

Riverscapes

Research essays on the social context of
southern catchments of Aotearoa New Zealand

EDITED BY

Mick Strack, Nicola Wheen, Brent Lovelock and Anna Carr
Catchments Otago

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2018

Catchments Otago

University of Otago

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About Catchments Otago

Co-Directors – Professors Kath Dickinson, Gerry Closs, Philip Seddon

Catchments Otago is a University of Otago interdisciplinary applied research theme that takes a systems approach to land and water management in the face of expanding urban development and land-use intensification. Integrated Catchment Management (ICM) takes a broad-scale multi-disciplinary approach to resource management, understanding that effective management of water resources cannot be achieved in isolation from management of the land and people. Allocation and equitable use of water resources is an ongoing challenge, even in a relatively water-rich nation such as New Zealand, where environmental concerns must be balanced against social and economic imperatives. New Zealand has a mixed history of successfully balancing social, economic and environmental bottom lines. While the Resource Management Act 1991 (RMA) has achieved some success in addressing point source pollution, it has not led to effective control of diffuse pollution, partly because difficult, catchment-scale issues have not been tackled adequately. ICM, underpinned by reliable information gained from sound research and monitoring, and translated into effective policy, is the logical way forward. The specific skills to integrate this learning and application exist at the University of Otago, and the potential for meaningful interdisciplinary engagement is only now being fully realised in the form of the *Catchments Otago* theme.

Catchments Otago began with its core focus the central lakes (Wakatipu, Wanaka and Hawea) catchments of Otago which embody the most difficult challenges facing resource managers and planners. For the past two decades, the region has had the fastest population growth rate in New Zealand; it has become an internationally recognised wine-producing region, and it has a long agricultural history. The importance of tourism to the region has also grown dramatically, with Lake Wanaka now listed by the Lonely Planet guide as 94th/500 best places in the world to visit. Environmental management, which has been largely effects-based (reactive), is being encouraged by new government policies such as the National Policy Statement on Freshwater Management to be more goal-oriented and community-driven. Together, these forces are revealing major knowledge gaps relating to the sustainable development of the central lakes region. *Catchments Otago*, by taking a specific focus on ICM, as well as a targeted regional approach focused on the Central Lakes catchments, seeks to: (i) build internal and external networks; (ii) extend and consolidate the existing considerable community engagement, and (iii) develop approaches that could be applied to ICM within other regions at any scale. Under such a framework, our work aims to benefit the environment and human health while fostering sustainable economic growth in the face of changes in climate, human demography, and resource access. Our research and development framework:

- utilises an inter/cross/multi-disciplinary team making use of multiple networks
- promotes a systems approach to land and water management
- directs engagement and dialogue with community and other stakeholders
- increases University of Otago's research and education presence in the Central Lakes Region

Catchments Otago engages researchers across three intersecting sub-themes: Water (availability and quality); Biodiversity (native and exotic); and People (community and policymaker activities and engagement). University of Otago staff members are involved in over 60 projects relevant to the focal region, and these have the potential to be expanded and integrated under the umbrella of the theme. *Catchments Otago* brings together University of Otago staff from over 14 departments across all four University Divisions: Science, Health Science, Humanities and Commerce.

By integrating land and water management *Catchments Otago* unites the considerable but formerly largely individual work being done by University of Otago staff in the central lakes region. The Central Lakes Catchments contains the fastest growing urban area in New Zealand and represents a microcosm of developmental challenges. The region also includes Mahu Whenua, a 53,000ha QEII Trust covenanted area, encompassing Aotearoa New Zealand's largest area of high country restoration. Further, being situated close to Dunedin, the University of Otago is able to establish a formal and visible presence in the region. There are significant stakeholder networks already in place and considerable research activity by University of Otago staff, and our research and education presence is already being vastly improved by having a co-ordinated approach and strategy to the region. It is an appropriate region in which to develop integrated management approaches for wider application in New Zealand, and there is a window of opportunity now to obtain comparative data to assess, monitor, and manage changes. This overarching goal can be achieved through coordination and expansion of University of Otago research activity in the region. Regional and District Councils have been overwhelmed by the development activity in the region and their management approaches have been top-down and effects-based (reactive) rather than based on community-driven, informed planning (proactive). *Catchments Otago* thus addresses a national priority by contributing to policy and best management practices for freshwater catchments, thereby encouraging councils to take holistic and proactive approaches to managing development and its effects.

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Karen Scott – Artist. Karen is an award winning artist who lives and works along with husband Murray and daughters Rosa and Sophie at Loch Linnhe Station on the shores of Lake Wakatipu. When she is not mustering the high country with her horse and team of dogs, she can be found in her studio painting. Inspiration for her work comes from the outstanding landscape, farming, family, friends and current events.

Grahame Sydney – Artist. Grahame is a Dunedin born and raised artist who has spent his lifetime painting the Central Otago heartland and the south. He has been a fulltime painter for over forty years, and lives near St Bathans. His paintings are held in collections throughout New Zealand and internationally.

Brian Turner – Poet. An outdoorsman, a mountaineer, a national representative hockey player, a keen cricketer, and an avid senior road cyclist he has made a unique career in New Zealand letters as a celebrated sports journalist, an author of a standard trout fishing guide among many other works, who is also a regular fixture in New Zealand poetry anthologies, an editor, critic, playwright and long-time environmentalist currently the chair of the Central Otago Environmental Society. His first collection of poetry, *Ladders of Rain* (1978) won the Commonwealth Poetry Prize and in 2003 he was appointed Te Mata Estate New Zealand Poet Laureate.

Marilynn Webb – Artist. Marilyn is considered one of New Zealand’s most important and influential printmakers. Her art explores concepts of land, ecology, politics, women in art, and Māori and post-colonial history. Her landscapes reflect her passionate environmentalism. In 1974 she was awarded the Francis Hodgkins Fellowship. She was appointed an Officer of the New Zealand Order of Merit in the 2000 New Years honours list for services to art and art education. She received an honorary degree of Doctor of Laws from the University of Otago in 2010.

DRY RIVER

When I hear a river murmuring
far off, or muttering

close by, I hear a major part
of what is true of me

and all of my dearest friends:
I hear them sing

like live rivers in me. But
when I see a dry riverbed

where clean, clear water used to be
bare stone is testimony

to turpitude, abuse, and chronic
intergenerational theft.

Brian Turner

Introduction

Mick Strack

Why are catchments important?

Water, waterways and their catchments hold a special place in the Kiwi mindset. There is a strong relationship between individuals, society and water which is exemplified by the place of water in our treasured landscapes; the expectations of public access to waterways; and the legal recognition of rights and responsibilities around water. However, water is often at the centre of conflict, significantly: how we might balance competing claims on water; the use and extraction of water; the ownership of water; Māori claims to water and the nature of Treaty settlements in this regard; other property rights in water and waterways; how water may be allocated to diverse users; and planning interventions in waterway management. Catchments have been significantly modified by human exploitative use. The evidence is there to observe especially in current water quality issues, that we have not cared for our water and catchments. It is the relationship we have with water and the catchments that is the focus of this sub-theme.

This book is the first of a series that will highlight the multidisciplinary interests and research output of *Catchments Otago* researchers. The sub-themes allow some grouping of common interests, but they are not intended to be too specifically defined within any disciplinary boundaries. It may be that to some degree the ‘social’ sub-theme can provide a sort of integrating opportunity between the other sub-themes, but it may also be that all the sub-themes think that about their special interests. Whatever the case, this volume demonstrates some of the connections and relationships that people and communities have with catchments.

Water is proving to be a key component of our political, legal, economic, social and cultural lives. While Aotearoa New Zealand is not considered to be water deprived, there is a large diversity of water fall and flow across different regions, with an interesting mix of arid (desert) landscapes and wet (rainforest) landscapes. The geomorphology also shows the imprint of the erosive effects of water. Most New Zealand catchments begin in the mountains and the rivers are fed by snow melt. There is a direct connection between subterranean aquifers and surface flows whereby each take from and recharge into each other, so that extractions

from one will also affect the other. ‘Original’ landscapes and land cover have been primarily defined by water availability and flow across the land. In short, everything we see out there was caused by or affected by water. Now, however, in the age of the Anthropocene, the impact human activity has had on the land is obvious. The changes wrought on the land by a mere few centuries of human exploitation have disrupted our catchments to the point of collapse. Many rivers no longer flow to the sea; no longer function as habitats; no longer provide ecosystem services and do not provide recreational opportunities.

Water: a challenge

A growing literature is developing which recognises rivers as more than engineering, economic, political and ecological challenges. Rivers and water have direct physical effects and those effects mediate social structures and relationships. Rivers as the focussing point of catchments are both creative and destructive.

The river as a living entity, constantly branches and repositions its channel as it meanders. In so doing ... [it] carries fields away and eats land on one bank while ‘burping them up’ on the other. These transformations of the earth’s surface necessarily have significant implications for the definition, delimitation, and determination of property relations and legal spaces more broadly ... An elastic land makes property elastic as well.¹

Rivers build up land and wear it down. Rivers as living entities² spread out in times of excess water and shrink in times of drought, shift course or settle into distinct channels. At only the shortest time frames can river courses be considered static, otherwise they are obviously dynamic. In their elasticity they demand elasticity in the occupation, production and administration of the adjoining land and property. They therefore introduce conflict in how society responds.

There are two very contrasting responses to living on this land: adapting our needs and expectations to what is available (a model often characterised as a settled indigenous response to the land, but perhaps now, a truly sustainable response to land care), and modifying the land to suit human demands (the high productivity, capitalist, technically interventionist response where we use all the natural and technical resources available to us to do what we want). It is interesting to observe land use change since the history of settlement on this land. Māori arrival in Aotearoa prompted massive land cover change with burning and clearing native forest and loss of iconic avian fauna, until Māori society adapted to new lifestyles and began living in closer harmony with the land. The second major wave of colonisation occurred with European arrivals and again significant habitat destruction occurred and was actively encouraged in order to produce the familiar agricultural products and landscapes of Europe based on sheep, cattle and grain production. It might have been hoped that Pākehā society also reached a point of adaptation to sustainable lifestyles, and the implementation of the Resource Management Act with its purpose being the ‘sustainable management of natural and physical resources’ could have led the way. Unfortunately the technology to extract water, transport it large distances and sprinkle it on land not naturally able to grow grass provided part of the incentive to convert large areas of Aotearoa New Zealand from extensive sheep grazing or forestry or undeveloped open countryside to intensive dairying pasture. This led to large extractions of water from

the waterways, large inputs of energy, fertiliser and water to the land, and large discharges of pollutants back in to waterways and aquifers. This is a wicked cycle of unsustainable practices and effects, most obviously visible now with polluted and depleted rivers, and probably in future, polluted and depleted aquifers which will directly affect our drinking water supplies.

But water is essential for life, and like air it should be part of the global commons and a human right. We might recall Garrett Hardin's 'Tragedy'³ and observe that the ability to access and use the water as a resource without limits leads to self interest, greed and overuse. New Zealand's use of water for dairy conversions appears to be a model example of such a tragedy. Hardin's responses to the tragedy were either mutual coercion (in other words, strict regulation of the common resource and human access and use of it⁴) or establishing a property regime in water (in other words, allocate water to private owners) which could supposedly make it more measurably valuable so used more carefully. Unfortunately, as many commentators have recognised, "Private rights do not necessarily solve the problem of overexploitation of the commons."⁵

To create property in water is also problematic. Almost inevitably a property regime will support those who can afford to acquire that property and use it to produce a profit, leaving all others excluded from the resource. The water will be appropriated from the commons. Justifiable public resentment about private ownership will arise, hardly helping the cause of better water management.

Water in the Capitalist state has no intrinsic value, no integrity that must be respected. Water is no longer valued as a divinely appointed means for survival, for producing and reproducing human life, as it was in local subsistence communities. Nor is water an awe-inspiring animistic ally as it was in the agrarian states. It has now become a commodity that is bought and sold.⁶

Water management has been dominated by engineering. Hydro-electric power has supported major economic growth while taking land for storage and artificially controlling flows. Automated sprinkler irrigation systems have extended land productivity while depleting surface and aquifer water sources and adversely affecting water quality with discharges from the land. Urban water storage, treatment and reticulation have enabled urbanisation while allowing people to use and discharge water without a second thought. Water now piped underground means that the link between source and use is hidden just as the link between use and disposal is hidden. Out of sight, out of mind. Water is too easily taken for granted.

For another perspective, we may observe the genderisation of water management as Veronica Strang⁷ has:

Changes in material culture generate and reflect changes in meaning: there is a fundamental difference between carrying (female) vessels of water from the (female) well, and pumping an ejaculative stream of it out of the earth through a (male) spout. The invention of homologously male objects for water management is a telling analogue of the technological development that is generally acknowledged to have enabled male social and political dominance.

As the effects of climate change become more apparent, on the one hand, our relationship with water gets focused on weather effects; rainfall, droughts, storms, flows. Extreme weather events will require a strong reactive response as we deal with hazard remedies. On the other hand, we must maintain a longer-term wider-ranging proactive response which will force us to

think more holistically about water and catchments.

Our past exploitative uses need not determine current responses and attitudes. If we are to take sustainability seriously we will need to change old attitudes and previous expectations about our freedom to exploit and learn to live within the life supporting capacity of our water.

Book Structure

This book includes a range of perspectives on water and catchments, how they are defined, used, controlled, how they are affected by institutions, law and economics, and how they affect individuals and society in general.

Williams explains the Kai Tahu relationship with water and the southern catchments. Pre-contact Māori regarded land and water as a single entity, with a common regime of resource management practices. Underpinning these was a world-view that involved unique spiritual concepts, the most important of which was *mauri*: the notion that a body of water had its own life-force. Waters were classified according to the state of their *mauri*. This chapter outlines traditional approaches and how they are applied today.

Mager and Horton introduce the southern catchments describing the hydrology and formative processes of the major southern catchments, from the Canterbury rivers through Otago to the Southland rivers. The catchments have obviously been significantly altered by human use and occupation mostly by deforestation which has affected water volumes, river morphology and sediment supply to the coast. They review some research about different replacement land cover – snow tussock and *pinus radiata* which affect water yield. The demands on these catchments (damming for hydro power, water extraction for irrigation, habitat conservation, and recreation and tourism) are unrelenting and will require a difficult balancing act for water managers.

When examines Aotearoa New Zealand's environmental law and shows how human use (exploitation) and the subsequent environmental problems throughout the southern catchments have been so influential on the development of that law. An environmental history of southern catchments takes into account early Māori use of resources, gold mining activities (especially the water diversions and tailing stockpiles), hydroelectricity dams on rivers and lakes, and more recently large scale water extractions for irrigation. All these activities have been supported by laws promoting economic and industrial development. They have a lasting legacy on current rules in spite of the flurry of new environmental law and greater recognition of Māori perspectives since the 1980s.

Mosse⁸ observes “because water moves, it erases as well as makes social boundaries; it changes landscape, provides the basis of new claims and threatens established orders”. The issues of boundaries are canvassed in two chapters. Bond and Soal recall the conflicts over local government administrative boundaries surrounding the Waitaki catchment. They make the point that while physical catchments may seem to establish functional ecological boundaries, politics and social connections to land, water and space naturally evolve within different boundaries. They note that boundaries shape power relations, determine access to resources and can impose costs on communities. Rivers often act as barriers to access across, while they may facilitate access along. As Strack looks at land parcels in the finer scale and

observes that property boundaries (and our cadastre) are based on utilisation of land. Riparian property boundaries are usually surveyed as the bank of a river or stream. This determines how property is mapped and how legislatively enforceable rights are defined. Common law riparian rights can provide significant benefits to adjoining riparian owners (use of water, access to water, rights to drain into the water). However, the river space is usually just defined as the space left over after property has been allocated. In other words there is no proactive definition of the river or stream. The way property and boundaries are defined imposes impediments to integrated management.

Hayes and Lovelock report on the experience of angling tourists in relation to the clean and green image promoted by Tourism New Zealand and how their concerns with water quality, fish stocks and over-crowding on rivers was a threat to that image. The suggestion from this investigation was that there is an opportunity for citizen or participant science; that the anglers had a personal stake in catchment management, and their engagement with solutions could be significant.

The artists and poet featured within demonstrate a wider vision of our catchments and help us see through different lenses. We all have a relationship with land and water, and everyone has something to offer. Catchments Otago researchers wish to share their knowledge with their communities. It is hoped that communities will similarly develop the confidence to speak out and be heard. Commentary within this book will have relevance well beyond Otago, but it is the local scale where people can make the greatest improvements in their lives. We embrace the local proudly and consciously.

As with any multi-disciplinary undertaking there is some variety in style and usage amongst the authors which we have only softly attempted to standardise. Also, the chapter themes at times touch closely and at other times take off on their own. We did not want to reach absolute conclusions other than to acknowledge the integrating nature of water and its influence on the land and the people. How we care for our rivers says much about how we care for our wider environment. By coming together in conversation and study we can broaden our perspective, understand the dynamics of our watery environment, and strive for a sustainable future.

Endnotes

1. Camargo, A. 2017. Land born of water: Property, stasis, and motion in the floodplains of northern Colombia. *Geoforum*. DOI: 10.1016/j.geoforum.2017.11.006
2. Maori, particularly, see rivers as whole and indivisible entities from the mountains to the sea (see the recent Treaty settlement of the Whanganui River finalised in Te Awa Tupua Act 2017).
3. Hardin, G. (1968). The Tragedy of the Commons. *Science* 162(13): 1243.
4. Some regulation is demonstrated in water allocation models such as the Resource Management (Waitaki Catchment) Amendment Act 2004 and the preparation of the Waitaki Catchment Water Allocation Regional Plan, 2006. www.waitakiboard.mfe.govt.nz
5. Doremus, H. (2011). Climate Change and the Evolution of Property Rights. *UC Irvine Law Review* [2011 1:1091] at 1097.
6. Worster as cited in Strang 2004:36.
7. Strang, V. (2004). *The Meaning of Water*. Berg, Oxford, at 24.
8. Mosse, D. (2008). Epilogue: the Cultural Politics of Water – A Comparative Perspective. *Journal of South African Studies* 34:4, 939-948 at 944.



Karen Scott, 2008. Loch Linnhe Station – timeless landscape with ever changing light.
Acrylic on canvas. Collection of M. & M. Strack.

Māori Attitudes to Water in Southern New Zealand

Jim Williams

Introduction

To Māori the land is indivisible from the waters and all resources associated with either. The whenua, or land, mentioned in Article II of the Treaty of Waitangi, guaranteed to Māori the land with its forests and rivers, its flora and fauna.¹ However, besides being regarded as one with the land, water was also the subject of its own definition and values. Water was used in a variety of ways in addition to drinking and as a source of foods. Both sea coasts and inland waterways were set aside for marine farming and aquaculture.²

Life was difficult for Kai Tahu people in pre-contact Te Wai Pounamu (South Island). Food had to return more calories than were expended in the efforts of acquisition. People operating at subsistence level could not invest effort in unproductive activity, eschewal of prey or production of confections. But it was important that areas of land and water from which food was harvested were not merely used but managed and conserved. Resources and their habitats were managed with a view to limiting long-term resource diminution, with the systems that evolved being particularly suitable to regional conditions.³ This is clearly demonstrated in the management of water-based resources, which reflects how they are regarded.

Attitudes to water

The first and most fundamental influence on Māori attitudes towards water is the world-view, underpinned by the relationships between the atua of the creation story. Atua are distant ancestors, seen to be of ongoing influence in certain domains. The Kai Tahu version illustrates the approach to water as:

traditions to water begin with life itself, when Maku mated with Mahoranuiatea, another form of water, and begat Raki [Ranginui]. Water therefore is the promoter of all life and represents the life-blood of the environment. Its condition is a reflection on the health of Papatuanuku.⁴

Today, all water is seen to have originated from the separation of Ranginui and Papatūānuku and their continuing tears for one another. Rain is Ranginui’s tears for his beloved and mist is regarded as Papa’s tears for Raki. Takaroa, as Papatūānuku’s first husband, is on the same level (Fig. 1).

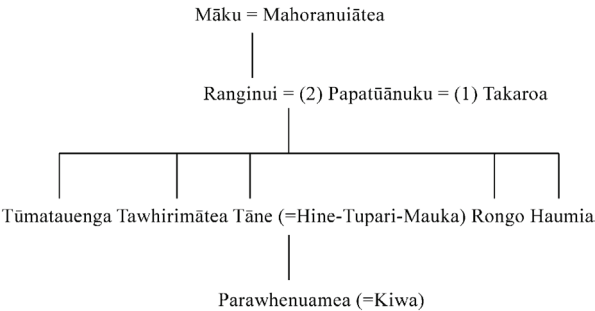


Figure 1: Kai Tahu hierarchy of atua, showing seniority decreasing from top to bottom and left to right.

Amongst their children, Rongo and Haumia, representing cultivated and uncultivated foods, are weaker and need the protection of the forest (Tāne), which is subject to the vicissitudes of the elements (Tāwhirimātea) and humankind (Tūmatauenga). Only humankind can provide protection for the realms of Tāne, Rongo and Haumia, especially from the elements and, then, only sometimes. But we have a duty to do so. This duty of care is termed ‘kaitiakitanga’.⁵

The tutelary deity of all water is Parawhenuamea, daughter of Tāne and Hine-Tupari-Mauka, and is seen as the personification of rivers and streams, especially flood-waters. She is the wife of Kiwa, personification of the ocean. Thus estuaries are the shared domain where they meet.

Mauri

In Māori thought all things are believed to have mauri, or vital essence; the spark of life kindled at the conception of all living things. All mauri comes from atua and provides every entity with its unique personality. The key to the Māori view towards environmental issues is the importance of not altering mauri to the extent that it is no longer recognisable; an area being harvested must not have its essential character changed as a result of the harvest. An example of this might be that whereas it may be acceptable to cut one tree from a totara grove, a lone totara would not be available as it is part of the vital essence of the locality and to remove it would change its character. As will be seen from the examples and case study that follows, the principle applied traditionally irrespective of whether we are dealing with an area of land, a grove of trees, a body of water or even another group of people.

This contrasts with the realm of Rongo-maraeroa, the domain of cultivated food, where the entire crop was at the disposal of humans, so long as certain protocols were observed, because the crop was dependent on humans throughout its growth. Preservation of mauri controls the sustainability of resources.

Classification of waters

According to the traditions of Kai Tahu, it was the early iwi, Te Rapuwai, who first classified the waters of Te Wai Pounamu. This was done according to its nature and its uses, which in turn determined all future uses.

As with all things emanating from atua, water always has mauri unless this has been taken away. Māori traditionally looked at water in terms of the interaction between the influences of deities and today the Māori perspective is, to some extent, still influenced by that traditional view. Water is seen as a living thing with mauri of its own and this mauri varies from one body of water to another; indeed mauri varies from one place to another on the larger bodies (see case study where the mauri of the Taieri River changes through four phases).

The purity of water is precious and jealously guarded because the mauri, the vital essence, is the same spiritual stuff as vivifies and enlivens human beings and all other living things. To violate the purity of water is therefore to violate your own essential purity.⁶

Mauri can be summarised in two different ways. First, there are two classes of water: waimāori and waitai. This most fundamental split, between fresh and salt water, is self-explanatory, the former being te wai ora a Tane; the latter, te wai ora a Tangaroa. The intermediate class is waimataitai (e.g. estuarine water, or coastal lagoons ‘hapua’). Second, there are three states in which water might be, irrespective of whether it is waimāori or waitai.

Waiora: (water of life) especially rainwater or tears; also springs, holy water and water from special places where the mauri of the water changes or where exceptional events have occurred in the past. Waiora can often rejuvenate a damaged mauri, even that of humans (through the ceremony known as ‘pure’).

Waikino: (bad water) either a dangerous place such as a stretch of water with rapids or snags, or water that has become physically or spiritually polluted.⁷ In each case the mauri has been changed and is susceptible to being changed back again. Flooding is an example of waikino.

Waimate: (literally dead water) is water that has become metaphysically dead through the complete loss of its mauri. It cannot support humanity or human food. It can absorb or contaminate the mauri of other living things or waters. This can come about in two ways: mixing of a number of incompatible mauri, in an unnatural way, or total pollution so that the water is no longer capable of sustaining human life. Many stagnant pools were seen in this light, resulting in ‘waimate’, or the more intensive ‘waimatemate’, becoming relatively common place-names. “In [these cases], the mauri has been lost and can only be restored through Papatūānuku”.⁸

It remains inimical to Māori thought that waters of different mauri should be deliberately mixed. This is why the Tainui people would not agree to Waikato river water being used to pipe ironsand to the Glenbrook steel mill, and then discharged into the Manukau harbour. The mauri of the two waters is incompatible and, besides, the mauri of the Waikato would have been deliberately polluted.⁹ However, after the 1995 water shortage in Auckland, Tainui agreed to piping Waikato river water to the city for human consumption as this use is consistent with a mauri that is waimāori and waiora.

Water can become polluted physically or spiritually. The mauri, or life-supporting ability and vitality of a coastal or marine resource, may be compromised through a variety of means.

Discarded pieces of rope from boats and moorings, plastic packaging strips, lost fishing gear, waste glass and plastic bottles, and lengths of timber and aluminium are among the rubbish that is commonly found polluting beaches and shores. Similarly, sewage, industrial waste and run-off from farms may carry traces of chemicals and pesticides. These are carried down rivers to the sea, where they compound and accumulate as they pass up the marine food chain, until they may debilitate or kill the higher predators. As a result of inappropriate land management and riparian clearance, fine terrestrial sediments are discharged into estuaries where they flow out across the sands smothering shellfish beds, in particular, spawning and nursery areas, and generally degrading the environment. Eutrophication is regarded as a type of pollution and is exacerbated by fertilizer run-off.

Drownings or frequent mishaps are often causes of spiritual pollution, which may be of a temporary nature, or long-term, or water may be considered polluted through exposure to menses. Elders have commented that the contemporary practice of women swimming during their menstrual cycle was one reason for the loss of fishing resources. Spiritually polluted water is regarded as having become tapu and therefore cannot be used in any way until the tapu has either been removed or is believed to have completely dissipated.

These various pollutions are all changes in mauri, the water having become waikino and unhealthy to humans and other species. Such changes might also result from natural interferences with the normal flow: containment by a gorge, waterfall or rapids or because of flooding, but only when considered a danger to human beings does it become waikino. A major river like the Taieri undergoes several changes between its headwaters and the sea.

Case study: Taieri River (properly: 'Taiairiari')

A helpful way of viewing mauri is to see it as 'personality' or 'mood'. This may apply at a general, and at a local level. The pervading characteristic of the Taieri River (Fig. 2) is the regularity of flooding, all along its course but especially on the plain between Outram and Henley. The original name, Taiairiari, meaning stars twinkling in the sea, reflects this propensity and describes the overall mauri of the river.

From the headwaters to the sea, four distinct local 'moods' may be observed and these might be compared to stages of human growth. First, on the Strath-Taieri, the river begins as small, tinkling streams that merge to become the young river, joyous and busy, noisily wending its way through braided, shingle beds. Side-streams gradually increase the volume but without changing the general nature of the free-running river. Second, there is the upper gorge, the turbulent teenage stage, where the flow is constricted and the river loses altitude quickly. Here the aspect is one of waikino. The bed is rocky and the gorge one long, turbulent, dangerous, white rapid. Side-streams add significantly to water volume. The third stage is when the mature river disgorges and meanders across the Taieri plain. Quite the adult river now, its flow is strong, stately and inexorable. Finally, just before it enters the sea, the lower gorge provides the confinement of old age. It becomes a swollen estuary, soon gathered up by the tide.

When the river floods, stages two and four show little change other than in turbidity from the increase in water volume. The first occasionally overflows but is relatively easily controlled and danger avoidable. The mature river, however, quite irresistible when angry, bursts over the

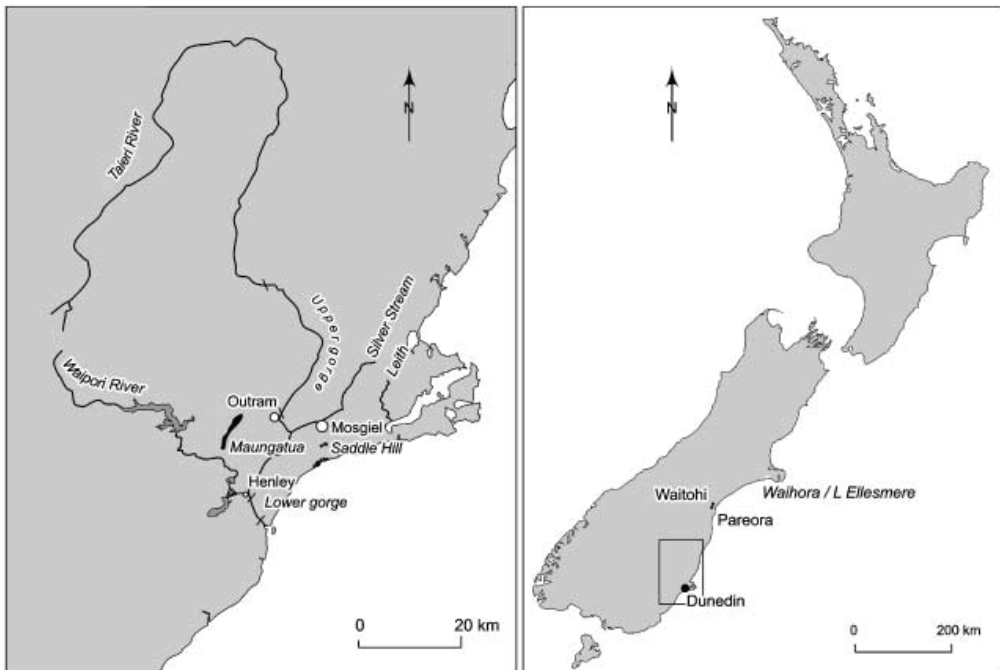


Figure 2: The Taieri River.

plain like an inland sea. The stars reflect in its nocturnal waters: Taiairiari – the twinkling tide, reduced by Europeans to the meaningless Taieri, the name-change a metaphor for assumption of control by new organisations such as catchment boards which denied Māori any input to management regimes.

It is instructive to focus on the locality near Outram (Outram Glen, now a popular picnic spot), where the river disgorges, undergoing a change in mauri from the waikino of the gorge to once again become waiora. This is a special place, not only because the positive change in mauri is a place of ‘rejuvenation’ of the waters but also because the range through which the gorge flows, Maukaatua (Maungatua), is a tapu place,¹⁰ thus intensifying the positive forces associated with the change of mauri. Hence, the pool is a ‘waipure’, a place where people with a weakened mauri may go to enhance their convalescence. According to tradition, the course of the river between Outram and Henley was formed by the wriggling along of the taniwha Makamaka. Makamaka came down the Silver Stream, had a ‘nest’ in the swamp that is now Mosgiel (Te Konika a Makamaka), and eventually became metamorphosed into the two-humped Saddle Hill. Makamaka is also regarded as spiritual guardian of this section of the Taieri.

Management of the waters

Various concepts give an insight into the various ways that traditional concepts and practices, and the Māori world-view that they were based upon, supported the management of waters and life within them. Many Māori continue to view matters through this lens.

Tapu: Water that had been ritually set aside was waitapu. It was subdivided into: waikino (dangerous water – see above); waipure (water for ritual cleansing); waitohi (waters of dedication, a ceremony somewhat similar to baptism); and waiwhakaheketupapaku (water burial sites). It was essential that water set aside for one purpose not be used for another. Food would not be taken from any waitapu and it would not be appropriate to ritually cleanse in water usually used for burying the dead. Nor was it appropriate to bury the dead in a fishing ground.

Today, place-names can be indicators to the classification of waters: Pareora (correctly, Pureora) and Waitohi, both in South Canterbury, were places where ritual cleansing and dedication, respectively, were carried out, not altogether dissimilar activities but each requiring its own form of waitapu. They are approximately equidistant from Waiaeruati, the major local traditional centre of population, but about 10 kilometres in different directions, an indication of the distances folk would travel for the appropriate type of water with which to perform a specific ceremony.¹¹

Such sophisticated classification of waters indicates the extent to which spiritual concerns permeated traditional society. Dame Joan Metge (1979) demonstrates degrees of tapu in relation to water. She writes “there are springs where water was used only for the sick; springs where water was used only for the dying; springs where water was used only for baptism (tohi).” She goes on to point out that the tapu was a protective mechanism for springs.

It was fundamental to any area where resources were harvested that the locality be treated with respect. Metge offers a contrast:

they [Europeans] fish anywhere at any time, make loud noises in the harbour, urinate and drop food in the water, gut fish in the sea or open shellfish on the shore, trample the shellfish beds, or raid the sea to line their own pockets. Worse, they treat a great food garden as a garbage can for unwanted waste.¹²

Urupa: burial sites were, and continue to be, secret places. ‘To identify the location of these waters identifies the funerary places which Ngāi Tahu are less than anxious to do. For this reason Ngāi Tahu require some restriction on the information about these sites, and they are therefore identified in the ‘Silent file’.¹³ Developers wishing to guard against impinging on an area with special values, may provide Kai Tahu with the co-ordinates of a project and apply to check whether any tapu site is registered in the vicinity. Thus a ‘silent file’ may be checked without specific details ever becoming public knowledge.¹⁴

Restricted access: As with land, restrictions were applied to water bodies in a number of ways. Rāhui were temporary restrictions, usually imposed at species level to allow the species to be reserved, or build up after being depleted.¹⁵ Tapu was a permanent or semi-permanent restriction, usually over a small locality. Wakawaka were divisions, facilitating the sharing of a resource between kin groups. Access to particular stretches of water was limited to certain descent groups; for example a succession of eel weirs may be erected, each operated by a different group. Eel drains at hapua (coastal lagoons) are still operated in this traditional way and the licensing of whitebait stands on West Coast rivers is a contemporary usage consistent with the wakawaka principle.

Owheo: Sometimes whole catchments were permanently proscribed. Huata Holmes, a prominent southern Kai Tahu kaumātua, gave testimony to the Waitangi Tribunal in 1988, that

owheo was a conservation measure to allow land or water to remain unchanged. It could not be cleared, burnt for fern root, have houses or weirs constructed there. Unlike rāhui, owheo was permanent and applied to all species in the area. Holmes advised that he had been given this information in 1947 by the late Te Ari Pitama and Mahui Manawatu. The stream in Dunedin, known as the Leith, is named Owheo in Māori as it was permanently under this prohibition because of sacred activities being carried out in the upper catchment. A number of local families still do not take resources from the Leith catchment, or eat anything taken from it by others, believing the proscription to continue today.

Habitat enhancement: An example of traditional practice is the flushing of hapua (coastal lagoons), in particular Waihora (Lake Ellesmere). Walter Mantell, Crown agent for early South Island land sales, recorded in his journal in 1848 that “We passed the closed mouth of the Puarau lagoon which is occasionally opened by the Natives in the same manner as the Waihora.”¹⁶ This enhanced the habitat for those species, like flounders, that disliked a muddy bottom, and assisted in the harvest of species like tuna (eels). Other practices were the positioning of fallen logs (pouwhenua) in the shallows of streams to provide shelter for species that avoided sunlight (such as most adult Galaxids, the major genus of native fresh-water fish). The objective in all cases was to improve a local ecosystem.

Population improvement: Shellfish beds were seeded from areas with superior strains and beds were improved by biological culling.¹⁷ The mauri of the waters where seeding took place must be compatible with the mauri of the waters from which the seed-stock originated. The places were marked to ensure that there was no interference with the process of seeding and strong social controls ensured the success of such practices. In recent times, many families have been unable to continue their traditional practices as there are no longer effective sanctions against transgressors.

Harvesting restrictions: Garven et al. point out that “great care was taken to ensure that only young birds and fish were taken, leaving the breeding stock, and thereby sustaining the resource. This system is analogous to ‘modern’ livestock farming systems where the welfare of the capital stock is always considered paramount.”¹⁸ They go on to say “water-sourced foods were particularly important in Te Wai Pounamu because of the harsh climate which precluded the easy or extensive growing of horticultural crops.”¹⁹ These were classified as kai moana (sea foods), kai awa (river foods) and kai roto (lake foods) and this division has persisted through to the present. Many such foods are species under-valued by non-Māori and accorded little consideration by regulatory agencies. The same authorities who accepted Māori representations to set up eel ladders allowing elvers to bypass a number of the South Island’s hydro dams, refuse to recognise that lamprey (*Geotria australis*) have a similar need; the latter were not seen to have any economic value.

Kaitiaki: Guardians of the waterways could be spiritual or a local group. One of the most prominent spiritual notions Māori have about water-ways is that they were guarded by taniwha (spiritual guardians). Taniwha may act as guardians of a particular area, of particular people or as messengers, signaling the end to a fishing season or impending misfortune.²⁰ This has given rise to the common, over-simplified translation of taniwha as ‘water-monster’.

Kaumātua, Tim Te Maiharoa²¹ said that families known as rūpara were specialist kaitiaki of the waterways. His family acted in that capacity in regard to the Waitaki, right up to contemporary times. The world may have changed but, in the Māori world, families still try to exercise their traditional responsibilities.

Contemporary recognition of Māori values

In recent legislation such as the Resource Management Act (1991), and more particularly in the settlement of Ngāi Tahu's and other tribes' Treaty claims, various levels of recognition have been accorded Māori vis-a-vis the management of waterways. In some cases this involves concepts virtually unknown previously to the wider New Zealand society. These are now summarised, in so far as they apply to water. In each case, new management regimes have been instituted, consistent with the Ngāi Tahu philosophy outlined above, and usually following traditional practice.

Taiāpure: Part IIIA of the Fisheries Act (1983), as amended by Section 74 of the Māori Fisheries Act (1989), permitted the establishment of taiāpure, described as: local fishery areas, in estuarine or littoral coastal waters, which are of special significance to iwi or hapu as a source of seafood or for spiritual or cultural reasons. They are established to give Māori a greater say in the management of the areas.²² Several taiāpure have been registered in the Kai Tahu rohe.

Deed of Recognition: This takes the form of a formal agreement between Ngāi Tahu and the Crown, providing a basis on which Ngāi Tahu has registered their right to advocate their interests, in a given area, in Resource Management Act and Conservation Act processes. Deeds of recognition or statutory acknowledgements (see below) have been registered in relation to 12 named lakes, vesting the lake-beds in the iwi. The Tasman, Greenstone and Caples valleys are also subject to deeds of recognition.

Statutory Acknowledgement: An instrument that acknowledges Ngāi Tahu's special relationship with an area and provides the tribe a standing, that is greater than that of the general public, to challenge applications under the Resource Management Act and the Historic Places Act (but not the Conservation Act).

Nohoanga: Entitlements have been provided for 13 lakes and 19 rivers. This is a revival of a traditional concept which will provide Ngāi Tahu with temporary campsites adjacent to nominated waterways for the express purpose of harvesting customary fisheries and other natural, water-based resources (e.g. raupo). These campsites may be occupied up to 210 days per year, between mid-August and the end of April; a clear reflection of traditional practices. A maximum of two nohoanga sites, up to a hectare each, are to be provided for each named waterway and are to be on Crown land.

Tōpuni: In traditional times a tōpuni was a fine dogskin cloak which was highly treasured and, accordingly, only worn by people of exceptional standing, perhaps as few as half a dozen in an entire iwi. Thus, this metaphor is appropriate to designate areas of exceptional values. As a statutory concept, under the Ngāi Tahu Treaty claim settlement, tōpuni entails "the creation of a separate, statutory 'overlay' classification over land administered under the Conservation, National Parks or Reserves Acts."²³ It will not override the existing protection or classification of the area to which it relates but will identify and acknowledge the special values (cultural,

spiritual, historic or traditional) of the area. Ngāi Tahu will have the opportunity to define the types of action that could diminish or harm those values and the Crown will be required to control such behaviours.

At the beginning of the 21st century, Te Rūnanga o Ngāi Tahu issued a policy statement on freshwater in order to articulate to territorial local authorities the tribal approach to freshwater management, including a description of the ways in which, as tangata tiaki (tribally appointed guardians), the iwi wish to engage in freshwater management and the environmental outcomes sought.²⁴ It should be noted that the policy statement does not discuss issues relating to the ownership of water, which Ngāi Tahu believes is unresolved.

Conclusion

Contemporary Kai Tahu approaches to the management of waterways focus on water quality and quantity, and respect for ancestral knowledge and values that for centuries ensured that resources, so vital to the survival of the people, thrived. Put simply, that is the reason that Kai Tahu believe that there is an ongoing role for Māori in the management of waterways and adjoining riparian areas. Māori concepts and practices as discussed above have a vital role to play in the development of resource management law and decisions in New Zealand.

Acknowledgements

The author wishes to acknowledge access to the Potiki papers,²⁵ on which much of the traditional material above was based. The guardians of the collection have asked that specific references not be used, but preferred that their tupuna's intellectual property be recognised with a general acknowledgement.

This chapter has its origin in previously published work.²⁶

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The Hydrology of Southern New Zealand

Sarah Mager and Sophie Horton

I Introduction

The water resources of Southern New Zealand are a dominant feature of the landscape, that connect the highest mountains through river corridors to the coast. These river corridors reflect the integrated catchment response that redistributes material from mountain erosion, as well as dispersing water across the landscape. From the orogenic headwater catchments of the Southern Alps with steep alpine streams, to small native forest catchments, Southern New Zealand illustrates how rivers influence topography and landscape. With increasing use and pressure on water resources there is a need to understand the land-river relationship – as illustrated by the effects of loss of native vegetation, pastoral intensification, and hydroelectricity demand and development, all of which directly impact water quality and water quantity. This chapter explores some of the distinctive features of the rivers of Southern New Zealand using case studies that draw on the influence of indigenous New Zealand flora and fauna, transformations of our river networks, and high intensity practices to demonstrate how human land use and disturbance affects the behaviour of river systems.

2 Ki Uta Ki Tai: From the Mountains to the Sea

The Southern Alps/Kā Tiritiri-o-te-Moana are the quintessential feature of the South Island/Te Wai Pounamu where tectonic forces have converged to uplift a 480 km long chain of mountains. With 20 mountain peaks over 2,000 m in elevation, the Southern Alps provide the architecture for the South Island, transforming the climate, the distribution of winds, rain, soils and plants, and create the distinctive landforms of Southern New Zealand. The arc of the Southern Alps, lying transverse to the westerly wind circulation that characterises much of the latitudes between 40° and 50°, causes winds to deflect, air parcels to ascend, and creates conditions of intense orographic precipitation.

The force of these uplifted air parcels causes much of the moist humid-air that forms over the Tasman Sea to be dropped on New Zealand's west coast (Te Tai Poutini), forming steep,

short rivers that rise rapidly during rainfall. Across the main divide, however, rain spills over into the eastern range fronts, with intense rain falling up to 20 km beyond the main divide, providing critical water sources to the relatively drier east coast. East of the main divide, air parcels that have been thrust upwards and over the Southern Alps, are forced to condense, and once this water vapour is lost as rain, and the topography flattens out, the air descends, becoming denser, faster, and warmer, and fuelling the ‘*nor’wester*’ winds that are characteristic of Canterbury.

The process of orographic rainfall driven by the presence of the Southern Alps lies at the heart of the rapid changes in landscapes observed across Southern New Zealand. The rainfall gradient fuels the cool temperate beech and podocarp rainforests of the west and the alpine grasslands and herbfields below the snowline. The relatively drier east suits large swales of grassland that traverse the Otago and Canterbury rolling high country. The dry interior of Canterbury and Otago is a product of the atmospheric barrier of the Southern Alps, but these landscapes are transected by large alpine rivers. These eastern alpine rivers provide a critical water resource for regions that are climatically drier, and more continental than any other part of New Zealand.

2.1 The Braided Rivers of Canterbury

The Canterbury rivers run eastward from the Southern Alps (Fig. 1), following the wide valleys carved out by glaciers during the last glacial maximum. These valleys have long since been filled by river sediment (alluvium) transported from the continual erosion of the mountains, and the flush of sediment associated with the cessation of glaciation. The combined effect of steep mountains, wide valleys, and plentiful sediment supply fuels the large braided rivers that flow unimpeded to the east coast. Braided rivers, like the Waitaki,¹ Waimakariri, and Rakaia provide essential ecosystem services, including niche habitats for indigenous birds: the banded dotterel (*turiwhatu*), wrybill (*ngutu pare*), oystercatcher (*tōrea*), black stilt (*kakī*), black-billed gull (*tarāpunga*), and the black-fronted tern (*tarapirohe*).² Of these indigenous birds, many are now nationally, or critically, endangered as the gravel-beds of large braided rivers are threatened by encroaching farming, riparian grazing, invasive weeds like Russell lupin that stabilise river beds and change river morphology, predation, and disturbance from recreational activities.

Braided rivers are also under pressure from water and gravel extraction, which disturbs river beds and increases the movement of fine silt particles downstream. The water volume in the large alpine rivers provides a valuable resource to the community, so that extensive investment has taken place to develop water diversions from the Rangitata, Waimakariri, and Rakaia rivers for irrigation. The Canterbury region accounts for 65% of the nationally allocated consumptive water-takes, and there are concerns that the region may approach allocation limits and future water scarcity.³

The reduction of flows in the lower reaches of the Canterbury rivers has potentially negative implications, with increased invasion of nuisance weeds and algae, and in extreme cases, cessation of flow. The reduction and diversion of water from braided rivers also has implications for groundwater sources. Canterbury is comprised of stacked layers of gravels and finer material that provide a regionally-important source of groundwater, however, this

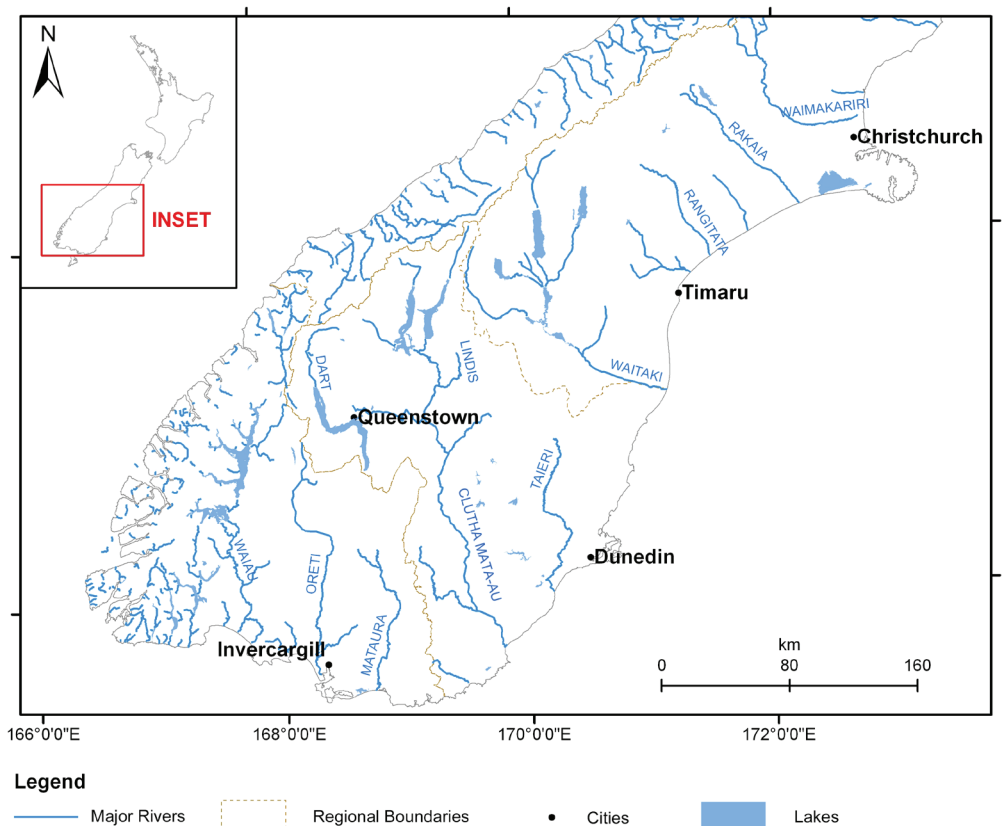


Figure 1: The major rivers of Southern New Zealand.

groundwater is sustained by rainwater in the foothills and water leaking freely from the braided rivers. The exchange of water between ground and river is important, because if too much water is taken from one, the other will also decline. For example, drinking water in Christchurch is extracted from deep aquifers beneath the city, but that water is actually from the Waimakariri River,⁴ which loses water through its gravel-bed as it flows across the Canterbury plains. If too much water is diverted from the upper part of the Waimakariri, then there will be less water to refill Christchurch's aquifers. Thus, local water allocation needs to carefully balance what happens across the whole catchment, including both the surface and groundwater components.

2.2 The Mighty Clutha and the Modest Taieri

The water resources of Otago are dominated by the Clutha Mata-Au River which flows 322 km from Mt Aspiring National Park through Central Otago, to its mouth near Balclutha. The Clutha Mata-Au and its tributaries drain 20,586 km², equivalent to 66% of Otago's area, making it the largest river basin – and the largest river by volume – in New Zealand, with a mean annual flow of 614 m³s⁻¹. With headwaters nestled against the ridge of the Southern Alps, the combination of spill-over rain and steep mountains produce significant amounts of sediment that are flushed down the tributary headwaters. Most of the sediment comes from the Shotover

and flows subsequently through the Kawarau River. At Cromwell, the Kawarau and Clutha converge, with 89% of the sediment supply being derived from the Kawarau, and substantially less sediment moved through the upper Clutha Valley due to sediment entrapment in Lakes Wanaka and Hawea.

Two major hydroelectricity plants operate on the Clutha Mata-Au:⁵ Roxburgh (commissioned 1956) and Clyde (commissioned 1993) with a combined generation capacity of 752 MW. Collectively, these dams impact the movement of sediment downstream by gradually filling their reservoirs with coarse sediment at a sedimentation rate of 1.4 million cubic metres per year (for the period 1961–1979).⁶ As a result of such high sedimentation, the Roxburgh Dam filled quickly, so that by 1979 25% of the reservoir capacity had filled. The subsequent construction of the Clyde Dam, along with dredging of the Roxburgh Dam has increased its water holding capacity and power generation longevity. Downstream of both dams, however, the river beds are vulnerable to erosion as the rivers are starved of sediment. The cumulative impact of these dams has been to reduce the amount of sand and gravel transported to the Clutha mouth by 95% from 0.9 to less than 0.06 million tonnes of material a year.⁷ The storage of this sediment also has impacts on the coast, and is likely contributing to coastal erosion at Molyneux Bay.⁸ There have been proposals to build further dams on the river, including feasibility studies for Luggate and Queensbury (upstream of Clyde), and Beaumont and Tuapeka (downstream of Roxburgh), although local opposition remains strong to further flooding in these regions.

The Taieri River catchment is considerably smaller than the Clutha Mata-Au at 5650 km², with a mean flow of 35 m³s⁻¹, despite being the second largest catchment in Otago. The Taieri River flows northward from the Lammerlaw Range as a slow moving and tightly meandering river and scroll plain, with extensive riparian wetlands providing habitat for indigenous fish species. With the confluence of the Kyeburn, the Taieri swings southward and curls back toward the Strath Taieri bound by mountain ranges. Continuing to flow south, the Taieri flows through a series of gorges and plains to the sea at Taieri Mouth, 40 km south of Dunedin.

The Taieri catchment has one of the driest climates in New Zealand, with the central basin at Waipiata receiving only 380 mm of rain per year. The highest amounts of precipitation (<1800 mm) occur along the Rock and Pillar Range, however, high summer temperatures and consistently high winds lead to very high evaporation rates. The region is also vulnerable to drought so flow allocation is an important aspect of its management, as is water quality, since modest flows mean that even modest amounts of pollution may impart a significant influence. The Taieri discharges onto the low-lying Taieri Plains, which are less than 1 m above sea level. Once an extensive wetland, the plains were drained for agriculture, and remain vulnerable to flooding in extreme events. Following extensive damage caused by the 1980 floods,⁹ an elaborate flood scheme was developed in the region, with dedicated spill areas and elevating the main route south on State Highway One. However, because of its low-lying elevation it remains vulnerable to the effects of future sea level rise.

2.3 The Four Rivers of Southland

The Southernmost region of New Zealand, Southland, has plentiful water resources. Situated

away from the highest crest of the Southern Alps, the local climate is dominated by westerlies and south-westerlies, which bring moisture-laden air from the cool Southern Ocean onto the Southland Plains. Formed similarly to Canterbury, the region is dominated by four mountain-fed rivers, which flow through former glaciated valleys and across broad plains filled with alluvium. These rivers (Waiau, Aparima, Oreti and Mataura) provide plentiful water to the region, as well as having significant groundwater resources through the aquifers along the plains, which have relatively shallow water tables across the region. In areas of plentiful sediment supply, the rivers are braided, but quickly transform into wide meandering rivers as they flow south across the gently dipping plains.

The largest river, the Waiau, has its headwaters in Fiordland National Park, and has a mean flow of $550 \text{ m}^3\text{s}^{-1}$, and was the second largest river by volume in New Zealand, until much of its flow was diverted from Lake Manapouri to Doubtful Sound as a part of the Manapouri Power Scheme (capacity of 850 MW). Since diversion in the mid-1970s, the Waiau has a reduced flow of $167 \text{ m}^3\text{s}^{-1}$, and the reduction in stream flow has had a substantial effect on river morphology downstream. Since flow regulation there has been a decrease in river channels, loss of river bars and sediment, and a change in channel shape and area.

Like many of the rivers discussed in this chapter, the Mataura River is highly valued for its mahinga kai by Ngāi Tahu Whānui, and it was an important traditional access route from coastal Southland to Fiordland for pounamu collection. Recognition of the cultural value of the river in the Ngai Tahu Claims Settlement Act 1998 also resulted in part of the Mataura River being recognised as a mātaihai reserve (a traditional fishing ground), the first freshwater mātaihai reserve in New Zealand, in 2005. The area most treasured for its mahinga kai is the Mataura Falls (Tuturau), also prized in Victorian times as a tourist spot, where the Mataura River cuts through the Murihiku syncline and has formed a series of cascading falls. These falls were noted particularly for the collection of lamprey (kanakana) as they climbed across the stepped bedrock channel.

The headwaters of the main Southland rivers are all highly valued recreational fishing rivers, particularly for brown trout; however, the middle and lower reaches of these catchments are under increasing pressure from intensification of agriculture, and the issues around managing agricultural waste. The current challenges for lowland rivers in Southland is around balancing the economic imperatives for maintaining agriculture and declining water quality.

3 The Effects of Land Use on Southern Rivers

The rivers of Southern New Zealand have a long history of providing for human settlements, as resources of mahinga kai, pounamu, culturally valued sites, and navigation routes (awarua). Māori recognise rivers as possessing mauri, a distinct life force and rivers are essential elements to Māori cultural identity. Early Europeans used indigenous knowledge of awarua to explore and map the South Island, using the location of river valleys to find passes over the Southern Alps. The resources of these Southern catchments have been indelibly exploited throughout human occupation and with the expansion of settlement into the interior of Southern New Zealand these rivers provided essential resources that were ripe for exploitation. In Otago, tail races transect the landscape, with gentle gradients that move water across the rolling hill

country, directed initially for gold mining sluicing and latterly, used for irrigation after the collapse of the gold mining industry. With the settlement of Southern New Zealand, by Māori and then Europeans, came a transformation in land cover, which has profound effects on the water resources; especially how much water remains in river channels, and the quality of that water for consumptive and recreational use.

3.1 Thirsty Trees and Foggy Summits

Prior to human settlement, Southern New Zealand was covered in cool temperate forests.¹⁰ These stands of indigenous trees of beech and podocarp forests provided contiguous coverage from the coast to the sub-alpine zone. Forest rivers have cool waters, as the presence of trees to the water's edge provides canopy cover and reduces solar heating. Indigenous forest rivers are shaded and have a plentiful supply of leaf drop and a rich macroinvertebrate community. The regular supply of tree-fell provides log jams, so the runs of rivers are characterised by steps, rapids and riffles – fast runs of water that mix plenty of dissolved oxygen into the water – as well as deeper, slow pools, and it is the mixture of these forms that provides key habitat spaces for indigenous fish populations.

In all but the biggest of storms, forests hold onto water, intercept rain through the canopy, store more water in soil, and generally delay its pathway to the river network. Under these conditions indigenous fish species evolved to suit forested rivers, cool water temperatures, fast and slow runs of water, but also shallow waters. New Zealand longfin eel (tuna) and lampreys (kanakana) adapted to these environments by being able to navigate around river barriers, and survive for short times out of the water.

Human settlement, however, dramatically transformed the vegetation of New Zealand. Fire, forest clearance, settlement, and stock grazing resulted in rapid transformation. The loss of trees exposed bare ground to the elements. The combined effects of less tree cover lead to an increase in river flows, and more extreme floods; more water was able to erode away unstable soils and rocks, leading to rapid siltation of harbours and estuaries.

The forest cover of Southern New Zealand was replaced mostly by grasslands. In the alluvial plains, exotic pasture was sown; but in the difficult rolling hill terrains, with thin soils, and harsh winters, indigenous grasslands dominated. Nearly all areas of indigenous grasslands in New Zealand have been modified by sheep grazing and invasion of weeds. Much of the grasslands at higher elevations are protected in the conservation estate although approximately half of these grasslands remain in private ownership. The lower elevation indigenous grasslands are threatened by the expansion of intensive agriculture.¹¹ Snow tussock (wī kura) (*Chionochloa rigida*) dominate many of the mid-altitude regions of the South Island, with only a few pockets of red tussock (hau mata, *Chionochloa rubra*) remaining. These grasslands are highly valuable ecosystems,¹² and one of their truly remarkable attributes is their conservative use of water.

To understand the hydrological effects of changing land use, the New Zealand Forest Service established the Glendhu Experimental Catchments near Lawrence. In particular, the Forest Service wanted to assess the impacts of converting snow tussock grasslands to *Pinus radiata* plantation forestry,¹³ and the Glendhu Experimental Catchments are now the longest running paired catchment study in New Zealand. The study allocated one catchment within

Glendhu Forest to be retained in tussock grassland under conservation covenant as a control to compare the effects of forestry plantation on an adjacent catchment of similar size. The establishment process included a two-year calibration period (1979–1980), followed by land clearance, ripping, and forest planting in December 1981, after which the effects of the maturing crop on water yield were studied.¹⁴ Research in the Glendhu Experimental Catchments showed the expected reduction in stream water runoff that occurred during the growth phase of *Pinus radiata*.¹⁵ The difference in stream runoff between the two catchments was equivalent to a 27% reduction in water yield due to afforestation of *Pinus radiata*. Not only is annual runoff affected, but afforestation also reduced flood peaks during rain events.

Following canopy closure in the planted Glendhu catchment, water runoff decreased as the *Pinus radiata* crop matured, significantly reducing stream flow. Such patterns of reduced stream flow in forests are widely recognised as afforestation affects water yield through increased interception and increased evapotranspiration, resulting in a net reduction in stream water yield. However, one unexpected outcome of the paired catchment study at Glendhu has been the observation that since 2010 there has been a reduction in stream flow coming from the tussock covered catchment.

The decline in stream flow is not associated with any change in local rainfall, but rather, it reflects increased water uptake in the catchment. Since 1986 there has been a creeping increase in the amount of woody plants and scrub in the tussock catchment at Glendhu. In particular, mānuka has spread on the sunnier east and northerly faces of the catchment, so that by 2016 mānuka covered 32% of the tussock ‘control’ catchment. Preliminary observations of water use by mānuka at Glendhu suggests that woody species likely use twice as much water as tussock grasslands. Tussock grasslands in the conservation estate are becoming increasingly vulnerable to vegetation change as mānuka, kānuka, speargrass (taramea), hebe, flax (harakeke) and hawkweed are becoming more widespread in these grasslands, which likely has significant implications for stream flow and down stream water use.

So what is it about snow tussock that makes it such an efficient user of water? Snow tussock has a variety of physiological adaptations which makes it a conservative water user able to regulate water loss. Snow tussock tillers (leaves) are long and thin and able to furl and unfurl depending on water availability. Stomata are only located on the inside of the leaves, in deep furrows, and are covered in a thick waxy deposit which further reduces transpiration.¹⁶ If there is plenty of water, the tillers are relaxed and unfurled, so the stomata are open to transpiration. Under water stress, however, the leaves curl and fold back in on themselves, substantially reducing transpiration. As a result, snow tussock plants have transpiration rates that are half that of exotic grass species, and similar to that of mature forests (Table 1). Thus, in places where there is relatively little water, or – like through Central and Eastern Otago – the risk of drought, tussock provides a resilient vegetation cover that is able to substantially reduce water use when under stress.

Another benefit of tussock is that the tillers are well suited to capturing water from fog. Fog interception in snow tussock grasslands occurs when water droplets in fog collect on the tillers and coalesce to form larger droplets causing these to fall to the ground (Fig. 2). In the Glendhu Experimental Catchments fog is relatively rare, and accounts for only 1% of the

Vegetation Type	Location	Mean Annual Evapotranspiration Rate (mm d ⁻¹)
Snow Tussock	Glendhu, Otago	0.6–1.1
Snow Tussock [#]	Central Otago, Mackenzie Country	1.1 1.1
Indigenous red and silver beech forest [^]	Murchison, South Island	1.0–2.0
Mixed podocarp-beech forest	Nelson Lakes and Westland	0.9–1.2
Pinus Radiata (5 years)	Rotorua	2.7
Pinus Radiata (17 years)	Rotorua	2.4
Pinus Radiata (26 years)	Rotorua	2.0
Pinus Radiata (23 years)	Otago	1.5
Douglas fir (15 years)	Rotorua	2.3
Douglas fir (66 years)	Rotorua	0.4
Exotic Pasture [§]	10 locations across NZ	2.0–3.0

[#] Data from author from unpublished data. Mackenzie Country data from Hunt *et al.* (2002).

[^] Data from Kostner *et al.* (1992)

[§] Data from Schotter and Kelliher (2004)

Table 1: Transpiration rates of different vegetation types in New Zealand estimated using water balance calculations. (Source: Rowe *et al.*, 2002)¹⁷



Figure 2: (left) Water droplets coalescing on snow tussock tillers during a fog event on the Rock and Pillar Range, and (right) example of advective fog which forms as moist air parcels are forced over ridges causing the vapour to cool and condense, as observed in the Saint Marys Range, Central Otago.

overall precipitation budget, but this is a relatively low elevation site (< 600 m asl). Further studies have suggested that wind-driven fog could contribute as much as 9 or 10% of total precipitation,¹⁸ but that fog as an isolated weather event probably only ever contributes a small amount to overall water budgets.

3.2 Racing to Consume Water

The drier interior climates of Central Otago, in the shadow of the Southern Alps are a distinct feature of Southern New Zealand. In Otago, these landscapes are characterised by a mosaic of rolling hills and flat basins, where the hills receive upwards of 1000 mm of rainfall a year and have sufficient water resources. However, the steep slopes, thin skeletal soils, and pockmarking of bedrock tors make these high country hills difficult to farm, particularly given the presence of snow in winter. Thus, the iconic inland Otago landscapes, of rocky ridges, and swales of tussock are largely restricted to light grazing by the hardiest of sheep. Intensive farming is largely restricted to the plains carved out by rivers and filled with rich alluvium. These basins, however, have low rainfall (<400 mm a year) and warm summers leading to water deficits, and much of the water resource is diverted via races for summer irrigation. The races, a combination of irrigation schemes set up in the 1900s–1930s along with existing mining races allowed for the redistribution of water from the rivers into a complex network. Irrigation traditionally followed border dyke schemes, where paddocks were saturated with water that drained through the alluvial soils – which had the benefit of providing excess water to percolate down into groundwater, likely sustaining local shallow boreholes. The transformation of irrigation techniques away from border dyke irrigation to more efficient k-line and centre pivot systems has reduced the amount of water that goes into groundwater, and several shallow bores, that were once used to extract water, have dried up.

The diversion of water in and out of water races across the Maniototo and Central Otago is a relict from the gold mining days, when no limit was placed on water taken out of rivers.¹⁹ The effect of water diversion on these rivers is complex, as water is lost from one section of river, diverted down a race and partly used for irrigation, and then the residue water is returned to the next section of river. The in and out diversion pattern is repeated along the river, so that water volume fluctuates downstream. The overall effect is that if sufficient water is diverted out of the waterway, then part of the riverbed may end up running dry for part of its water course. For example, during the peak irrigation season numerous tributary rivers in Otago dry up for part of their length. The Lindis River, a 60 km long catchment that flows south, then south-west from Lindis Peak is a tributary of the Clutha Mata-Au. Covering 1040 km², the Lindis is a typical high country catchment, with tall tussock headwaters, and intensive grazing in the low-reaches. Substantial water-takes exist in the lower catchment, so much so that the Lindis regularly runs dry for a 2–3 km stretch above its confluence with the Clutha Mata-Au near Tarras. The cessation of flow during hot dry summers is due to the cumulative effects of low flows and irrigation water takes in the lower catchment, and in the absence of these irrigation takes, the Lindis River would rarely disconnect from the Clutha Mata-Au.²⁰

The drying up of sections of headwater tributaries has some advantages and disadvantages for the protection of indigenous fish populations. For example, shallow rivers exclude trout



Fish recovery from a depleted Pigburn (Ian Hadland, Fish and Game New Zealand)

from headwater streams as there is insufficient water depth for their survival, which is a boon for indigenous species as they cannot compete with trout predation. However, the main risk of drying up of headwater tributaries comes from the reduced volume of water. Reduced water flow creates numerous problems, including reduction in the wetted bed area for macro-invertebrates, which are an essential food source for fish populations; decline in habitat space like cool and shaded ponds; and water temperature increase. Increasing water temperature changes water chemistry, decreasing the amount of dissolved oxygen and potentially suffocating vulnerable fish species. Less water also means that nuisance plants are able to invade river beds, potentially slowing water and further reducing habitat. Managers of water resources have the unenviable job of trying to balance different values in water when determining allocation: the contributory factors to riverbed drying, and the vulnerability of recreationally-valuable fish species versus protecting indigenous species in headwaters, all of which are pitted against the need to sustain livelihoods, provide safe drinking water, and balance the economic imperatives for intensified water use.

3.3 Water Quality

Over the last three decades the shifts from native vegetation to high-intensity agricultural development, forestry plantation, and urban expansion has put pressure on freshwater quality.

In Southern New Zealand, these impacts are most closely linked with agricultural intensification coincident with the loss of indigenous vegetation cover – specifically the effects that nutrients, like nitrogen and phosphorus, have on water quality. It is imperative that the form and function of New Zealand's waterways are preserved, not just for human health, but also to ensure the environmental integrity of the high endemism of New Zealand ecosystems, as well as sustaining communities' livelihoods and economic productivity. By international standards the water quality in New Zealand is regarded as good, despite the continued decline in lowland river water quality.²¹ However, it is disingenuous to compare New Zealand's degraded waterways to the even more degraded international context, because water quality is so locally contextualised.

The current concern for water quality in New Zealand focuses on monitoring and managing nitrogen and phosphorus (also *e. coli* and water clarity), because of the increasing frequency with which they are being identified in catchments at excessive levels causing detrimental effects on the local aquatic community.²² Characterising nitrate concentration, in the absence of human effects is difficult, since so much of the landscape has been transformed; however, the water quality in remaining pockets of indigenous forest can be used as indicators of pre-human settlement water quality for Southern New Zealand. New Zealand indigenous forests export lower concentrations of nitrogen and phosphorous compared to pasture and forestry plantation, and produce a higher concentration of dissolved organic matter. Studies of the water quality in upland indigenous vegetation cover catchments have consistently reported nitrate concentrations ranging from 10 to 50 $\mu\text{g N L}^{-1}$ for the South Island. The main source of nitrogen from forest catchments is from soil leaching, so that most of the nitrogen exported is in organic forms, and not the inorganic form that dominates lowland water quality, which largely derives from fertilizers and animal urine and manure. The conversion from tussock grassland to exotic forestry plantation also increases concentrations of nitrogen and phosphorous; however, these effects are relatively minor compared to the nutrient loading generated under intensive agriculture.

Phosphorus, like nitrogen, is essential for all living organisms. It plays a significant role in the metabolism, photosynthesis, and growth of plant species. Naturally, phosphorus is derived from rock weathering and is regarded as a trace amount; i.e. < 0.4% in rocks. In freshwater systems phosphorus naturally occurs in very low concentrations, making it a biologically limiting constituent. However, due to the rapid expansion of urban areas and agricultural development in Southern New Zealand, there has been widespread enrichment of phosphorus in freshwater systems due to increased use of anthropogenic-derived phosphorus.²³ Globally the concentration of phosphorus in rivers is steadily increasing, due to the widespread use of fertilizers since the 1950s. The natural concentration of phosphorous in New Zealand is very low by global standards because of few natural mineral sources of phosphorous, combined with careful use and recycling of phosphorus within indigenous forest soils. Thus, under pristine conditions in indigenous covered catchments, the phosphorus concentration consistently ranges between 1 – 5 $\mu\text{g P L}^{-1}$ (Table 2).²⁴

Assessing the current trends in water quality in Southern New Zealand is difficult as many of the large catchments in the region have a long history of land use transformation that predates water quality assessments. Comparison to the water quality of headwater catchments

River	Nitrogen ($\mu\text{g N L}^{-1}$)	Phosphorus ($\mu\text{g P L}^{-1}$)
Clutha Mata-Au	74	2
Taieri	46	14
Waiau	380	< 4
Aparima	920	7
Oreti	1219	12
Mataura	1369	9
Rangitata	2650	1
Rakaia	65	1
Waimakariri	261	3
Waitaki	68	1
Headwater Catchments	< 50	< 4

Table 2: Water Quality of Selected Southern New Zealand Rivers: Data from National River Water Quality Network (2013) and the Land and Water Aotearoa website (2017). Nitrogen concentrations are for nitrogen-nitrate.

that remain in indigenous forest or grassland cover shows that there is considerable enrichment in both nitrogen and phosphorus in Southern New Zealand’s lowland rivers, although the effects of these nutrient enrichments are less evident in the large catchments, like the Clutha Mata-Au, Waitaki and Rakaia rivers. For some catchments, like the lowland reaches of the Rangitata, Mataura and Oreti rivers there are high nitrate levels that continue to present challenges for regional authorities in terms of setting appropriate water quality limits that preserve the integrity of ecosystem function, while balancing the economic needs of the regional communities. The freshwater management framework, as mandated by the National Policy Statement for Freshwater Management (2014) is to maintain or improve river quality, and this presents many local challenges into the future, particularly towards stabilising nutrient water quality which requires collaborative management between all stakeholders to negotiate key values for the different river systems.

4 Conclusion

Southern New Zealand has a diverse landscape with water-rich and water-scarce areas that are defined by the architectural organisation of the Southern Alps. The water resources are all connected from the mountains to the sea, as these mountains are the source of recharge to the aquifers, and fuel the headwaters of the iconic rivers that define Southern New Zealand. The large volume rivers provide essential power generation for New Zealand, with 11 hydroelectric power stations with a generation capacity of 3,300 MW (half of which is generated in the Waitaki catchment). These rivers also provide essential environmental functions, including: niches for endangered indigenous species that are only found in New Zealand; highly valued cultural sites as pathways, routes, stories, and customary rights; highly valued landscapes for tourism, including recreational activities like fishing; and essential water resources that sustain local communities and industries.

Endnotes

1. The Upper Waitaki is braided, but due to extensive engineering works much of the water is diverted through hydroelectricity canals, so that only the lowest portion of the Waitaki as it flows to the coast remains truly braided. The 8 hydroelectricity dams on this river have a generation capacity of 1550 MW.
2. Department of Conservation “Life on a braided river” (Online resource).
3. Our Fresh Waters. 2017. Report by the Ministry for the Environment.
4. Wilson, D. 1975. *Journal of Hydrology (NZ)*, 15, 101–120.
5. The Clutha Mata-Au also has numerous small hydroelectricity generators on its tributaries, with Pioneer Energy operating at least a dozen smaller schemes, including plants on the Roaring Meg, Wye Creek and Teviot River.
6. Jowett, I. 1984. *Water International* 9, 172–176.
7. NIWA. 2000. *Clutha River sediment budget*, Report prepared for Contact Energy Ltd.
8. Otago Regional Council. 2016. *Natural Hazards of the Clutha Delta*, Dunedin, New Zealand.
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10. McGlone, M. *et al.* 2014. *New Zealand Journal of Ecology*, 38: 1–11.
11. Mark, A. and McLennan, B. 2005. *New Zealand Journal of Botany*, 43: 245–270.
12. See Mark, A. *et al.* 2013. Ecosystem services in New Zealand’s indigenous tussock grasslands: conditions and trends. Manaaki Whenua Press: Lincoln, New Zealand for a comprehensive review of the numerous ecosystem services provided by tussock grasslands.
13. Fahey, B. and Payne, J. 2017. *Hydrological Processes* 31: 2921–2934.
14. The Glendhu Experimental Catchments have produced lots of different studies beyond just the main purpose of water yield characterisation and have contributed to our understanding of hillslope processes, wetlands, soils, water quality and evaporation. Studies are ongoing to this day with collaborations between Matariki Forests Rayonier, Landcare Research, Otago Regional Council and the University of Otago.
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18. Mager, S. *et al.* 2016. *Journal of Hydrology (NZ)* 55 (2): 107–120.
19. The allocation of water via Mining Rights is a peculiarity unto itself, where water diversions were left largely untouched and grandfathered into 30-year permits after the Resource Management Act was enacted. These water rights expire by 2021 so that Otago now finds itself in the difficult position of trying to determine how much water should be left in rivers and setting minimum flow rules. The process has been highly contested as the Regional Council tries to find a middle way through preserving river function, providing water for economic purposes, and environmental conservancy values.
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Marilynn Webb. 1988. Orange & long shadows – St Bathans tailings. Pastel on paper.
Collection of Ian Keiller and Nicola Wheen.

Southern Catchments and the Evolution of New Zealand's Environmental Law

Nicola R. Wheen

Introduction

'Environmental law' is the law about environmental problems.¹ Like most law, environmental law develops over time as society evolves and as environmental problems emerge. This chapter describes how environmental problems in the southern catchments have impacted – and continue to impact – on the evolution, form and content of New Zealand's environmental law over time.²

Environmental history can be defined as “a kind of history that seeks understanding of human beings as they have lived, worked and thought in relationship to the rest of nature through changes wrought [by the actions of human and non-human agents over] time”.³ In this environmental history of the southern catchments, environmental law provides the record of the past. The law's purpose and content tells us about how people have lived and worked in the southern catchments, about the environmental problems they have faced, and how they have responded to those problems. In so doing, it reveals how New Zealanders' perspectives on their relationship with the rest of nature have changed over time. Pawson and Brooking remind us that in studying history, we must consider both the past and how it and “present behaviours shape environmental futures.”⁴ This chapter shows how the law acts as a conduit that has enabled our past to affect our present (for good and bad) but which also enables us, living in the present, to shape a better future.

This chapter focuses on four human activities and their associated environmental problems: resource gathering from the twelfth or thirteenth century AD;⁵ gold mining during the early 1860s; hydro-electric generation between the 1960s and 1980s; and irrigation for farming. These activities exploit(ed) key natural resources of the southern catchments: birds (originally including moa), fish and eels for food, rivers and their energy, watercourses and valley systems for movement of people and goods, freshwater, and alluvial gold. The fact that these activities have so clearly affected the form and content of this country's environmental law demonstrates

the importance of the southern catchments to the social and economic development of New Zealand.

The Goldrush and Water

Released from quartz veins in schist rock ground down by advancing and retreating glaciers, and washed with gravel into the beds, banks and tributaries of the streams and rivers of southern New Zealand, gold lay undisturbed for hundreds of thousands of years. Passed over by Māori engaged in seasonal hunting or en route to and from Te Poutini (the West Coast) on the pounamu trails,⁶ the gold waited until 1861, when it was first discovered by Europeans at Gabrielle's Gully near the Tuapeka River, and New Zealand's first big goldrush began.⁷ The Otago goldrush peaked in 1863, when the goldfields population reached an estimated 24,000, but from 1865 many miners were already moving on to new goldfields on Te Poutini and in Nelson,⁸ and settlers' interests in the southern catchments had turned towards farming.

Early prospectors arriving in the southern catchments simply picked up gold nuggets from the surface of riverbeds and banks, and most early diggers were armed with just a shovel, pan and cradle to work the surface gravels. But miners in Otago soon turned to ground and hydraulic sluicing, and hydraulic elevating. After 1900, dredging flourished, especially of the bed of the Mata-au and in the areas around Cromwell and Alexandra. The environmental demands of these mining methods are significant: they use a lot of water, displace a lot of gravel and rock, and create a lot of tailings. Hence, Otago's miners sought to take water from local watercourses, to dam and divert water through races to supply their works, and to discharge water and tailings back into rivers and streams or just into piles nearby.⁹

To manage the competing claims between miners to gold, and among and between miners and other settlers to freshwater resources, English laws¹⁰ and legislation made by New Zealand's fledgling Parliament were applied. These laws established systems, principles and approaches many of which can still be observed in New Zealand's mining and water law today.

Crown ownership of all natural deposits of gold was established in English common law by the *Case of Mines* in 1567, and this rule was assumed to apply in New Zealand even though this was not confirmed until 1875.¹¹ The discovery of a small amount of gold in Collingwood/Takaka in 1857 had prompted the government to legislate in anticipation of further discoveries, and the resulting Gold Fields Act 1858 aimed to promote private mining of the public estate in the interests of the developing national economy.¹² While access to land with gold deposits had presented challenges in the north, where Māori still owned and occupied much of the affected land, most land in Otago had already been acquired or assumed by the Crown by 1861, allowing for the unimpeded application of the Act.¹³

The Act authorised the Governor to proclaim goldfields on "any portion of the Colony" and lease auriferous Crown-owned land to others for mining purposes.¹⁴ Within goldfields, "the social choice mechanism employed to allocate resources was the ... principle of 'first in time, first in right'".¹⁵ Miners could obtain rights to mine gold and occupy Crown-owned "waste lands", and were entitled to apply for and obtain rights to use water for mining purposes.¹⁶ From 1865, an amendment to the Act made it clear that miners' rights included rights to cut, construct and use water races through any land that was included in a gold field, to divert and

use water for mining purposes, and to deposit gravel and soil removed from water races on the land adjoining the races.¹⁷ Mined gold belonged to miners. Mining law thus “facilitated mining by creating clearly defined user rights and establishing rules governing ... the allocation, use and transfer of the relevant material resources”.¹⁸

The Gold Fields Acts either ignored the environmental problems of mining, or resolved them in mining’s favour. Mining operations were allowed to consume the entire flow of streams, as were dams and races to bring water from other rivers and streams, often from many kilometres away.¹⁹ Tailings and sludge were discharged into rivers and streams, or dumped nearby in great piles, many of which still exist today. Small farmers with leaseholds in goldfields²⁰ were expressly prevented from making claims for damage caused by the diversion or pollution of rivers or streams flowing through or along the land.²¹ Some headway was made in 1875, when judges in two Otago cases upheld the rights of landowners in, and neighbouring, goldfields²² to receive the unpolluted flow of natural streams running through or past their land.

However, given the serious implications for mining, Parliament amended the Gold Fields Act, empowering the Governor to proclaim any watercourse to be a sludge channel open for unlimited dumping of mining debris. Existing riparian rights to unpolluted water were extinguished (though landowners were entitled to compensation for losing these rights), and no new rights would be allowed to arise. Miners were absolved of any responsibility to landowners for polluting “sludge channels”, and no attention at all was paid to the rivers or their ecology, or to any pre-existing rights or interests Kai Tahu had in them. As it turns out, the 1875 amendment was taken to imply that miners were not entitled to discharge tailings into



Figure 1: ‘The Dredging industry in Otago: Dredges at work on the Clutha River two miles from Cromwell township’. *Otago Witness* 22 April 1908 page 49. Reproduced with permission Hocken Collections - Uare Taoka o Hākena, University of Otago. S18-034a

watercourses unless they had been proclaimed to be sludge channels and, once the true costs of compensation to landowners were realised, the Governor became reluctant to make such proclamations.²³ Sadly, none of this actually stopped sludge from being discharged into rivers, and in the south; the Kawarau and Mata-au rivers were long used to carry off mining waste.²⁴

Today, the prerogative assumption that the Crown owns all natural deposits of gold is stated outright in legislation, as is the general goal of promoting mining of Crown-owned minerals.²⁵ Mined gold belongs to miners. Gold prospecting, exploration and mining require permits under the Crown Minerals Act 1991 (“CMA”).

Today’s mining permits under the CMA do not carry with them rights to access, occupy or use land, or use, take, dam or divert water for mining purposes. These rights must be obtained from access arrangements with landowners and under the Resource Management Act 1991. Even though mining legislation still fails to directly address the environmental effects of mining, access arrangements can include conditions prescribing what miners must do to protect the environment,²⁶ and the Resource Management Act aims to promote sustainable management of land and water, which includes avoiding, remedying and mitigating the adverse effects of mining-related activities on the environment. Furthermore, mining law since 1997 has listed conservation areas – including all national parks and marine reserves – where mining is not permitted at all.²⁷ Today’s environmental law is very much more responsive than yesterday’s to the environmental effects of mining.

The pattern of common law water rights being incrementally removed by legislation, first displayed to facilitate gold mining by removing downstream landowners’ rights to receive unpolluted water from their mining neighbours in the Gold Fields Act and its amendments, has been extended to cover any use, taking, damming or diversion of water for any purpose. These rights were assumed in two steps by the Crown. First, the Water-power Act 1903 vested “the sole right to use water in lakes, falls, rivers, or streams for the purpose of generating or storing electricity or other power” in the Crown. Then, in the Water and Soil Conservation Act 1967, the Crown assumed the sole right to dam any river or stream, divert, take, or use natural water, or discharge natural water or waste into natural water, along with the authority to confer those rights on others on application. This separation of rights and interests in water from ownership of land was implemented expressly to promote multiple use – exploitation – of freshwater.²⁸ Rights to use water have been allocated – like rights to mine gold for most of the last 170 years – on a first come, first served basis under legislation since 1967. This is an issue that re-emerges later on in this chapter.

The apparent willingness of central government to trump existing rights to enable particular activities for economic gain but to the detriment of the natural environment, which emerged in the Otago gold rush with the sludge channels amendment in 1875, has also been a persistent feature of New Zealand’s environmental law since, as the next section of this paper explains.

Hydroelectricity, Manapouri, Te Anau and Te Mata-au

No account of the development of environmental law in New Zealand would be complete without a mention of the law surrounding the construction and operation of the Manapouri and

Clyde hydro-power schemes. The law surrounding these schemes provides dramatic examples both of the willingness of central government to sweep community and environmental goals aside in pursuit of economic gains, and the resolve of environmental groups to resist and insist on measures that have resulted in developments in our environmental law.

After World War II, state development priorities here and elsewhere focussed on industrialisation. During the period 1945 to 1984, successive governments in New Zealand fully used – and even abused – Parliament’s legislative powers to pursue industrial development to the apparent detriment of environmental and community concerns. Two of the most controversial examples, with the most impact on the development of environmental law, relate to two of the largest catchments in the south: the catchments of the Waiau and Mata-au rivers. In both cases, special legislation was enacted to enable the construction and operation of the power schemes – for Manapouri in the absence of an existing legal and planning regime to manage the process, and subsequently for Clyde in apparent defiance of the existing systems and wider constitutional rules. In both cases, the public’s response to the government’s heavy-handedness reflected the burgeoning environmental movement taking place overseas in other parts of the Western world, and led to major changes in New Zealand’s environmental law.

The Waiau river catchment lies on the eastern edge of Fiordland, and the river’s upper reaches run from Lake Te Anau into Lake Manapouri. The river then flows down to the sea at Te Waewae Bay, and is joined along its way by the Mararoa river and other tributaries.²⁹ Manapouri and Te Anau were first officially earmarked for hydro-electric development in 1903, but nothing happened until 1959 when the government announced it had agreed with an Australian company to develop a power scheme on the lakes to supply electricity for a proposed aluminium smelter at Bluff. When the company subsequently withdrew for financial reasons, the government forged ahead, securing the enactment of the Manapouri-Te Anau Development Act 1963, and reverting the water rights to the Crown so that it could develop the hydro resource itself.³⁰

The Manapouri-Te Anau project involved the construction of an underground power station “of a scale unprecedented in the southern hemisphere”,³¹ and as proposed would raise the levels of Manapouri and Te Anau by eight to ten metres. Nevertheless, the need for environmental impact assessment and monitoring was not realised until after the station’s turbines first turned in 1969. Then, public sentiment against the emergent effects of raised lake levels on shoreline habitats and the Waiau river itself, exploded into this country’s first large-scale environmental campaign. The existing government refused to budge, but the new Labour government elected in 1972 required the lakes to be kept within their natural levels and approved the appointment of Guardians, who were to devise and supervise the implementation of guidelines for the lakes’ management. The role of the Guardians was formalised in 1981 when the Manapouri-Te Anau Development Act was amended to provide for guidelines to protect the ecological stability and recreational values of the shorelines, at the same time as optimising energy production.³²

Statutory “guardians” have reappeared in environmental law in New Zealand three times since the Manapouri-Te Anau guardians were established in 1972. First, soon after Manapouri, came guardians to protect Lake Wānaka from the threat of raised levels caused by hydro-development of Te Mata-au. The Lake Wānaka Preservation Act 1973 charges Wānaka’s

Guardians with reporting and making recommendations to the Minister of Conservation on any matter affecting the purposes of the Act – which include preserving the lake’s water levels and shoreline in their “natural state” – and on the use of the lake for recreational purposes, and consulting the Otago Regional Council on any matter which may affect the lake.³³

More recently, marine guardians have been established for the Fiordland (Te Moana o Atawhenua) Marine Area (in 2005) and Te Whata Kai o Rakihiouia i Te Tai o Marokura–Kaikōura Marine Area (in 2014). The Fiordland Guardians advise and make recommendations to management agencies and Ministers responsible for biosecurity, marine reserves, fisheries, resource management and the environment on matters affecting the Fiordland Marine Area, its threats and management.³⁴ Kaikōura’s Marine Guardians – who between them must represent Kai Tahu, community, biosecurity, conservation, education, environment, fishing, marine science, and tourism interests and areas of expertise – are responsible for advising relevant Ministers on “any biosecurity, conservation, or fisheries matter related to the marine and coastal environment within Te Whata Kai o Rakihiouia i Te Tai o Marokura–Kaikōura Marine Area”, including the Hikurangi Marine Reserve, the Ōhau New Zealand Fur Seal Sanctuary, three mātaītai reserves and two taiāpure-local fisheries.³⁵

According to one of the original Manapouri-Te Anau Guardians, the public campaign to save Manapouri marked a “milestone in the transition from the pioneering era of resource exploitation to one aimed at integrating conservation with development, and associated with the sustainable management of our natural resources”.³⁶ Indeed, there is little doubt that the campaign kick-started the environmental movement here, and that improvements to law and policy – including the introduction of environmental impact assessment processes for government projects (in 1973), and of legislation to improve the environmental and scientific priorities of public reserves and national parks legislation (in 1977 and 1980 respectively) and to establish marine reserves and protect marine mammals (in 1971 and 1978 respectively) – followed in its wake.

However, despite these environmental gains, most law continued to facilitate development.³⁷ Rights to use, dam and divert freshwater were allocated to promote multiple uses of the resource, and although the courts determined that only beneficial uses of water could be authorised,³⁸ the legislation provided no tools for river or lake conservation until 1981. Meanwhile, the global oil crisis of the 1970s had spurred Sir Robert Muldoon’s National government to enact the National Development Act 1979, creating a fast-track procedure for development proposals accepted by cabinet to be in the national interest and essential for the orderly production, development and utilisation of resources or the major expansion of exports.³⁹ Several proposals for fast-track developments were made, including one for an aluminium smelter at Aramoana. And so another quest for cheap power to supply another proposed smelter began, and this time eyes turned to Te Mata-au.

Sourced in the three glacial lakes, Wakatipu, Hāwea and Wānaka, Te Mata-au has the largest catchment in New Zealand. The river is reputed to have the greatest volume of water of any river in New Zealand, with a mean annual flow greater than that of the Waikato and Whanganui rivers combined. Major tributaries including the Papapuni, Kimi-ākau, Arrow, Roaring Meg, Bannockburn, Cardrona, Lindis, Fraser, Manuherikia, Teviot, Pomahaka and

Waitahuna rivers feed into Te Mata-au below the lakes.⁴⁰ Clearly, “the water energy resources of the Clutha Valley are of considerable magnitude”.⁴¹ Large-scale hydro-generation began on Te Mata-au with the commissioning of the Roxburgh Dam in 1956.

In 1972, new proposals for a dam at Clyde that would flood the valley floor upstream to Tarras, including part of the existing town of Cromwell were released. These plans faltered as public opposition to the proposal mounted, especially when it became apparent that part of the government’s goal was to generate cheap power for the proposed Aramoana smelter. “The smelter proposal was itself highly contentious: the intended site was ... across Otago Harbour from Taiaroa Head, where the only mainland royal albatross colony in the world is situated. Both the dam and the smelter disputes moved into the courts.”⁴² Objectors successfully persuaded the High Court that the end use of the power to be generated by any dam was a relevant factor in the decision of whether (or not) to grant the water rights required to build the dam.⁴³ Given that the consortium behind the Aramoana smelter proposal had by now withdrawn for financial reasons, this finding could make a decision against the high dam proposed the only reasonable outcome. Enabled by New Zealand’s constitutional structure, with its unicameral Parliament with unlimited legislative powers, a frustrated government again resorted to special legislation and enacted the Clutha Development (Clyde Dam) Empowering Act 1982. Questions were raised about the constitutional propriety of the government’s bullish actions in (ab)using Parliament’s law-making powers by interfering with the independent judiciary,⁴⁴ but the project went ahead anyway.

There is “little doubt that ‘the perceived indifference, if not open hostility’ of the National government towards environmental interests was exploited by the Labour Party in the run-up to the 1984 election”.⁴⁵ Although National had presided over a 1981 change to the Water and Soil Conservation Act to protect wild and scenic rivers of national importance,⁴⁶ “Labour offered a marked shift in environmental policy, along with institutional reform to provide a more effective voice for conservation” and the environment.⁴⁷ Thus, events surrounding the damming of Te Mata-au at Clyde contributed directly to the raft of changes improving conservation and environmental law that were made by the fourth Labour government between 1984 and 1989. These include the enactment of legislation establishing the Ministry for the Environment to provide policy advice to government on environmental matters, the Parliamentary Commissioner for the Environment to serve as a watch-dog over governments’ environmental performance, the Department of Conservation, the New Zealand Conservation Authority and conservation boards to manage land and resources for conservation purposes, and creating a statutory list of protected areas where mining is banned.⁴⁸ This government was also responsible for the complete overhaul and integration of land, air and water law that resulted in the RMA, which put sustainable management into law for the first time ever, anywhere. Sustainability has subsequently become the statutory purpose of fisheries management, indigenous forests production and regulation of activities in the exclusive economic zone and continental shelf.⁴⁹

Hydroelectricity and Irrigation – Competing Claims to Tekapo’s waters

Despite many changes to environmental law, including the enactment of the Resource Management Act in 1991, the law on allocating rights to use water has remained essentially

Figure 2: Three legacies of the Manapouri and Clyde Dam Controversies



A: Statutory Guardians – ‘The original Guardians of Lakes Manapouri, Monowai and Te Anau, appointed by the Prime Minister Norman Kirk in 1973, meet again in 1994 (from left) Wilson Campbell, Prof (later Sir) Alan Mark, John Moore, Jim McFarlane and Les Hutchins.’ (Photo courtesy of *Otago Daily Times*). Since 1973, statutory guardians have become a feature on New Zealand’s environmental management scene.



B: Department of Conservation – ‘Black stilt/kakī release at Lake Tekapo’, DoC, *Kakī set free*, <http://www.doc.govt.nz/news/media-releases/2012/kaki-set-free/>. This picture shows the 2012 release of 45 kakī reared in DoC aviaries. Kakī are endemic to the braided rivers and wetlands of the upper Waitaki and Mackenzie basins, and are critically endangered. Some of DoC’s most important work involves captive breeding as in the kakī recovery programme, which is based near Twizel and has seen the kakī population recover to 106 adults in 2017 from just 23 in 1981.



C: Resource Management Act – the RMA aims to promote sustainable management and mandates that decisions on resource development are to be made taking into account the actual and potential environmental effects of proposals. Some blame, others credit, the RMA with slowing down hydro development in the southern catchments. RMA processes and costs may well have contributed to the decisions by Contact Energy to shelve plans for further projects on Te Mata-au at Queensbury, Luggate, Beaumont and Tuapeka Mouth, and Meridian Energy’s ‘Project Aqua’ in the lower Waitaki valley. This picture shows the township of Beaumont, which would be flooded by Contact’s proposed Tuapeka Mouth dam (Photo courtesy of *Otago Daily Times*).

unchanged since 1967.⁵⁰ All rights to use, take, dam or divert natural water must be secured [subject to rules in regional plans⁵¹ or] on application for statutory resource consent. Applications for consent are considered on a ‘first-in, first-served’ basis. Statutory consent authorities decide which applications are allowed. [Consent authorities are required to consider the actual and potential effects on the environment of allowing the activity, and promote the sustainable use, development and conservation of water.⁵²] Third parties with interests in the water that is subject to an application may make submissions on applications and, in some cases, appeal against decisions to grant applications.

The Waitaki catchment is second only to that of the Mata-au when it comes to size in the south, and culminates where the Waitaki river reaches the east coast, just north of Oāmaru. The Waitaki river has several major tributary rivers, including Tekapo, Pukaki, Ohau, Ahuriri, Hakataramea, and Otematata. The first three of these rivers are glacier fed in the Southern Alps and drain the south’s northernmost glacial lakes, Tekapo, Pukaki, and Ohau. Hydro-electric development in the Waitaki catchment began in the 1920s, and today comprises a scheme of eight major plants, including major dams and stations at Benmore and Aviemore, and smaller stations at lakes Tekapo, Ohau and Pukaki. The Waitaki scheme was originally developed and operated by government, but it is now owned and run by private power companies. To enable the operation of the scheme, the government and then the power companies have dammed, diverted and used water from the Waitaki river and lakes Tekapo, Pukaki and Ohau pursuant to a series of statutory consents granted since 1929.

The stations at the outlet of Lake Tekapo have a combined generation capacity of 187 megawatts of electricity, and provide water storage and flow control crucial to the operation of the larger power stations downstream. The existing consents entitle the holder, *inter alia*, to take water up to a maximum rate of 130 cubic metres per second (cumecs) from the lake, and were last issued by the Canterbury Regional Council in 1991 for a term of 25 years. Conflict arose in 2003, when the Aoraki Water Trust applied to take water from Tekapo to supply water for farm irrigation in the Mackenzie Basin. Meridian Energy – the company which then owned all eight plants in the Waitaki Scheme – opposed Aoraki, arguing that its own rights already exceeded Tekapo’s capacity (the lake has a natural mean water flow of 82 cumecs) and so there was no ‘surplus’ available for lawful use by third parties. Any additional permits “would derogate from, and devalue, [the company’s] existing rights.”⁵³ The High Court agreed with Meridian that the Council could not lawfully diminish rights it had granted to Meridian in 1991 without express authority, and must keep its promises. The Court also held that the ‘first in, first served’ rule – which had been confirmed by the Court of Appeal to apply⁵⁴ – would be “pointless” unless it meant that the first permit in time of grant had priority of right to use the resource.⁵⁵

The immediate result for Meridian was a declaration that the council could not grant new permits to use Tekapo’s fully allocated resource. But the Court’s finding that the first permit in time necessarily implies priority of right to use a resource also reignited debate about legal ownership of water and the ‘first in, first served’ rule.

The priority right to take water from Lake Tekapo vested in Meridian by the water rights is very close to being a property right in freshwater.⁵⁶ But the question of whether strengthening rights in freshwater would be good or bad for the environment is open. So far, governments have

refused to discuss ownership of water either generally as a law reform option, or specifically in the context of negotiating and implementing its Treaty of Waitangi settlement process. The Crown's view is that the common law asserts that no one owns water. This may be true, but the extent of any pre-existing Māori rights, which are also protected by common law unless they have been extinguished by legislation, has not been tested before a New Zealand court. It is more likely that competition over water resources will increase than decrease, in the future. It would seem prudent to resolve some of these issues about ownership and user rights so that they do not impede the development of a water allocation system that provides the flexibility and adaptability likely to be needed then.

The 'first in, first served' rule is used to determine priority between competing users of the same resource. It prescribes that "the first person to make a 'complete application [for a resource consent] is presumptively entitled to the first hearing', and that the second person to make a complete application regarding the same resource may only participate in the resource consent application process as a submitter."⁵⁷ The rule is administratively efficient, and coupled with priority of right to use the resource as established in the Aoraki case, clearly rewards investment and resource development. Of course, 'first in, first served' is not the only legal rule established to protect economic investments in natural resources – other examples under the Resource Management Act include the potentially long term of consents,⁵⁸ the limited opportunities for review of consents,⁵⁹ provisions creating priority for renewal applications for existing permits,⁶⁰ and the continuation of historic consents under new environmental legislation when it is made.

An illustration of this last example is currently playing out in several of the southern catchments, including the Lindis and Manuherikia river catchments. Here, gold mining and water-race permits granted in the 1800s and carrying with them rights to take much more water than is available in the rivers, which therefore run dry most years, have been deemed to be resource consents under the RMA, and are valid through to 2021. Today, these consents are used for irrigation not mining, and deeming them to be current consents protects the irrigators' investments. The consent holders are entitled to priority use of what water there is, but the Regional Council has stepped in and is introducing minimum flows for the rivers, which will limit the quantity of water that will be able to be taken when new consents are issued to replace the historic mining permits in 2021. Critics have argued that the Council's limits are not low enough to protect the ecology of the rivers and, although not all existing irrigators will be satisfied because there will not be enough water to go around, they will still have priority rights to the water over other potential abstractors.⁶¹ Those who apply for renewal first, will have their applications considered first.

Given the increasing need for future environmental management (including legal) systems to allow for flexible and adaptive resource management, continuing with a system that focuses on protecting user rights and economic investments may not be our best option.⁶²

Furthermore, it is clear that 'first in, first served' is not a strongly comparative rule for allocating increasingly scarce water resources. The statutory framework ensures that decisions on applications for consents are determined taking the environmental effects of the activities proposed into account, and approved where proposals promote sustainable resource management. Although this inevitably compares the positive and negative effects of

proposals, it does not involve direct comparison of the relative merits of proposals against each other. Although the Resource Management Act makes some provision for some comparative elements, overall this is minor. Lack of direct comparison between possible users of resources matters, especially given that the application of sustainable management under the Resource Management Act is a largely qualitative exercise involving an “overall broad judgment”.⁶³ The possibility that regional councils will adopt rules other than ‘first in, first served’ to determine priority of use to resources exists, but seems remote. Arguably, this is an important enough matter for change or guidance at the national level.⁶⁴

Kai Tahu and the Southern Catchments

Ever since English law was first applied, and New Zealand law first created, to respond to environmental problems in the southern catchments, that law has, with a handful of exceptions, failed to recognise or protect Kai Tahu rights and interests in the catchments’ natural resources. This, and other failures by the Crown to comply with the Treaty of Waitangi, were the subject of the 1986 Ngai Tahu claim, the first comprehensive claim lodged in the Waitangi Tribunal. The Tribunal claim had nine “tall trees”. There was one tall tree for each of the eight major land purchases through which Kai Tahu had been rendered largely landless. Kai Tahu contended that much of the area that includes the southern catchments was wrongfully included in two of these purchases. There was one more tall tree to represent Kai Tahu’s loss of access to and protection of mahinga kai throughout southern New Zealand.

Many of the rivers and lakes of the southern catchments are named in the claim as having been significant mahinga kai for traditional Kai Tahu, including Taieri, Papapuni, Mata-au, Waitaki and Waiau rivers and Wakatipu and Manawapōpōre and Hikuraki (the Mavora Lakes). Moa were extinct by the time Kai Tahu people first crossed Cook Strait, but the “swamps,

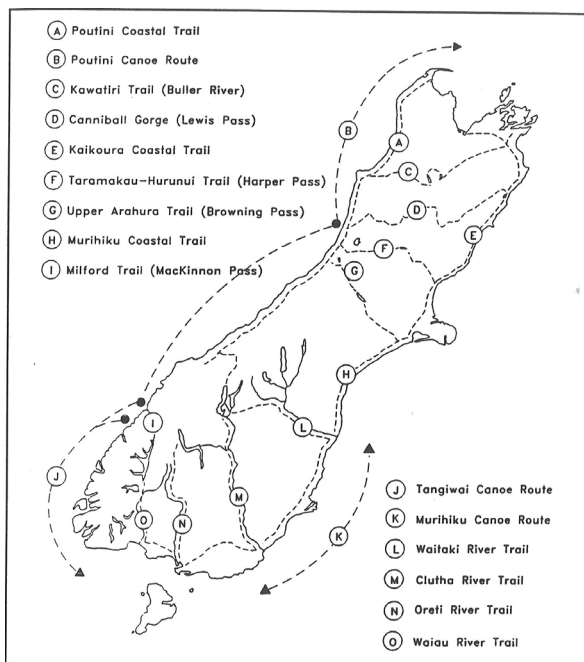


Figure 3: Kai Tahu Trails – Included in the evidence given to the Waitangi Tribunal in the Ngai Tahu claim was this map, originally drawn to show trails identified by Barry Brailsford *Greenstone Trails: The Maori Search for Pounamu* (Reed, Wellington, 1984) (Waitangi Tribunal, *Ngai Tahu Report* at 89 (Department of Justice, Wellington 1991). Trails L M, N and O follow the four major rivers in the southern catchments.

lakes and rivers writhed with fish life, especially tuna – once a staple diet – and yielded other food sources such as weka, pukeko and whio.”⁶⁵ People, goods and resources were transported between the interior and coastal settlements along the rivers in purpose-built mōkihi. The valley systems that glaciers, streams and rivers carved through the southern mountains and hills provided pathways for the “elaborate system of trails” developed by Kai Tahu “to link various ... settlements into the social and economic life of the tribe and tied them into networks of trade which extended well beyond the South Island.”⁶⁶

The Tribunal found that almost all aspects of Kai Tahu’s claims were well-founded, and recommended a negotiated solution. Negotiations between Kai Tahu and the Crown resulted in a settlement that was implemented in stages via legislation. First,⁶⁷ the parties agreed to a Deed On Account of settlement, to stimulate negotiations that had stalled. The resulting legislation returned Tutaepatu (Woodend Lagoon) near Kaiapoi in North Canterbury to Kai Tahu ownership and co-management, and returned the taonga mineral pounamu to Kai Tahu ownership, management and control.⁶⁸

The main parts of the settlement were implemented in the Ngāi Tahu Claims Settlement Act 1998. In Chapter 2 of this book, Williams describes the mechanisms employed by this Act to recognise Kai Tahu perspectives, rights, interests and practices associated with natural resources: deeds of recognition, statutory acknowledgments, nohoanga, and tōpuni. Some specific sites were also returned to Kai Tahu ownership and management (the Tītī Islands, for example), and in some sites were identified for special co-management arrangements but retained in Crown ownership (for example, Whenua Hou).

Significantly for this chapter, the mechanisms devised for the 1998 Act were used again in later settlements with other claimant groups.⁶⁹ The Ngāi Tahu settlement provided the precedent, and together the Treaty settlements have added an important dimension to environmental law. New mechanisms to implement claimants’ perspectives and rights in natural resources have also started to appear in more recent settlements, in a process of evolution that is inevitable in a system which only responds to Treaty grievances on a claim by claim basis.⁷⁰ It is possible, for example, to see progression in the weight given to iwi voices in the settlements over time. Two recent settlements have recognised Te Urewera and the Whanganui River as legal persons in their own right.

In 2011, the Waitangi Tribunal criticised the ad hoc nature of the settlements process: ... settlements cannot deliver a transparent, nationally consistent approach to iwi involvement in environmental management because settlements are, by their nature, local, ad hoc, and subject to high levels of political pragmatism. When kaitiaki control and partnership are delivered only through historical settlements, this is a recipe for unfairness and inconsistency, both in terms of the forms of power-sharing that result and the environmental outcomes that follow. ...

... Iwi should not have to spend their Treaty settlement credits in this way, and nor should those who have not yet settled have to wait before they get a say in decision making about environmental taonga. Nor, indeed, should smaller iwi have to settle for less in the way of influence over taonga simply because they lack political leverage to win seats on conservation boards or influence around the Cabinet table, nor iwi who reached settlements some time ago get less than those who have settled more recently. If innovative approaches

to land ownership and power sharing can be achieved under the intense pressure of Treaty settlements, they ought also to be possible in the ordinary course of ... business.⁷¹

The Tribunal's call was for less reliance on settlements to provide mechanisms supporting Māori environmental co-management, and more emphasis on improving 'mainstream' legislation.

First, it is important to understand that the legal position is that Māori rights in the Treaty of Waitangi are unenforceable unless or until Parliament recognises those rights in legislation. 'Mainstream' environmental legislation is indisputably better at recognising Māori perspectives and rights, and the Treaty of Waitangi's principles, than it was before the fourth Labour government took office in 1984. This government included wide duties on Ministers and agencies to recognise (and give effect to) Treaty principles – including the principle of partnership between the Crown and Māori (imputing duties to act reasonably, and in good faith, on both parties), and the Crown's duty to actively protect Māori rights and interests – in its environmental legislation, and authorised the Waitangi Tribunal to hear claims dating back to 1840.⁷² Nevertheless, Māori were still relegated to, at best, a participatory role, and were seldom allowed to manage, or even co-manage, natural resources. Since then, negotiated settlements have become the preferred mode for advancing Māori interests and addressing historic Treaty grievances, and the most recent environmental legislation suggests that governments have become less open to recognising Māori perspectives, rights and practices in mainstream legislation.⁷³

Conclusion

The environmental problems caused by the gold rush in Otago were managed by law that favoured mining, and protected investments and economic interests. Beginning in the gold rush, but also since, New Zealand governments have been ever ready to legislate across customary and common law rights and constitutional rules, to promote economic and industrial development. Dramatic examples are provided by the construction of hydro-projects at Manapouri and Clyde in the 1960s and 1980s. Since the 1980s, there has been a turning of the environmental tide, evident both in the explosive development of environmental law since the 1980s, and in the improved recognition of Māori perspectives, rights and interests in environmental legislation. But the legacy of the early law is still evident in environmental law's on-going emphasis on protecting investments and economic interests, illustrated in examples like the 'first in, first served' rule applied to allocated freshwater resources and the legal protection of historic permits and existing uses. These legal rules have come to a head in disputes concerning the waters of Lake Tekapo and the Lindis river. New Zealand's abject failure to properly recognise Kai Tahu rights and interests in the southern catchments has been addressed through the settlement process, but the unfairnesses apparent in this process will surely affect the durability of settlements, and should not be allowed to diminish the need for mainstream environmental law to measure up in Treaty of Waitangi terms.

Endnotes

1. Elizabeth Fisher *Environmental Law – A Very Short Introduction* (Oxford University Press, 2017) at 1.
2. In this chapter, “southern catchments” means the catchments east of the Southern Alps, and south of and including the Waitaki catchment. Rivers I have discussed or mentioned are Te Mata-au (Clutha), Kawarau, Papapuni (Nevis), Kimi-ākau (Shotover), Manuherikia, Waiau, Waitaki, and Taieri; lakes I have discussed or mentioned are Wakatipu, Manawapōpōre and Hikuraki (Mavora Lakes), Te Anau, Manapouri, Tekapo, Pukaki and Ohau.
3. J Donald Hughes, *What is Environmental History?* (Polity Press, Cambridge, 2006) at 1. Hughes’ definition is quoted and analysed by Eric Pawson and Tom Brooking, ‘Introduction’ in Eric Pawson and Tom Brooking *Making a New Land – Environmental Histories of New Zealand* (Otago University Press, Dunedin, 2013) at 18. The inserted words “by the actions of human and non-human agents over” are suggested by Pawson and Brooking.
4. Eric Pawson and Tom Brooking ‘Introduction’, above n 3 at 18.
5. Atholl Anderson, ‘A Fragile Plenty: pre-European Māori and the New Zealand environment’ in Eric Pawson and Tom Brooking *Making a New Land – Environmental Histories of New Zealand* (Otago University Press, Dunedin, 2013) at 40 dates the arrival of people in southern New Zealand to the twelfth or thirteenth century.
6. On the trails generally, see Basil Keane, ‘Te ohanga onamata a rohe – economic regions - Te Wāhi Pounamu – hunting and gathering’, *Te Ara - the Encyclopedia of New Zealand*, <http://www.TeAra.govt.nz/en/map/23612/pounamu-trails> (accessed 9 November 2017). Speaking of Te Papapuni (the Nevis river), Edward Ellison, a Kai Tahu kaumātua of the Ōtakou Rūnanga on Otago Peninsula, said in 2009: “Tribal history is embedded in Te Papapuni; both the river and the valley it flows through.” For many generations, the river and its tributaries, as well as the surrounding valleys and mountains had provided people with abundant natural resources and food, he said. The valley had been an important route for those traveling from Southland into Central Otago and the Queenstown area, and was used well into the 19th century. Evidence suggested there was also seasonal settlement by Kai Tahu in the valley during the early moa-hunting period” (Lynda van Kempen, ‘Area “was the beaten track” for Maori’, *Otago Daily Times* (30 May 2009).
7. Gold had been discovered as early as the 1850s, but it was Gabrielle Read’s 1861 discovery that triggered the Otago gold rush – Carl Walrond, ‘Gold and gold mining - Otago’, *Te Ara - the Encyclopedia of New Zealand*, <http://www.TeAra.govt.nz/en/gold-and-gold-mining/page-3> (accessed 14 November 2017).
8. Carl Walrond, ‘Gold and gold mining – West Coast’, *Te Ara – the Encyclopedia of New Zealand*, <http://www.TeAra.govt.nz/en/gold-and-gold-mining/page-4> (accessed 14 November 2017).
9. T J Hearn, ‘After the Gold Rush: Economic Change and Resource Use Conflict in Central Otago’ in Geoff Kearsley and Blair Fitzharris (eds) *Southern Landscapes – Essays in Honour of Bill Brockie and Ray Hargreaves* (Department of Geography, University of Otago, Dunedin, 1990) 55 at 63.
10. The English Laws Act 1858 declared that all the other laws of England applicable to the circumstances of New Zealand and in existence on 14th January 1840 had also applied in New Zealand since that same date in 1840, and continued to do so.
11. The first New Zealand case to provide direct authority for Crown ownership of gold deposits was *Borton v Howe* (1875) 2 NZ Jur 117 (Robyn Anderson/Waitangi Tribunal, *Rangahaua Whanui Series Goldmining: Policy, Legislation and Administration* (Waitangi Tribunal, 1996) at 7 and D V Williams, ‘Gold, The Case of Mines 1568 and the Waitangi Tribunal’ [2003] *Australian Journal of Legal History* 11).
12. T J Hearn, ‘After the Gold Rush: Economic Change and Resource Use Conflict in Central Otago’, above n 9 at 60.
13. D V Williams, ‘Gold, The Case of Mines 1568 and the Waitangi Tribunal’, above n 11 at 11.
14. Gold Fields Act 1858, ss 2, 3, 4 and 7.
15. T J Hearn, ‘After the Gold Rush: Economic Change and Resource Use Conflict in Central Otago’ above n 9 at 61.
16. “A justification for the transfer of millions of acres of Māori land to settlers was that Māori did not use their land for productive purposes and therefore it was wasted” (Jim McAloon, ‘Land Ownership’ in *Te Ara - the Encyclopedia of New Zealand*, <http://www.TeAra.govt.nz/en/land-ownership/print> (accessed 2 February 2018). See also: Hazel Riseborough and John Hutton, *The Crown’s Engagement with Customary Tenure in the Nineteenth Century* (Waitangi Tribunal Rangahaua Whanui Series, 1997), and Richard Boast, ‘Te tango whenua – Māori land alienation’, in *Te Ara - the Encyclopedia of New Zealand*, <http://www.TeAra.govt.nz/en/te-tango-whenua-maori-land-alienation/print> (accessed 2 February 2018).
17. Gold Fields Acts Amendment Act 1863, s 18.
18. T J Hearn, ‘After the Gold Rush: Economic Change and Resource Use Conflict in Central Otago’, above n 9 at 61.
19. Carl Walrond, ‘Gold and gold mining - Methods of mining’, *Te Ara - the Encyclopedia of New Zealand*, <http://www.TeAra.govt.nz/en/gold-and-gold-mining/page-7> (accessed 15 November 2017).
20. Plots of land no bigger than 10 acres could be leased for agricultural purposes, Gold Fields Act 1858, as amended in 1860, s 3.
21. Leaseholds also required open access to the land for gold prospecting, and could be terminated if the land was subsequently discovered to be highly auriferous. Gold Fields Act 1858, as amended in 1860, s 4 and T J Hearn, ‘After the Gold Rush: Economic Change

- and Resource Use Conflict in Central Otago’, above n 9 at 63, 66, 67 and 68.
22. *Borton v Howe* (1875) 2 NZ Jur 97 (CA) and *Glassford v Read* (1875) and discussed in T J Hearn, ‘After the Gold Rush: Economic Change and Resource Use Conflict in Central Otago’, above n 9 at 73 and Terry Hearn ‘Mining the Quarry’ in Eric Pawson and Tom Brooking *Making a New Land – Environmental Histories of New Zealand* (Otago University Press, Dunedin, 2013) 106 at 108-109.
 23. Terry Hearn ‘Mining the Quarry’, above n 22 at 118.
 24. Terry Hearn ‘Mining the Quarry’, above n 22 at 110.
 25. Crown Minerals Act 1991, ss 1A and 10.
 26. Crown Minerals Act 1991, s 60.
 27. Crown Minerals Act 1991, s 61 and Schedule 4.
 28. Water and Soil Conservation Act 1967, Long Title.
 29. ‘Waiau River’, Land Air Water Aotearoa, <https://www.lawa.org.nz/explore-data/southland-region/river-quality/waiiau-river/> (accessed 28 January 2018).
 30. Nicola Wheen, ‘An Updated History of New Zealand Environmental Law’ in Eric Pawson and Tom Brooking, *Making a New Land – Environmental Histories of New Zealand* (Otago University Press, Dunedin, 2013) 277 at 279.
 31. Nicola Wheen, ‘An Updated History of New Zealand Environmental Law’, above n 30 at 279.
 32. Nicola Wheen, ‘An Updated History of New Zealand Environmental Law’, above n 30 at 279-80.
 33. Lake Wanaka Preservation Act 1973, ss 4 and 5(2).
 34. Fiordland (Te Moana o Atawhenua) Marine Management Act 2005, s 13.
 35. Kaikōura (Te Tai o Marokura) Marine Management Act 2014, ss 6(4) and 7(1) and (2).
 36. Sir Alan Mark, quoted by Nicola Wheen, ‘An Updated History of New Zealand Environmental Law’, above n 30 at 281.
 37. Nicola Wheen, ‘An Updated History of New Zealand Environmental Law’, above n 30 at 282.
 38. *Keam v Minister of Works and Development* [1982] 1 NZLR 319 (CA).
 39. National Development Act 1979, s 3(3).
 40. Ministry for the Environment, ‘The Nature of New Zealand’s Water Environment’, <http://www.mfe.govt.nz/publications/environmental-reporting/state-new-zealand-s-environment-1997-chapter-seven-state-our-6> (last accessed 29 January 2018).
 41. R J Calvert, ‘History and Background of the Clutha Schemes’ (1975) 14(2) *Journal of Hydrology (NZ)* 76 at 76.
 42. Nicola Wheen, ‘An Updated History of New Zealand Environmental Law’, above n 30 at 283.
 43. *Gilmore v National Water and Soil Conservation Authority and Minister of Energy* (1982) 8 NZTPA 298 (HC).
 44. F M Brookfield, ‘High Courts, High Dam, High Policy: the Clutha River and the Constitution’ (1983) *Recent Law* 62.
 45. Nicola Wheen, ‘An Updated History of New Zealand Environmental Law’, above n 30 at 285.
 46. The water conservation scheme was enacted in response “to the impacts of increasing development pressures and the shortcomings of the Water and Soil Conservation Act 1967”. The final straw was yet another controversial hydro-project, this time on the Rangitaiki and Wheao rivers in the North Island. See New Zealand Conservation Authority *Protecting New Zealand’s Rivers* (New Zealand Conservation Authority, Wellington, 2011).
 47. Nicola Wheen, ‘An Updated History of New Zealand Environmental Law’, above n 30 at 285.
 48. Environment Act 1986, Conservation Act 1987 and Conservation Law Reform Act 1990.
 49. Fisheries Act 1996, s 8, Forests Act 1949, s 67B (as inserted in 1993), and Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, s 10.
 50. In the summary that follows, the text in square brackets indicates aspects of the law that have been added or adjusted after 1967. Provisions enabling regional councils to make rules about taking, using, damming or diverting water in plans were introduced by the Resource Management Act. In 2005, the Resource Management Act was amended to expressly and specifically allow regional councils to make rules about allocating water (s 30(1)(fa) and (fb)). Under the Water and Soil Conservation Act, all uses of water were required to be beneficial, and decision-makers balanced the benefit of a proposed use against its detriments, see *Keam* above n 38. Under the RMA, decision-makers must consider the environmental effects of proposed uses of water (s 104(1)), promote sustainable resource management (s 5), and consider all of the matters listed in ss 6, 7 and 8 (including the principles of the Treaty of Waitangi).
 51. RMA, ss 14 and 30(1)(e) and (fa).
 52. RMA, ss 5 and 104.
 53. *Aoraki Water Trust v Meridian Energy Ltd* [2005] 2 NZLR 268 (HC), sitting with a full bench comprising Harrison and Chisholm JJ, at [2] and [15].
 54. *Fleetwing Farms Ltd v Marlborough District Council* [1997] 3 NZLR 257.
 55. *Aoraki Water Trust v Meridian Energy Ltd* above n 53 at [46], and see Ceri Warnock and Maree Baker-Galloway *Focus on Resource Management Law* (LexisNexis, Wellington, 2015) at 252-253.
 56. Barry Barton, *The nature of resource consents: statutory permits or property rights* (New Zealand Law Society, Wellington, 2009) and Ceri Warnock and Maree Baker-Galloway *Focus on Resource Management Law* (LexisNexis, Wellington, 2015) at 253.
 57. Trevor Daya-Winterbottom, ‘Sustainability, governance and water management in New Zealand’ in Michael Kidd, Loretta Feris, Tumai Murombo and Alejandro Iza (eds) *Water and the Law* (IUCN Academy of Environmental Law Series, Edward Elgar, Cheltenham UK and Northampton USA, 2014) 167 at 188, summarising the rule following the Court of Appeal’s decisions in *Fleetwing Farms v Marlborough District Council* above n 54, *Central*

- Plains Water Trust v Ngai Tahu Properties Ltd* [2008] NZCA 71, and *Central Plains Water Trust v Synlait Ltd* [2009] NZCA 609, [2010] 2 NZLR 363.
58. The maximum term possible is 35 years, unless the activity is a reclamation or a subdivision, Resource Management Act s 123.
 59. RMA, ss 128-133. In *Aoraki Water Trust v Meridian Energy Ltd* above n 53 at [52], the Court agreed that “where Parliament has conferred power on a consent authority to interfere with an existing grant, it has acted expressly and for very limited purposes”.
 60. RMA, ss 124A to 124C, as noted by Robert Makgill ‘A New Start for Fresh Water: Allocation and Property Rights’ (2010) 2(1) *Lincoln Planning Review* 5 at 9.
 61. Ian Telfer, ‘Pumped Dry - Central Otago Farmers’ fight for water (RadioNZ, 23 April 2017) <https://www.radionz.co.nz/national/programmes/insight/audio/201840959/insight-pumped-dry-central-otago-farmers'-fight-for-water> (last accessed 12 April 2018).
 62. Trevor Daya-Winterbottom, ‘Sustainability, governance and water management in New Zealand’ in Michael Kidd, Loretta Feris, Tumai Murombo and Alejandro Iza (eds) *Water and the Law* (IUCN Academy of Environmental Law Series, Edward Elgar, Cheltenham UK and Northampton USA, 2014) 167 at 176-190.
 63. *North Shore City Council v Auckland Regional Council* [1997] NZRMA 59.
 64. D F Sheppard ‘Reaching sustainable management of water’ [2011] *Resource Management Theory and Practice* 85 at 100; New Zealand Institute of Economic Research *Water Management in New Zealand – A Road Map for Understanding Water Value* (NZEIR, 2014).
 65. Waitangi Tribunal, *Ngai Tahu Land Report* (Department of Justice, 1991) at [2.1.2].
 66. Waitangi Tribunal, *Ngai Tahu Land Report* at [3.2.7].
 67. Actually, the first stage implemented in legislation was the creation of a body to receive and administer settlement assets in the Te Runanga o Ngai Tahu Act 1996.
 68. Ngai Tahu (Pounamu Vesting) Act 1997 and Ngāi Tahu (Tūtaepatu Lagoon Vesting) Act 1998.
 69. Waitangi Tribunal, *Ko Aotearoa Tēnei. A Report into Claims Concerning New Zealand Law and Policy Affecting Māori Culture and Identity* Te Taumata Tuarua Volume 1 (Waitangi Tribunal, 2011) at 333-337.
 70. The two first large, modern-day settlements – Ngāi Tahu and Waikato-Tainui – include “relativity clauses” that some may think provide parity between these two settlements and others over time. However, the clauses were specifically negotiated to recognise that these two groups were willing to proceed with negotiations and settlement despite the government having unilaterally announced a \$1 billion fiscal envelope for all settlements. The clauses only address parity of the fiscal, or dollar value, of the settlements, and do not respond to any of their cultural aspects. The clauses only apply to Ngāi Tahu and Waikato-Tainui because of the fiscal envelope policy – none of the other settlements address the fiscal parity of settlements.
 71. Waitangi Tribunal, *Ko Aotearoa Tēnei. A Report into Claims Concerning New Zealand Law and Policy Affecting Māori Culture and Identity*, above n 67 at 341.
 72. Conservation Act, s 4; Environment Act 1986, s Long Title; Resource Management Act 1991, s 8, for example. The Tribunal’s jurisdiction was extended back to 1840 from the original cut off date of 1975 in 1985.
 73. For example, Climate Change Response Act 2002, s 3A and Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, s 12.

When is a catchment not a catchment? Rescaling freshwater management in the Waitaki

Elizabeth Soal and Sophie Bond

Deciding whether a river is in one region or another is theoretically a simple exercise. To determine what is an Otago river, one could simply consult a map, find the boundary of the Otago province and any river that is within those boundaries would be an eligible candidate for management by the relevant regional authority. A simple exercise in theory, yes, but boundaries and governance change over time. What we see on the map in 2018 were not always the administrative boundaries or even the administrative units for water management. Historically, determining where boundaries should be drawn has often caused fierce public debate which is indicative of the high stakes involved, particularly in relation to freshwater management. The history of the Waitaki catchment is no exception. The lower Waitaki River has long been the social boundary between Otago and Canterbury, and the drainage line south of the River, and partly the River itself, is currently the boundary between the administrative regions of Otago and Canterbury (see Map 1). Moreover, the River divides the districts of Waimate in the north and Waitaki in the south. Water management typically sits with the regional council (therefore Environment Canterbury in the case of the Waitaki), yet the Waitaki District is half in the Otago region and half in Canterbury. Moreover, the Waitaki River is the fourth largest river (by flow) in Aotearoa New Zealand, and the importance of the catchment, locally and nationally, is described in the Waitaki Catchment Water Allocation Regional Plan as follows:

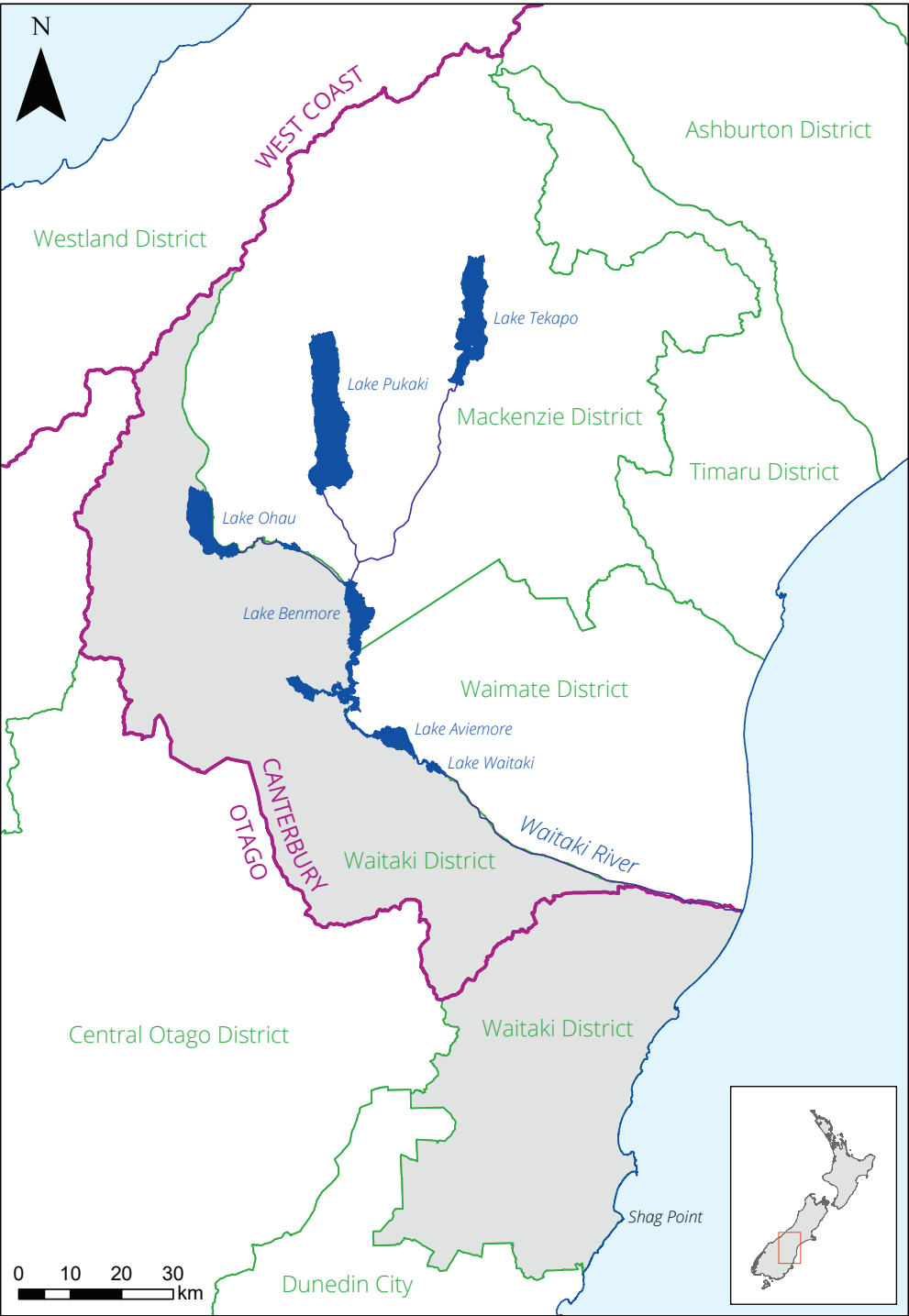
The Waitaki catchment, with its extreme variation in topography and climate, provides a diverse range of freshwater habitats and species, and a strong sense of place for people. The catchment is home to a large number of indigenous fish and birds ... Just over 5,000 people live in the catchment, with many more returning to visit year after year. The rivers and lakes are popular recreation resources for a range of activities. Aoraki/Mt Cook and the Waitaki River are the ancestral mountain and river of Ngāi Tahu. The upper catchment and Aoraki/Mt Cook National Park are nationally and internationally recognised nature and tourism locations. Water in the catchment provides essential supplies to towns and communities,

including Oamaru and parts of Waimate District, and is a very important source of electricity and hydro-electricity storage nationally. It also provides for significant irrigation on land both in and out of the catchment.¹

However, such diverse values of a river often give rise to potential conflicts particularly when they become entangled with livelihoods, cultural identity, ecological systems and governance. This was the case in the 1970s through to the late 1980s, when various proposals for the administrative and water management boundaries of the Waitaki were hotly debated and redrawn. The purpose of these proposed reforms was to reduce the ad hoc nature of governance units across several areas of natural resource management which had developed over time, to increase administrative efficiency and to recognise the central importance of the Waitaki Catchment for the region. There were a number of contentious themes, often involving different parties in each case, including: a strong place identity of being ‘the Waitaki’ and maintaining that identity in redrawing boundaries; issues around funding, efficiency and the rating base which put into question the relative size of administrative units; the value of the electricity generation and irrigation potential to whichever administrative unit gained management over the river; and tensions between local government and central government. Broader implications also exist where boundaries in water management create different rules for water users across neighbouring communities (such as for allocation, quality etc.). When these rules have significant effects on livelihoods, or force changes in practices, perceptions of winners and losers can provoke conflict.

We might describe this boundary-drawing as rescaling, meaning that the scale at which something (such as a river) is managed or governed is altered according to physical area and/or who is involved in decision-making processes. Rescaling changes boundaries for governance purposes, and boundaries for water management matter because of the often contested values associated with rivers. Boundaries, by definition, shape power and influence, determine access to resources, and can result in cost burdens on communities.² In this paper we explore some of the key tensions that highlight these power plays and what is at stake in the rescaling of water governance in the Waitaki in the 1970s and 80s. We suggest this is important because contemporary water governance in Aotearoa New Zealand may be set for further rescaling. Currently, water is primarily managed by regional councils under the Resource Management Act 1991. The nature of that management is likely to be altered as a result of the National Policy Statement for Freshwater Management 2014³ which directs regional authorities to manage freshwater at the level of ‘Freshwater Management Units’. The interpretation section of the National Policy Statement defines Management Units as a waterbody, multiple parts of a waterbody, or any part of a waterbody that is determined by a regional council to be the most appropriate spatial scale for setting freshwater objectives and limits, and for freshwater accounting and management purposes. Thus these management units become a subdivision within regional level water management. Fierce historical debates around rescaling tell us there are risks to such boundary-drawing. In this chapter, we use the tensions that arose over the management of the Waitaki River in the 1970s and 1980s to explore these risks and tease out key lessons from history.

In the following sections we briefly discuss rescaling in water governance, before turning



Map 1: Current local authority boundaries

to the empirical context of the Waitaki's contested boundaries in the period from the mid-1970s to the mid-1980s. We pick up on two key points that this rescaling highlights in the following two sections. First, we explore the apparent arbitrariness of drawing boundaries and the associated politics of place that are highlighted when proposed boundaries threaten particular values and place attachments. Second, we turn to the power relations and shifting positions that have played out over time, highlighting tensions between different agencies and individuals that occur in complex rescaling activities. Finally, we draw these stories of past rescaling together with contemporary water governance to suggest that there are risks associated with rescaling and how they might be mitigated. While the purpose of current rescaling differs from that of the 1970s and 80s, we argue that the nature of conflicting interests and the effects of rescaling are sufficiently similar to provide a useful case from which to learn.

The 'messiness' of rescaling water governance

Freshwater governance and management is a good example of complex, wicked policy issues.⁴ They are wicked in the sense that their causes are the result of actions or inactions across different spheres. These causes are all interrelated but traditionally have been managed and analysed separately. In addition, these problems are typically costly to fix in terms of public money and private pain. They require people to make hard choices for themselves and others, and change is unlikely to be quick nor results immediate. Naturally, they are risky and challenging for political leaders to address.

Freshwater systems are complex, dynamic, and each system is unique. Pollution and abstraction can occur incrementally without noticeable effects until a tipping point is reached. Freshwater outcomes can be affected by policy settings in relation to land-use planning and zoning, international trade, domestic economic levers, energy production, biosecurity, conservation, cultural values, tourism, and emergency management, as well as the management and use of the water resource itself. Given the complex nature of freshwater issues, one of the arguments frequently espoused (which is a fairly logical one) is that better management and governance of freshwater can be done through an approach which integrates all elements relating to freshwater use.⁵ Such integrated management relies on rescaling to a watershed or catchment area deemed to be the most suitable boundary for water governance. The theory is that 'natural' and objective, scientific scales of governance for water are preferable to 'unnatural' political, administrative, or jurisdictional ones. Such assumptions around the easily identifiable natural boundaries of catchments ignore that they are but one type of natural boundary and they can, and generally do, cut across other natural boundaries, such as aquifers (groundwater), fauna habitat boundaries, and air-sheds. There are also very few entirely natural surface water catchments that exist as closed systems, free from human interference. People alter watersheds through the movement of water from one catchment to another – for irrigation, domestic supply, and industrial uses. Water systems within a catchment can be altered through damming and diversions of water from natural channels into hydro-electricity infrastructure such as canals and generation points.

In addition, such an approach, rested in notions of scientific, objective scales of governance, demonstrate a Westerncentric approach to nature, which precludes or marginalises

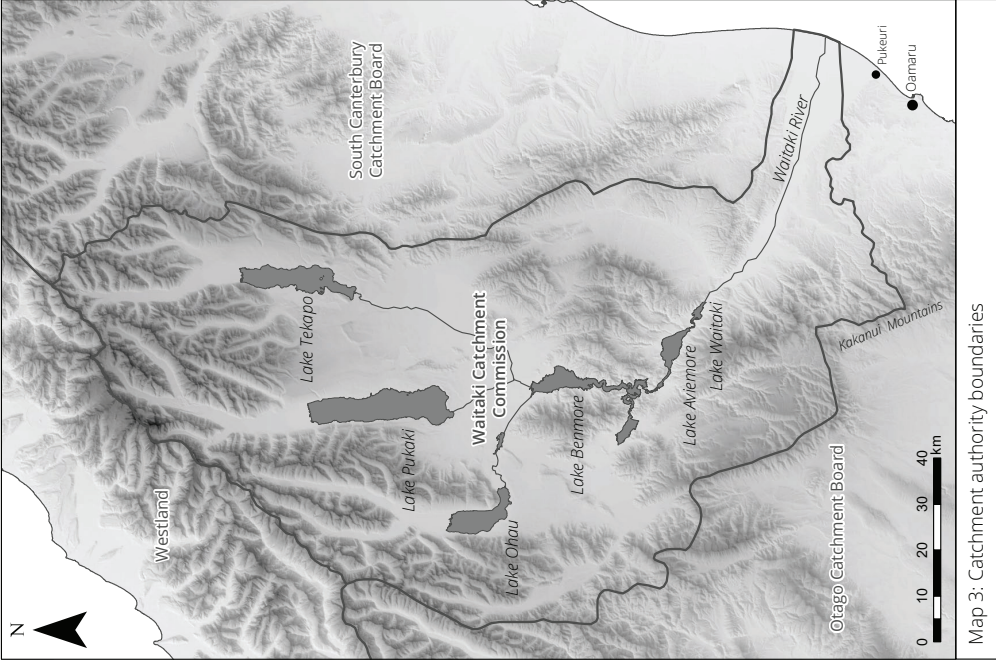
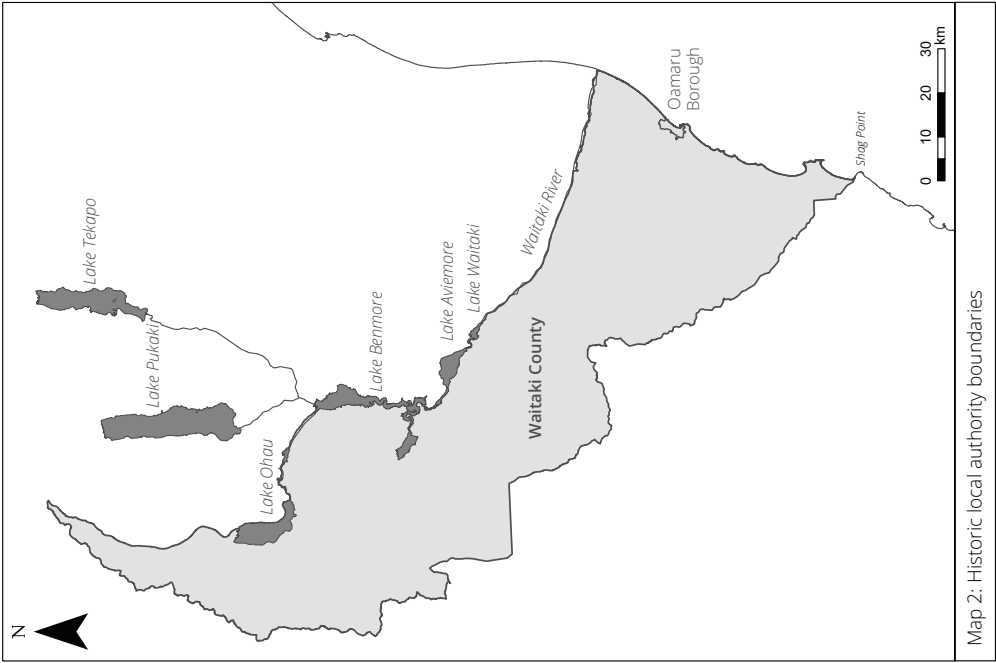
consideration of Indigenous knowledges, such as mātauranga Māori, and Indigenous ways of knowing and being with the natural world. Such worldviews or ontologies provide different ways of valuing and relating to water, and contrast starkly to the worldviews that separate the physical environment from human occupation as is typical of Westerncentric models of environmental management. Within such Westerncentric understandings, adjusting governance boundaries to match natural catchment boundaries is assumed to mean the decision-making process becomes simpler and less contentious, and will result in better environmental outcomes because the resource is being managed at a scale that matches the environmental processes at play. However, the greater the human intervention in a catchment's natural functioning, the greater the likelihood that more interventionist governance will be required, as human management of water systems brings with it "political disputes".⁶ The decisions made will have greater cultural, political, social, and economic ramifications – as there is more at stake for the community and the stakeholders involved.

Despite much literature that promotes catchment level management (see for example work on Integrated Watershed Management⁷), the empirical evidence that natural scales of governance produce better environmental or ecological outcomes is somewhat scant.⁸ This may be because the problems that we are seeking to solve with rescaling, including degrading water quality, reduced aquifer levels, declining habitat and indigenous biodiversity, increasing pest encroachment, and increased human conflict, are actually symptoms of political problems.⁹ Therefore, we cannot ignore the fact that politics will likely be part of the answer. As Cohen suggests: "rescaling to watersheds...can be seen not as a value-neutral exercise in emphasising some boundaries over others, but as an act reflective of and infused with the logics and ideologies held by decision makers".¹⁰

The boundary demarcating (South) Canterbury from (North) Otago (see Map 1 above), and thereby, the question of who manages the waters of the Waitaki catchment highlights the 'messiness'¹¹ of any negotiation of boundaries, whether following natural contours or political ones. The following section provides some context into this messiness of water governance and contestations for rescaling during the 1970s and 80s.

Shifting boundaries: defining the Waitaki catchment and how it became a 'problem'

The local government reforms across the country undertaken by the Fourth Labour Government after its election in 1984 were highly controversial and contentious – not least because they were undertaken in parallel with sweeping economic and social reforms which saw the political economy of New Zealand dramatically changed. However, the controversy relating to boundaries in the Waitaki watershed came well before the neoliberalisation of Aotearoa New Zealand's economy in the 1980s. It is this earlier controversy that is the focus of this chapter, even though the final decisions for local government boundaries were firmly embedded within that neoliberalisation process. Prior to the reforms in the late 1980s, the local government arrangements in the Waitaki and surrounds separated water management (the Waitaki Catchment Commission (WCC) and Catchment Boards) from political administration (Borough and County Councils) (see Table 1 and Maps 2 and 3 below).



Governance body	Geographic area	Responsibility
Oamaru Borough Council	Town of Oamaru	Municipal and rural local government administration
Waitaki County Council	Waitaki area, excluding Oamaru	
Waimate County Council	North of Waitaki River	
Mackenzie County Council	Upper Waitaki/Mackenzie Basin	
Waitaki Catchment Commission (WCC)	Upper and lower Waitaki catchment, including lower River and tributaries, hydro lakes (Waitaki, Aviemore, and Benmore) and alpine lakes (Ōhau, Pūkākī, and Tekapo).	Water and soil management, engineering, and planning
Otago Catchment Board	Included south Otago, Central Otago lakes, part of the West Coast, north to the Kakanui Ranges, and to the east coast north of Oamaru at Pukeuri.	
South Canterbury Catchment Board	North of the Waitaki up to and including the Ashburton River (Hakatere).	

Table 1: Waitaki local government arrangements prior to 1980s reform.

Formed under the Soil Conservation and Rivers Control Act 1941 and subsequently the Water and Soil Conservation Act 1967, Catchment Boards, Water Boards, and Catchment Commissions were semi-independent bodies with representatives from various local authorities in each area and employed their own staff. They reported to the National Water and Soil Conservation Authority (NWASCA) and levied general and special rates against properties in their respective catchment areas to fund their activities. Catchment Commissions were appointed by central government, rather than being elected representatives of the local populace (as Catchment Boards were). The Waitaki Catchment Commission (WCC) was established in 1960. That this was a Commission rather than a Board indicates the importance of the catchment to the national interest because the Waitaki hydro system generated a significant proportion of Aotearoa New Zealand's electricity.¹² The significance of the catchment is further suggested when it was later provided with the powers of a regional Water Board as well as those of a Commission.

Despite the size of the WCC's management area (covering an area of 11,957 km², see Map 3) and its national significance, the WCC struggled for funding and resourcing due to its small rating population (around 10,500 residents) and the financial burden created by the significant engineering requirements caused by the extensive hydro-electricity infrastructure. For this reason, the WCC was reliant on administrative grant funding from central government to enable it to carry out its functions.¹³ A formal review of the WCC by the Local Government Commission (LGC) commenced in 1975,¹⁴ after the WCC requested increased resources and funding from central government, which led to questions over its continued financial viability.

By extension, this review included all the local government arrangements in the Waitaki area generally.

As discussed further below, despite an apparent immediate funding crisis, the various proposals, reports, reviews, litigation, referenda, and debate around local government arrangements for the Waitaki raged on for over a decade. The nub of the issue was where the boundary should be drawn – was the Waitaki River and its management part of Otago’s jurisdiction? Was it part of Canterbury? Or should it continue to exist as a catchment for water management purposes, distinct from the political boundaries of boroughs and counties in both south Canterbury and north Otago?

The ‘Waitaki problem’ (as it was described by the Otago Catchment Board in 1985¹⁵) demonstrates that defining a catchment can be difficult. And even where it might be simple in terms of geography, the accompanying politics around social communities of interest, parochial loyalties, and economic control can sometimes be almost insurmountable. The following sections draw out two key themes that emerge from key events that occurred in relation to the ‘Waitaki problem’ from 1975 to the eventual proposal for restructuring that went ahead in the late 1980s. These have been derived from research into archival material from the Waitaki County Council, the WCC, and the LGC.

More than lines on a map – place identity and values

The tensions around the different proposals for administrative boundaries that sought to increase rating bases, and provide more efficient management units (including for water), highlight how social boundaries are constructed over time, and how these relate to people’s attachments to place.¹⁶ Historically, multiple different governance bodies were established on an ad hoc basis and according to function. This meant that boundaries were inconsistent, and administration and sometimes functions were overlapping. The WCC had a central role in the region, but reviewing its structure and role, which occurred multiple times in the 1970s and 80s, also meant reviewing other local government boundaries.

An early (1976) proposal for a ‘North Otago’ region encompassed the full Waitaki watershed (largely reflecting the existing WCC area) to “preserve [the] County’s identity with the river.”¹⁷ However, a second proposal, put forward and favoured by the LGC in 1977, described as the ‘Aorangi’ proposal, encompassed a much larger area, from the Rakaia River in Canterbury, south to Shag Point, and inland to the main divide.¹⁸ The LGC suggested it would not consider a smaller region because of the smaller rating base would mean it was financially unviable, thereby rejecting the North Otago proposal even though locals polled on both options in 1979 predominantly favoured the North Otago option.¹⁹

Place attachments with both the Otago province and the Waitaki as an area with its own identity are reflected here, as opposed to a region that would include these places but extend well into the Canterbury province. A 1979 review of the WCC by the LGC noted the competition between Timaru (Canterbury province) and Oamaru (Otago province) and where the ‘social boundary’ between the two lay:

It would appear that locally the Waitaki River is a boundary in that generally people south of it look towards Dunedin and the province of Otago. Those north of the river prefer heading

towards Timaru and Canterbury. Consequently there is obvious rivalry between Oamaru and Timaru... There is a definite community of interest as between the WCC's area and the whole of the Waitaki County and Oamaru despite what current local body representations might expound. Those interests are not necessarily economic ones, but there is a definite common bond in the social, recreational, tourist and electoral associations.²⁰

The Waitaki County Council and Oamaru Borough Councils differed in their opinion on where the boundaries should be drawn - and whether preservation of catchments or public sentiment should be the deciding factor.²¹ But while there was resistance to being seen to be part of Canterbury, some in Waitaki also resisted becoming part of Otago, preferring an explicit and autonomous Waitaki identity.

Following the poll in 1979, the LGC shifted its preferred position from the larger autonomous 'Aorangi' proposal to one where the majority of the Waitaki would become an 'out district' of a larger Otago regional authority. Several local groups (Federated Farmers, the Oamaru Chamber of Commerce, and the County Council) lodged objections in the High Court, describing it as the 'worst' outcome they could have hoped for.²² For example, the Lower Waitaki branch of Federated Farmers was quite clear on the matter:

The sooner that some hysterical people forget their ancestry affiliations with Dunedin and also forget the results of a ridiculous postal poll on the subject... hopefully some meaningful and worthwhile decisions will be made for the future planning of this area.²³

Despite the divergence of views, the ethos of local management of local matters still resonated. Media reporting at the time indicated: "the river is a common factor both as a water source and the major district recreational area, the full potential of which is yet to be exploited. All of this should be managed locally."²⁴

This is further exemplified by events following a leak in 1981 of a confidential review undertaken by the NWASCA in 1979. The report put forward yet another proposal for an enlarged autonomous WCC - like the 'North Otago' proposal, but including the area covered by Oamaru Borough, Waitaki County, and the existing WCC.²⁵ The Otago Catchment Board took a position on the NWASCA report, preferring that its own jurisdiction be enlarged to include the Lower Waitaki with a merger that took the boundary along the Waitaki River downstream of the dams. This proposal divided the physical catchment and the WCC's boundaries, and instead followed the apparent 'social boundary' between the two provinces marked by the river itself.²⁶ But this position incensed politicians in North Otago. The Waitaki County Chairman, T. M. F. Taylor, was reported in the *Oamaru Mail* as stating that to have the Waitaki River as a boundary for the Otago Catchment Board appeared to be "empire building":

There is no way while I am chairman of the Waitaki County and live on the Waitaki that I will consider a catchment boundary down the river... You are living in Dunedin and say a boundary at the river would be good - but what about the people living in the area? For technical offices [sic] to suggest that the Waitaki can be a boundary appals me. It is one of the major catchments in the country and main power producing areas and it can't be cut in half.²⁷

Mr Taylor was also reported as saying that a forced amalgamation of the WCC and another Board would be over his and the mayor's "dead bodies." He described the proposal as a "shotgun marriage" and said that catchment services should remain local so its officers can meet ratepayers personally at any time.²⁸

The unresolved situation in 1981 demonstrates the tensions over the control of resources and the natural features that embed a sense of connection and identity to a place. Although those ‘place’ identities are diverse, they are a crucial dimension of water governance. Interestingly, a later paper (1983), stating the position of the then newly formed Coastal-North Otago United Council highlights the necessity of thinking of water management boundaries in association with “social and economic considerations rather than physical concepts and boundaries.”²⁹ And yet it is also clear that at this time, some local identifications with Waitaki waterways remained invisible. In all of the archival material explored in this research, there is a resounding silence of local hapū voices. This clearly highlights the ways that power relations infuse place based identities and knowledge, constructing processes of inclusion and exclusion that play out in conflicts around nature.

The power of influence and the influence of (hydro) power

The history of the ‘Waitaki problem’ illustrates two further levels of tension in drawing boundaries. The first is conflict created between national and local interests. This is particularly likely to occur when a central authority (such as the LGC) determines who may wield power at the local level and the extent of that power. The second is the power struggle that rescaling creates between different actors in a particular context. Massey describes these power struggles at different scales as power geometries.³⁰ They are always present, but are exacerbated through the act of demarcating boundaries which in turn determines how waterways are framed (for example as a resource to be exploited), financial capacity and control of resources. In this case the water of the Waitaki is framed as a resource for hydro-electricity generation.

Power geometries: national-local

Illustrating the first level of tension between national and local interests, the Mayor of Oamaru Borough described the decision of the NWASCA not to release the 1979 report (proposing a larger autonomous WCC that, as noted above, was leaked later in 1981) as a “bit of skulduggery”.³¹ He implied that the report was kept confidential because central government politicians didn’t agree with its recommendations, and were hoping to rationalise governance arrangements (and at the same time reduce funding accordingly) to a much greater degree than the report recommended. The point which seemed most alarming to those involved locally was that, contrary to the recommendations of the 1979 review, central government was actually seeking to divide the functions of the WCC between two regional Catchment Boards (Otago and South Canterbury), meaning any local management or control would be lost.

Up until this point, the Waitaki had been critically important to the national government, because of the extensive hydro-electricity system that had been established along the river from the 1930s to the 1970s (and later in the upper reaches including Lakes Ōhau, Pūkaki and Tekapo). Through construction and as the water flowed into the hydro lakes of Waitaki, Benmore and Aviemore, financial resources flowed into the area from central government and economic gains were felt through employment and population growth. However, once construction was complete and operations became business-as-usual, the catchment became a financial millstone to the local community due to maintenance costs. The extensive engineering

and river protection works necessitated by the hydro system could not be funded from the rating base of the catchment's sparse population.³² While the local population may have sought autonomy, they did not have the wherewithal to sustain independence in the face of the retreat of government brought about by the Fourth Labour Government in the 1980s, and the neighbouring Catchment Boards saw the catchment as something of a white elephant.³³

Around the mid-1980s, there was also a growing interest in environmental issues and concern was mounting that reduced government intervention and oversight would lead to unbridled resource exploitation and degradation. Some commentators considered that in order to protect the country's water and soil, catchment authorities should be allowed greater autonomy to control and limit use of freshwater, and responsibility for the authorities should be removed from the Ministry for Works and Development where it then resided – to shift the focus from development to protection and conservation. For example, in a compilation of experts' views which appeared as a series of articles in the *Soil and Water* magazine,³⁴ some authors argued for increased autonomous, localised decision-making by catchment authorities. John Wilding, a past member of the national Soil Conservation and Rivers Control Council and the Marlborough Catchment Board, stated that “we now see catchment authorities as strong multi-disciplinary regional bodies capable of standing up to Government, Industry, and Territorial Authorities in the interest of the environment.”³⁵ Similarly, Sir Alan Mark, Professor of Botany at the University of Otago, considered that “the regional catchment authorities are sufficiently competent to justify being given greater autonomy and independence from the bureaucracy than they have been allowed to enjoy in the past.”³⁶ And Chris Kerr, Management Officer for the Centre of Resource Management at Lincoln University carried on the theme:

It is now appropriate that the government pass to catchment authorities...the responsibilities for all but national policy matters concerning soil (land) and water management. This would involve complete devolution of ... planning, water allocation, water protection, water quality, water resource development, land protection and land management.³⁷

He went on to suggest that catchment authorities have budgets of around \$1 million each. This is indicative of the increasing tension between national-level development and economic aims (which sought to reduce the number of authorities and consolidate their functions at the regional level) and localised concerns for water resource and soil management.

Power geometries: local actors

The second example of contested power lies between local actors and is clearly illustrated by the ongoing tension around the collection of rates. Wherever the boundaries were drawn would necessarily result in the enlargement of one body's rating base, and the reduction of another. As noted above, the rating base matters in order for local administration to cover the costs of ongoing management and maintenance of the hydro resource. For instance, the Otago Catchment Board provided the Oamaru Borough Council with a position statement on the matter on 17 March 1981.³⁸ It stated that “the [Otago Catchment] Board is gravely concerned at the situation which appears to be developing in North Otago.” The Board had “been silent on the recommendations of the [leaked 1979] NWASCA report” but had been forced to comment, in case its silence “may be interpreted as consent.” It was particularly concerned about an area

of land that extended from the coast at Shag Point along the Kakanui ranges, to the river and back to the East Coast known as ‘the Triangle’. The report indicated the Triangle would be severed from Otago, and this would not be financially viable. The Otago Board would support the WCC “staying in existence...but not at the expense of the Otago Catchment Board.” Its preference was for the Otago Board’s jurisdiction to be enlarged to include the Lower Waitaki River.³⁹

The sweeping reforms in the 1980s included the quasi-privatisation of many state assets, under the State-Owned Enterprises Act 1986 – including electricity generation through the development of the new State-Owned Enterprise Electricorp. Under this legislation, the administrative bodies of public infrastructure were to be operated as if they were privately-owned companies. This included paying local government rates. The potential financial implications for whichever body would receive the rates payable on the Waitaki hydro infrastructure (which had become owned by Electricorp) were considered game-changing.⁴⁰ In timing that cannot be coincidental, in September 1987, the WCC decided to withdraw its previous support for a merger with the Otago Board, as it argued that the WCC could survive with rates from Electricorp. But of course, the Otago Board had only agreed to the merger on the proviso that the WCC would bring with it the Electricorp rates!⁴¹

As the contest around the Waitaki catchment demonstrates, when it comes to drawing boundaries, the people and the politics they bring matter. Although the management of water (and soil) are ostensibly physical matters, boundaries shape and are shaped by people’s identification with land and rivers, and where they ‘fit’ into the community. Boundaries also shape and are shaped by power geometries that determine who has power and access to resources.⁴² Changing such boundaries can lead to conflict as it changes power relations and the distribution of financial (and other) benefits and burdens. The ways in which particular issues are debated and framed (around rates, or infrastructure and land development, or as the previous section showed, historical and sometimes parochial attachments to place) as well as the notable omissions in such framing (an absence of the role of tangata whenua as kaitiaki for water management), there are lessons to be learned as we continue to rescale water management.

Before shifting to more contemporary rescaling, it should be noted that the controversy over the Waitaki as a boundary between Otago and Canterbury was not smoothly resolved in the major local government restructuring that culminated in 1989. Local government reform in the 1980s was part of the unprecedented political, economic and social changes experienced over that period, sometimes dubbed the ‘New Zealand Experiment’,⁴³ and involved extensive local government rescaling in a comparatively short space of time. Under the Fourth Labour Government, through 1985-89, the number of multi and single purpose governance bodies (e.g. Catchment Boards, Harbour Boards, Pest Destruction Boards etc) was reduced from 466 to just 7 regional and territorial authorities.⁴⁴ Additionally, over 800 different kinds of governance bodies across the country were reduced to 86 multipurpose territorial and regional authorities.⁴⁵ It is hardly surprising then that contention and conflict continued in places like the Waitaki given the previous 15 years of uncertainty and tension that occurred there and the scale of changes. Indeed, legal challenges followed, whereby some unsuccessfully sought a single Waitaki Region.⁴⁶ That period of extensive rescaling is beyond the scope of the present

chapter.⁴⁷ We have focused instead on the specific period between the mid-1970s and mid-1980s as this revolved around the question of the continued viability of an independent Waitaki catchment authority, prior to the removal of catchment authorities entirely.

Bringing the past into the present – lessons for rescaling

As we have shown through the story of the Waitaki, catchment rescaling is not new. The politics of water management will not go away simply through redrawing lines on a map. In fact, rescaling can bring such politics into stark relief. Aotearoa New Zealand is now embarking on a new catchment rescaling programme. As discussed at the outset of this chapter, under the National Policy Statement for Freshwater Management 2014, regional councils are required to undertake rescaling processes, by addressing water management issues at the level of newly-defined ‘Freshwater Management Units’ (FMUs). While wider issues of local government boundaries and functions are not likely to be raised through this rescaling process (unlike during in the 1970s and 80s), there are risks that can be highlighted from that tense period of conflict around redrawing boundaries in the Waitaki. This section considers two main risks that are drawn from lessons of the past. First, the question concerns how ‘sense of place’ issues are to be recognised and provided for in the rescaling process. Second, there are the potential localised tensions over control of land and water resources.

In relation to the ‘sense of place’ issue, central government has provided advice to councils for the establishment of (FMUs) in *A Guide to Identifying Freshwater Management Units under the National Policy Statement for Freshwater Management 2014*.⁴⁸ The *Guide* states:

Councils could identify FMUs themselves (without stakeholder engagement) as a distinct process ... Alternatively, councils could identify FMUs in parallel to engaging with communities on identifying freshwater values, defining objectives and setting limits ... to ensure FMUs reflect the different values and uses associated with particular freshwater bodies.

The history of the Waitaki tells us that drawing boundaries without the input of affected communities could be a dangerous path to go down. For example, in 1982, the LGC met with the affected local bodies to discuss options. The meeting was described by Waitaki County as “well orchestrated” whereby the LGC “set about dismantling any hope” of a localised solution.⁴⁹ In a second example, the 1985 NWASCA Waitaki review provoked a scathing critique by the WCC manager who stated that he considered it lacked objectivity, was leading and biased.⁵⁰ Or consider the labelling of the decision to keep the 1979 review confidential as “skulduggery.”⁵¹ These examples highlight the indignation felt at the local level when such decisions are made remotely by a central or (in the contemporary setting) regional agency.

The National Policy Statement *Guide* provided by the Ministry for the Environment proposes two sets of questions to aid in setting FMU boundaries. These questions are grouped into three ‘primary considerations’ (covering the hydrological, social, political, and cultural characteristics of the region) and twelve ‘secondary considerations’ (the practical, largely physical issues around freshwater management to be addressed in implementation).⁵² The *Guide* clearly highlights the need to consider social, political, cultural, and community issues

as primary, but these issues are only identified as one question in a list of many. The rest of the questions that councils should ask are focused on geographical, physical, and management issues. Given how limited local authority resources are, and given the fact that addressing social, political, economic, and cultural issues tends to be challenging, messy, and with a high number of variables, it seems likely that councils will devote more consideration to the physical aspects of management unit demarcation, than the social ones.

For example, the regional authority now responsible for management of the Waitaki watershed, Environment Canterbury, has delegated the role of identifying the FMUs for Canterbury to its (local) water management Zone Committees. The Lower Waitaki-South Coastal Canterbury Zone Committee considered the creation of FMUs at a meeting held on 17 December 2014.⁵³ The Minutes of that meeting referred to an advisory paper on the process of setting Management Units provided to the Committee by Environment Canterbury staff. Two steps provide for the process of establishing FMUs. First, “identify freshwater management units.” And second “Consider and identify values”. The Minutes indicate that the “committee considered the options that were presented for...Step 1”.⁵⁴ But the Committee did not appear to get any further than that. The Minutes go on to state that the Environment Canterbury staff member who prepared the paper would “provide further information on the matters discussed by the committee at the [next] meeting to be held in February.” However, the matter did not appear on the agenda for that meeting, and there is no mention of the issue in Minutes for that meeting or any subsequent meetings.⁵⁵ It seems that the Zone Committee considered the matter at that one meeting only, and no further advice was provided to them beyond that contained in the advisory paper. Yet the FMUs have been established through Plan Change Five to the Canterbury Land and Water Regional Plan, which was notified in 2016.

What is interesting in that the advice to the Committee is that the Management Units can be established *prior* to considering and identifying associated community values. This implies a view that drawing water management boundaries is simply a technical process, it is apolitical, with little need to consider social, cultural or economic values until after they are set. Subsequent steps outlined in the Environment Canterbury paper did refer to social, political, cultural, and economic issues within or across Management Units, but only in reference to “communities of interest”.⁵⁶ There is nothing in the document that indicates what this term means, how such a community is to be identified, and what interests are considered relevant. There is also no mention of *rūnaka rohe* boundaries, or economic issues within or across the proposed Management Units. As noted above the absolute silence in the late 1970s and 80s in the archival material around *iwi* and *hapū* interests in rescaling tensions in water governance is telling. Of even more concern is that those interests remain invisible in the public record in contemporary management examples such as this one, particularly as *kaitiaki rūnaka* have since stated within the policies of the Waitaki Iwi Management Plan 2017 that *rūnaka* partnerships in “planning and decision-making on freshwater management” should be provided for to ensure that their interests – at a minimum – are represented in (inter alia) “the definition of freshwater management units” and that “Manawhenua should be involved in determining freshwater management units.”⁵⁷

What the longer-term implications are of this seemingly cursory consideration of the people-related ‘sense of place’ and indeed, cultural identifications with waterways, remains to be seen, but this example demonstrates that regional authorities may not recognise the highly political nature of rescaling water management and remain very much situated in dominant western concepts of water as a resource for exploitation and human use. This is despite the importance of social and cultural dimensions hinted at in the Ministry for the Environment *Guide*. However, as the different FMU boundaries mean that different limits, policies and rules will apply within communities, contestation across boundaries may emerge. In more concrete terms, proximate differences on limits (in relation to freshwater quality and quantity) may affect current and potential land-use, which will in turn affect land values, economic productivity and profitability, water use, and therefore social structure and community cohesion. For affected water-users, landowners and hapū, this is therefore a high stakes process. As we saw in the Waitaki, the higher the stakes (in terms of economic power, costs, and benefits), the more likely tensions are to escalate across and between communities and political bodies. Regional authorities should carefully consider how to include communities in these processes, and the implications for them when delineating between FMUs and the consequential rules and limits of so doing.

More than technical – the politics of rescaling

At the outset of this paper we cited work by Alice Cohen that noted rescaling is never value neutral but is always “an act reflective of and infused with the logics and ideologies held by decision makers.”⁵⁸ This is clearly evident in the visible historic tensions around rescaling of both local governance and water management in the Waitaki and also in the omissions in the archival record and what is left invisible. This highlights that there are a variety of power plays – or power geometries – between different actors, agencies and viewpoints, which are further complicated with different identities and place attachments coming into play.⁵⁹ Pushing these highly political and complex dimensions of rescaling and water governance into the realm of technical expertise that frames water in a particular way and is set out as a process of apolitical steps that only involve a small range of stakeholders, risks later contestation once the uneven effects of such rescaling manifest. It has been noted that under contemporary forms of neoliberal political economy such techno-managerial approaches are inherent to a particular kind of pragmatism that avoids confrontation and contestation.⁶⁰ While it is clearly undesirable for rescaling to take a decade of debates and contestation such as occurred in the Waitaki, we suggest that an avoidance of any contestation in favour of techno-managerial decision-making in an effort to be apolitical is misguided. Such boundary drawing is always political. Processes that embrace such a politics can, we suggest, provide much more innovative and robust outcomes, are more inclusive of a range of views (including worldviews) and values, and are therefore likely to provide water governance that respects the complexity involved in solving such wicked problems.

Endnotes

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13. Report to NWASCA from Director of Water and Soil Conservation (R K Howard), re Waitaki Catchment Commission Administration Grants, 6 August 1985, Waitaki County Council archival records.
14. The LGC is an independent, national-level body originally formed under the Local Government Commission Act 1946. According to section 12 of that Act, it was established "to review from time to time the functions and districts of local authorities and to inquire into proposals and prepare schemes for the reorganisation thereof and generally to review and to report to the Minister [for Local Government] upon such matters relating to local government as may be determined by the Commission or referred to it by the Minister." The LGC still operates today.
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 36. Mark, A. "NWASCA – Under the Wing of Works or Where?" *Soil and Water*, 1986, 22:3, 10.
 37. Kerr, C. "NWASCA – Under the Wing of Works or Where?" *Soil and Water*, 1986, 22:3, 12.
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Marilynn Webb. 1987. The swimming hole & willows – Maniototo. Pastel on paper.
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Natural Boundaries, Legal Definitions

Making room for rivers

Mick Strack

Introduction

The legal definition of rivers has a significant impact on jurisdiction, management and responsibilities for rivers. Clearly rivers are of vital importance in the overall scheme of resource management, given the wide variety of statutory and policy statements about conservation, access and recreation on and adjacent to waterbodies. However, the statutes apply rather arbitrary and artificial definitions; dividing rivers into bed, banks, and water columns, and selecting three metre wide average as a defining dimension under which rivers seem to legally disappear. The common law makes various assumptions about navigability, ownership, and centreline divisions and about how rivers and their boundaries move. And underlying all this law exists the relationship that Māori have with rivers and water, which has only recently been recognised by legal authorities.¹ Such legal divisions and the confusion and fragmentation of spaces and boundaries have no connection with ecological zones; cross-boundary conflict impedes conservation management. This chapter will explore this legal uncertainty of boundaries and ownership to demonstrate the disconnect with integrated management of river catchments.

Ecologists know that rivers represent a complex ecosystem of interconnected processes, and Māori consider their river as a whole and indivisible entity – from the mountains to the sea, carrying their own wairua. On the other hand, our legal system insists on fragmenting rivers spatially, definitionally, and proprietorially. Furthermore, political struggles continue between those who would have rivers and waters described as property, to be owned, traded and exploited under the control of owners, and those who see rivers and waters as part of the public commons, to be shared and cared for, and under the control of natural systems.

The legal aspects of rivers and waterways is worth examining so that we can begin to understand the disconnect between the legal river and the actual river. We need to make room for rivers in our legal and proprietorial conceptions. Dame Anne Salmond has described rivers

as ‘anarchic’,² I have used the phrase ‘rebel rivers’³ – both phrases acknowledge that rivers cannot be controlled by the law, at least not politically constructed law, rather that rivers are a law unto themselves.

Land as property defined in our cadastral system, is dependent on accurate and complete definition of boundaries, and a complete record of the property rights attaching to that land.⁴ Rivers, on the other hand, actually fall outside our property regime; rivers are not generally defined as cadastral parcels, but are usually illustrated (if illustrated at all) as land left over from the cadastral structure. Furthermore, the legal rules about ownership of rivers are confused and confusing. This means that rivers as legal parcels, disappear and re-emerge into and from private and public property boundaries. Similarly, the riparian reserves that may be set aside for conservation, recreation and access alongside rivers often do not remain connected with the rivers. Naturally flowing rivers change course regularly, legal boundaries tend to be fixed. Our property law is fundamentally at odds with environmental law in representing rivers.

To apply a more holistic view of rivers, we must work out how we make legal room for rivers? I will suggest towards the end of this chapter that there are some innovative ways that the law could be as flexible as rivers are, and some lessons we may learn from Māori about establishing a relationship of care (*kaitiakitanga*) with our rivers. I conclude that to facilitate better river management, cadastral boundaries should more flexibly accommodate river movements.

What is the physical and legal extent of a river?

Surveyors, our cadastral system, and the state are fixated on establishing boundaries, compartmentalising land and water, defining who owns what. Our property law and cadastral system are focused on defining land parcels to be allocated as property. However, within some sort of legal blind-spot, rivers do not exist as property, so they have not been defined as parcels.

From a surveying and a pragmatic point of view, it is the land parcel that needs to be defined, not the water parcel, the locational fix is to a point on the top of a river bank which might be assessed as only being overtopped in an extraordinary flood. Those positions are then transferred onto a plan and joined by a hand-drawn line, from which the area of the parcel is measured (by a choice of scaling methods). In other words, the riparian boundary does not have the same standards of accuracy and repeatability that is expected of monumented corners and right-lined dimensioned boundaries. The survey fix is very subjective and may vary significantly from survey to survey, from time to time, and from the varying experiences of fullest flow and flood conditions. However, given that such a boundary is ambulatory (it can move depending on the various tests of accretion and erosion), perhaps concern about spatial and temporal accuracy is unnecessary.

Similarly, because of the uncertainty about riparian rights to rivers (see below for discussion about ownership of rivers), perhaps the spatial definition of a river bank is irrelevant if the river is owned by that adjoining riparian owner, or the practical effect of the river being the river and providing river services (including public navigation) means that the spatial definition of a bank has no practical effect on the existence and use of the river.

The different determinations about the extent of riparian parcels can have significant

impacts on the legal and spatial representation of rivers. Various sections of legislation define rivers for specified purposes. The Resource Management Act 1991 (RMA) states a “*river* means a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse” (RMA 1991, s 2). Then, for the purpose of setting aside an esplanade reserve “a *river* means a river whose bed has an average width of 3 metres or more where the river flows through or adjoins an allotment” (RMA 1991, s 230). Rivers less than 3m average width do not trigger any reserve or public access provisions.

The RMA further defines a bed: “*bed* means,—(a) in relation to any river—(i) for the purposes of esplanade reserves, esplanade strips, and subdivision, the space of land which the waters of the river cover at its annual fullest flow without overtopping its banks: (ii) in all other cases, the space of land which the waters of the river cover at its fullest flow without overtopping its banks” (RMA 1991, s 2).

In a very similar way, the Conservation Acts states: “*bed* means—(a) in relation to any river, the space of land which the waters of the river cover at its fullest flow without overtopping the banks” (Conservation Act 1987, s 2), and, for the purposes of setting aside a marginal strip the river is further defined as “the bed of any river or any stream being a bed that has an average width of 3 metres or more” (Conservation Act 1987, s 24).

In defining a cadastral parcel that has a natural boundary, the water boundary is “a boundary set at the landward margin of: (a) a river bed or a stream bed, (b) a lake bed, or (c) the common marine and coastal area or other tidal area, and includes a natural boundary where this term is used in enactments to refer to a boundary at a water margin” (Rules for Cadastral Survey 2010, rule 2).

Rivers as property

A property regime is characterised by “universality, where all resources are privately owned and entitlements are completely specified; exclusivity so that all benefits and costs only accrue to owner; transferability so that all property rights are transferable from one owner to another in a voluntary exchange; and enforceability so that property rights are secure from involuntary seizure or encroachment by others.”⁵ The purpose of property is to grant power to those who hold it, to allow the exclusion of others, to commodify a resource, and to provide security of tenure. Normally we do not expect rivers to support these characteristics. Usually river spaces become property only in relation to the surrounding dry land (notwithstanding the recent Treaty settlement which creates a riverbed title owned by itself – Te Awa Tupua Act 2017).

The common law (and often further clarified or re-stated in legislation) has provided a whole set of rules about ownership of rivers: primarily that water cannot be owned. The discussion about ownership therefore remains about the land; specifically the riverbed. The ownership question therefore needs to be reported on, especially in what might be seen as a period of conflict about ownership and allocation of water, public access to water, and a growing recognition that the state of rivers is deteriorating and cooperative efforts are required to restore riparian ecosystems. For example, ownership will eventually affect management responsibilities, or rather, management cannot be autonomous if control and ownership are contested. So who owns riverbeds?

Who owns riverbeds? – No-one, because they are included in the Coastal Marine Area

Rivers which are included in the Coastal Marine Area (the lesser of – 1 kilometre upstream from the **mouth** of the river; or the point upstream that is calculated by multiplying the width of the river mouth by 5 – RMA 1991, s 2) are part of the common marine and coastal area and are not owned by anyone: “Neither the Crown nor any other person owns, or is capable of owning, the common marine and coastal area...” (Marine and Coastal Areas (Takutai Moana) Act 2011, s 11(2)). This is in recognition of “the protection of public rights of access, navigation, and fishing” (MACAA 2011, s 4).⁶ It might be noted here that the public rights of access, navigation and fisheries are not necessarily incompatible with common law (or even statutory) ownership; they are just elements of the bundle of rights that might be or might not be granted.

As might be expected, this definition also causes some uncertainty, particularly because the river mouth is a vague feature not capable of exact measurement. Therefore, the **mouth** of a river is as declared by the Minister of Conservation or the Environment Court (RMA 1991, s 2).

Who owns riverbeds? – the Crown, because they are tidal

Riverbeds which are upstream of the Coastal Marine Area, and are **tidal**, are considered to be extensions of the sea – and (by common law) owned by the Crown. However, it is uncertain if this is still the case now that the Crown no longer owns the seabed (MAACA 2011). Also, the tidal test is very uncertain – it is impossible to make a rational determination about the extent of tidality. Tidally affected sea water flows into many rivers. That sea water then holds back the flow of fresh water on a tidally created cycle. The fresh water will then rise and fall in the lower reaches of a river in a tidal pattern. So is tidal defined by the extent of salt water, the composition of the water (the proportion of salt to fresh water), the horizontal direction of flow of the water, or the vertical changes of the water level? There has been no clear legal determination about these questions, but there is clear acknowledgment of the common law tidal test being applicable in New Zealand: “The English law was clear – riverbeds were vested in the Crown to the tidal limit ...”⁷

Who owns riverbeds? – the Crown, because they are navigable

The *Taupiri Coal Mines* case⁸ in 1900 questioned the ownership of the bed of part of the Waikato river, specifically whether the *ad medium filum* presumption could be rebutted by the fact of navigation. The court found that when the adjoining parcels were granted, the Crown was at war with Waikato iwi, the river was being used as a military highway, and therefore the Crown would have retained title to the riverbed. This case prompted clarifying legislation in the form of the Coal Mines Amendment Act 1903, which appeared to confirm that rivers which are navigable are considered to be owned by the Crown unless they have been granted otherwise.

The Coal-Mines Amendment Act 1903 states:

s14 (1) Save where the bed of a navigable river is or has been granted by the Crown, the bed of such river shall remain and shall be deemed to have always been vested in the Crown, and, without limiting in any way the rights of the Crown thereto, all minerals, including coal, within such bed shall be the absolute property of the Crown.

(2) For the purpose of this section - “Bed” means the space of land which the waters of the river cover at its fullest flow without overflowing its banks; “Navigable river” means a river continuously or periodically of sufficient width and depth to be susceptible of actual or future beneficial use to the residents, actual or future, on its banks, or to the public for the purpose of navigation by boats, barges, punts, or rafts; but nothing herein shall prejudice or affect the rights of riparian owners in respect of the bed of non-navigable rivers.

Perhaps this should have clarified the question of ownership of riverbeds, but there is a concern that a section in special legislation such as s14, which was made in relation to a specific case may not have general applicability.⁹ Furthermore, more recent case law has questioned what is meant by navigability. The *Hutt River* case¹⁰ interpreted navigation as a purposeful and commercial activity. Although the *Taupiri Coal Mines* case asserted that the Crown’s rights might take priority and would not be easily overridden, the Hutt River court found that private rights should not be easily overridden; the Act is confiscatory of private rights to riverbeds and therefore Crown assertions of navigability should be treated cautiously.¹¹

More recently at the Supreme Court, the *Paki v Attorney General*¹² case examined navigability with particular discussion on whether to take a ‘whole of river’ approach or a ‘segmented’ approach, in other words, whether if a river was navigable in part, was it navigable as a whole. The court found in favour of the ‘segmented’ approach so that a river may be a patchwork of public and private portions – that this better reflects parliament’s intention to balance the relevant public and private interests.¹³

Who owns riverbeds? – the adjoining land-owners, because of *ad medium filum aquae*

The beds of rivers which are neither tidal nor navigable are owned (by the common law) by the adjoining land owners to the centre line of the river - *ad medium filum fluvium*. When there is a public reserve adjoining a waterway, then that half of the riverbed is owned by the local authority or the Crown. The *ad medium filum* concept provides for a common law property right rather than a statutory right, so that the *ad medium filum* boundary is not made explicit on certificates of titles.¹⁴ This means that any determination or assessment of property in the river is for the courts to decide not for the document to make explicit.

It is worthy of note that a dissenting opinion in *Paki* (at para 130) suggested: “The *usque ad medium filum aquae* rule was not an obvious candidate for adoption in newly established colonies ... In the UK ... where public use of rivers and streams was practicable and useful, there were likely to be associated rights established by long usage ... The predominantly gentle topography of much of the UK and its very long established network of roads were in marked contrast to the circumstance which obtained in Australasia and North America. It is unsurprising that courts in North American jurisdictions rejected the wholesale application of the rule.” And at para 131 “... the particular circumstances of New Zealand provided a reasonable basis for concluding that it was not applicable in New Zealand, at least in relation to rivers which were significant to Māori .”¹⁵

Who owns riverbeds? – adjoining land-owners because the river is not defined

Many rivers (especially those less than three metres wide) have not been specifically defined so they exist legally only within and as part of the land estate granted as a fee simple title – as private property. Furthermore, in many instances rivers which have changed course (by avulsion) from their originally described cadastral boundaries now exist totally, or in part, within, and therefore incorporated as part of, private land title.

Who owns rivers? – Māori, because customary title is retained

When Māori customary land was initially alienated (by direct Crown purchase, by confiscation, or by the operations of the Native Land Court in granting fee simple title in exchange for extinguishing customary title) it was rarely made explicit about whether rivers within or bounding those land parcels were included in the alienation or in the grant. The courts have clearly recognised that customary title can only be extinguished by the free consent of the native people, or by acts of the legislature.¹⁶ Māori customary title may not have been extinguished or alienated to the Crown, so some rivers may remain as Māori customary title, but this would have to be determined by the courts, having regard to the particular circumstances of a claim. Of course customary rights may continue to be asserted and some Treaty claims may allow for these rights to be accepted.

Who owns rivers? – themselves, because they are their own legal entity

In the case of the Whanganui River, the Crown has declared (by Te Awa Tupua Act 2017) that the Crown-owned parts of the river are Te Awa Tupua, which has its own legal personality. “Te Awa Tupua is an **indivisible and living whole**, comprising the Whanganui River from the mountains to the sea, incorporating all its physical and metaphysical elements” (Te Awa Tupua Act 2017, s 12), and “Te Awa Tupua is a **legal person** and has all the rights, powers, duties, and liabilities of a legal person” (s 14(1)). Furthermore: “the fee simple estate in the Crown-owned parts of the bed of the Whanganui River vests in Te Awa Tupua” (s 41(1)).¹⁷ While this Whanganui settlement is revolutionary, it is also perhaps experimental. There is an expectation that the arrangement will provide greater participation for the iwi in river management and will enable better environmental outcomes for the river.¹⁸ It is not yet clear whether this settlement will be a successful model, but if it proves to be so, then irrespective of Māori claims, the idea that a river can own itself may be extended to other rivers and even their wider catchments.

Elsewhere I have argued that the grant of a fee simple title to a riverbed may provide little benefit to Māori given that all the normal rights of alienation, exclusivity and use that attach to a fee simple title are excluded in this settlement.¹⁹

Ambulatory boundaries

The way riparian boundaries have been established is crucial, because there are complicated legal arrangements in place to determine what happens to that boundary and to the ownership of the bed of the waterway when it moves. The doctrine of accretion and erosion states that when a waterway moves slowly, gradually and imperceptibly²⁰ then the boundary moves with the water, but when the waterway shifts due to a rapid event like a flood, then the boundary

stays where it was originally defined, and the boundary is no longer related to the bank.²¹

If a public riparian reserve is fixed by survey (as is normally the case) and the river moves, then the reserve may be submerged or left isolated from the waterway depending on the direction of movement.²² This is obviously unsatisfactory in terms of the purpose of the reserve – to provide access to the water.²³

If a public reserve is ambulatory (for example a marginal strip created after 1990 or an esplanade strip) then it remains defined by the river wherever the river happens to be, so the accretion and erosion tests that apply to other riparian parcels do not apply. This is convenient in respect of the public who can be sure that if they are within 20 m of the river bank then they are in a public space, but may be not so convenient for the adjoining land owner who has only peripheral notice (an obscure record on a CFR, rather than a surveyed boundary) about the property in the river and the reserve.

Riparian rights

Many private property titles have their boundaries identified by a natural boundary; a river or lake bank or at the sea coast by MHW. When this is the case then by the common law, those proprietors own to the centre line of the river. English land law also recognises that any riparian parcel (i.e. a parcel with a natural boundary defined by a river bank, and irrespective of who might own the bed of the waterway) has common law riparian rights.²⁴ Riparian rights, in general, include the right to access the waterway, to have reasonable use of the water (usually for domestic rather than commercial purposes) and other resources in the river, to drain water off the upland parcel to the river, to have a similar quality and quantity of water flowing past the property (subject to the same rights of upstream proprietors), and to have an ambulatory boundary. Some of these rights may have been abrogated by legislation (e.g. RMA 1991), and they are not often explicitly stated, but they do have some impact on the rights of adjoining owners to have some management impact on the rivers. Residual public rights to rivers, including the right of casual recreation on and access to the river are largely unaffected by these common law riparian rights.

Public access – “Queen’s chain”

Access to riparian land is problematic; both symbolically and economically it is the most sought-after land, long held by the most wealthy and powerful members of the community. Landowners’ responses to pressure for increased access range from lukewarm to actively hostile, and this is keenly felt by people attempting to negotiate access or mediate in the debate.²⁵

In Aotearoa New Zealand there has been a strong public expectation of public access to waterways. While there has been some effort to provide for a public reserve strip alongside all waterways (established by a cadastral survey showing strips variously as roads, s58 strips (Land Act 1948), marginal reserves, esplanade reserves, or colloquially ‘the Queen’s chain’) such a strip has not always been set aside.

There is a long history of setting aside riparian strips, roads or reserves alongside

waterways: what is colloquially known as the ‘Queen’s Chain’.²⁶ Changes in practise, legislation and definitions of rivers²⁷ have left us with a seemingly random patchwork of riparian land set aside for conservation, recreation and access, and some left in private title. Now the Resource Management Act normally requires an esplanade reserve to be set aside upon the subdivision of land (ss229-237) adjoining a river, but only for lots created less than four hectares, and the Conservation Act 1987 requires a marginal reserve to be set aside upon the alienation of Crown land (Part IVA). It is unlikely that current legislation will provide any integrated network or assurance of public rights to river margins. A government proposal in 2005 to provide a blanket provision for a five metre strip for public access to all waterways was vehemently protested by rural New Zealanders and the government backed down.²⁸ Widespread consultation in the early 2000s by the Walking Access Consultation Panel led to the establishment of the Walking Access Act 2008 and the Walking Access Commission which prioritises efforts to extend public access to waterways. The contest between private property and public rights is alive and well.

The cadastral record

Our property rights system – the cadastral system – has been set up to provide for strong protections of private property rights. The Torrens system (established by the Land Transfer Act 1870 and subsequent replacements – currently 2017) focuses on private property and only in a residual sense does it also record public rights and public property. Māori Land is mostly dealt with by the Māori Land Court and recorded in that Court’s registry, and Crown land is often not recorded in title form at all. Strictly speaking Crown land is the land that has not otherwise been alienated, it is the land left over from private allocations (of course the Crown can also purchase general land). The cadastral system requires that boundaries are well defined and the extent of all parcels is fully surveyed and recorded. Similarly, all those parcels must have a full record of the rights, restrictions and responsibilities assigned and to whom.

So when land is parcelled up and boundaries are defined, the river and lake banks are shown as the boundaries of the statutory title although the common law expects that a land title might extend to the *ad medium filum*. Case law has confirmed that it is inappropriate for New Zealand titles to record such common law rights.²⁹ The result is that rivers are shown on the spatial plans as the space left over after the private titles are defined by survey. No appellation, no spatial definition, and no record of any rights (private or public) attaching to that waterway is recorded. So in spite of rivers being included in the definition of land, and at least having a common law property regime around them, they are not part of any formal land parcels or property definition.

Our land rights depend on the registration of rights in our cadastre (LINZ) associated with clearly defined parcels (boundaries). There is no clear statutory or documented definition or description of the rights attaching to rivers. And the problem remains that river ownership is uncertain – similarly, management responsibilities are uncertain.

Southern Lowland rivers

The Taieri River

Many southern catchment rivers are now highly modified by flood control works and have engineered banks and controlled courses. The Taieri River through the Taieri Plain is a mere metre or so above mean sea level (MSL) and the plain is subject to regular flooding. There has been a long history of river modification since the early European settlers decided that the wetlands had no value and the plain could be drained for agricultural production. Engineered stop banks control the river path and allow for some overflow of normal banks while also allowing for occupation and use of these riparian meadows. But sea level rise and increased high intensity rain expected with climate change will increase the vulnerability of property throughout the plains. The conflict between tidy rectangular property boundaries and the difficult-to-tame river remains. And the balance between demand for occupation and development of this productive pastoral region and avoiding the regular flood hazard is difficult to negotiate. Perhaps as storm event frequency increases with climate change and 100 year return floods become 10 year or annual return floods, insurance cover will lapse and riparian land will become undevelopable and unmarketable.



Fig 1. Screenshot of Taieri River near Allanton showing stopbanks allowing for some flood protection for the surrounding arable and pastoral land. (GoogleMaps)



Fig 2. Oreti River north of Winton Bridge. The cadastral overlay on an aerial photo. Previous courses of the river are evident in the landforms, only a few of which have been picked up in the cadastral form. The historic legal property boundaries bear little relationship to the current course of the river. (source: LINZ Data Service)

The Oreti River

Sometimes rivers slowly meander, sometimes they slice straight through the landscape. The Oreti River has regularly changed course since early European surveys and occupation through natural accretion and erosion, and also through rapid avulsion. Past surveys have fixed property boundaries, riparian reserves and roads with reference to the adjoining river, but fixed boundaries do not comply with nature's changes. How is anyone to make sense of the properties that are now encroached upon by the river, how to access the riparian reserves that now have no reference to the river, how to manage a river that cuts into and through private property, and who is responsible for the dry land still defined as river bed? The course of the river is very apparent on the ground. Does it matter whether it got there by slow and gradual accretion or by rapid avulsion? The law thinks it does matter but common sense and pragmatism suggests it does not. We need to make room for rivers.

Matauranga Māori

Māori perceptions of rivers and the nature of customary rights in rivers is a critical concern for resource management decisions. The Waitangi Tribunal³⁰ (and backed up by the courts³¹ and more recently by specific settlement legislation³²) described rivers as a whole and indivisible entity, and yet our legal and property system maintains the fragmentation of rights and allocations described above. Matauranga cannot be exercised when there is no freedom of access and the multiple layers of common law and legislative rights make little sense. A level of responsibility must be provided to iwi to provide for Māori values to be recognised. When iwi have prepared their resource management plans³³, a focus on water and catchments emerges as key to restoring ecological integrity. The establishment of artificial, political and legal boundaries around land breaks down the fundamental webs of whakapapa. Ecological management and Matauranga Māori should not be confined by artificial legal boundaries. Property rights put up a barrier to implementation.

Some Treaty settlements appear to provide for some Māori management by setting aside areas of Statutory Acknowledgement and also surveyed land parcels adjoining some rivers for customary camping and resource gathering – nohoanga (Ngāi Tahu Settlement Act 1998) and ukaipo (Ngati Ruanui Settlement Act 2001). Full advantage of these spaces and instruments remains dependent on how well resourced and politically and environmentally motivated an iwi is.

Integrated management and the RMA 1991

Sustainable management (s 5) in the RMA requires integrated management: the functions of local authorities include the "integrated management of natural and physical resources", and the purpose of Regional Policy Statements is the "integrated management of natural and physical resources" (ss 30, 31 and 59). It is difficult for regional authorities to manage rivers when there is no right of access, no clear delineation of property rights, and the law prioritises private property over public and environmental interests. "[O]ne of the main shortcomings in freshwater governance in New Zealand is that water and the land over which it runs are insufficiently integrated in environmental policy and resource consent applications".³⁴

The National Policy Statement for Freshwater 2014 also requires integrated management. Objective C1 states: “To improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment”.

There is a statutory implication that rivers should be managed for public access, recreation and conservation. There is a policy expectation that river/land relationship and effects are considered, but integrated management is impeded when there is neither a clear expression of property nor general freedom of access. Access is only provided for when it is specifically established in the cadastral record of rights, restrictions and responsibilities as an encumbrance on adjoining land. Furthermore, access may conflict with best practice riparian management and ecological conservation.

What next?

The rigidity of the cadastral record (fixed boundaries) is an impediment to integrated management of rivers. On the one hand, there are continuing calls to strengthen property rights,³⁵ on the other hand the concept of property in the foreshore and seabed has been removed, and the allocation of property in the Whanganui River and Te Urewera has been radically modified. Perhaps the example of Te Awa Tupua (i.e. rivers are owned by themselves) may provide a new approach. Although this is a settlement of Māori Treaty claims to the river, a similar approach could easily be used for other significant rivers even where there is no Māori claim. The concept of rivers owning themselves at least avoids the concerns of property owners that their property rights to the beds are being confiscated. However, to date the Crown has avoided affecting private property in these arrangements. The Crown has only removed property from the **public** foreshore and seabed (MAACA 2011) and the **publicly** owned parts of the Whanganui River. There is an opportunity for the Crown to acknowledge that rivers have a greater public value, that private ownership of riverbeds (and the seabed) makes little sense, and the removal of private property in riverbeds is not a significant derogation of property. It would seem from anecdotal evidence that New Zealanders expect rivers and the sea to be public or un-owned, but private property owners with economically valuable riparian rights³⁶ are likely to defend their property vigorously. Property brings an expectation of exclusivity of rights, rather than the responsibilities of a collective commons. The Māori concept of kaitiakitanga which is about responsibility towards Papatūānuku is a world apart from the concept of rights that flow from the western property regime. Property is therefore a barrier to public responsibility for ecological management. The Crown will need to negotiate these conflicting positions carefully. The lesson from the orange ribbon campaign of 2005 is evidence of that.

The philosophy of “making room for rivers” is gaining widespread international support as a way of reducing flood and erosion risks and allowing rivers to exhibit their more natural morphological behaviour.³⁷ The law could be modified to acknowledge the greater public interest in rivers in a similar way to how the law deals with the greater public interest in roads; the legality of a road survives the inclusion of that space in a private title (Land Transfer Act 1952, s 77). Similarly any river space could be recognised as public even though it may exist within a legal private land title. Furthermore, development, use and occupation of riverside

land should not be protected but should be required to retreat from mobile river courses.

All riparian margins should have a public reserve adjoining the bank of at least 20 m. This will ensure that property claims cannot encroach on the river margins and the margins can be more explicitly used for riparian management. Filtration planting can serve to isolate productive management of private land from ecological management of rivers. And because public access to rivers for fishing and other recreation is a reasonable expectation, and one that exists at least in the mythology of Kiwis,³⁸ then those reserves should be identified as allowing public access.

Since 1990, when Crown land is alienated it will be subject to the setting aside of a marginal reserve. Such reserve does not need to be surveyed as a separate parcel of land nor spatially indicated on the cadastral record. All that is required is that a notation is recorded on the title recording that it is subject to Part IVA Conservation Act 1987. In this way the reserve is exclusively defined by the course of the river rather than by survey marks or dimensions, and is therefore infinitely mobile and will always serve the reserve purposes (conservation, recreation and access) without derogating from the surrounding private land titles. The Resource Management Act 1991 which requires esplanade reserves to be set aside upon any (with some exceptions) subdivision of riparian land must be fixed by survey, identified on survey plans and title documents and held as separate parcels by local authorities. While this might clarify and protect land title boundaries, it results in spatial anomalies and disconnections when rivers move. From an ecological point of view, the ambulatory boundaries allow for logical riparian spaces, and provide notice to owners that riparian margins are free to move. The situation illustrated in Fig 2 above would not exist and private property will not be a hindrance to river management or public access.

In short, rivers should be seen as public spaces (specifically to allow for integrated management), riparian margins should have public reserves set aside (primarily for conservation, but also when appropriate for public access), and those reserves should be ambulatory (they should move with the natural movement of the river).

It is right that our socially and culturally developed law should generally provide security and stability. It is also to our advantage that our common law system provides flexibility and adaptability. In the case of management of waterways subject to natural laws generally beyond human control we need to be more proactive in ensuring that the law makes room for rivers.

Endnotes

1. That Māori see rivers as a taonga and “a whole and indivisible entity, not separated into bed, banks and waters”. Waitangi Tribunal Mohaka River report 1992 and quoted in *Te Runanganui o Te Ika Whenua Inc Soc v Attorney-General* [1994] 2 NZLR 20 at 26 line 44.
2. Dame Anne Salmond, December 2016 at NZFSS Invercargill conference. “Rivers are anarchic – The Grid is static – Ecosystems are dynamic”.
3. Strack, M. 2008. Rebel Rivers. PhD Thesis. University of Otago.
4. That is the purpose of our Torrens system of property registration.
5. Bramley, M. & McNeill, J. 2011. Chapter 6. Up the Creek and Down the River: in Bosselmann & Tava *Water Rights and Sustainability*. New Zealand Centre for Environmental Law. Auckland. At p175.
6. This Act follows a period of significant controversy since 2003 with the *Ngati Apa v AG* case and the Foreshore and Seabed Act 2004.
7. Waitangi Tribunal 1999, WAI167 Whanganui Report; xvi).
8. *Mueller v Taupiri Coal Mines Ltd* (1900) 20 NZLR 89.
9. It is also worth noting that the Crown has always been capable of taking absolute property in minerals without necessarily owning the surrounding land; so why did it use this excuse to take ownership of navigable rivers?
10. *Attorney-General, ex relatione Hutt River Board, and Hutt River Board v Leighton* [1955] NZLR 750
11. See Fair, J. in *A-G v Leighton* at 768 line21 “the section is, in effect, a confiscatory provision.”
12. *Paki v Attorney-General* [2012] NZSC 50.
13. *Paki v Attorney-General* at para 30: “a balance was struck in the legislation between private property and public property which protected both.”
14. Certificates of Title are now referred to as a Computer Freehold Register (CFR).
15. The English Laws Act 1858 clarified that the laws of England were in force in New Zealand “so far as applicable to the circumstances of the Colony”.
16. Customary property “can be extinguished by sale to the Crown, through investigation of title through the Land Court and subsequent deemed Crown grant, or by legislation or other lawful authority.” (*Ngati Apa v AG* [2003] 3 NZLR 643 at[47].
17. This settlement therefore leaves the privately owned parts of the river unaffected and not part of Te Awa Tupua – nobody has clearly identified which parts were public and which are private.
18. See Strack, M. & Goodwin, D. P. (under review 2018). More than mere shadow?: The colonial agenda of recent Treaty settlements. *Waikato Law Review*. And Strack, M. 2017. Land and Rivers can own themselves. *International Journal of Law in the Built Environment*. Vol. 9(1):4-17. DOI:10.1108/IJLBE-10-2016-0016.
19. Strack, M. & Goodwin, D.
20. The law here applies the principle of *de minimus* – in this situation; what cannot be observed in its progress is deemed not to have moved at all.
21. See the case *Humphrey v Burrell* (1951) NZLR 263 to observe the unsatisfactory result of this doctrine; property owners who were separated by a river have ended up with large portions of their property on the opposite sides of a shifted river.
22. Sax provides a comprehensive analysis of the history and effect of the doctrine of accretion and erosion, but concludes that modern tests should govern the law: “Clearly the public interest does not vary depending on the source of the change, nor does the interest of the upland owner in maintaining water access depend on how the sea [river] happened to move landward” and “maintaining water adjacency for riparian/littoral landowners... are the central goals of law relating to migratory waters”. Sax, J.L. 2009. The Accretion/Avulsion Puzzle: Its Past Revealed, Its Future Proposed. 23 Tul.Envtl.L.J.305 at 352-353.
23. The purpose of riparian reserves is stated in the RMA 1991 s 229 and the Conservation Act 1987 s 24C as for conservation, public access or recreation.
24. See Nolan, D. 2015. *Environmental and Resource Management Law*. 5th edition. LexisNexis. Wellington. Water Rights at Common Law ss8.7-8.13.
25. Strang, V. 2004. *The Meaning of Water*. Berg. Oxford. At p17.
26. See Baldwin A.J. 1997. *Access to and along water margins: the Queen’s chain myth*. MSurv thesis. Dept. of Surveying. Otago.
27. Specifically, reserve provisions often depended on river widths, that width sometimes being 10feet, 33feet, 3m, and then determining an average width and the exact top of the bank made for a great deal of uncertainty.
28. See McDonald, P. 2011. Foot-tracks in New Zealand: Origins, Access Issues and Recent Developments. Chapter 22 The Footways Cabinet Paper. The proposal resulted in a passive rural protest of orange ribbons on farm gates that nevertheless forced a government back-down.
29. *A-G v Leighton* at p774.
30. Waitangi Tribunal, 1992. WAI119 Mohaka River Report. Wellington. at p36.
31. *Te Runanganui o te Ika Whenua Inc Society v Attorney-General* [1994] 2 NZLR 20 at p26.
32. Te Awa Tupua (Whanganui River Claims Settlement) Act 2017 “Te Awa Tupua is an indivisible and living whole, comprising the Whanganui River from the mountains to the sea, incorporating all its physical and metaphysical elements” (s12).
33. Kai Tahu Ki Otago, 2005. *Natural Resource Management Plan*. s1.2 “The kaupapa “Ki Uta Ki Tai”, emphasises holistic management of the interrelated elements within and between catchments, from the air and atmosphere to the land and the coastal environment, ...”
34. Bosselmann, K. & Tava, V. (Eds) 2011. Introduction:

Water in Context. in *Water Rights & Sustainability*. Monograph Series Vol 3. NZ Centre for Environmental Law. Auckland.

35. For example in attempts to include the right to property in the Bill of Rights Act, and resistance to imposing a capital gains tax that would perhaps compromise the investment value of land.
36. Many common law riparian rights have been restricted by legislation but domestic use of, and access to water remain as valuable rights (see RMA ss 13 and 14).
37. For example the Rhine and the Mississippi catchments, which are both heavily populated and in the past have been controlled with levees, dykes and groynes, are now being re-engineered to provide more natural approach to flood control; freeing up floodplains and restoring wetlands. Columbia Water Center, Columbia University. 2011. 'Making Room for Rivers: A Different Approach to Flood Control'. <http://blogs.ei.columbia.edu/2011/06/07/making-room-for-rivers-a-different-approach-to-flood-control/>
38. See Baldwin A.J. 1999. Explaining the Queen's Chain Myth: The Evolution of Laws for Marginal Strips. *NZ Surveyor*. No. 189. April 1999.



Aerial view showing intensive stocking, Taieri River (Fish and Game New Zealand).



Aerial photo Lindis River (Fish and Game New Zealand).

Warning Signs over the Water

Angling tourists' perceptions of change in southern waters

Stuart Hayes and Brent Lovelock

Introduction

Angling and tourism in New Zealand

The promise of a clean, green and wild experience omits a strong pull for international anglers who visit New Zealand to fish its freshwaters. In an increasingly urbanised and industrial world such an experience remains potentially unique. In terms of promotion, little has changed since the emergence of New Zealand as an angling destination almost one hundred years ago. Back then New Zealand was already being heralded as one of the finest angling countries in the world.¹ Guidebooks and government publicity material from the period projected an image of waterways stocked with an abundance of huge, wild fish. Early promotional adverts such as the one below from the then New Zealand Government Department of Tourism and Publicity (NZGDTP) in 1938 also conveyed a sense of what it meant to 'experience' fishing in New Zealand, one where open spaces, peaceful waterways and pristine conditions offered the promise of an almost mythical encounter:

The Fisherman's Eldorado! Trout-fishing in a new country! What angler is there who would not thrill at the prospect? To cast a fly on waters flowing from strange mountain heights, or plunging through gorge and valley where beautiful ferns, palms, and forest trees clothe the slopes and banks – this all-satisfying experience awaits the man who sets out with rod and basket in New Zealand.²

Recreational freshwater angling flourished throughout the preceding decades and the 'Eldorado years' conferred New Zealand's place on the global freshwater angling map.³ As Orton Hintz attests in his now legendary 1980 angling anthology, "with open water and a merciful freedom from exploitation, we are in many ways the most favoured angling nation on earth."⁴ The 'clean and green' open waters and unexploited landscapes that continue to

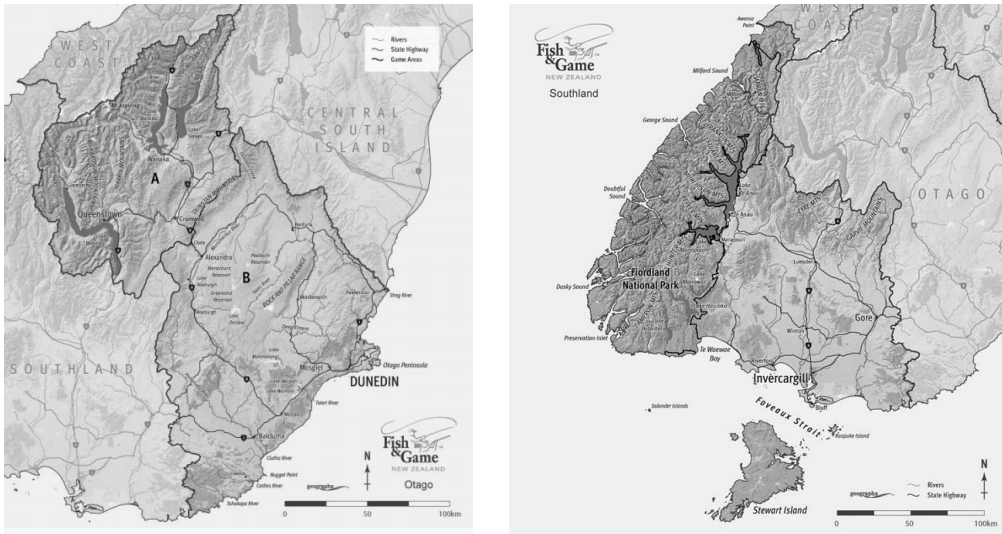


Figure 1: Otago and Southland catchments. Source: Fish and Game New Zealand.

be promoted to anglers are also a valuable ‘commodity’ in respect to the 100% PURE New Zealand brand that the country’s \$12.9 billion tourism industry⁵ relies so heavily on.

A seemingly abundant supply of quiet and pristine backcountry waterways in the Otago and the Southland catchments (hereafter referred to as ‘southern waters’, see Figure 1 for map) has meant that this region of New Zealand has been continually used as a focal point in touristic and angling promotional material.

Iconic catchments such as the Mataura, Oreti, Clutha, and Taieri, and the southern lakes of Te Anau, Manapouri, Wakatipu, Wanaka, and Hawea, and the backcountry rivers and tarns feeding these lakes form an integral part of the the New Zealand angling experience. It is therefore the southern waters that still promise ‘Eldorado’.

Destination south: A ‘clean and green’ resource in a global context

The freshwaters of New Zealand, and in particular its southern waters, are one of many global destinations that are popular with international recreational anglers. The main set of international freshwater angling destinations includes the USA, Australia, the UK, Canada, South Africa, Chile and Argentina. Destinations such as these though are being increasingly overlooked in favour of alternative and lesser-known destinations. One may reasonably speculate that this behaviour is potentially being driven by negative perceptions of the quality of the freshwater resource. In the UK for example, agricultural and hydromorphological⁶ pressures continue to have a detrimental effect on the freshwater resource.⁷ Eutrophication⁸ in lowland rivers is considered pervasive and, for anglers, the effects have been fewer and/or smaller fish.⁹ A higher level of pollution in the waterways generally has also resulted in over-crowding as a result of a reduction in the number of quality fishing sites, and this increases the potential for conflict between anglers. Moreover, historical property rights mean that landowners control the rights to most waterways and often further restrict access.¹⁰ In the USA and Australia, too, and in

addition to the problems associated with the anthropogenic pressures outlined above, over-fishing is particularly problematic and this has had a significant effect on fish populations.^{11,12}

Anglers as scientists? The role of citizen science in our fisheries

In recognition of the fact that “recreational fishers have an inherent interest in the conservation and management of the fisheries”¹³ various grass-roots and/or fisheries management-led initiatives that focus on a citizen science¹⁴ approach, where citizens as stakeholders in natural resource management are involved in collecting and analysing ecosystem data, have been developed globally to help combat some of the issues outlined above. In Mongolia for example recreational anglers have been contributing to the preservation of Eurasian Giant trout in the Eg-Ur Watershed by supporting research teams with creel surveys and spawning fish counts. Initiatives like these have engaged recreational anglers as conservation partners and the idea of citizen science in this broad sense has been to provide somewhat of an early warning system about the current and predicted threats to the waterways and, in doing so, aid fisheries management agencies in decision-making.

Despite citizen science gaining some traction in New Zealand through small-scale initiatives such as stream health monitoring,¹⁵ recreational anglers, and in particular international visiting anglers, do not yet appear to have been actively employed in the conservation of the freshwater resource. This might be due to longstanding perceptions, both at home and abroad, about the ‘purity’ of the freshwater resource, perceptions that have become almost part of the national and overseas psyche and are continually reinforced through powerful campaigns such as the 100% PURE promotional campaign. This campaign espouses New Zealand’s clean and green environmental credentials¹⁶ and the wild and pristine landscapes and waterscapes associated with the southern waters are often placed at the centre of these touristic projections. For angling tourists these projections promise an abundance of big fish, solitude and a wild challenge: in other words, a continued promise of Eldorado.¹⁷ The idea of 100% PURE clean and green is not, however, without its critics^{18,19,20} and an increasingly powerful counter-narrative is that the New Zealand environment is far from ‘pristine’. There is, importantly, some suggestion that, as is the case elsewhere in the world, New Zealand’s freshwater fisheries are beginning to suffer as a consequence of anthropogenic pressures (e.g. agricultural pollution^{21,22} and angling pressure²³). The question is, of course, how does all this play out in the southern waters? To what extent do international anglers who visit the southern waters experience this sense of clean and green in all its purity? In what ways are they in agreement with critics of 100% PURE? What might all this mean for the future of freshwater angling in the southern waters? This chapter seeks to explore these questions through a discussion of our research findings²⁴ into the angling experiences of international visitors in the southern waters.

Methods

Our findings were generated using a mixed methods approach. The first part of the study involved the distribution of a survey to international anglers ($n = 749$) who had purchased a Fish and Game New Zealand whole season fishing license during the 2014/15 season. The survey included several sections that broadly focussed on the characteristics of overseas visitors

who fish in New Zealand, specific trip characteristics of overseas visitors, and their satisfaction with the New Zealand angling experience. The survey also included a number of open-ended questions, for example '*Do you have any other comments about your angling experience in New Zealand*'?, which allowed anglers to expand on their survey responses, and the discussion that follows focuses on data from these. Follow up interviews ($n = 24$) were also conducted with regular angling visitors to New Zealand in order to further probe what the angling experience means to international anglers and how, if at all, this has changed over time. The data from the open-ended survey questions and the follow up interviews was analysed using thematic analysis.²⁵ The following sections include direct participant quotes and these were chosen on the basis that they best represent the theme being discussed. Quotes generated from the survey are presented along with the respondent's country of residence. Interview quotes are presented with a pseudonym name and the interviewee's country of residence.

Findings

This section seeks to illustrate the ways in which the southern waters are being experienced by international anglers. Our findings demonstrate that, for most overseas anglers, fishing the southern waters is still about an Eldorado-like experience. For some, though, this experience is being slowly diluted by a number of human induced factors. At the same time, those who are witnessing an erosion in the quality of their angling experience are beseeching policy makers not to follow the same path of destruction as has happened in other popular angling areas around the world. Many of our international anglers originate from parts of the world where

Crystal clear southern waters (Ian Hadland, Fish and Game New Zealand).



pollution, water abstraction, and other changes to waterways have seriously impacted upon their fisheries.

Our study findings suggest that these anglers, and particularly those who have been witness to the negative changes in the quality of their angling experience, are now sending an important ‘early warning’ to fisheries management agencies such as Fish and Game New Zealand and more broadly to New Zealand’s government. They have seen first-hand how human impacts on the waterways have caused an almost irreversible level of destruction and they are begging us – for our sake and theirs – to learn from these mistakes. Their wealth of experience combined with a strong sense of place attachment to the southern waters also means that these international anglers want to be an active part of the solution, primarily through adopting a citizen science approach. Such an approach carries the potential to provide fisheries management agencies with data on various aspects of the freshwater fisheries, their status, evidence of deterioration and other useful data that can feed into the on-going management of the waters.

Eldorado

For international anglers the promotion of the New Zealand experience, often with the southern waters at its core, has been successful. Either as a result of effective marketing, word of mouth, old fishing tales, folklore or past experience, 15% of all fishing licence sales during the 2014/15 season were generated from non-residents.²⁶ Most of these visitors were experienced fly-fishers who visit New Zealand and other angling destinations on a regular basis. The southern waters represented the ‘draw-card’ angling destinations, with 45% of respondents indicating that either



Southland (27%) or Otago (18%) was where they fished the most during their visit.²⁷ And, by and large, the vast majority of these anglers thoroughly enjoyed their southern waters angling holiday and continue to benefit from a ‘wild’ and ‘unique’ experience. Comments such as these were prevalent:

*Bar none - the best fishing experience in my various fishing travels around the globe ...
Pristine, relatively low angler density.* (Survey respondent, Singapore)

*The scenery and landscapes are beautiful, the rivers and fishing opportunities are almost
endless.* (Survey respondent, Germany)

*Just love the opportunity to go to secluded rivers to enjoy the ambience, scenery and fishing
opportunities.* (Survey respondent, Australia)

*It is to come and fish in beautiful environments where you can stalk large individual rainbow
and brown trout in crystalline water.* (David, interview, USA).

These sorts of comments attest to the vitality of the southern catchments and in many ways provide some rebuttal to critics of the 100% PURE ideal. Whilst satisfaction levels were generally high, international anglers did, however, highlight other worrying issues that seriously threaten to devalue, dilute or perhaps even destroy fully the ‘unique’ experience that is angling in New Zealand. As one angling guide from the US warns:

*The attraction that was once New Zealand and what is lessened today is the uniqueness of
the fishery. New Zealand has a great national resource that isn't getting protected enough.*
(David, interview, USA)

It is comments such as these that paint a worrying picture of a freshwater resource that is being neglected or perhaps even taken for granted.

Eldorado no more?

Non-resident anglers appear to have serious concerns about the damage being caused to the waterways by intensive agriculture and increased intrusions. This respondent for example, a regular visitor since 1978, outlined his concerns about issues associated with intensive agriculture:

*I mostly fish the Taieri System and have been doing so several times a year for about 15 years.
The fishing is still good but it is deteriorating as levels of pollution from farming increase
in the streams, especially in the river below the Paerau Power Station. Insect hatches are
now less reliable than before and the condition of the fish seems to be falling off.* (Survey
respondent, Australia)

Comments such as this provide evidence in support of other research^{28,29} highlighting the negative effects of agricultural production on the freshwater resource and they also appear to

affirm a growing sense of scepticism with the 100% PURE ideal:³⁰

In the 15 years that I have been angling in Otago, there has been a noticeable deterioration in water quality, especially in the Taieri system. New Zealand's claim to being "100% pure" is approaching farce. (Survey respondent, USA)

The ... issue New Zealand has is dairy! The excessive use of fertiliser and water is ruining water quality ... New Zealand Pure will be no more if this continues and the evidence is clear. (Survey respondent, Australia)

Anglers also raised other concerns in relation to crowding – an issue that has been highlighted in the past³¹ – access and etiquette:

It is now far more crowded than it was 15 years ago, the fishing pressure has led to a general reduction in average fish size, or it could be didymo,³² or both. Due to pressure, confrontations are happening more often. There seem to be more landholders refusing access or being ambivalent, more go away signs, possibly also due to pressure, a few obviously have deals with local guides, although they will never admit it ... Ignorance and/or arrogance is leading to more confrontations on the water. (Survey respondent, Australia)

We have encountered increase in jumping in ³³... which is very frustrating. (Survey respondent, USA)

It would appear then, based on the experiences of international anglers, that the southern waters are not only facing similar pressures as other global angling destinations but the rivers, lakes and streams that make up the catchment may also be struggling to contain the impact of these pressures.³⁴ Promisingly though, there are clear signs that international angling tourists want to be a part of the solution and be involved in the management and conservation of the freshwater resource.

A common cause

Our study suggests that it is the sense of uniqueness that keeps international and domestic anglers returning year after year to the southern waters. Perhaps then, just as they share similar enjoyment of and concerns about the freshwater resource, the resident and non-resident angler also shares a common purpose: to protect the unique experience that is New Zealand angling, and in particular those activities that take place in and around the southern waters:

Any activities which serve to raise awareness of how fragile the freshwater systems in New Zealand are and increase the public awareness of these issues. Very important to maintain public access to waterways and avoid the privatisation of sections of rivers for the elite or wealthy. (Survey respondent, Germany)

Authorities may wish to compare New Zealand with other countries, where habitats are being destroyed by ever intensifying chemical agriculture, and banks/beds straightened in

flood management schemes, hydropower interrupting natural flows, as well as local climate change impacts. Trout are the best bio-indicator of the overall health of an environment. Please take a long-term view and defend their interests. We anglers are just spectators.
(Survey respondent, Hong Kong)

Comments such as these demonstrate how international anglers share the same sentiments as domestic anglers and, indeed, the wider New Zealand public in respect to the freshwater resource, where water-related issues are considered the most pressing environmental issue.³⁵

Interestingly, it is the backcountry waters that tend to receive the most attention from the New Zealand government and from Fish and Game New Zealand, and these waters will inevitably, given their aesthetic appeal, form the cornerstone of future fishing tourism-projections. Our research suggests, however, that it is the lowland rivers in the southern catchments that are the most used type of waterway for visiting anglers. Subsequently, there was a strong suggestion from non-residents that Fish and Game New Zealand lobby government more strongly on behalf of the lowland rivers:

Seriously, do all you can to preserve your streams and the life they support. They are a world-class asset you have been entrusted with and we depend upon you to look after them. I am particularly concerned about the potential impact of bulk dairying on lowland streams. More effort is required to apply approval conditions on such industries to treat their effluent including the concentrations of suspended solids and nutrients. (Survey respondent, Australia)

Comments such as these allude to the fact that international anglers have in their midst a passionate, committed, knowledgeable (and potentially influential) group who want to be part of the solution. If galvanised into action or, at the very least, afforded more opportunities to be heard, these anglers represent a group who are willing to serve as guardians of the waterways *alongside and with locals* and not against them. It is, then, perhaps about engaging the regular angler in practical support. As one visiting angler to Otago stresses:

It is the responsibility of anglers to be custodians of what they enjoy. (Tim, interview, UK)

In this respect international anglers have the desire to offer tangible support for waterway conservation. A willingness to be involved, according to another UK based angler:

Makes you feel a part of it then, you don't just feel like a punter. (Sarah, interview, UK)

Such willing commitment on the part of volunteers also addresses the practicalities of human resource limitations within organisations such as Fish and Game New Zealand via the creation of:

A cohort of people. You have eyes and ears on the ground that you could never possibly manage through paid staff. (Sarah, interview, UK)

The idea of involving recreational fishers in conservation is not new and, elsewhere around the world, a range of initiatives have been implemented to help mitigate some of the issues that have been outlined in this chapter.³⁶ Initiatives have included the development of coalitions and stakeholder collaborations, all of which have proved hugely successful. International anglers in our study spoke in depth about the possibilities of citizen science and their potential involvement in projects and they also shared examples of outreach initiatives that have been successful in their home countries.

A potential role for citizen science and outreach

Some United Kingdom based anglers in our study offered practical solutions that could be implemented in order to raise awareness about the specific impacts of effluent run-off, including a ‘citizen science’ approach to fly-life monitoring. One interviewee, for example, identified the potential of fly-life monitoring in response to the successes that have been witnessed on his local chalk streams. In respect to the feasibility of such initiatives on New Zealand waterways, he suggested that fly-life monitoring could be an excellent way of gathering relevant data on fly-hatches which, at the same time, could encourage greater involvement of visiting anglers, domestic anglers, guides and angling clubs toward supporting conservation goals. Portable kick trays/sample trays could be made available in Department of Conservation huts, for example, and a network of monitoring sites developed. Guides could also play a critical role in regular fly-life monitoring and this could also be an attractive ‘ecocentric’ add-on to current fishing packages. The end goal, of course, would be that resident and non-resident anglers, together, could help gather the relevant data for comparative purposes (i.e. fly-hatches where intensive agriculture takes place compared to those where none takes place).

In addition to citizen science, the benefits of outreach initiatives aimed at stakeholder collaboration were also heralded by international anglers as an effective way for fisheries management agencies to work with – rather than against – landowners (and specifically dairy farmers). In relation to the differing interests placed on land-usage there is the perception amongst international anglers that farmers are only interested in the short-term financial benefits that can be accrued from milk production. However, given the potential short-term future for milk demand in New Zealand, there could be an opportunity to work effectively with farmers to demonstrate the financial benefit that can also be accrued from fly-fishing activity on rivers adjoining their land. By diversifying into angling tourism, farmers may then have a vested interest in maintaining good water quality.

Another interviewee from Australia provided some excellent suggestions about how local partnerships have worked in Australia. In the case of the Murray Darling Basin, the numerous stakeholders that have a vested interest in waterway/fisheries management have been prompted to join together to support river rehabilitation programmes, each of which are specifically tailored to a certain river. Collaboration is based solely on a shared understanding of the long-term importance of clean waterways and, importantly, these instances of community engagement and the subsequent improvements to freshwater habitats have all served to effectively draw more support from central government. As the interviewee pointed out, this type of broad strokes approach is ‘a win/win’ for all fishery users but, ultimately, success is

reliant upon effectively engaging with the farmers who influence the politicians. Whilst the work conducted as part of demonstration outreach relate(s) primarily to Australian habitats most of the principles and ideas can be applied to projects involving trout habitats in other parts of the world (such as the southern waters).

Initiatives such as these in the United Kingdom and Australia, together with evidence from those that have been implemented elsewhere³⁷ serve to highlight the benefits that can be accrued from utilising anglers in the conservation and management effort. In order then to help minimise future negative impacts to the southern waters, international anglers have the propensity to provide a stronger voice to aid other domestic freshwater advocacy groups such as Fish and Game New Zealand and the Royal Forest and Bird Protection Society of New Zealand in achieving their conservation/management aims.

Discussion and Conclusion

The New Zealand angling experience, with the southern waters at its core, is arguably still unique in the sense of being largely clean, green and even pure. However, for some anglers, the 100% PURE projections did not match the reality of their angling experience here. In many ways, these perceptions of international anglers can serve as a barometer for managers of New Zealand's freshwaters, alerting them to act before it is too late. As one angler implores:

It would be a tragedy on a worldwide scale if New Zealand didn't keep itself unique for what it is. (Tim, interview, UK)

Such a comment underpins a more general feeling of urgency, one that suggests the pressure on the southern catchments, brought about by intensive dairy farming and other human-induced factors, may soon become so acute that any recovery from the subsequent negative impacts will be difficult to achieve and will require major commitment. International anglers know this because they have seen it happen in their home countries, and in their local catchment areas.

The sense of uniqueness that continues to draw visitors back to the southern waters also appears to have nurtured a strong sense of environmental place attachment toward the region (and New Zealand as a whole). This sense of attachment amplifies international anglers' concerns that New Zealand may follow in the footsteps of other angling destinations where economic goals related to intensive farming, for example, have been achieved at the expense of freshwater quality. Rather than turning a blind eye to the issues they are witnessing, international anglers are actively challenging the traditional, and arguably taken-for-granted notions of 'clean and green' purity associated with New Zealand's freshwaters. Given the urgency of the situation and in light of their commitment, sense of custodianship, and vested interest in fishery conservation, international anglers are willing to help avert a potential tragedy.

There is then a potential role for citizen science. International anglers bring a wealth of experience to our waters and can be as engaged in the protection of the southern waters. In this sense there is the potential for the southern waters to serve as a staging ground in the creation of an international community of care for our waters. Indeed this may offer a true

operationalisation of what the concept of ‘World Heritage’ should actually be – where we have a mass of critically engaged global citizens.

An important question is how can we maintain, grow and make use of this knowledge and goodwill and build it into a critical mass that can drive positive change in the southern waterways? Examples outlined in this chapter illustrate how citizen science approaches have been successfully adopted in the UK, Australia and Mongolia. Other instances of recreational anglers successfully serving as conservation partners exist elsewhere. For example in South Africa recreational anglers have been involved in a different form of citizen science whereby their experience and knowledge of the Yellowfish species has been harnessed in the development of formal conservation strategies.³⁸

Interestingly however, in each of these examples of citizen science the focus has been on domestic anglers as conservation partners rather than international visitors. The willingness on the part of international visitors to New Zealand’s southern waters to be involved in the conservation and management of freshwater resource therefore raises some additional questions. How can the non-resident angler play an active role, as legitimate stakeholder in protecting these waterways? To what extent can the knowledge and skills of this group be channelled and operationalised in freshwater decision making? Perhaps in part, these questions are better suited to a much broader discussion about who actually ‘owns’ the freshwater resource, and who is ultimately responsible for its protection. In order to embolden the cause of protecting the valuable resource that is the southern waters – and indeed for wider New Zealand –these questions need to be addressed as a matter of urgency.

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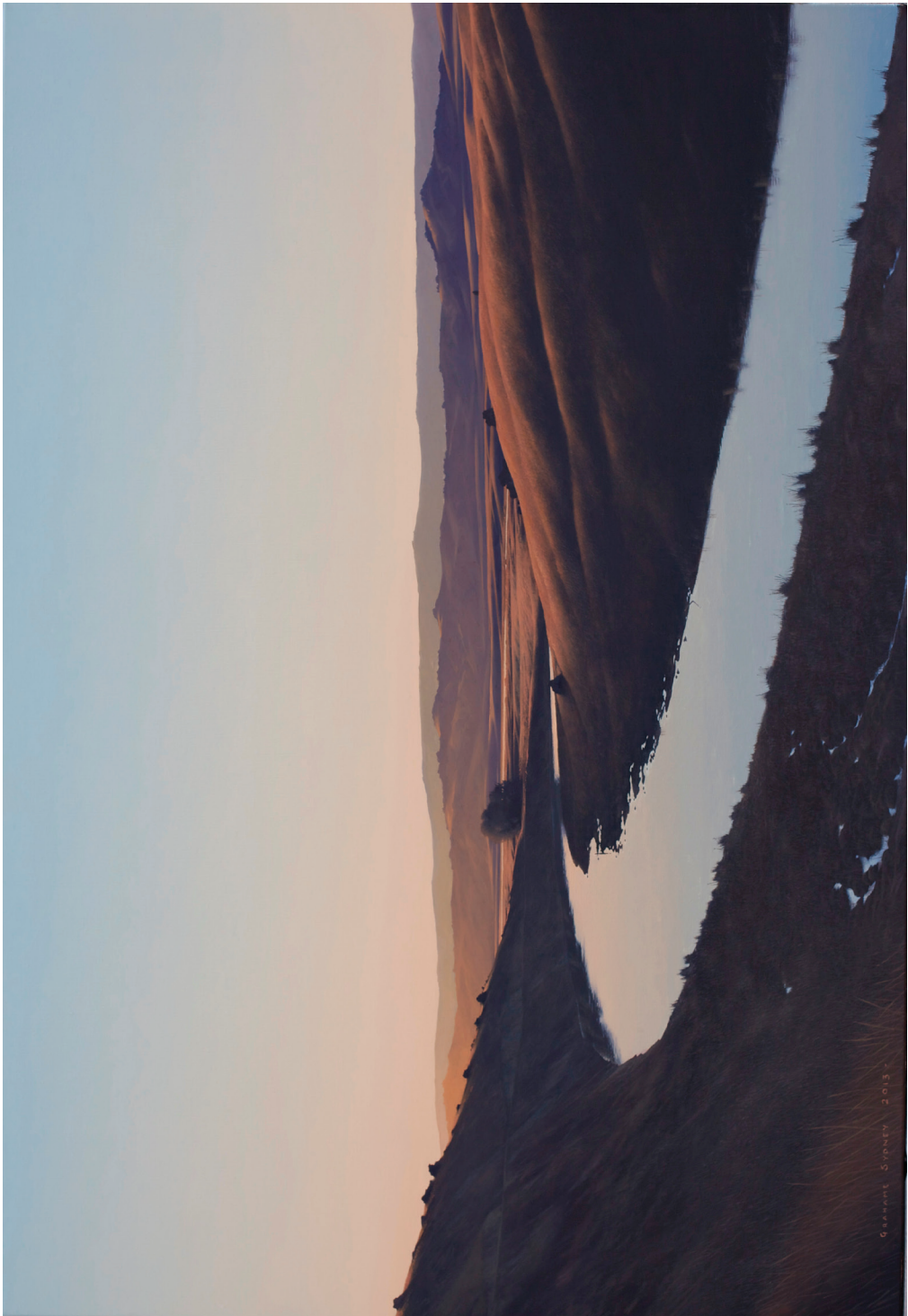
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