continent. Rainfall ranges from 450–800 mm per annum on the goldfields but surface water is scarce. Lakes and ponds are rare, and rivers are small by world standards. To get the water they needed, miners had to devise ways of storing it and diverting it to their claims. Victorian miners confronted the unique challenges of the Australian environment and developed responses that continue to make Australian water management distinctive in the world today.

Gold miners invested hundreds of thousands of pounds in infrastructure to secure water supplies, some of which are still in use. In the process they redefined water as a commodity, established principles of water regulation that underpin modern Australia's multibillion dollar water industry, and created consequences for the environment that are only now being understood. Unravelling the environmental history of water in Victoria's mining industry starts at the small scale, explaining the presence of fragmentary archaeological evidence of water channels and dam walls. It connects local places into networks of technology and social relationships up and down river valleys and across mountain ridges into neighbouring watersheds. It replicates those networks across the colony, wherever the presence of gold drove miners to harness water for their



Figure 1:
Map of central
Victorian goldfields.
Source: the authors

needs, using it to sluice gold from the wash-dirt. Stepping back, it considers how those long-ago actions continue to influence modern society and the land we live with.

Local Places

Our starting point is the dry eucalypt forest along central Victoria's mountainous spine. This is where the richest gold was worked and where abandoned mine shafts and crumbling stone cottages can still be found. Winding among the shafts and footings are small ditches (known locally as "races") up to two meters across and one meter deep. They are usually filled only with leaf litter and fallen branches, but even now after heavy rains they sometimes still carry water. Generally these ditches attract little attention because they appear small and inconsequential and seem to go nowhere in particular. Sometimes the ditches start or end at the mounded earthen wall of a shallow dam. The reservoirs too are usually empty and far less interesting than ghost towns and industrial heritage. It turns out though that these ditches and dams, these picnic spots and jogging tracks, are the beginning of something much larger.



Figure 2:
Eucalypt forest near
Creswick, Victoria.
Photo by the authors.

Mining ditches were built by numerous parties on the goldfields and were often the source of legal, verbal, and physical hostilities as water supplies ran short. Chinese miners were frequently at the centre of such disputes, accused of cutting races and pilfering water. A good example of a water race is the

one built by John Boadle Bragg, an Irish-American miner at Creswick in central Victoria. Bragg and his partners in the Humbug Hill Sluicing Company needed water to work their claim. In 1856 they secured one of the early water rights in Victoria and started building an extensive network of ditches and reservoirs. By 1859 they had spent £1,000 constructing a reservoir that could hold up to 90 million litres of water, and had built an 11 kilometre ditch to their claim at Humbug Hill. Bragg saw the chance to make money

from water as well as from gold, and he urged his seven partners to extend the ditch a further 10 kilometres west to the Bald Hills, where water could be sold to other miners. Not all of them agreed with him, however, and in 1860 the eight partners appeared in court after their arguments turned into a vicious brawl. Eventually, Bragg and his supporters bought out the dissenters and work continued. By the time the water reached customers at the Bald Hills in 1862 at least another £3,000 had been spent on an innovative (and unsuccessful) system of paper pipes coated with bitumen. Bragg died in 1865 but the company continued sporadically until 1880, when its water right and other assets were taken over by the local council and incorporated into the town's municipal water supply. Modified in some places, abandoned in others, much of what Bragg and his associates built in the 1850s and 1860s remains intact in the Creswick State Forest.

Bragg's other legacy is the system of water right licenses that he and others like him fought to establish. From the early 1850s miners began claiming water, building the infrastructure to manage it, and fighting to retain control of it. Mining wardens and local courts gradually responded and by 1865 the ragtag collection of local custom and regulation in each Mining Division had been codified under provisions in the *Mining Statute*. The *Statute* combined elements of the British tradition of riparian rights, where water belonged to those who owned the adjoining land, with the new California Doctrine of appropriation emerging from the American gold rush, where water belonged to those who first claimed it. In the new Victorian system, water belonged to the Crown but rights to it could be leased for periods of up to 15 years. The water right or license permitted water to be bought and sold along with the infrastructure that delivered it. Miners and the new class of water merchants had security of tenure for the period of the licence, while the Crown retained ultimate control. In the 1880s the colonial government, looking to establish irrigation for agriculture, completed the process of nationalising water and borrowed the miners' water rights system to license irrigators. Today's pattern of state and federal government control over water licences and entitlements had its origins on the goldfields of Victoria.

Valleys

With secure legal access to water, miners were able to manage river flows along entire valleys. John Pund, a gold miner near the town of Beechworth in northeast Victoria,

used the system established by pioneers like Bragg and his peers to make a fortune. Starting in 1865, Pund began acquiring mining claims and water licenses in the Three Mile area. Eventually his race network extended 28 kilometres from the source of water in the springs around Stanley to his claim at Three Mile, and when he died in 1915 Pund left an estate worth £16,000, having amassed 24,000 ounces of gold in his career. Pund's success was entirely unremarkable around Beechworth, where he was one among many and by no means the foremost.

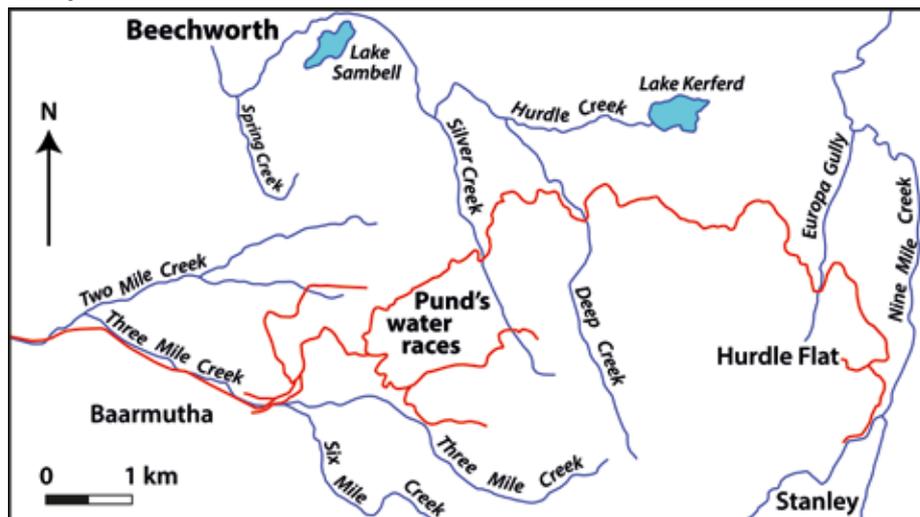


Figure 3:
Plan of John Pund's
water race system
near Beechworth,
Victoria.
Source: the authors

Unusually for Victoria, many Beechworth water licenses, including Pund's, tapped underground springs (i.e., groundwater) in addition to collecting rainwater in reservoirs (i.e., surface water). They were able to access enormous volumes of water. Pund held licences to divert more than 6 million litres per day by the 1890s, enough to fill three Olympic swimming pools, but a small amount compared to those of others in the district. Some held licenses entitling them to 8 million, 20 million, and in one case up to 320 million litres per day. By 1884, there were 75 water right licenses issued in the Beechworth district, capable of supplying more than 500 million litres per day between them—an amount of water that today would supply the domestic needs of a city of several million people. Pund's claim at Three Mile was on a tributary of Hodgson Creek, but the water he used to work it came largely from the Upper Nine Mile Creek. Nine Mile is part of an entirely different river system, draining north into the Kiewa River, while

Hodgson Creek flows west into the Ovens. This means that Pund, like many of the other Beechworth water bosses, was carrying out major and significant water diversion between catchments. Spring water flows in Pund's races today, still running west into the Ovens instead of north into the Kiewa.

Pund's influence on Hodgson Creek did not end with the delivery of millions of litres of extra water, nor with the work at his claim. Once he and the other sluice miners had used the water, they released it back into the nearest creek or gully, where it carried vast quantities of sediment downstream from their diggings. At the time, "sludge" was defined only by its sediment load. Concerns about chemical contamination, including potentially mercury, arsenic, and cyanide, were not raised until well into the twentieth century. In Pund's case, the sludge flowed a further 30 kilometres downstream to Tarrawingee, where the sludge spilled out of the channel and across the floodplain, covering ten thousand acres of prime agricultural land. The local council channelised the creek in the 1880s in the hope of controlling the damage, but to no avail. Even the passage in 1904 of anti-sludge legislation that required Pund and all the other miners in Victoria to build tailings dams to contain their waste on site was of limited effect. Farmers on the plains were still protesting about sludge in 1917, by which time Pund's son had taken over the operation. Today erosion in the creek at Tarrawingee has cut down through the old layers to reveal 1.5 metres of Pund's sludge lying above the original ground surface.

Colonial Landscapes

Pund and his fellow water merchants at Beechworth controlled the way that water ran in their local catchments, Hodgson and Woolshed Creeks. They moved water into the valleys from elsewhere, diverting it into and out of the creeks at will. They used water to change the contours of the valleys they mined, polluting the water with sand, gravel, and silt, and discharging their waste to reshape the distant plains. All over the colony, miners and water merchants used water in similar ways to reshape other river valleys. Gold was widely distributed in Victorian rock and soil, with 75 per cent of the colony's major river catchments having mines somewhere within them. This set the Victorian experience apart from those of California, the Klondike, and New Zealand where gold was concentrated in a few major rivers and the environmental impact of sludge was similarly concentrated.

The impact of mining on so many of Victoria's rivers did not go unnoticed. Beginning in the 1850s those affected by mining sludge, including shop owners, publicans, and farmers, began to complain. Councillors in goldfields towns were forced to raise road levels and continually replace bridges. Vineyards, orchards, and market gardens were inundated in the immediate vicinity of the towns, and even 60 kilometres downstream sludge flowed out over pastoral properties and made water undrinkable. Numerous royal commissions and government inquiries were held, the first in Bendigo in 1859, followed by a colony-wide inquiry in 1887, and another in 1914. Mining interests were powerful in Victoria, however, where gold was the major export industry well into the 1880s, and it was only with the decline of the industry early in the twentieth century that legislation was finally enacted that curbed the worst effects of sludge.

By then, though, the damage had been done. Bendigo's alluvial miners had sent clays and silts downstream to settle in a thick layer that covered 700 square kilometres of grazing land. The stamping mills that crushed quartz from the mines in Ballarat had choked the Yarrowee/Leigh River for 60 kilometres downstream. Hundreds of millions of tonnes of soil had been dislodged and sent into rivers in northeastern Victoria, and sludge 1.5 metres thick covered the river flats below the mines at Castlemaine and Daylesford. Even at the end of the century, when mining was in decline, the sludge continued to move downstream. It settled in the new irrigation reservoirs being constructed for agriculture, raising base levels by three metres in just over a decade.

Today

The effects of the miners and their thirst for water are still felt in many ways, large and small. Mining sludge remains in the river channels, working its way further downstream as sandbars in each flood event. These scour the river beds that provide habitat for plants and insects and fill the pools that shelter the fish. Sludge is also still present on the floodplains, forming a hard crust that inhibits the growth of plants. Scientists have many terms for the soil that has washed into New World waterways as a result of land clearing and agriculture, "post-settlement alluvium" and "legacy sediment" are two, but the proportion that has come from mining in Victoria is only now being documented. The re-contouring of rivers and the reshaping of floodplains by miners around the world—in

California, the Klondike, and New Zealand in the nineteenth century, and in many developing countries today— is a permanent, widespread change to the Earth's surface that is a marker of the Anthropocene, an age in which the impact of humans on the surface is so profound that it creates its own geological epoch.

Other effects are more positive. The infrastructure built by the miners, for example, still helps deliver drinking water to regional Victoria. Anti-sludge legislation was the antecedent of further Victorian laws to protect the environment and make polluters responsible for the damage they caused; strong environmental legislation engendered by mining continues to protect Victorian waterways. Legislation and practice that have their origins in mining also underpin the allocation of water across much of inland Australia. The Murray-Darling Basin Authority allocates water licenses over an area covering one-seventh of Australia, sharing water between upstream cotton growers in southern Queensland at one end and the one million people living in the city of Adelaide at the other. People still make fortunes buying and selling water licenses in a market that is now worth billions of dollars annually.

Significantly, environmental flows that divert some of the water for the health of rivers and the ecologies they sustain are now embedded in Australia's water allocation scheme, which is one of the most sophisticated and successful water-sharing systems in the world. Environmental releases are often held back in dry years, however, when the rivers need them the most. Of equal significance is the flexibility provided by public ownership of water. The Victoria government actively encourages homeowners to collect rainwater as part of the strategy to use water sustainably in the face of climate change and increasingly severe droughts. This is in stark contrast to parts of the American West, where the mining doctrine of prior appropriation is still in effect and makes it illegal for homeowners to collect more than a few hundred litres of water from their own roofs.

Mining continues to be an important part of the global economy. While mining in some parts of Australia is governed by strong regulations that ensure protection for the environment, this is not the case everywhere, especially in the developing world where most modern mining takes place. Victoria's experience more than 100 years ago offers an important historical perspective on the environmental impact of mining and on potential solutions to the challenges that mining brings. Miners adapted traditional meth-

ods to the unique conditions they encountered, dramatically transforming soils, plants, streams, and entire landscapes, leaving scars that can easily be read today. A century after mines stopped pumping sludge into Victoria's rivers, most of them are sufficiently recovered that they are aesthetically pleasing amenities to their communities. One hundred years is a long time to wait, however, and it is not yet enough to fully restore the aquatic communities the rivers once hosted. It took Victorians 50 years to learn to control sludge, but there is no need for other countries to take so long.

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Andrea Gaynor

Entangled Nature: The Stirling Range National Park¹



Figure 1:
Western section of
the Stirling Range
from the summit
of Mt. Trio, 2016.
Source: Andrea
Gaynor.

From the top of Mount Trio, the Stirling Range National Park appears covered in khaki velvet, a little threadbare in parts, but soft in the folds. Stretching up to worn peaks, the velvet tears to reveal the grey metamorphic rock beneath. The view to the west, but for the small orange spot and curved line arcing out from the base of the next peak, evokes a fantasy of timeless, ancient wilderness. Looking north or south, however, canola and wheat fields bring to mind the local and global flows of ideas, commodities, and organisms that define this place, and of which you are a part.

Early national park advocates in Australia regarded the process of reservation as the major challenge for conservation: once a park was declared, its flora and fauna were “preserved,” and the main work lay in fending off attempted resumption for agriculture and (other) extractive industries. While advocates and politicians initially saw public health and recreation as good reasons—or convenient justifications—for park creation, concerns soon arose over the impacts of mass tourism on national park nature. Historians have subsequently portrayed the conflict between recreation and conservation as a key tension at the heart of the “national park idea.” The history of the Stirling Range

¹ I would like to thank Keith Bradby and Damien Rathbone for their helpful comments on earlier drafts of this work and provision of relevant material, and Jane Davis for her assistance with the archival research.

National Park complicates this focus by foregrounding the entanglement of the park's nature with diverse human activities within and around the park, as well as the non-human agents they unleashed upon it: reservation alone achieved neither ecological separation, nor ecological maintenance.

The peaks of the Stirling Range rise unexpectedly from the otherwise flat landscape of southwestern Australia. Their elevation, rock formations, and spring wildflower displays have for decades made them a popular destination for visitors seeking alpine scenery, as well as nature-lovers, bushwalkers, and rock-climbers. One of the largest reserves within the southwestern Australian global biodiversity hotspot, the Stirling Range National Park is today celebrated as one of the most species-rich places in Australia and valued as a significant but threatened conservation asset. The park is also part of country occupied and managed by the indigenous Noongar people and their ancestors for at least 50,000 years. Some of the peaks were avoided by Noongars; others were visited only by "clever people," such as keepers of medical knowledge. Family groups would visit parts of the surrounding bushland seasonally to hunt game and harvest Christmas tree roots, tubers, quandong, acacia seed, yate sap, and banksia nectar. They made small conical huts for shelter, and used fire for cooking, ceremony, and perhaps also land management. The area was never a wilderness and Noongars continued to visit it even as parts were converted to pastoralism and then, in 1913, 1093 square kilometres of it was declared a national park. While the first Australian national park had been announced in New South Wales 34 years earlier, the Stirling Range National Park was distinguished by its enormity, being at the time almost three times the size of all of the national parks in Victoria put together.²

To the settler society of early twentieth-century Western Australia, economic development was paramount. Yet, at this time, some elements of the state's unique flora and fauna were increasingly valued for their beauty, scientific interest, and tourism potential. Evidence of the rarity and extinction of some species gave rise to anxiety about the state's native nature as rapid agricultural development took place. The Under Secretary for Lands, Cecil Clifton, therefore recommended the Stirling Range reserve to the Minister for Lands on the basis that it was unsuitable for settlement and contained fine scen-

2 J.M. Powell, *Environmental Management in Australia, 1788–1914* (Melbourne: Oxford University Press, 1976), 115.

ery as well as unique flora and fauna in urgent need of protection.³ Nature protection at this time involved reservation against alienation for agricultural development, along with state-wide legal restrictions on activities such as hunting and wildflower picking. While a board established in 1921 under the Parks and Reserves Act “controlled” the Stirling Range National Park, little supervision took place on the ground before the first ranger was appointed in 1964.⁴

The interwar years saw considerable interest in having the park live up to its recreational, and commercial, potential, although these aims were not uncontested. In 1921 the state’s leading daily newspaper touted the park as a “splendid health resort”⁵; proposals to drive roads through it and construct a chalet in the mountains followed. This continued throughout the 1920s, as increasing emphasis was placed on both preserving and developing the state’s “natural beauties” for tourism. However, while a road to the park was opened in 1924, the park’s remoteness from Perth—around 350 kilometres away—protected it from mass tourism: in the mid-1920s, three or four large parties and as many sole visitors was a busy year for one of the main peaks.⁶

By the 1930s, a transnational movement was seeking the declaration of “primitive areas” that would preserve wilderness in its “natural state,” devoid of human influence. In practice, this entailed opposition to economic uses such as grazing and the development of infrastructure for mass tourism. The vision was both aesthetic and scientific; however for the Stirling Range it ignored not only the long history of Noongar stewardship of the land, but also the diverse ways in which the movements and activities of people, fire, animals, and pathogens shaped the park’s ecosystems.

As the land adjacent to the park was gradually cleared for agriculture, some of the new neighbours came to see the park as a menace—a fire hazard and a haven for pest animals, including native animals such as kangaroos, emus, and wallabies. Large bushfires swept through the park in 1949/50, and by the mid-1950s landholders adjoining the

3 Memo from Under Secretary for Lands to Minister for Lands, 13 May 1913, Department of Lands and Surveys, “National Park—Stirling Range,” 1908/03809, Cons. 1778, State Records Office of Western Australia (hereafter SROWA), Perth.

4 *Stirling Range and Porongorup National Parks Management Plan, 1999–2009* (Perth: Department of Conservation and Land Management for the National Parks and Nature Conservation Authority, 1999), 51.

5 “The South-West,” *West Australian*, 8 February 1921, 7.

6 Emily Pelloe, “A Wildflower Paradise,” *West Australian*, 19 September 1924, 14.

park were letting fires go into the park “to protect themselves.”⁷ In 1964, a visiting ornithologist noted that bushfires were frequent—probably more so since the surrounding farms were developed—and supposed that the flora was “doubtless in the process of adapting itself accordingly.”⁸ In 1965 one of the local Bush Fire Brigades complained that it had been eight years since a fire had been through their section of the park, and it was “becoming extremely difficult to take a motor vehicle into the park to fight a fire, owing to the heavy regrowth of bush and scrub.”⁹

The local Bush Fire Brigades and the National Parks Board possessed neither the knowledge nor the resources to establish fire regimes that met the needs of both the park’s ecosystems and the surrounding landholders. Noongar people still camped in the area, however laws prohibiting burning of crown land, part of a broader process of dispossession, had long since disrupted any systematic Noongar fire management regime. In this context, authorities increasingly sought to manage fire in the park for the protection of human lives and property. By 1969 the National Parks Board had a policy of burning thousands of acres of the park each year, with a view to cyclically burning the entire park over a four or five year period in order to prevent large wildfires that would threaten adjoining properties. Though it is doubtful whether they had the resources to ever fully implement this policy, some local observers felt the burning was too widespread and frequent, and negatively impacted the flora and fauna.¹⁰

As burning increased with the creation in 1985 of a new Department of Conservation and Land Management, landholders near the park became increasingly involved in debates over fire management. In 1990 the Albany Zone Council of the Western Australian Farmers Federation held a public meeting at which participants agreed that fire management in the region should “reflect the historical and evolutionary history” of the relevant park ecosystem, namely “regular wind driven strip burning to guarantee regeneration zones for native flora and fauna.”¹¹ The 1999 management plan divided the park into three fire zones: one with no planned fire; one with mosaic burning for vegeta-

7 Rev. W. A. Atkins, Extract from State Gardens Board File 1214/2, National Parks Board, “Fire Control—Stirling Range National Park,” 1942/1382 V1, Cons. 1068, SROWA.

8 L. E. Sedgwick, “Birds of the Stirling Ranges, Western Australia,” *Emu* 64, no. 1 (1964): 9.

9 Letter from Kojeneerup Bush Fire Brigade to Parks and Gardens Board, 16 September 1965, National Parks Board, “Fire Control—Stirling Range National Park,” Cons. 1068, SROWA.

10 Western Australian Tourist Development Authority, “Stirling Ranges—General,” 1966/177, Cons. 924, SROWA.

11 Janette Trent to Keith Bradby, 10 April 1990, Gondwana Link Archive, Albany.

tion, habitat, and fuel management; and fuel reduction burning around the perimeter zone. The highest peaks, usually too moist for frequent fires, were in the “no planned fire” zone but wildfire reached them in 1991 and again in 2000. The second wildfire, occurring only nine years after the first, contributed to a major collapse in the montane vegetation, which was unable to regenerate in such a short interval.¹² Fire management in such a large area proved complex, costly, and was confounded by lightning and accidental escapes from prescribed burning.

A general policy drawn up in 1960 charged the Western Australian National Parks Board with preserving natural beauty, conserving native flora and fauna, and protecting geological and other features of special interest in the lands under its control. At the same time, however, it required the Board to develop and improve these areas to promote their enjoyment by the public. Rising car ownership made the park more accessible and, as the director of the state’s Tourist Development Authority pointed out in 1961, “Western Australia has developed a name as the Wildflower State and every effort must be made to see that visitors to the State are not disappointed.” Though hoping to maintain some parts of the park as “primitive areas,” in the early 1960s the Board set about extending the network of roads inside the park (also to serve as firebreaks) and providing camping and parking facilities.¹³ The construction of a toilet block and car park at the foot of the highest peak attracted criticism on aesthetic grounds, but more significant ecological impacts—and new challenges to the park’s management—arose from the greater number and variety of people, animals, plants, and pathogens entering the park.

By 1963, busloads of tourists were visiting the park and taking away posies of wildflowers; visitors also dumped rubbish, shot kangaroos, dug up plants, and took away stone and gravel. In an area with a large number of endemic species, such activities could have serious consequences. As well as bringing in more people, the roads also provided corridors into the park that facilitated the entry of cosmopolitan animals and plants, including foxes, rabbits, and weeds. Rangers pulled weeds out by hand, while foxes would later be targeted by aircraft dropping baits containing sodium fluoroacetate (1080) poison. By the early 1970s, tyres and boots were carrying mud containing an introduced water mould, *Phytophthora cinnamomi*, through the park. This organism moves indepen-

12 Sarah Barrett and Colin J. Yates, “Risks to a Mountain Summit Ecosystem with Endemic Biota in Southwestern Australia,” *Austral Ecology* 40, no. 4 (2015): 423–32, doi:10.1111/aec.12199.

13 Western Australian Tourist Development Authority, “Stirling Ranges—General,” 1966/177, Cons. 924, SROWA.



Figure 2 & 3:
View in the eastern
Stirling Range, 1965
and 2012, showing
effect of dieback.
Source:
Eileen Croxford and
Damien Rathbone
respectively.

dently at a rate of around one metre per year and can be spread over small distances by animals, but in the Stirling Range its principal vector is humans, who can carry it long distances in soil attached to footwear, machinery, and tyres. Locally known as “dieback,” it engineers a more favourable soil environment for itself by killing susceptible vegetation. In affected areas, it radically changed the composition of the park’s flora.

Though dieback was established in the southwest jarrah forest by the mid-1960s, it took some time for researchers to understand the organism and develop measures to limit its spread. Park managers did not restrict access; and by the time CSIRO researchers formally detected dieback in the Stirling Range in 1974, it was already widespread within the park’s boundaries. The opening of gravel pits and the road construction within the park in the 1960s—probably with infested gravel—hastened the spread of dieback, as did the increasing number of bushwalkers who traversed the highest peaks without any soil hygiene management. By the 1970s, the army was using the park for training and testing troops; in return for their use of the park, army personnel assisted with management activities.¹⁴ Army and hiking boots carried dieback to the peaks, then rainfall and gravity spread it down the slopes. As the impacts were belatedly realised, and as the rise of environmentalism fostered widespread community concern over the loss of biodiversity, in 1994 managers restricted access to parts of the park. To increase the dieback resistance of rare vegetation communities they began a programme of spraying phosphite from aircraft over small areas of the park. They also translocated some endangered plants and caged others to protect them from introduced rabbits, as well as quokkas, themselves a vulnerable native species.¹⁵ The desire to prevent further loss of plant biodiversity to dieback called for intensified human intervention.

¹⁴ *Stirling Range and Porongorup National Parks Management Plan*, 79.

¹⁵ Damien Rathbone et al., “Battling the Odds,” *Landscape* 31, no. 3 (2016): 40–4.

Over the last decade of the twentieth century, political and economic pressures to use the park as a scenic and recreational resource increased, while the rise of neoliberalism saw funding for park management and maintenance reduced. In this context, park management became ever more challenging. Conservation staff, researchers, and volunteers worked hard to protect the park's flora and fauna; as a result, none of the park's many endemic plant species have yet become extinct, and plant and invertebrate species new to science are still being discovered. Yet the combined forces of fire and *Phytophthora* have rendered the Eastern Stirling Range Montane Heath and Thicket ecosystem critically endangered. In a region that has experienced declining rainfall since the 1970s along with increasing temperatures, climate change also poses a significant threat to existing ecological communities, while hikers entering restricted areas in defiance of signage have contributed to the ongoing spread of dieback.¹⁶

Meanwhile, a growing number of people began to argue that native nature—in the southwest and elsewhere—was not effectively protected in fragmented reserves. Theirs was a vision of agricultural production that accommodated nature conservation and sustained ecological processes over a much larger area. Ecologists researched ways of “reintegrating fragmented landscapes.”¹⁷ An NGO, Gondwana Link, sought to reconnect landscapes across southwestern Australia through knowledge sharing, conservation planning, and private conservation. Starting with the area between the Stirling Range and Fitzgerald River National Parks, they aimed to restore and maintain biodiversity and ecosystem function in both reserves and farmland.¹⁸ This vision began to supplant the old model of conservation based on separate spaces for “nature” and “culture.”

Those who fought for the establishment of national parks in Australia provided subsequent generations with invaluable scientific, ecological, recreational, and spiritual resources. Given the rate at which Australian ecosystems were being transformed by extractive industries in the late nineteenth and early twentieth centuries, the declaration of any national park was a triumph for conservation. However, reservation alone was insufficient for preservation, as park boundaries proved no barrier to fire, *Phytophthora*, animals, and climate. The nature of the Stirling Range National Park today—while still

16 Phoebe Wearne, “Frontier Falls,” *Albany Advertiser*, 4 March 2010, 1.

17 R. J. Hobbs and D. A. Saunders (eds.), *Reintegrating Fragmented Landscapes: Towards Sustainable Production and Nature Conservation* (New York: Springer Verlag, 1993).

18 See Gondwana Link, “Stirlings to Fitzgerald,” http://www.gondwanalink.org/whatshapwhere/fitz_stirlings.aspx. Last accessed 23 February 2017.

valuable in its own right—is quite different from that reserved in 1913. As the settler society forcibly took over management of the area from the Noongar people, they found their separationist paradigm of environmental protection impracticable in a more-than-human world. Their vision of nature preservation in discrete reserves and business-as-usual elsewhere was a modernist fantasy. The challenge now is to mobilise sufficient people and resources to care for this country to sustain both human livelihoods and nature’s flourishing on a bioregional scale.

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Rohan Lloyd

Through the Reef: Settler Politics, Science, and the Great Barrier Reef

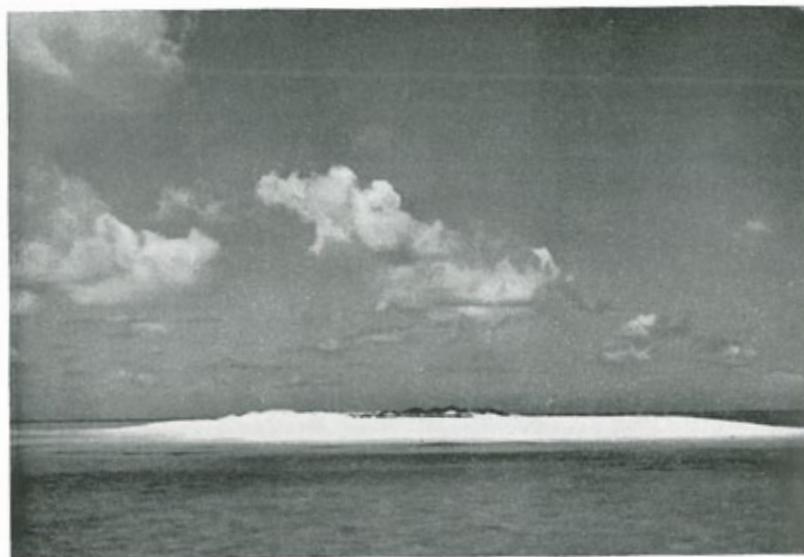
Accounts of the Great Barrier Reef written before 1975 usually begin with a list of the reef's physical features: Australians, while familiar with the Reef, were still establishing its importance within their collective consciousness. Scientists, natural historians, travel writers, and politicians promoted an awareness of the reef as a place rich in splendour but also, and quite literally, wealth. However, the establishment of the Great Barrier Reef Marine Park Authority (GBRMPA) in 1975, following a protracted environmental campaign, marked the ascendance of science in the management of the reef and was thought to herald a golden era of reef preservation.

The GBRMPA was established to manage conflict over the uses of the reef, and the values attached to it. After 1975, the reef became partitioned—zoned for specific user groups and agendas. Understanding threats to the reef, both in terms of human behaviour and of naturally occurring phenomena, became the paradigm of Australian coral-reef science. Reef scientists pursued their investigations in marine research stations from Lizard Island in the Reef's north to One Tree Island in the south. Australian coral reef scientists quickly caught up with, and then led, coral reef research throughout the world. This regime, however, was predicated on the notion that the reef's health was mainly impacted by local events (such as cyclones, heavy rains, pollution, and Crown of Thorns); the impact of global climate shifts had not entered into discussions of the reef's future in the 1970s.¹ Today, that issue is paramount in understanding coral reef, and indeed the Great Barrier Reef's, health. While the Great Barrier Reef is one of the best-protected coral reef systems in the world, scientists have lamented the way governments, industry, and even the GBRMPA itself have sidelined their voices, been slow to implement effective management policies and, in the case of the expansion of coal exportation, disregarded advice completely. Consequently, in the twenty-first century, a new understanding of the Reef is emerging, one that acknowledges that its declining health is a sign of the harmful impacts of global climate change.

1 Crown of Thorns starfish (*Acanthaster planci*) is a native coral-eating starfish common to the reefs of the Indo-Pacific region. While it can play an important role on a reef by feeding on the fastest-growing corals, the starfish has, according to the Australian Institute of Marine Science, been responsible for nearly half of all coral decline over the last 30 years on the Barrier Reef. The most significant damage occurs when outbreaks of the starfish occur. The first reported outbreak occurred in the early 1960s on the popular reefs near Cairns. Since then there have been three further outbreaks, the most recent starting in 2010.

A history of the Great Barrier Reef reveals that the contemporary tensions between the desire for economic growth and protection of the reef have a long past. Appreciation of the reef's social and economic value increased dramatically as settlement spread along the Queensland coast after 1860. With greater access to the reef, however, came greater human-caused damage to its varied marine environments. As environmental loss became more obvious and less socially palatable, and anxieties over reef resources emerged, the Australian federal and Queensland state governments were compelled to act to protect and preserve various reef features through the establishment of sanctuaries, prohibitions on shell and coral collecting, and regulation of industrial exploitation of the reef's biological and geological resources. This paper will give a brief overview of these developments to provide context on contemporary issues and on predictions of the reef's future.

190 THE AUSTRALIAN MUSEUM MAGAZINE. JUNE 15, 1951.



Upolu Bank, near Green Island, off Cairns, Queensland. A typical small mound (cay) resting atop a large coral bank. Except for the sparse vegetation, the composition is carbonate of lime—gravels and fine sand.

Photo.—H. Chargeis, F.R.P.S.

Wealth in Coral Gravels

By FRANK McNEILL.

Figure 1:
Frank McNeill was an Australian marine zoologist working for the Australian Museum. His article explained that "vast accumulations of detritus along the Great Barrier Reef have lain dormant and unnoticed for centuries...It will be interesting to see how long a time will elapse before this source of national wealth is turned to account."

From the time of the reef's settlement, appreciation of its economic potential (and its aesthetically pleasing and environmentally valuable attributes) was evident. Before the underwater world was easily accessible, the reef's migratory bird species and turtles formed an identifiable and spectacular treasure of its unique ecosystem. The birds that flocked to the reef's cays and islands received widespread admiration and subsequently official protection. Turtles received various levels of protection in the interwar and post-war periods as a result of concern over dwindling numbers and the magnitude and cruelty of their slaughter. The reef's aesthetic and environmental virtues had been broadcast by natural historians both amateur and professional, such as William Saville-Kent, Edmund Banfield, C. M. Yonge, and Theodore Roughly. Journalists and nature writers such as Sydney Elliot Napier and Charles Barrett had also publicised the reef's appeal. Politicians keen to draw attention to the economic possibilities of the reef wrote lyrically about its environmental splendour. Collectively, these writers encouraged a sympathetic regard for the reef and the protection of its most important natural features. Additionally, all were eager to highlight the reef's potential for economic development and exploitation. More importantly, they asserted the worth of the reef to the Australian public. Within this view, its islands could be sites of agricultural, pastoral, or fishery development, while other islands, less suitable to productive development, could be set aside as tourist and nature reserves. A sense was building in the early twentieth century that the reef, a wonderful showcase for Australian nature, had economic potential that had barely been realised.

While reef tourism had existed in rudimentary form since the nineteenth century, isolation, poor infrastructure, and obstructionist lease arrangements slowed the development of a truly modern tourism industry. In 1947, the development prospects of reef tourism prompted concern from the Queensland Tourist Development Board and the National Parks Association of Queensland about the reef's preservation. Tourists, they argued, were poorly informed about the impacts of shell and coral collecting, and island rangers (responsible for protecting the reefs) were found to be illegally collecting and selling corals and shells. There was a growing conviction that accessible reefs were being plundered. In response, the Parks Association advocated that either the entire Barrier Reef, or at least the popular tourist islands of the Whitsundays Passage, be amalgamated into a single Barrier Reef National Park. Their latter proposal suggested that individual islands like Long, Whitsunday, South Molle, and Hook would lose their individual names and be referred to collectively as the National Park. The Parks Association considered



Figure 2:
Exposed coral reef
at Lodestone Reef,
off Townsville, 1951.
Image held by Townsville
City Libraries.

such a move would both dramatically improve the islands' management and bring about greater international recognition and tourism. The government disagreed, no notable changes to the reef's preservation status were made, and development of the tourism industry continued, as did the expressions of concern surrounding the reef's degradation.

In the postwar era, concerns were raised by local citizens, scientists, and conservation groups about the increasingly obvious human impacts on the reef. Exploration for oil and minerals, the first outbreak of the coral-eating Crown of Thorns starfish, and terrestrial pollution's impacts on marine environments reinforced the notion that new forms of regulating human engagement with the reef were required. At the end of 1966, Don McMichael, a marine biologist at the Australian Museum, decried what he saw as complacency about the possible loss of the reef. He wrote that "most people have regarded the Reef as something completely permanent, of great age and with a future stretching ahead just as long as its past. They would probably agree that nothing we could do would conceivably affect the future of this enormous complex of coral reefs."² McMichael asserted that further "positive steps towards safeguarding the Reef's future" would need to be taken in order to protect the reef from the major "alterations to the environment" he foresaw. But the scientific community remained eager to manage development rather than arrest it, and to ensure that the reef's economic resources could be exploited while its natural values were enjoyed and maintained.

The "Save the Reef" campaign took place in this context. That campaign, which lasted from 1967 to 1975, was at first concerned with protecting a particular section of reef from limestone mining, but it came to defend the entire reef from oil drilling. It gave impetus to the national discussion of how the reef would be managed into the future. One of the major concerns of the campaign was whether or not reef tourism and oil

2 Donald McMichael, "The Future of the Great Barrier Reef," *Australian Natural History* 15, no. 8 (1966): 269–70.

extraction were compatible. While pro-oil exponents suggested the two could coexist, the prospect of oil spills and oil rigs ruining the aesthetics of the reefscape loomed large in the imaginations of Australians. This scenario was made all the more compelling by contemporary images of the 1969 Santa Barbara oil spill off the coast of California.

In 1970, the campaign to save the reef had gained such popularity that a trade union “black ban” halted the oil rig construction on the reef, necessitating the intervention of a Royal Commission. In Australia, the term black ban refers to the mass refusal by trade union workers to supply or purchase goods or services. Eventually the term “green ban” was coined in 1973 to distinguish traditional black bans from those with a distinct environmentalist agenda. Most historians consider the earliest green bans to have been conducted in Sydney in 1971; however, few could doubt the environmentalist underpinnings of the reef black ban. As a result of this union intervention, the future of the reef’s management came under far greater public scrutiny. Again, attention was drawn to the possible loss in tourism revenue that would come about by ruining an environment with significant natural value and tourism potential. A bill was introduced to the Commission that sought to reconcile the conflicting and multiple uses of the reef while ensuring its preservation. The bill dictated that a single authority would manage the reef’s conservation, exploitation, and research. In 1975, less than a year after the Commission’s report was distributed, the Commonwealth government passed the *Great Barrier Reef Marine Park Act*, the founding principle of which was for the GBRMPA to manage the reef in line with a multi-use approach.

Accompanying the conservation campaign was a significant increase in investment in reef research in Australia. A major hurdle for pre-1975 reef management was the scarcity of reliable scientific research. The conservation controversies demonstrated the necessity of informed science to the ongoing management of the reef. Consequently there has been a considerable increase in the number of coral reef observatories in Australia since the early 1970s, along with a significant increase in research output. Initially this research was directed towards establishing, rationalising, and monitoring the various management zones along the reef region. Since its inception, the GBRMPA has been regarded by coral reef scientists as a paragon of marine park management. Some of its successes include the maintenance of mangrove communities; the establishing of sustainable fisheries; increases in whale populations; the prohibition of oil and mineral mining; positive responses to sewage and effluent discharge in the form of state and fed-

eral government cooperation and legislation; and strong action on pilotage, including introducing restrictions on shipping sewage discharge and provisions for the full cost of environmental rehabilitation following incidents in the Marine Park.³ Yet it is precisely because the management regime has been so successful that signs of the reef's general decline are so concerning. Since the late 1980s there has been more of a focus on the causes of coral reef decline. Consequently, coral reefs have become identified as major losers in a warming climate. Scientists have highlighted the inefficiencies of a management system that is unable to mitigate, without significant changes, the decline in the Barrier Reef's health. Three major issues have been identified as concerns for the reef's response to climate change.⁴

The first, and the one which the GBRMPA has been able to address, is water quality decline. While the reef is well protected and managed, its catchment area is less well maintained. It is estimated that the amount of runoff into the reef has increased to 5.5 times the pre-European load levels, or 17, 000 kilotons a year. The consequences of increased terrestrial loads are multiple: sediment runoff has resulted in a reduction in coral settlement, increases in juvenile mortality, reductions in coral diversity, and other issues that are attributable to reduced light. Additionally, corals are dependent on low nutrient levels to thrive. Increased nutrient loads are considered to be the primary cause of outbreaks of the Crown of Thorns starfish.

The second and third causes of the reef's decline are direct results of global anthropogenic climate change. While increased ocean temperatures might seem beneficial for coral growth, since they thrive in warm, tropical waters, corals are acutely sensitive to elevated sea temperatures. Higher-than-normal sea temperatures can result in a breakdown of the symbiosis between corals and their algae symbionts, causing an event known as coral bleaching. Coral bleaching is often described as the bushfire of

3 See: J. Brodie and J. Waterhouse, "A Critical Review of Environmental Management of the 'Not So Great' Barrier Reef," *Estuarine, Coastal, and Shelf Science* 104–5 (2012): 3–12.

4 These concerns are reflected in a massive number of articles that focus on both the Barrier Reef and on global reef system declines. The following are important for both the frequency with which they are cited and the impact of the research: Ove Hoegh-Guldberg, "Climate Change, Coral Bleaching, and the Future of the World's Coral Reefs," *Marine and Freshwater Research* 50, no. 8 (1999); D. R. Belwood et al., "Confronting the Coral Reef Crisis," *Nature (London)* 429, no. 6994 (2004); Glen De'ath, Janice M. Lough, and Katharina E. Fabricius, "Declining Coral Calcification on the Great Barrier Reef," *Science* 323, no. 5910 (2009); J. E. Brodie et al., "Terrestrial Pollutant Runoff to the Great Barrier Reef: An Update of Issues, Priorities, and Management Responses," *Marine Pollution Bulletin* 65, no. 4–9 (2012); Glenn De'ath et al., "The 27-Year Decline of Coral Cover on the Great Barrier Reef and Its Causes," *Proceedings of the National Academy of Sciences of the United States of America* 109, no. 44 (2012).

the marine world. It leaves the corals white and devoid of life, and reportedly smelling like rotting animals. Initially observed in the late 1970s, coral bleaching, including the large-scale phenomena known as mass bleaching events, has become one of the major concerns of global reef science. In 1998, during one of the largest mass bleaching events on record, bleaching occurred on nearly every major reef system in both hemispheres. On the Barrier Reef, the damage was extensive in 1998, 2002, and locally severe in the reef's southern regions in 2006. Reports of the extent of the damage caused by the 2016 event have suggested that only seven per cent of the reef escaped bleaching. While there are no human casualties in a bleaching event, the images of white, lifeless reefs along Australia's coast have invoked widespread concern for the Great Barrier Reef's future in a changing climate.

Also associated with anthropogenic climate change is the increasing acidification of the world's oceans. As a result of this, organisms with calcium carbonate skeletons, such as corals, are inhibited from calcifying and building crucial tissue. There have been notable declines in the rates of calcification of corals that correlate with increases in water acidity in the reef. The ocean acidification has led some to assume that a temperature-driven decline in coral reefs, manifesting in bleaching, will eventually be displaced by an acidification-driven degradation of coral reefs, even if global warming is limited to under 2° Celsius.

Despite our increased understanding of reef ecosystems, uncertainty remains over the future of coral reefs. Research using geochemical and geological records suggests that coral reefs have survived previous CO₂-driven climate changes. It is, however, unknown whether corals will be able to acclimatise or adapt to the rapid rate of change that is underway today. Given that some predict that mass bleaching events will be annual occurrences by 2050, and that by 2020 the average rate of bleaching will be equivalent to the 1998 mass bleaching event, there is little room left for optimism for the future of the Barrier Reef.⁵

Yet it is important to acknowledge the source of whatever optimism remains. Scientists are increasingly revealing mechanisms of resilience within corals and their symbiont partners to the changing climatic conditions and are identifying species-specific abilities to acclimatise and adapt, despite the pace of change. Additionally, identifying those

5 See: Hoegh-Gulberg, "Climate Change, Coral Bleach, and the Future of the World's Coral Reefs," 853.

characteristics that correspond to positive responses to bleaching has allowed scientists to predict, to some extent, future responses. A key factor in coral resilience to both bleaching and acidification, and indeed to any major disturbance, is water quality. Since 2003, improving the water quality of the Barrier Reef has been one of the major environmental initiatives of the Queensland and Commonwealth governments.

While new biological evidence provides some room for optimism, the past can be a source of optimism too. The reef is a biological wonder, protected by its World Heritage listing since 1981. It contributes a disproportionate amount of Australia's biodiversity, protects the Queensland coast from the Pacific Ocean, and contains important sites of Indigenous cultural heritage. Additionally, the reef is of considerable economic value. Reef-based industries generate nearly six billion Australian dollars of revenue annually. Tourism's share of Australia's economy is nearly three per cent and the reef, which generates just over five billion dollars annually, remains a significant tourist destination for both domestic and international travellers. The importance of reef tourism for Queensland coastal communities in particular, struggling now in Australia's post-mining boom slump, was made even more apparent by recent protest flotillas at Great Keppel Island calling for the approval of a gaming licence for a proposed island resort. In the "Save the Reef" campaign, the prospect of an oil industry was considered to be in direct opposition to the needs of the tourism industry. In 2016, the tourist industry is once again aligned with conservation movements. Reef tourism operators who are concerned with the decline in reef health and the consequences it would have for their businesses are routinely amongst the most vocal supporters of reef conservation and action against climate change. After the bleaching in 2016 was widely broadcast, tourism operators raised concerns that their businesses would suffer because of a decline in the reef's health: potential tourists would not be inclined to visit an environment that is scarred and dying. Both this episode and the Great Keppel Protest exemplify the entangled visions of the reef's worth, but are also expressions of the importance the reef has for the communities who live alongside it.

As scientists and many others assert, the Great Barrier Reef needs to be protected because of its multiple values to human actors. These values have a past. They are part of the reef's heritage, manifested in the episodes in which people sought to ensure its protection. If the history of the reef has a lesson to teach us, it is that these values are not the reasons why the reef should be saved; they are likely the reasons it will.

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Seeing Australia

Ruth Ford

Mallee Residues: A Family Photograph Album from Southern Australia

In early winter 1920, 23-year-old William Victor Carson and his 27-year-old brother James Edward Carson took up soldier settler blocks in Kooloonong, Victoria, in southern Australia's Mallee lands. Mallee was the name given to scrubby, multi-stemmed bulbous-rooted eucalypts (*Eucalyptus dumosa*) but was also used to describe the northwestern part of the state of Victoria covered by mallee vegetation as shrubland and woodland. Almost immediately after arrival, the brothers began photographing their land, their living quarters, and their efforts to clear the mallee and these photographs became part of a Carson family album.



Figure 1:
Brothers Jim and Will Carson, casually holding shovels, Jim with a cigarette in his mouth.

Both Will and Jim were single returned servicemen, having been discharged from the Australian Imperial Forces (AIF) in January 1920. Both had been injured during active service and declared medically unfit. The Land Board's notes of evidence recorded of Jim: "I am capable of doing the work incidental to putting the block applied for into a productive state"; and of Will: "Satisfied I can make a living of it, will keep wheat." Within days of their leases being approved, the bachelor brothers had shifted from urban Melbourne to work their blocks together. They erected tents as a temporary home and began clearing the land, using a mallee roller. And they began taking photographs.



Figure 2:
"Bringing the Roller
Home"

The Carson album was typical of family albums from this period that depicted the settler colonial project of clearing and rolling the mallee, establishing a house and garden and planting, and harvesting wheat crops. These snapshots are both evidence of environmental change and a form of storytelling about the transformation of the land. The taking, displaying and viewing of these images acted to reinforce their identity as pioneer settlers and as "mallee men."

The photograph captioned "Bringing the Roller Home" shows the extent of cleared land with mallee shrubland and woodland in the distance. The album as a whole has very few photographs of Mallee vegetation without any human figures, work animals, or clearing or farming equipment. The album reflects the settlers' desire to record their transformation of the landscape and their gradual possession of that landscape. The act of photographing, as with the act of mapping and surveying, is an act of visually possessing the landscape; of creating new meanings about that place.



Figure 3:
A wagonload of wheat

There is only one photograph that depicts the landscape without any human figures, work-animals, buildings, machines, or tracks. The image with the caption “How the country looks before rolling” could be read in different ways. Did the Carsons perhaps see value in recording what was about to be destroyed? Or did the Carsons seek to underscore the enormity of the work before them?



Figure 4:
“How the country
looks before rolling”



Figure 5:
Jim on his horse

The majority of images depict Jim and Will with their horse teams clearing the Mallee. The photograph of Jim on his horse draws on visual codes of rural masculinity and Australian horsemanship.

Yet, while the photographs consciously depict their labour in transforming the environment, they also reveal their intimacy and connection with the environment as they work. Images of clearing mallee scrub, cooking, washing, eating outside, and sleeping in a tent reminds us of their daily enmeshment in that environment—from its smells, sounds, vegetation, and birdlife, to its heat and wind.

A photograph depicting Jim and Bill at their initial wagon tent is striking in showing the extent of mallee woodland vegetation and their close contact with it. Other photographs depict the brothers as bachelor men engaged in domestic tasks. Photographs labelled “Will at the wash tub” and “Jim at the oven” create a very different image of mallee masculinity.

A number of photographs also depict their friends or neighbours relaxing and socialising in the landscape, eating lunch under trees and emphasising the family settlement project with women and children present.

There are notable absences and silences in the album. We see no photographs of failed wheat crops or neighbours walking off their farms or of clearing sales after leases were forfeited. The Carsons photographed only their arrival and beginnings in the Mallee, not endings and failures.

In February 1927, Jim died suddenly at the Commercial Hotel, Swan Hill. Two weeks later, Will went ahead with his marriage to Bobbie (Ada) Fuzzard.

* * *

Following a Commission into Soldier and Closer Settlement, the state intervened to compulsorily reclaim some blocks, in order to increase the farm size of settlers deemed most successful and assessed as being “good farmers.” In 1935, as part of this closer settlement adjustment process, the Lands Department wrote to Will Carson offering £75 to relinquish his holding. Will refused the offer, evidently deeming it grossly inadequate compensation. The Commission recalled advances and demanded monies due of £4663. Carson’s lease was subsequently declared forfeited and his block was



Figure 6:
Jim and Bill at their
initial wagon tent



Figure 7:
“Will at the wash tub”



Figure 8:
“Lunch time at a
neighbour’s”



Figure 9:
Rolling mallee

allocated to a neighbouring settler. Jim Carson's block, which had been managed by his brother George Carson since his death in 1927, was also reclaimed.

In 1935, Will Carson and his wife Bobbie move back to urban life to live in Essendon, in Melbourne's western suburbs. The photograph album becomes a material residue of the Carson brothers' years of farming the mallee.

The photographs, taken within the historical conjuncture of the state-sponsored project of clearing and settling the land, and recording progress towards transforming mallee scrub into wheat fields, gain new meanings in an era of emerging conservation. They become both a record of heroic pioneer settlers' attempts to farm the mallee and evidence of environmental destruction, and the need for the conservation of surviving mallee.

Cameron Muir

Fifty Shades of Shadow Places:¹ A Photographic Essay

Every time there's a big wet, say every four or so years, the creek at Chidna Station runs blue. A lurid, cobalt blue. At the Pilliga, tailings turn the ground white and the forest black. Further south, the Murray River blooms green. At Roxby Downs, in South Australia, where we mine the world's largest known deposit of uranium, the water takes on a yellow hue. Here is a rainbow of toxicity. Agriculture, mining, and industry have transformed many of Australia's waterways, often in faraway localities, where the consequences of our consumption and exploitation of people and places remain out of sight and out of mind. These are shadow places.



Figures 1 & 2:
A creek on Chidna Station near the abandoned Mount Oxide mine, Queensland. Photos courtesy of Vernon Spreadborough.

Vernon Spreadborough fears for the health of his cattle here. He sees birds drop dead at the old Mt Oxide mine pit at the edge of his property. The mining company left decades ago and the government won't spend the money to clean up the site. He carries on with his blue water and dead animals up in Queensland, towards the Northern Territory border, one of the most sparsely populated places in the world.

1 Val Plumwood, "Shadow Places and the Politics of Dwelling," *Australian Humanities Review* 44 (2008), <http://www.australianhumanitiesreview.org/archive/Issue-March-2008/plumwood.html>.

Figures 3 & 4:
Bibblewindi spill site,
Pilliga Forest, New
South Wales. Photos
by the author.

Wastewater from coal seam gas extraction spilled into the forest in 2011 and killed the vegetation. The site has been rehabilitated but the ground still leeches salts. New gas and coal mining developments have divided the rural communities in northwest New South Wales.



Figure 5:
Tailings dam from
the uranium mine at
Roxby Downs, South
Australia. Photo cour-
tesy Jessie Boylan.

The Olympic Dam mine near Roxby Downs in South Australia holds the world's largest known deposit of uranium. It has been the site of anti-nuclear protests since 1983. Australia doesn't produce nuclear energy but it supplies uranium to most of the world's nuclear energy producers.





Figures 6 & 7: Blue-green algae in the Murray-Darling River system, Australia. Photos courtesy of Murray-Darling Basin Authority.

Australia has transformed many of its inland rivers. In the summer of 1991–92, the Darling River became the site of the world’s largest toxic blue-green algae outbreak. The bloom stretched for over 1,000 kilometres, locals along the river reported. The New South Wales government trucked in drinking water and called on the military for support.

I think I am drawn to Val Plumwood’s “shadow places” more than any other concept in the environmental humanities. Plumwood was a founding ecofeminist philosopher and her words influenced scholars and activists around the world. In Australia, she was a key member of the ecological humanities group that included Freya Matthews, Kate Rigby, Libby Robin, and Deborah Bird Rose. *Shadow Places* was only a short essay, written towards the end of Plumwood’s life and published after her death in 2008. Others, however, are quietly expanding the ideas in that essay.

Shadow places are sites of extraction and production that provide for our material comfort, yet they are places “we don’t know about, don’t want to know about, and in a commodity regime don’t ever need to know about.” The enjoyment of our homes and national parks and other privileged places is made possible by outsourcing risk and disorder to other people and places—often to the most vulnerable—and to future generations. Plumwood argued we should expand our idea of “home” to include all the places that nourish us, the places that provide our material needs and comforts. This expands our responsibilities beyond the local. Many of us continue to grapple with what that means in practice. Maybe the act of acknowledgement is enough at first.

Figure 8:

Thermal water pollution from the Vales Point Power Station, Lake Macquarie, New South Wales. Photo courtesy Mark Merton, sydneyimages.com.au

This small power plant burns coal mined in the nearby Hunter Valley. It emits nearly 10 million tonnes of greenhouse gases each year.

**Figure 9:**

Contaminated water samples from Teshima Island, Japan. Photo by the author.

In the 1980s and 90s, hundreds of thousands of tonnes of toxic waste from the car industry were illegally dumped on the island. Locals lived with the dioxins, PCBs, and lead material for years before the Japanese government began remedial works. Australia imports many of its cars from Japan. Where does responsibility for the "local" lie in the Anthropocene?





Figure 10: Facility for processing and transferring toxic waste from Teshima Island, Japan.

The cost of the facility alone was around US \$250 million. Running the disposal facility will cost hundreds of millions more before the cleanup is complete.



Figure 11: Traditional leather tannery in Fes, Morocco. Photo by Andrew E. Larsen.



© 2012, Hani Amir

Figures 12 & 13:
Thilafushi has become known as “Rubbish Island” in the Maldives. Photos by Hani Amir.

From the leather goods we import to the places we travel, our actions come with costs. Leather tanneries pollute waterways with toxic materials such as chromium salts, especially in China, India, and Bangladesh, the main countries where leather is processed. Tourism has placed such pressure on waste management in the resource-poor Maldives that Thilafushi Island has become a dumping ground.





Figure 14:
Contaminated Rio
Doce water flows into
the Atlantic. Photo by
NASA.

In November 2015, an iron ore tailings dam in Bento Rodrigues collapsed, sending 60 million cubic meters of toxic brown mud into the Doce River and eventually into the Atlantic Ocean. Seventeen people died and many more were injured. The mine was part-owned by BHP Billiton, the world's largest mining company, and one of Australia's largest companies.

The concept of shadow places is more than the old accounting-based notions of “ghost acres” and “ecological footprint.” It is those and more. It pulls us to concrete localities. It includes the experiences of people in those places. It brings a strong moral dimension. It demands a humanities approach.

Some of us are pushing the earth into a new epoch, the Anthropocene, and it is harder to think about Australia in isolation. Trade ties other individuals, groups, and nations to our shadow places, just as it ties us to theirs. Australia's private rooftop solar installations may reduce our greenhouse gas emissions but we give little thought to the pollution released by the factories that manufacture the panels. Fishers and villagers in China have complained that contamination from solar plants has killed wildlife and domestic animals and poses a risk to human health. Demonstrators have clashed with police. Australian companies mine around the world. We buy cars from Japan where the industry dumped waste illegally on surrounding islands. Europe, China, the US, and the UK buy our uranium.

The question of shadow places goes to the heart of justice in the Anthropocene.

Tom Griffiths

The Transformative Craft of Environmental History: Perspectives on Australian Scholarship

I want to draw out some of the distinctive qualities of Australian environmental history, but first I will reflect on the field of environmental history in general as well as on the radical practice of history itself.

Transforming History

Environmental history emerged in the 1960s and 70s as an intervention in an established discipline, as one of a series of intellectual and political movements that swept through historical practice in the second half of the twentieth century—along with social history, “history from below,” indigenous history, and feminist history. Nature joined class, race, and gender as fundamental, and also disruptive, categories of historical analysis. Nature, declared environmental historians, could no longer be seen as just the passive backdrop to human action; it was no longer the stable stage on which the human drama played out.

But nature hadn’t always been outside history. The tension between nature and humanity, between civilisation and the wild, was part of classical literature and lore. And in the modern era, we could say that geologists have been doing environmental history since James Hutton and Charles Lyell; biologists have been doing it since Darwin; and physicists since Einstein. In the early and mid-twentieth century, “environmental history” was a term often used by geologists, palaeobotanists, and archaeologists in their analyses of environmental change in the quaternary period. In the same decades, historical and cultural geographers were major players in a field that was belatedly colonised by historians.

Something happened to history in the West in the nineteenth century that defined it against nature. Professional history became aligned with the rise of the nation state and the creation of state archives. As Christof Mauch has argued, the material progress and technological development of industrial societies probably cultivated a cultural blind-

ness to the force and changeability of the natural world. Economics and technology were seen to drive change forward; they were the engines of progress and the sinews of the state. Political history came to the fore and nature was its servant. Paradoxically, just as a historical perspective came to permeate the natural sciences, history as a discipline increasingly focused on humans as above and outside nature.

Thus history became professional and academic by attending to empire, nation, politics, bureaucracy, and the systematic analysis of documents. This focus on literacy and nationalism enforced a rupture not only between history and prehistory, but also between the civilised and the primitive, humans and animals, and culture and nature. So it was not just nature that was placed outside of history, but also hunter-gatherers and most of the history of humanity itself. The Australian historian David Christian and the American historian Daniel Lord Smail have studied the marginalisation of “deep history” from the late nineteenth century. The rise of civilisation came to be defined against nature—indeed, as the acquisition of mastery over nature—and history was the story of the exceptionality of humans.

An example of how entrenched was this view of history is the work of R. G. Collingwood, one of the most influential twentieth-century philosophers of history. Collingwood regarded nature as outside history because nature has no “inside” that we can recognise, no thought or agency for the historian to discern. “Thus *the least true thing that can be said about a man* is that he is a product of nature,” concluded Collingwood. He argued for a distinction between historical and non-historical human actions: “So far as man’s conduct is determined by what may be called his animal nature, his impulses and appetites, it is non-historical; the process of those activities is a natural process.” Thus, declared Collingwood, “the historian is not interested in the fact that men eat and sleep and make love and thus satisfy their natural appetites.”¹ So the “animality” of humanity lay outside history, and the moral and biological worlds were separate.

In the Anthropocene, that separation is no longer tenable, as Dipesh Chakrabarty has eloquently argued.² Environmental history has turned out to be far more radical than

1 Quoted in W. J. van der Dussen, *History as a Science: The Philosophy of R. G. Collingwood* (New York: Springer, 2002), 46 (italics in the original); see also R. G. Collingwood, *The Idea of History*, rev. ed. (Oxford: Clarendon Press, 1993), 216.

2 Dipesh Chakrabarty, “Humanities in the Anthropocene: The Crisis of an Enduring Kantian Fable,” *New Literary History* 47 (2016): 377–97.

we thought four decades ago, when it aimed modestly to add nature to the fundamental categories of historical analysis. We have stepped beyond the binary that Collingwood saw as the foundation of history and now accept that the fate of humanity is bound up with that of nature and the Earth.

Historical Thinking

Environmental historians often work in an interdisciplinary setting; thus, they represent not only a transformation within their own discipline but also the radical perspective of history more broadly in debates that tend to be dominated by the natural and social sciences. Environmental historians often speak across the science-humanities divide and, in that conversation, they bring historical thinking to the table. It is a surprisingly unusual perspective in environmental and social policy debates. I don't mean the casual, superficial plundering of "history" for lessons from the past; rather, I mean the demanding discipline of leaving the present behind for a time so that the full strangeness of past worlds might be inhabited and comprehended. It is this "letting go" that is sometimes difficult for our colleagues in other disciplines. Archaeologist and historian John Mulvaney bravely advocated "the wisdom of non-relevance."³ Contemporary society's fatal embrace of relevance impoverishes our archive of future possibilities, which good history can enrich.

But it is hard to think one's way out of the thin, captivating moment of "now." The American historian and educationist Sam Wineburg wrote an important book with a great title, *Historical Thinking and Other Unnatural Acts*, in which he argued that historical thinking goes against the grain of how we ordinarily think. He warned against "the seduction of coming to know people in the past by relying on the dimensions of our 'lived experience.'" Ethnographic historians Greg Denning and Inga Clendinnen, like Wineburg, argued that the discipline of history is required to help us discover what we cannot instinctively feel or see.⁴

3 John Mulvaney, *The Wisdom of Non-Relevance: The Humanities and Australia's Cultural Heritage*, The Kenneth Myer Lecture (Canberra: Friends of the National Library of Australia, 1994).

4 Sam Wineburg, *Historical Thinking and Other Unnatural Acts: Charting the Future of Teaching the Past* (Philadelphia: Temple University Press, 2001), chap. 1; Greg Denning, *Readings/Writings* (Melbourne: Melbourne University Press, 1998), 209; Inga Clendinnen, "Understanding the Heathen at Home: E. P. Thompson and his School," *Historical Studies* 18, no. 72 (1979): 435–41.

Curiously, we can more readily find historical thinking among our colleagues in the natural sciences than among our more closely related social scientists. In the natural sciences, historical thinking—which often operates on timespans of thousands or millions of years—tends to ignore the human or to underestimate the cultural dimensions of natural history. In the social sciences, although they *do* consider the human, historical thinking may operate only over very short timespans or even be entirely absent. Thus historical thinking—with its focus on century-scale change over time, its search for contextual meaning, its commitment to contingency and particularity, and its respect for the integrity of the past—has much to offer a multidisciplinary environmental inquiry.

Furthermore, the art of historical narrative should not be misunderstood as easy and inherent. Story is the most powerful educational tool we possess; it is learning distilled in a common language. It is also a privileged carrier of truth, a way of allowing for multiplicity and complexity at the same time as being memorable. In the words of the American environmental writer Barry Lopez, “Story creates an atmosphere in which truth becomes discernible as a pattern.”⁵ And so I would argue that narrative is not just a means; it is a method—and a rigorous and demanding one. The conventional scientific method separates causes from one another; it isolates each one and tests them individually in turn. Narrative, by contrast, carries along multiple causes together and tests and enacts connectivity. We need both methods.

Let me now turn to three distinctive dimensions of Australian environmental scholarship.

Travelling in Deep Time

The experience of the Anthropocene and the rapprochement of scientific and historical narratives have demanded that we learn to think across much greater timescales, both human and natural. Australians today live on a precipice of deep time. It is a stunning discovery of the last half-century that the human history of the continent goes back not just a few thousand years, but about 60,000. Modern Australia—once regarded as “the timeless land”—has actually been forged in a time revolution. In the two hundred years following the European invasion of Australia, the known age of the

5 Barry Lopez, “The Literature of Place,” *Heat* 2 (1996): 52–53.

Earth increased from about 6,000 years to 4.6 billion. And in the second half of the twentieth century, the timescale of Australia's own human history increased tenfold in thirty years. Even the best northern hemisphere scholars struggle to digest the implications of the Australian time revolution. For example, Dan Smail makes two assumptions an Australian scholar would argue with: that "civilisation" is a term associated with agriculture, and that 50,000 years is a possible horizon for modern humanity.

There is a vertiginous edge in our historical consciousness that comes from a strengthening awareness of that abyss of time. Greg Denning saw that Australians "live in and with deep time."⁶ The challenge to scholars is to piece together a complex, contoured history of social and environmental change from the arrival of people in Australia to the present. A nuanced narrative of change through millennia ultimately conveys depth better than dates can. Indigenous societies once dismissed as "primordial" and "stone-age" are now understood to have been diverse, innovative, and dynamic. When British colonists encountered Australia's Indigenous peoples, most of the learning was done by the invaded. It was not just because of the power relationship; it was also because Aboriginal peoples were used to change and encounter, and they were at home. They lived in a land with hundreds of languages, where travel involved cultural sensitivity, ritual, and exchange, and where the Dreaming sanctioned a constant, adaptive renaissance. It turns out that the classic settler ethnographies of a "timeless" people actually described societies that had been transformed by an environmental rollercoaster and which, at the moment of contact with Europeans, were undergoing accelerating cultural change. Archaeologist Mike Smith concludes in *The Archaeology of Australia's Deserts* that the foraging landscapes of Central Australia that explorer Ernest Giles described in 1872 and the elaborate ritual and ceremonial life recorded by Baldwin Spencer and Frank Gillen in 1896 "appear to be products of historical changes within the last millennium."

On the eastern shores of Australia in the late eighteenth century, peoples of immensely long and intimate histories of habitation encountered the farthest-flung representatives of the world's most industrialised nation. Aboriginal people survived colonisation and many now live across at least two cultures. A deep, rich human past embedded in known country is one of the gifts of Indigenous people to the new Australians. Aboriginal leader and historian Noel Pearson wrote in 2015: "The songlines are also the heritage of non-Aboriginal Australians. It is this culture that is the *Iliad* and *Odyssey* of Australia. It is

6 Greg Denning, "Living In and With Deep Time," *Journal of Historical Sociology* 18, no. 4 (2005): 269–81.

these mythic stories that are Australia's Book of Genesis."⁷ Australia has become one of the few countries in the world in which a conversation across deep time is truly possible—and it is also vitally necessary. All environmental history in Australia is thus also Aboriginal history, and vice versa.

Ecological Distinctiveness

Australia has a confrontingly different climate and ecology from that of Europe and was much more alien to Europeans than was North America. The strangeness of Australian nature was part of the narrative of European “discovery” from its beginnings. But because modern environmental history came into being through its alliance with ecology, it has gradually recast these imperial stories with biological insights. The well-worn metaphors that arose from the settler's encounter with a strange, southern land—a “land of contrarities,” of “droughts and flooding rains,” and of “upside-down nature”—have, with an ecological perspective, been given new life and dignity. Now, instead of being a mere artefact of settler sensibility, the wide, brown land is also explicable as an ancient craton, a low-energy ecosystem, a boom-and-bust ecology, and an El Niño continent. The biological cringe about “monotonous gums,” “songless birds,” and “fossil animals” has been replaced by a deep historical narrative about the continent's Gondwanan inheritance, its long, isolated voyage north into drier latitudes, and its embrace by fire.⁸ The cultural disdain with which colonists noticed that native flora and fauna generally gave way to imported exotics has become cultural pride in the evolutionary sophistication and fragility of a long-isolated biota. Instead of Australia's being cast as “the last of lands”—the left-over continent, the last to be discovered and to be humanised—it is Europe that is portrayed as the “new world,” ecologically young, colonised by opportunistic weeds after the ending of the last ice age, and settled by *Homo sapiens* later than Australia.⁹ Environmental history has emerged as a powerful tool in helping Australians understand their land, and also in enabling them to reimagine their continental nation as the jigsaw of bioregional countries that it had been for so long.

7 Noel Pearson, *A Rightful Place: Race, Recognition, and a More Complete Commonwealth* (Melbourne: Black Inc., 2014), 36.

8 See for example Stephen J. Pyne, *Burning Bush: A Fire History of Australia* (Sydney: Allen & Unwin, 1992).

9 The scientific and literary contributions of the Australian zoologist and palaeontologist Tim Flannery have been very influential, especially in *The Future Eaters: An Ecological History of the Australasian Lands and People* (Sydney: Reed Books, 1994).

Several influences made science and ecology especially strong in the development of Australian environmental history. Science and government were closely aligned in the colonial settlement project: in the collection and classification of a strange new world, the acclimatisation of species from “home,” the expansion of the mining frontier from the 1850s, the “improvement” of land for pasture and agriculture, and the biological control of insects, plants, and animals.¹⁰ Ecological imperialism and the acclimatisation of exotic species have shaped settlement. The Commonwealth Scientific and Industrial Research Organisation (established as CSIR in 1926 and CSIRO from 1949) made a priority of research that assisted economic development and productivity, and its focus was on “pests and weeds” rather than indigenous plants in undisturbed habitats. The privileging of science (especially agricultural science) in environmental policy—a legacy of British imperialism—meant that science in Australia has often been aligned with the national project. Thus, “ecology” is a word that invokes “science” more strongly than it invokes “politics” or “activism” (which are its more common affiliations in Europe and the United States).¹¹ Australia not only has a distinctive ecology; it has also given the science itself an unusual centrality in policy-making.

The Settler Revolution

For much of the nineteenth and early twentieth centuries, Australian history was celebrated for its triumphant social and political continuities, as a “blank space on the map” redeemed by Britain, and as a relatively unproblematic footnote to empire. But from the mid-twentieth century, an environmental perspective began to conceive the new southern worlds of Australia and New Zealand as extreme kinds of ecological and social laboratories. In 1941, the New Zealand geographer Kenneth Cumberland observed that “what in Europe took 20 centuries and in North America four has been accomplished in New Zealand within a single century.”¹² The Canadian historical geographer Andrew Hill Clark wrote about “revolutionary change” in *The Invasion of New Zealand by People, Plants, and Animals*, and United States historian Alfred Crosby devoted the longest

10 Libby Robin and Tom Griffiths, “Environmental History in Australasia,” *Environment and History* 10, no. 4 (2004): 439–74.

11 Libby Robin, *How a Continent Created a Nation* (Sydney: UNSW Press, 2007). On ecological consciousness, see Libby Robin, *Defending the Little Desert: The Rise of Ecological Consciousness in Australia* (Melbourne: Melbourne University Press, 1998).

12 Cited by Tom Brooking and Eric Pawson, “Editorial: New Zealand Environmental Histories,” *Environment and History* 9, no. 4 (2003): 375.

chapter in his *Ecological Imperialism* to a case study of New Zealand.¹³ New Zealand historian James Belich observed in *Paradise Reforged* that it is the speed, not the length, of New Zealand history that makes it remarkable—and traumatic.¹⁴ It is because colonisation and industrialisation arrived nearly simultaneously in many parts of Australasia. Australian ecologist Steve Morton has described the rate of mammal extinctions in the Australian rangelands, which is the highest in the world, as “catastrophic.” Morton declared that working as a CSIRO ecologist in Australia is akin to that of an ambulance driver arriving at the scene of a bad accident. As a result, he has reflected on the danger of pessimism in conducting his science in such a land.¹⁵ The modern settler histories of Australasia are like giant experiments in ecological crisis and management, sometimes horrifying concentrations of environmental damage and cultural loss, and sometimes heartening parables of hope and learning. Such rollercoasters of environmental history mean that, in the Tasman worlds, we can never blithely assume the dominance of culture over nature, nor can we believe in the infinite resilience of the land.

Australian history—once the whitest history in the world—became dramatically cross-cultural in the second half of the twentieth century. “The Great Australian Silence,” which veiled the dispossession and violence of the frontier, was finally broken, “settlement” was controversially re-envisioned as “invasion,” and European colonists began to seem like the real “nomads.” A new generation of historians found that the young nation that had invested so heavily in the Anzac legend of overseas war sacrifice was unable to recognise the traumatic war on its own grasslands. In the words of the great Australian historian of the frontier, Henry Reynolds, “Settled Australia . . . is a landscape of revolution.”¹⁶

As well as a long, continuing conflict over land, resources, and freedom, there was also learning and accommodation between the original Australians and their dispossessors. But the loss of environmental knowledge about the continent—of its wildlife and ecosystems, its natural and cultural histories, its traditions of land management, its lore,

13 Andrew Hill Clark, *The Invasion of New Zealand by People, Plants, and Animals* (Piscataway: Rutgers University Press, 1949); Alfred Crosby, *Ecological Imperialism* (New York: Cambridge University Press, 1986).

14 James Belich, *Paradise Reforged: A History of the New Zealanders from the 1880s to the Year 2000* (Auckland: Penguin, 2001).

15 Stephen Morton, “European Settlement and the Mammals of Arid Australia,” chap. 8 in *Australian Environmental History: Essays and Cases*, ed. Stephen Dovers (Melbourne: Oxford University Press, 1994). Morton’s musings on pessimism are to be found in “On Pessimism in Australian Ecology,” *Austral Ecology* 41 (2016): 1–10.

16 Henry Reynolds, *Frontier: Aborigines, Settlers, and Land* (Sydney, 1987), 192–93.

languages, and wisdom—was tragic. Understanding, retrieving, and renewing some of that knowledge—even just beginning to comprehend the immensity of that loss—have become major tasks for the environmental historians of Australia.

The craft of environmental history engages across the science-humanities divide and it challenges the anthropocentric, nationalistic, and documentary biases of conventional history. It asks us to work audaciously across time, space, and species and to link deep, evolutionary time with the human experience of daily, social time. It propels us to wonder what happens to the history we write if we recognise the non-human world, with its different timescales, as historical, dynamic, constantly changing, and as interactive with humanity in creative ways. It even destabilises our conventional assumptions about the proper domain of history.

The Australian experience, both ancient and modern, could not be more crucial or pertinent to this quest. Environmental history in Australia is shaped by a settler culture's slow and fitful adaptation to a unique ecology and a profoundly Aboriginal place. Indeed, we can argue that our unusual history and natural history have shaped an innovative environmental enquiry—one that has a peculiarly intimate relationship to deep time, approaches the last ice age as a human experience, engages with a very different ecology, and acknowledges the revolutionary character of Australia's settler history. Environmental history makes the Australian experience of vital interest to the rest of the world.

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About the Authors

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Nancy Cushing is a Senior Lecturer and head of the History discipline at the University of Newcastle, Australia. Her interests in environmental history focus on relations between humans and other animals, particularly the venomous, the companionate, and the edible. Cushing was the 2014 Merewether Scholar at the Mitchell Library in Sydney. She is the co-author, with Kevin Markwell, of *Snake Bitten: Eric Worrell and the Australian Reptile Park* (UNSW Press, 2010) and co-editor of *Radical Newcastle* (NewSouth Press, 2015). She is leading a working group expanding the activities of the Australian and New Zealand Environmental History Network and welcomes enquiries from those wishing to join the network.

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Peter Davies is a Senior Research Fellow in the Archaeology Program at La Trobe University, Melbourne. He has published widely in the areas of institutions, material culture studies, urban archaeology, and environmental archaeology. He is also a former co-editor of *Australasian Historical Archaeology*. He is currently part of a multi-disciplinary Australian Research Council project, "Rivers of Gold," investigating the environmental effects of historical gold mining on Victoria's waterways.

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Ruth Ford is a Senior Lecturer in History at La Trobe University. She is part of Australian Research Council Discovery Project “Changing Landscapes, Changing People: Australia’s Southern Mallee Lands, 1830s–1912.” Ruth is an environmental historian with intersecting research interests in rural history and gender history. Her research focuses on how women and men on family farms interacted with farm and bush landscapes and climates. She has published on rural and environmental history, including chapters: “‘Nature Is Around Us in Her Loveliness:’ Settler Women in the Gippsland Bush in 1930s Australia” (2015) and “‘The Wattles Are in Bloom. Crops Are Looking Wonderfully Well:’ Settler Women in the Victorian Mallee, 1920s-1930s.”

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Andrea Gaynor is an Associate Professor of History at the University of Western Australia. Her research seeks to use the contextualising and narrative power of environmental history to solve real-world problems. She has published on topics as diverse as landscape art and feral cats, and her recent publications include an essay on the Western Australian wheatbelt, published in *Griffith Review*: <https://griffithreview.com/articles/eat-wilderness/>. At present she is working with researchers from La Trobe University on an environmental history of the southern Mallee Lands of Australia, and a new project on nature in urban modernity.

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Katie Holmes is a Professor in History at La Trobe University and Director of the Centre for the Study of the Inland. She is currently working on a large environmental history of the Mallee Lands of southern Australia with Andrea Gaynor, Ruth Ford, Richard Broome, and Charles Fahey. Together with Heather Goodall, she is also co-editing a collection on oral and environmental history to be published by Palgrave in 2017. She moved into environmental history through her work on garden history but began her research life as a feminist and cultural historian and these two strands are still very strong in her research. Her most recent book is *Between the Leaves: Australian Women, Writing and Gardens* (UWA Press 2011).

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Susan Lawrence is a Professor of Archaeology at La Trobe University. Her research covers the archaeology of British colonisation, gender, and material culture studies and has focused on the Australian gold rush, the colonial whaling industry, the pastoral frontier, and comparative studies of nineteenth-century British colonies. She is the lead Chief Investigator of the interdisciplinary Australian Research Council project, "Rivers of Gold," investigating the environmental effects of the gold rush on Victoria's waterways. She is a Fellow of the Australian Academy of the Humanities, Fellow of the Society of Antiquities of London, past President of the Australasian Society for Historical Archaeology and a member of the Heritage Council of Victoria's Archaeology Advisory Board.

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Cameron Muir has written for numerous publications such as *Griffith Review*, *The Guardian*, *Inside Story*, and *The Canberra Times*, among others. In 2013–14 he was a Fellow at the Rachel Carson Center, Munich. His book *The Broken Promise of Agricultural Progress* (Routledge, 2014) was shortlisted in the 2015 NSW Premier's History Awards. He helped complete Tony McMichael's posthumous book, *Climate Change*

and the Health of Nations: Famines, Fevers, and the Fate of Populations (OUP, 2017). He is working with a team at the National Museum of Australia, University of Sydney, and Australian National University on an exhibition and book project called “Localising the Anthropocene.”

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Emily O’Gorman is an environmental historian with interdisciplinary research interests in the environmental humanities. Her research focuses on how people live with rivers, wetlands, and climates. Currently a Senior Lecturer at Macquarie University, she holds a PhD from the Australian National University and undertook a postdoctoral candidacy at the University of Wollongong. She is the author of *Flood Country: An Environmental History of the Murray-Darling Basin* (2012) and co-editor of *Climate, Science, and Colonization: Histories from Australia and New Zealand* (2014, with James Beattie and Matthew Henry) and *Eco-Cultural Networks and the British Empire: New Views on Environmental History* (2015, with Beattie and Edward Melillo).

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Jayne Regan is a PhD candidate in the School of History at the Australian National University. She is interested in twentieth-century Australian history, particularly cultural, literary, and environmental histories. Her thesis interrogates the way that the white Australian literary community engaged with and imagined the landscape in interwar and wartime Australia. Jayne has presented at a range of Australian and international conferences, taking her from Canberra to Cologne, Beijing to Ballarat, and Humpty Doo to Helsinki. Jayne is also the manager of the journal *Australian Literary Studies*.

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Karen Twigg is a PhD candidate at La Trobe University, Melbourne. The focus of her doctoral research is an environmental history of a farming community in the Victorian Mallee. This project forms part of a larger Australian Research Council grant entitled “Changing Landscapes, Changing People: Australia’s Southern Mallee Lands 1830–2012.” Prior to embarking on her PhD, Karen worked as a professional historian and has published in the fields of child welfare, heritage, and oral history.

An aerial photograph of a coastline, showing turquoise water on the left and a dark blue strip of land or reef in the center, with more turquoise water on the right. The image is partially obscured by a white curved line and a red curved line.

The contributions in this volume explore the way that Australasian environments have been envisioned, worked, and changed in the past, and how ideas about places inform the present and future of the continent. It looks at some typical visions of Australia—the bush, the Great Barrier Reef—but also at mines, shorelines, sediments, and wheatfields, and beyond these to the historical networks of human and non-human actors that shaped these places and the ideas around them. It argues for an environmental history that is uniquely Australian, but that can enrich and expand the field of environmental history across the globe.

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