

This book explores diverse ways to uncover groundwater stories. The contributions to this collection emerged from a symposium held at the University of Melbourne and a fieldwork day on the Barwon Downs in March 2021. The collection brings together ideas from twelve of the participants: community water activists, farmers, creative writing scholars, artists and hydrogeologists. Ranging from scholarly essays, memoir, to fiction, poetry, and artwork, the writing builds from the science of hydrogeology to tell some of the groundwater stories of the Barwon Downs Borefield.

Interdisciplinary projects between the humanities and the sciences are not common. A cooperative undertaking between hydrogeologists and creative writers, artists and community members is particularly rare.

Collaboration between a wide range of people strengthens the diverse voices of groundwater heard in this book. Ultimately, the voices of subterranean aquifers ring out, asking to be heard.

### Editor and Contributors

Deborah Wardle has researched subterranean imaginaries and groundwater's narrative potency through a PhD dissertation (held in RMIT Research Repository) and ongoing research and Australian and international publications.

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ISBN 978-0-646-89301-3



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UNDERSTANDING AQUIFERS THROUGH GROUNDWATER STORIES

# Understanding aquifers through groundwater stories

A collection of writing  
from a fieldwork day on  
the Barwon Downs borefield

EDITED BY DEBORAH WARDLE



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## ACKNOWLEDGEMENT OF COUNTRY

The book was prepared on unceded Country of the traditional owners of Dja Dja Wurrung Country; the symposium was held on Country of Wurundjeri, Woi-wurrung and Bunurong peoples, the fieldwork occurred on Wadawurrung Country. I pay my sincere respects to Elders past and present and honour the original custodians of lands and waterways in each of these territories. I acknowledge the deep knowledge and care that Traditional Owners have for subterranean waters.

## FUNDING AND IP ACKNOWLEDGMENT:

The original research received seed funding (2020-21) through the Melbourne Sustainable Society Institute (MSSI), a program of the University of Melbourne. MSSI closed operations in 2022. Its replacement at the University of Melbourne, Melbourne Climate Futures, does not make any claim by UoM over the IP of this academic work. Donations from three participants were received to fund the publication of the book, as a hard copy and an e-version.

Publisher: Deborah Wardle Books

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Cover Image: Oliver Wardle

Book Design: Lisa Major – Subgreen Design [subgreen.com.au](http://subgreen.com.au)



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[www.otwayrangessubterraneanationalpark.org.au](http://www.otwayrangessubterraneanationalpark.org.au)

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# Foreword

Peter Dahlhaus and Tim Peterson

Groundwater has long been the subject of imaginative visions, myths and mysticism. Seen only in discharge features such as springs, seeps and wells, it has been attributed with magical powers, such as miraculous cures, restoring youthfulness, and bodily and spiritual healing. From ancient times to the present day, groundwater discharge features have spawned cities and tourist resorts, built around mineral-rich and thermal groundwater springs, desert oases and village wells. Temples, healing centres, hotels, bathhouses and bathing pools have been erected over groundwater discharge features. In modern times groundwater remains a resource bank, exploited with increasingly sophisticated technologies to support human endeavours.

Being an invisible resource, groundwater processes must be imagined. For scientists, this clearly places it in the uncomfortable space of subjectivism, bridging humanities and science. Groundwater scientists – hydrogeologists – imagine groundwater bodies through conceptual models constructed using the laws and logic of Earth sciences, substantiated by observation and measurement. However, a science that relies heavily on imagination has a certain level of subjectivism. It is not uncommon for a lecture in groundwater hydrology to commence with the phrase ‘Imagine you are a drop of water in an aquifer ...’ to explain how gravity forces and hydrostatic pressure push groundwater through labyrinthine interconnected pores and fractures in rock formations. But in the lecture hall, each of our imaginings is different because it is subject to our experience and knowledge. As the old adage says, ‘The best geologist is the one who has seen the most rocks!’

By comparison, art starts with imagination, which is only tempered to make it accessible to the intended audience. Artists thrive on subjectivism, often delighting in the various interpretations of their works. While to some scientists or engineers the concept of giving groundwater a voice may seem absurd, or a fallacy to sentimentalise natural phenomena, to an artist or writer

it is an intuitive way to visualise and explain the importance of an unviewable resource to a wide audience. For that reason, this project, so creatively conceived and implemented by Dr Deborah Wardle, is an important experiment in bridging art and science across their subjective imaginings of groundwater.

The value of groundwater to the Earth's systems cannot be overstated. In the geosphere it creates and shapes landforms, dissolves and precipitates minerals, and lithifies sediments. In the hydrosphere it sustains baseflows to waterways, wetlands and coastal environments. In the biosphere it nourishes plants and animals in groundwater-dependent ecosystems. In the anthroposphere it provides humankind with obvious economic, environmental, cultural and social values. After all, water 'belongs' to us all and in most (but not all) countries groundwater is managed through statutes that increasingly recognise these values should be protected.

But the value that groundwater brings to our communities is often underrated by the legislation, which may no longer accord with community expectations. Global discord is manifestly shown through increasing community anxiety and concern over the impacts on groundwater resources and values from changing climates, population growth, mining and quarrying, energy generation, urban consumption, agricultural irrigation, water bottling, and fracking, to mention only a few. Communities are more vocal in disputing the legal allocation of groundwater resources, and pointing out groundwater misuse, overextraction and pollution, and poor policing of the legislation.

Some years ago, at an international groundwater congress, the conference satchel surprisingly contained a compact disc of Musical teaching material on groundwater. Vol. 1: Awareness (González 2003) commissioned by the conference organising committee. It is an eclectic collection of songs with upbeat Latin-Mexican-style music and lyrics that implore the listener not to waste, pollute or mismanage (ground)water. It reminds us that both the artist and the scientist share the same aspiration, albeit stated in totally different forms.

Community concerns are important and need to be heard by policy makers and their scientific advisers. It is the community

who are the early witnesses to the impacts of unsustainable groundwater exploitation: when their wells run dry, waterways stop flowing, land subsides and vegetation withers. At the local level, this is the case in the Barwon Downs borefield, and some of the community's stories are told in this volume. The herculean effort of making their voices heard, to raise a plaintive cry for the silent groundwater, eventually instigated change and action. It remains a credit to them.

It has been a real joy to be involved in this research project. It has been such a respectful exchange of knowledge that has challenged our scientific sensibilities, triggered philosophical discussion and made us wiser. Learning more about the cultural and spiritual values of groundwater, the discomfort of listening to stories of the community's battles with arrogant scientists, and pondering the literary prose and poetic verses are all essential sustenance to revise a scientist's imagining of groundwater.

**Peter Dahlhaus and Tim Peterson, 2022**

## **Reference**

González SA (2003), Material didáctico musical en aguas subterráneas. Vol 1: Concientización, Centro de Geociencias de la Universidad Nacional Autónoma de México.

# Understanding aquifers through groundwater narratives. An Introduction

Deborah Wardle

Exploring meanings of groundwater through storytelling invites creative and imaginative thinking. In Australia and internationally, an unsustainable, resource-usage perspective is the dominant way of thinking about groundwater. This is based solidly on colonial and extractive perceptions of Country. There is dissonance in many of the conversations about groundwater's increasing scarcity and pollution, particularly between Indigenous Australians and non-Indigenous groundwater managers and users. The stories and essays enveloped in this collection of writing represent a hope that the discord of perceptions about groundwater may spark new ways of thinking with water (Chen et al. 2013). Thinking with water is a cultural activity, using language and knowledges about a medium, a materiality, that is both us and not us, human and non-human. Groundwater may 'speak' for itself, through its own materiality and material actions. It also speaks in literature through human-ascribed metaphors and stories. Its announcements and conversations are muted, murmuring quietly, sometimes mundanely. As humans, we might incline ourselves forward, ears cupped, to listen to a quiet voice. This collection invites readers to listen to a diverse spectrum of expressions of groundwater.

The collection illustrates a conjunction of knowing and not-knowing groundwater's stories and voices. Hydrogeology helps us know much about groundwater, but at the same time distracts us from various wider knowledges. Fragments of images across this collection cross over and repeat to build a picture of a day on the Barwon Borefields. The underlying tones to the collection are groundwater's voices, each coloured by geographical locale, political nuance and primarily groundwater's connectivity to storytellers. Each writer here adds a piece to a mosaic that tells a story with aquifers.

I completed my PhD in 2019, where I investigated 'storying with groundwater' through creative writing practice, particularly through climate fiction (Wardle 2019). I continued an interrogation of how writers can bring creative approaches to understanding unseen, subterranean water bodies, predominantly through a research project seed funded through the Melbourne Sustainable Society Institute (MSSI) at the University of Melbourne. This project aimed, among several aspirations, to bring writers and hydrogeologists together in workshops and an excursion, to develop ways to represent groundwater's potency and vulnerability in Australian cultural narratives in response to climate change. The project ultimately engaged writers, hydrogeologists, artists, community members and representatives from a regional water authority in a collaborative process aiming to develop understandings of the 'wicked problems' of groundwater's blurry boundaries. The following collection of work is one of the outcomes from this project. I have also published several scholarly essays in Australian and international journals exploring themes from my research. Many of the ideas initially explored in this collection are taken up in more detail in my book *Subterranean imaginaries and groundwater narratives* (Wardle 2024). The book expands upon processes of storying with groundwater, writing creatively from foundations of hydrogeology, and develops an epistemology for creative writers to consider knowledge of groundwater in climate writing.

Groundwater means waterflows in underground aquifers where the interstitial spaces in solid rock and soil are filled or saturated with water. It seeps from place to place according to the effects of gravity and rock and soil types. It generally moves very slowly. The

underground flows of groundwater from recharge zones, where rains or rivers seep into porous geologies, to discharge zones may take thousands of years. Aquifers can be thousands of metres deep through to just below the surface. Springs, swamps, watercourses and coastal areas are some of the places where groundwater meets surfaces. The flows and qualities of groundwater vary according to geologies, climate patterns and landscape ecologies (Fitts 2013). The enormous realm of hydrogeological and associated scientific research is an important basis for understanding aquifers and the works collected in this publication. That groundwater and its effects in wide-scale environmental coherence are not easily seen by many people means that the lens of science becomes important in unravelling what is known and what is still to be known about groundwater's movements and interactions. Highly experienced hydrogeologists contributed information to the writers and scholars who participated in the project, aiming to ensure that the emergent writing had accurate foundations. I acknowledge them at the end of this book.

A rare player in Australian literature, groundwater is generally under-represented in fiction, poetry or creative non-fiction (Wardle 2024). This premise underpins the Understanding Aquifers project. Fictional and poetic impressions of groundwater are rare – it is hard to see and difficult to imagine. Wrestling groundwater from the complexities of science into an artistic form is the challenge that participants were invited to consider. Aquifers are not at first beautiful, scenic or pastoral, though groundwater's presence and absence can deeply affect surface appearances. The aim of this project was to continue an exploration of ways to express the material forces of a near-invisible body of subterranean water.

The Understanding Aquifers through Groundwater Narratives project (as funded by MSSSI) evolved into the stimulation of the diverse writing and artwork in this collection.

The project acknowledged with deep respect the ways that Indigenous people have for millennia storied the non-human entities of Country and continue to do so through the work of many activists and outstanding Indigenous writers and artists. The predominantly settler participants were invited to engage with Indigenous knowledges through listening to Indigenous

voices in readings of Indigenous-authored texts. The involvement of Dr Vicki Couzens in the symposium and her contribution to this collection are respectfully appreciated. Her deployment of Gunditjmara language activates the ways that language connects communities to place.

The writing for this collection emerged from two events held in March 2021 in a rare window of time between COVID-19 lockdowns in Victoria, Australia. An invitation was issued through a wide network of creative researchers, environmental humanities scholars<sup>1</sup> and groundwater-focused community members to attend the Understanding Aquifers provocation symposium at the University of Melbourne, and a day-long excursion to Barwon Downs borefield. Both activities enabled participants to see and consider places where groundwater's 'voices' were being expressed. The symposium on 15 March 2021 attracted 12 participants from various creative, scholarly and community perspectives in a dual-mode activity (face to face at the University of Melbourne and online). Hydrogeologist Dr Tim Peterson (Monash University) delivered a presentation on the foundations of what groundwater is, how it might be 'seen' and the experiences that fuel his passion for hydrogeology. Tim gave several examples of the effects of groundwater on landscapes and human civilisations over time, rurally and in urban settings in Australia and internationally. Groundwater, Tim explained, had a role in the Industrial Revolution, in the spread of agriculture and in the development of many cities. The complexities of groundwater flow paths and catchment boundaries were introduced. Foundations for the writing activities were laid. Next at the symposium, Amanda Johnson and I introduced the cultural dilemmas of writing with a focus on the 'voices' of non-human entities, particularly emphasising the importance of acknowledging the effects of climate change. Writers attempting to convey the perilous

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- 1 Networks that spread the invitation included ASLEC-ANZ, Nonfiction Lab (RMIT), Ecofeminist Fridays (University of Melbourne reading group), Sydney Environment Institute (University of Sydney), and J.M. Coetzee Centre for Creative Practice (University of Adelaide). Community members involved with the Barwon Downs borefield also distributed invitations.



conditions of ecocide and climate catastrophe were invited to lay aside romantic notions of place writing. Navigating writing *with* aquifers, rather than *about* aquifers as if they are separate from humans, was the theme of lively discussions.

The following Friday, 19 March 2021, 16 participants met at Birregurra, Victoria for a day-long excursion across six sites of the Barwon Downs borefield, led by Associate Professor Peter Dahlhaus (Federation University). The excursion attracted participation from community groundwater activists, two representatives from the Barwon Water authority, as well as writers and artists from four Victorian universities. Starting and finishing on the banks of the Barwon River near Birregurra, participants saw the effects of massive groundwater extraction for urban and rural demand on farming lands and forests, streams and swamps. At each site, I presented readings from literature and scholarship, emphasising the possibilities of ‘torquing ... our imaginaries so that matter can matter differently’ (Neimanis 2017:5).

At each of the six sites visited, Associate Professor Dahlhaus explained the deep time and contemporary geology and hydrology of the landscapes we observed, and the history of groundwater extraction and its effects. For over forty years Peter Dahlhaus has investigated the geology, geomorphology, soils, groundwater and geohazards in southwest Victoria. He has been influential in applying his scientific knowledge to direct policy on salinity, soils and catchment management. Peter is well-known as a science communicator by his students and community groups, and as an independent advisor to Catchment Management Authorities, (CMAs), domestic water supply authorities and municipalities in the region. He conveyed information based on contemporary science and a long-held understanding of the conflicts and complexities in groundwater narratives. The interweaving of scholarly cultural thinking with hydrogeology, and with the potency of creative narratives, embodied the aims of the activity.

The following chapters are observations and investigations from participants in the Understanding Aquifers project. The collection of writing presents a multifarious spectrum of observations and reflections. Each piece illuminates the potential and challenges of writing groundwater narratives as each author

strives to express groundwater's enmeshments with human and non-human ecologies. Expressing the potency and vulnerability of groundwater's essential life-giving roles to both surface and subterranean ecologies, within the context of climate change and increasing demands for groundwater extraction, makes the efforts to creatively give expression to groundwater narratives important and timely. Climate change-fuelled threats of extreme weather events, including both severe surface water scarcity and intermittent flooding, affect groundwater reserves in many complex ways. At the same time, the history of groundwater extraction in the Barwon Downs borefield region for over 40 years to provide water for growing populations (e.g. Geelong), combined with expanding agriculture and industry, has caused serious environmental damage to waterways, forests and swamps. Diverse ways of expressing various groundwater stories were invited. Environmental, political, social and economic threads to these stories interweave in this collection. 'Understanding Aquifers' introduced to participants the aim of disrupting a human-centred way of viewing groundwater's expressions.

I started the Understanding Aquifers project with the perspective that 'groundwater's potency and fragility in the Anthropocene, its scale and invisibility, its links to ecological and anthropogenic calamities, and that it cannot be directly experienced in the manner of flood, storm and tempest, puts it in need of narration' (Wardle 2019:vii). The project aimed to draw attention to the social, cultural and political imperative for engagements with the 'storied matter' of non-human actors (Iovino and Oppermann 2014), and aimed to show writing that expresses the necessary urgency for action on climate change. Initially, the project was structured to increase participants' awareness of the science of groundwater, of the knowns and the uncertainties of subterranean water flows. Eventually, it led to new understandings of human relationships with subterranean water flows.

Some of the 'provocations' we worked with at the symposium and the excursion were quotations from selected readings. We started with an excerpt from Alexis Wright's *Carpentaria* (2016). Wright tells an epic story in the voices of her ancestors, at times in the voice of the Country itself. In her description of the conflicts between Indigenous and non-Indigenous residents of the fictional Gulf of

Carpentaria township Desperance, Wright intertwines ancient and contemporary stories of Indigenous law and culture. The shaping power of waters and Country are felt in the lyric and galloping storytelling of *Carpentaria*. When laying out the foundations of the Serpent narration, the Serpent creation of rivers and Country near the start of the novel, the author writes:

This is where the giant serpent continues to live deep down under the ground in a vast network of limestone aquifers. They say its being is porous; it permeates everything. It is all around in the atmosphere and is attached to the lives of the river people like skin. (Wright 2006:2)

Wright's fiction invites readers to find connections with both surface and subterranean waters. Likewise, Deborah Bird Rose's essay on the 'poetics of fit' invites humans to hear the call of water and to understand 'the patterns of pulses and flows of water through which living being are brought into webs of life' (Rose 2014:432). Wright and Rose remind us that the poetics of writing are often formed in hidden places, and ask readers/writers to dig deep, to dwell in such places. In a similar way, the concept of shadow waters (McLean et al. 2018), derived from Val Plumwood's (2008) discussion of shadow places, invites analysis of the blurry spaces where water's power as a narrative force is acknowledged.

On a windy hilltop, we read an excerpt from 'Baweka Country' (Baweka Country et al. 2018). The multiple authors of this article, including the voice of Baweka Country itself, invite writers to think 'Who is the We?' (Baweka Country et al. 2018:62). Who are 'we' when we write groundwater stories? The question was asked of participants to provoke thinking about the shaky and permeable identities we each bring to our writing. Each of the pieces in this collection is individually authored. The collection reflects individual experiences and viewpoints, yet together as a collection the works create a way to construct readers' knowledge about groundwater.

Another example of the concepts we drew upon during the excursion was in a reading from Elaine Gan et al. from the introduction to *Arts of living on a damaged planet*:

In the midst of disaster, stones bring a gift of hope: of fortune, of insight, of the possibility of living with. In the Anthropocene, multiple conversations with stones are necessary. After all, the Anthropocene is a geological epoch proposed by geologists, climate chemists and stratigraphers – scientists used to studying stones, rocks, sediments, and chemical cycles. In the Anthropocene, they suggest, humans have become a geological force. (Gan et al., 2017:G11).

The reading inspired participants to consider their roles as Anthropocene forces and, in learning just some of the stories of groundwater, to build ideas from the insights of hydrogeologists, ethnographers and poets.

Each of the readings gave participants starting points of ethics and cultural insights and, while accepting the impossibility of ‘reconciliation’ between subjects and objects, between culture and nature, participants worked towards the recognition of human integration in a shared, ‘vital materiality’ (Bennett 2010). It was the ‘vital materiality’ of groundwater, the signs of its ‘forces’ and acts in relational processes, that we looked for.

The collection includes poetry, fiction, memoir, ekphrasis, a scholarly essay and creative non-fiction that participants produced in response to either or both of the provocation symposium and/or the excursion. Being on Wathaurong Country provided an embodied experience to locate each participant’s experiences and observations in ways that respected First Nations custodianship of the places we visited.

The following ten works in the collection open with Vicki Couzens’ translation of ‘Sing up Country’, an evocation of water places and locality. Relational connections to both surface and subterranean places are founded on and modelled by Indigenous relationships to Country. Vicki’s reclaiming of Country through local language reclamation reminds us that the words we use in speech and writing embody the relationships we aspire to. Kaye Gardiner’s reflections on the day express the mood that permeated the excursion in poetic form, giving shape to the chronology of activities. Marina Lewis opens the discussion of what language an aquifer might speak, reflecting on the work of fellow participant Malcolm Gardiner, who has raised the environmental repercussions of overextraction of groundwater in this region for decades. Marina’s work acknowledges the passion and pressures

of water activism and the importance of a human voice to speak groundwater's plight. Associate Professor A Frances Johnson provides a scholarly examination of colonial and settler poetry to the collection in her essay 'Deep leads and shadow places: Poetry's ecocritical subterranean'. Drawing on several poems and groundwater scenarios from around Australia, the essay reminds the reader/writer that, to render groundwater stories, writers 'walk the shadow places'. Jane Bartier's 'Compression blanket' gives material expression to groundwater through the practice of weaving and drawing. Images of her work that were inspired by her participation in Understanding Aquifers reveal the connections she made between the energies of groundwater and surface stillness. Local farmer Stewart Mathison writes of his historical observations of water flow on the agricultural land where he lives and works. His feeling for the slow flow of water across landscapes and their interconnections are based on a lifetime of observations. Three fictional pieces emerged in the collection. Malcolm Gardiner writes a triptych, starting with the platypus wars, anchoring the story with platypus diaries between 1975 and 2018 that depict the loss of habitat and platypus populations on local waterways, and finishing with a reflection. The platypus diaries are written from the perspective of Olly platypus. The reader learns of the fires of Big Swamp and the effects on several species. Malcolm has written and lobbied for decades on groundwater damage in the Otway Ranges, predominantly through the website he curates, [otwaywater.com.au](http://otwaywater.com.au). Malcolm shares his long-term passion and commitment to portraying the environmental effects of groundwater extraction. Also in a fictional form, Jack Kirne's short story 'Bunny Sherriff' gives an urban slant to groundwater use for gardens. Covering the effects of feral animals and neighbourhood disputes, the political and social impacts of groundwater depletion are revealed through characters who are activists, social climbers, hydrogeologists and a rabbit catcher. Deborah Wardle's story, 'An Outing' explores how groundwater information is perceived from various perspectives in a small community. Five poems by Carey Walden conclude the collection, encapsulating the grief of toxic and lost water reserves.

The collection is strengthened by the diversity of tone and forms of writing. As in any healthy ecosystem, diverse players, unique voices and at times non-conforming strangeness, together bring

the distinct complexity of a niche, a concept, to life. From the many perspectives from which the participants in this project came, an overall sense of groundwater narratives is approached, though, perhaps predictably, never fully met. No collection will ever completely define a place, a scenario, a circumstance. We merely approach the place, listening, knowing our limits, knowing the actions we might take to survive, rarely knowing it all. The collection does not express it all, but presents a rich array of writing and images to help the journey of 'Understanding Aquifers through Groundwater Stories'. The initial invitation to participants was to develop thinking and writing with awareness of groundwater and the effects of anthropogenic impacts on aquifers. The Barwon Downs site enabled this to occur through the on-ground observation and experiences of exchange between the broad range of participants. Interdisciplinarity and an interchange of ideas between community members, artists, writing scholars and hydrogeologists was a strength of this project. In the relatively uncharted terrain of finding groundwater's voices, the resulting works, as collected here, invite more and wider efforts to reveal the many tones of groundwater through a wide range of literary forms.

## References

Baweka Country, Wright S, Suchet-Pearson S, Lloyd K, Burarrwanga L, Ganambarr R, Ganambarr-Stubbs M, Ganambarr B, Maymuru D and Graham M (2018) 'Mobilising knowledges, identities and places as Baweka', in Gombay N and Palomina-Schalscha M (eds) *Indigenous places and colonial spaces: the politics of entwined relations*, Routledge, Abingdon, Oxon.

Bennett J (2010) *Vibrant matter: a political ecology of things*, Duke University Press, Durham, NC.

Chen C, Macleod J and Neimanis A (2013) 'Introduction', in Chen C, Macleod J and Neimanis A (eds) *Thinking with water*, Montreal-Queens University Press, Montreal.

Fitts CR (2013) *Groundwater science*, Academic Press, Waltham, MA.

Gan E, Tsing A, Swanson H and Bubandt N (2017) 'Introduction: haunted landscapes of the Anthropocene', in Tsing A, Swanson H,

Gan E and Bubandt N (eds) *Arts of living on a damaged planet: ghosts and monsters of the Anthropocene*, University of Minnesota Press, Minneapolis, MN.

Iovino S and Oppermann S (2014) 'Introduction: stories come to matter', in Iovino S and Oppermann S (eds) *Material ecocriticism*, Indiana University Press, Bloomington, IN.

McLean J, Lonsdale A, Hammersley L, O'Gorman E and Miller F (2018) Shadow waters: making Australian water cultures visible', *Transactions of the Institute of British Geographers*, 43: 615–629.

Neimanis A (2017) *Bodies of water: posthuman feminist phenomenology*, Bloomsbury Academic, London.

Plumwood V (2008) 'Shadow places and the politics of dwelling,' *Australian Humanities Review*, 44: 139–150.

Rose DB (2014) 'Arts of flow: poetics of "fit" in Aboriginal Australia', *Dialectical Anthropology*, 38(4): 431–445.

Wardle D (2019) *Storying with groundwater: why we cry* [PhD thesis], RMIT.

Wardle D (2024) *Subterranean imaginaries and groundwater narratives*, Routledge, Milton Park.

Wright A (2006) *Carpentatria*, Giramondo, Sydney.





# leerpeen kanoo meerreeng – Sing up Country pookkarr leerpeen (river song)

Vicki Couzens

Thangang poonhort moorree-murkree pookrrakeel porroinyel-o  
poora moyjeelpang tonedeetyerer tooram weenpoorren allopoorng  
lapeeyt parreeyt lapeeyt lappeeytmopor panneetarngeete  
perrenarrerwarrer porronederneete porry warerangejele woerrer  
wornghome worrocubberreen yeddy or yereim pookarr  
weerpyoong paller paller cort poonoong poonoong Hopkins  
Falls shivering with cold middle of winter – homestead of former  
junction of Hopkins and Blacks rivers (Mt Emu Creek) night moon  
(source near Ararat) kangaroo (western kulin) near Ararat mouth of  
river near Pt Ritchie refers to lower reaches of river waterhole near  
'Buruumbeep' station salmon/tidal estuary, where the salt water  
meets the fresh water locality locality salt water – locality on river  
(dharwurd) salt salt – locality on river at 'Gibbs' – possibly Bolac  
plains locality – mopor gundidj clan locality on river locality on  
river locality locality locality at 'Mt Fairies' west of Rodger at 'Kona  
Warren' and 'Merrang' sth of Hexham locality locality locality  
(worro = 'wurru', 'lips') locality at or near Websters, Mt Shadwell  
Mortlake lower reaches mouth of river baler baler cote gundidj  
clan near Hexham waterhole near Framlingham mission station

Dr Vicki Couzens © June 2021



# A rare and special Friday

Kay Gardiner

A beautiful Otway autumn day. I am gladdened and privileged to be included. We gather, diverse in views, but rather than conflict, gentle banter, listening intently with laughter and nodding as information reaches our minds and our hearts.

We learn from each other about millenniums past and human actions in the recent past. Not to our liking. With feet of clay. With the desire to sustain life. Decisions have been and are made without due consideration for Mother Nature and acted upon.

We move on.

The easterly wind blowing in the tree tops, a gentle swish as if to whisper, thanks, our roots able now to reach sustenance. The maggies are carolling in the trees above the now closed treatment works.

Do they know, I wonder, that they too can rejoice in its demise. I am momentarily distracted from the issue at hand, to gaze towards them and thoughts of my Dad and Malc come to me as they are both connected in different ways to the magpies.

I hear the birds of the Otways, their gentle song, their chortle, the sound of their wings in flight as I toil amongst them and their sounds of alarm when 'slitherers' are about.

They calm me and enchant me with their specific characteristics. I return to hear the words ever constant in my life, such dedication is required and wholly supported to the tenth degree. Such is the love for the man and the cause.

The much-loved platypus, the black fish, the tiny others above

and below the earth need our caring attention.

Every natural living thing deserves to be considered and not jeopardised by greed and lack of concern.

We lunch in a gentle sunny place. We all are comfortable in each other's company, our lunch carefully put together in a most sustaining and delicious fashion.

On we go to the swamp where the ruination is immense.

Once again each person present is able to express their feelings and no malice is present.

Throughout our day together we are treated to beautiful excerpts of writings, never heard by me before. I will look forward to revisiting them when able.

Time to draw to a close this special day. Some share another coffee and seem sorry for the day to end. Others have long journeys ahead of them and need to depart.

A lovely concept to put this day together, poets, authors, artists, scientists, geologists and dedicated others.

Thank you all.

# Voice of the aquifer

Marina Lewis

What is the voice of the aquifer, in what language does it speak? If a voice implies presence, aliveness, a sense of agency, surely the aquifer speaks, at least in terms of human apprehension. It speaks in the language of the waterways and their creatures and plant-beings, the denizens of the 'groundwater-dependent ecosystems'. This aptly mind-bending concept challenges us to understand the relationship between groundwater and the surface waters with their dependent life. This is a fine example of anthropologist and cyberneticist Gregory Bateson's (1972) observation that relationships are the essence of the living world. For proper understanding, a language of relationship is also required. To interfere with that intimate interface of groundwater and surfaces by pumping the aquifer lowers the ancient engendering underground waters, the waters sequestered deep in sand, rock and clay. It quietyens the presence, stills the aliveness of the aquifer. It diminishes its language of life. As the streams and springs and little creeks dry, so do the living beings die, often quite quickly, and the aquifer falls silent. The Otways aquifer is falling silent.

Such thoughts arise in response to the Groundwater Provocation Day in the Otways initiated by Dr Deb Wardle, from Melbourne University, a rare event inviting participants to stand in places beholden to the unseen aquifer and ponder its presence. Many voices had a say in the day's deliberations and wanderings. We heard something of the interesting hydrology of the Otways, as well as a justification for the extreme incursion by water authorities into the aquifer for urban water supply during the millennium drought, and how a local Landcare group tried to prevent the overuse. We also heard the reflections of creative people, poets, artists, a

playwright, attentive to the meaning and resonance of places fed by such profound ‘invisible’ waters, and were provoked and invited throughout by Deb to meditate on wider cultural observations, realities and possibilities. Especially vivid is the hour towards the end of the day when participants, with their many different perspectives on groundwaters, stood in a circle in the eucalypt forest not far from the Big Swamp, a peatland made toxic and flammable from the decades of over-pumping.

One voice was qualitatively different from other voices: Malcom, a local, decades-long campaigner for the aquifer, spoke with quiet authority to the facts and a simultaneous passion, urgent and urging. Deb, in her necessary role as the day’s facilitator, tried several times to open the conversation, but Malcolm was unstoppable. Forty years’ worth of walking every nook and cranny of this naturally wetland country, noting changes beginning with the first aquifer pump by urban water authorities in the ’80s, taking measurements year after year with rising concern, trying time after time to draw the water authorities’ attention to the changes taking place in the waterways, being ignored, patronised and discredited for his efforts, had built up a head and heart of pressure in this man. He had borne witness to small ‘perennial’ creeks drying up – Boundary, Callahans, Pompabill – springs no longer flowing, lush swamplands transformed into oily orange dead acres as dried peatlands released their heavy metals, farmers increasingly alarmed as their water sources dwindled or became toxic, and the destruction of ecosystems and, with them, their creatures – platypus, endemic blackfish, galaxia, gone. Malcolm had gathered not only evidence but, slowly, talking again and again and again, he had brought the out-of-sight to mind. He invited an increasingly informed and disturbed community to walk and work with him until the water authorities were forced to desist, a rare achievement, though uncertain to hold.

Later in the day, as several of us enjoyed a coffee with Malcolm and his wife Kay, we recalled the hydrologist who had described how the Otways aquifer, when first tapped, spouted a marvellous fountain 20 feet into the air, the ‘aquifer under pressure’. We joked with Malcolm that he had spoken just like an aquifer under pressure. The attentive forest circle had opened some psychic valve in him, releasing in that moment a fullness of pent-up history of

standing up for the aquifer and all its creatures, his voice a fountain propelled by a long undeviatingly loyal love for the wetland world and a deep frustration at its ongoing, almost casual destruction. Malcolm, in deep relationship with this complex ecosystem – ‘I think about water 90% of the time’ – is also a voice of the aquifer.

## Reference

Bateson G (1972) Steps to an ecology of mind: collected essays in anthropology, psychiatry, evolution, and epistemology, University of Chicago Press, Chicago.





# Deep leads and shadow places: Poetry's ecocritical subterranean

Frances A Johnson

The site of the human soul someone says  
A so-called 'weak' bond  
The hydrologic cycle and its proponents the lakes  
Hydrocarbon of course the world  
Children play in the contaminated river  
Pluck a doll from the sediments  
– Evelyn Reilly, 'Broken water' (2008)

## Introduction

Poet Evelyn Reilly creates a world of unfinished fragments in her free-verse poem 'Broken water' of 2008, deploying images from science and cultural history, but she also borrows from chemistry to take down notions of the human soul and tropes of romantic repose in nature, her broken sentences a metaphor for the broken stream. This poem breaks with arcadian representations of the natural world to foreground toxification, the vulnerability of water's weak bonds to unregulated extraction and exploitation. Reilly's approach leads me towards a consideration in this essay of poetry's subterranean potency.

The broad question for poets is this: how to map and evoke the hidden shadows, disfigurements and despoliations of country/land/landscape? What specific creative tools and techniques

enable contemporary writers to best portray complex ecocritical shadowlands? Working with and against models of traditional nature poetry to focus on aspects of ecological restoration requires that poets stand back from the seductions of time-honoured pastoral literatures that idealise the natural world. Thus, certain kinds of environmental writing can offer formally and conceptually imaginative pathways to the ecological ‘real’, foregrounding loss and often revealing, beyond colonial capitalist paradigms, the ongoing cultural, spiritual and social significance of ecological systems.

Poet Nick Admussen (2016) asserts that writers must choose to represent *systems* over landscaped objects of wealth in fiction and art. That is, writers must deconstruct the binary between absence of objects (nature) and the presence of objects (wealth). Following a vital materialist philosophy, he also stresses the importance of writing against the individualist hero/heroine protagonist in favour of ‘dense networks of interconnection whose logics and complexities are more layered and more powerful than any individual character could ever be’.

Another important question is how poets writing groundwater stories (as with all stories of despoiled locations) might express eco-mourning without simplistic descents into reverent elegiac lyricism or, worse, gloomy endgames of apocalypticism. Consider Henry Lawson’s incantatory chant of ‘death and ruin’ and more ‘death and ruin’ in ‘The song of the Darling River’ of 1899, a poem pertaining to surface water. In this older colonial work, death and ruin are driven home as manifest outcomes of unregulated water extraction, yet a message of economic triumphalism overrides. But perhaps the work also reminds contemporary poets to be wise about aestheticising disfigured ecosystems to literal death, allowing space for complex portrayals of places and ecologies as these now are, producing practical artefacts that acknowledge mourning, yet point to practical environmental activism and conservation strategies.

As Cameron Muir (2019:227) notes, the weight of ecological mourning can’t be carried by scientists alone, and the collective experience of grief is fruitful in building deeply felt, embodied commitment to environmental concerns. Deploying diverse imaginative strategies and listening to stories is crucial, but is no more crucially generative for the environmental poet than listening

to science and taking practical action.

Groundwater connects to surface water but, with rare exceptions, remains largely invisible in settler cultures as a representational entity. This is not, and never has been, the case for First Nations peoples over many thousands of years. As IAE Bayly notes, groundwater is variously defined as:

flooded 'gnammas' (rockholes), soakage wells in permeable sediments, clay dams, flooded claypans, riverine waterholes, mound springs, rainwater accumulated in tree hollows (especially *Allocasuarina decasneana*), water from excavated tree roots (especially from Mallee tree roots), dew, and water from the body of the water-holding frog (*Cyclorana platycephala*). (1999:17)

Great violence was committed against Indigenous peoples in the name of pastoral expansion and the forcible acquisition of groundwater, their stories and representations forcibly commandeered to ensure the survival of white people and the animals they introduced and overstocked across the continent. That water was gold to settlers needing to feed and water growing herd stock meant that politics around water distribution and access became an early political football, long before the modern disputes over the Murray–Darling Basin erupted.<sup>2</sup>

Groundwater, for settler artists and poets at least, as for experienced hydrogeologists, has variously remained mysterious, abstract, hard to map or pin down. As Deborah Wardle has noted: 'The mathematics may be definitive, the modelling processes exhaustive, but aquifers remain at another level imaginary, always out of sight' (2019:12). It is this liquid, hidden imaginary that poetry and art may help restore to wider cultural and environmental consciousness. Radical kinship with inanimate others, in vital materialist philosopher Jane Bennett's (2010) parlance, is possible through inventive approaches to art and language. But firstly, any such imaginative evocations of groundwater must also point to and

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2 The Federation Drought that took place from 1895 to 1903 rivals the millennium drought (2002–09) as the worst in Australia's history. It altered squatter-dominated pastoralism in New South Wales and Queensland, 'as bank foreclosures and the resumption of leases led to the partition of large stations for more intensive settlement and agricultural use' (National Museum of Australia 2021).

explore the ongoing and crucial importance of Indigenous water knowledge and lore. Foregrounding the wonders and difficulties of hydro-geological science then follows. Another challenge is to evoke the political complications of water ownership, security and regulation across state and federal jurisdictions.

‘Shadow places’ are sites of extraction and production that ensure our material comfort, yet which, in the words of philosopher Val Plumwood, are places ‘we don’t know about, don’t want to know about, and in a commodity regime don’t ever need to know about’ (2008:146–147). Indigenous criteria of place, Plumwood asserts, have the capacity to reveal such denied or shadow places (146). Thus, Plumwood insists, we must expand our notions of responsibility and awareness to include spoiled and so-called unspoiled nature, engaging with the abject places that have been exploited at great cost to enable us to live in (deceptive) security.

### **Early colonial groundwater representation: AB Paterson’s seminal ‘Song of the artesian water’**

Settlers continue to have a slow start on questions of groundwater representation. Nonetheless, scattered historical postcolonial poetic depictions of water mining and artesian bores exist in colonial literature. Lawson wrote ‘The song of the Darling River’ in 1899, discussed briefly above, well after Arthur Streeton painted his famous sylvan scene of eternal colonial water security, *Still glides the stream and shall forever glide* (1890). But the Lawson poem, as with Streeton’s painting, was strictly a poem pertaining to surface water. More relevant was the earlier poem penned by his fellow poet AB Paterson. ‘Song of the artesian water’ was written in 1896, at the beginning of severe drought and depression. As OC Powell writes, ‘water power, industrial disputation and environmental transformation form salient themes in the work of Paterson and other Australian poets writing in the late 19th century’ (2012:305). Reading back from a new colonial century, threatened anew with exacerbated drought and climate change, these poems were in many ways prescient expressions of environmental and economic disaster that link directly to the ecological problems of our own time and place, to the fact that the discourse is still colonial.

Paterson wrote this poem at a time of severe drought and related social turmoil in outback Australia, evoking interactions between ‘water, scientific knowledge, drought and environmental transformation along the pastoral frontier of Queensland’ (Powell 2012:305). Paterson’s alliterative, iambic rhymes pull the threads of these knowledges together in ways that offer contemporary readers crucial historical snapshots of environmental and agricultural history. As Powell goes on to say, ‘Song of the artesian water’

is not only indicative of 19th-century Australian values, but articulates a wider phenomenon within European settler societies whereby arid landscapes were conceptualised as frontiers that could be ‘civilised’ and ‘tamed’ through capital investment and ambitious irrigation schemes (Worster 1992). Marginal rainfall areas became the objects of environmental conquest, driven by confidence in technology. The manipulation of water resources and transformation of the environment were often a means of consolidating imperial power in newly conquered territories (Gilmartin 1994). (Powell 2012:305)

Paterson’s work is also prescient, connecting with contemporary creative interrogations of environmental despoliation and climate change:

Sinking down, deeper down  
Oh, we’re going deeper down:  
If we fail to get the water, then it’s ruin to the squatter,  
For the drought is on the station and the weather’s  
growing hotter,  
But we’re bound to get the water deeper down.

– Paterson, ‘Song of the artesian water’ (1986)

Depictions of early mechanical boring technologies interweave Paterson’s evident compassion for the ‘tortured’ bovines, suffering farmer families and a land in severe drought, though the poet’s social lens does not mark Indigenous dispossession and that which Virginia Marshall (2016) names as the illegal colonial depredations of ‘aqua nullius’. Yet the earth he describes is threatened with collapse by industrial boring processes, controlled by bosses who insist on extractive outcomes at all costs; the capitalist contractors of the poem will ‘cave the roof of hell in’ if need be, regardless of ecological and social implications:

But there's no artesian water, though we're passed three  
thousand feet,  
And the contract price is growing, and the boss is  
nearly beat.  
But it must be down beneath us, and it's down we've got  
to go.  
Though she's bumping on the solid rock four thousand  
feet below, Sinking down, deeper down,  
Oh, we're going deeper down:  
And it's time they heard us knocking on the roof of  
Satan's dwellin',  
But we'll get artesian water if we cave the roof of hell in –  
Oh! we'll get artesian water deeper down.

– Paterson, 'Song of the artesian water' (1986)

Repetition of 'deeper down' in the refrain exposes the folly of this quest (one that may consign the perpetrators to new hell). When water is finally struck at four thousand feet, spilling 'above the casing in a million dollar flow', spillage becomes less celebration than an image of waste and violent contractual blow-out. We see a process imposed on land that was never supposed to be 'managed' in this way.<sup>3</sup>

Paterson ably shows the degradations of drought as he is able to show the liquid 'treasure' of what lies beneath, imagining the invisible subterranean and then showing, in a mostly triumphal coda, how the geyser 'flashes in the sun' on the 'blazing plain', 'bringing gladness in its going'. But there is ambiguity in Paterson's coda. It is one thing for the poem to glimpse spilt buried treasure, but an end to the riches may be imagined in the deceptively upbeat coda where the

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3 Powell (2012:307) notes Paterson's detailed knowledge of artesian water technologies in the nineteenth century: 'The second verse refers to "Canadian Bill", one of the North American style rigs used for deep drilling. The engine was "built in Glasgow" but its importation to Australia meant it was powered by native timber including "sun-dried gidgee logs" (*Acacia cambagei*), common throughout the arid zone. The third verse is dedicated to describing the predicament of jammed casing, which could jeopardise an entire operation. The fourth verse focuses on the financial risks for the private investor where the "contract prize is rising, and the boss is nearly beat".'

water ‘is flowing, ever flowing – It is flowing, ever flowing, further down.’

It is very easy to re-read this poem with hindsight of environmental crises. Paterson at that point could not have realised the extent of the decades-long drought and its far-reaching social and environmental impacts. The white settler is finally depicted in this poem as eternally tantalised by water ‘ever flowing, further down’. But the poet suggests that straining capitalist quests to drill below four thousand feet may ‘cave in’ the roof of hell and result in deaths of human and non-human kin desperately competing in times of drought to access receding supplies ‘down and deeper down’. As Wardle observes: ‘Ecosystems that rely on groundwater are easily ignored in the commercial stampede to command decreasing and ever lower aquifers. Economic interests have prevailed, with little responsibility for ecological damages’ (2019:4). Wardle’s wider points target past, present and future in relation to unregulated exploitation of subterranean water. Paterson, nonetheless, alludes to potential damage to earth and humankind brought about by wholesale boring; to wit, he celebrates the geyser uprush but ‘bores’ down to cautionary notes.

Colonial poetic arcadias always have a hole in their pretty buckets; in Lawson’s poem, demonised nature is flood after flood with no gauge. Both poems fail to recognise First Nations water knowledge and the importance of water to First Nations survival and storytelling.<sup>4</sup>

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4 Despite the important anthropological work of Donald Thompson (1975), Norman Tindale (1974) and others, as well as consecutive lobbying by Aboriginal elders from specific communities over time, exclusion of Aboriginal voices in the formation of successive groundwater policies continues. Allocation of Indigenous positions on Murray–Darling Basin Plan committees has been equally hard-fought and only recently changing (Moggridge and Thompson 2019). One hopes they will not be forced to buyback their own water, having fought for an Aboriginal position to be a legislated, permanent role on the Murray–Darling Basin Authority (MDBA) Board in 2020. In 2020, the Murray–Darling Basin Authority (MDBA 2019b) welcomed the appointment of Nari Nari man Rene Woods to the permanent Indigenous Authority Member board position.

One hundred and twenty years on, the Murray–Darling Basin Authority website openly states that groundwater is important for ecosystems in caves, acting as water source and pressure for springs and supporting rivers and wetlands. Almost as an afterthought, its website adds after ‘caves’ that ‘Many groundwater dependent ecosystems are also significant cultural places for First Nations’ (MDBA 2019a).

There is no other discussion of Indigenous water knowledge. Under the basin plan, basin-wide ‘sustainable diversion limits’ have been set on the amount of groundwater that can be taken from the basin. For Virginia Marshall (2016), governments’ failures to enshrine Indigenous water rights and interests in legislation directly reflects Australia’s western framing of Indigenous land rights, as shaped by the doctrine of ‘terra nullius’, whereby Indigenous water rights are reconstructed as ‘aqua nullius’ or ‘water belonging to no one’.

## Contemporary poets

Some years ago I alluded to failures and features of the groundwater debate in ‘Coal and water’, a poem about the Murray–Darling Basin, excerpted here:

Now the dry line won’t irrigate  
 Governmental half-rhymes spill  
 upon dry channels  
 as if from a child’s flask  
 Leadership stills  
 in tour-of-duty heat  
 though a neat tie  
 may be a metaphor for resolution  
 If only the lack of a definite article  
 before ‘country’  
 didn’t make them stammer so  
 Meanwhile the press’s compound eye  
 hallucinates a Chinese-invested coal station  
 mid-stream, when mid-stream is simply an illusion  
 of a liquid past  
 something the doctor asks you to save



in a bottle...

There is nothing I want to save in a bottle

– Johnson, ‘Coal and water’ (2012:21–22)

What strikes me in revisiting this free-verse poem is the silence of the water, my inability to conjure water systems beyond death-knell portrayals of dry alluvial riverbeds. I feel certain that now I would write a very different poem. But perhaps, in keeping with the spirit of Paterson’s goading rhythmic repetitions, the poem is not quite the miniature disaster movie I once thought. Perhaps it is more of a cautionary lament, laced with glancing parodies of political process on issues facing the weakened Murray–Darling. The poem uses a lyric confessional form, conflating ‘dry channels’ with poetry’s inability to summon environmental change. Hence: ‘The dry line’ doesn’t ‘irrigate’. The poem’s narrator fears her own inevitable capitulation to nostalgia for trees and rivers, those exemplary tropes of older poetries of the natural world now difficult (if not impossible) for poets to confidently/liberally apply. As the small dramatic terror/tenor of the poem builds, I aimed to invite both narrator and reader to face up to ‘what comes after trees and rivers’, to the spectre of the land of plenty become a land of empty. The poem arguably stops there, refuting the sweet proleptic taste of apocalypse, the stasis of full-blown despoliation:

Is this all that’s left?

The restive recitals

the pained nostalgia for trees and rivers

that comes after trees and rivers?

Contemplating this dun catalogue

makes me tired

as if I had walked

the salt bed of the Murray from north to south

dragging my plastic pen

through the silt like an ape

– Johnson, ‘Coal and water’ (2012:21–22)

Cloying nostalgia for the Murray–Darling’s ‘natural world’ may soon be all that’s left to us. But what of the ‘deep leads’ of groundwater ‘flowing deeper down’, as Paterson had it? My poem may be mute on that front, the desertification of the river almost, but not quite, suggested as a ruinous *fait accompli*. To that end, the

poem performs the role of elegy and ecocritical mourning.

Eight years on, I found myself writing on the Murray–Darling again in the poem ‘Book club for dry towns’:

Inside the bar, the mounted, taxidermied  
cod with rheumy eyes knew a single-use  
destiny, as if he too were a bookclubber  
in search of a river on a page. Flow.  
His shrunken, scaly chest and mournful  
stare told of old troubles: thieftoms  
of water, friends transmogrified into  
seafood baskets. All the mighty river corpses,  
the barmaid heard, had been interred  
in soft plastic and dumped on the edge  
of town. A great silver stink rose.

– Johnson, ‘Book club for dry towns’ (2021a)

This poem overtly commemorates the mass death of thousands of native fish at over twenty sites along the Murray–Darling basin in 2020 as a result of compound problems of drought, toxification of waterways due to the 2019 bushfire run-off, algal blooms, temperature drop-off and general problems associated with historical ‘thieftoms’ of water, such as increased salinity. The MDBA now acknowledges that groundwater and surface water, like rivers and wetlands, are highly connected, providing permanent pools for fish and other aquatic animals when shortages in surface water occur. It also concedes that, in the past, the complexity and importance of groundwater has not been well recognised in water management, just as the connection between groundwater and surface water has not been well understood. This, it says, stating the obvious, has led to inadequate management of this precious and finite resource, resulting in problems with access and water quality. Of course, no one is to blame ... In reading key points on the MDBA website, one notes the smooth tone, lack of urgency and spelling out of gentle facts, as if settler readers are primary schoolchildren needing to complete an assignment, learning how to solve a problem – that of elusive, fractious, ever-vulnerable groundwater.

Deborah Wardle has noted that the ‘deep leads’ of groundwater are both ‘potent and fragile’ (2019:2). She writes how she has been

struck by ‘the potency of groundwater’s so-called silence’, citing American writer Annie Dillard’s directive to writers to ‘witness the noises, and search the hums of silence’ (Wardle 2019:6). In her original creative mapping of groundwater, Wardle has been diligent in listening for what she calls underground ‘ecotones’, though these may be imaginary, even speculative. She notes that, in her studious listening in for the sounds of sub-surface water bodies, she hears only ‘discord and unrest’ (6). But voicing agitation and rumblings may be one crucial task of imaginative writing in the Anthropocene. After nearly two colonial centuries of unregulated groundwater extraction, Wardle’s emphasis on both individual and collective ‘listening’ is salutary. Wardle stresses both literal and metaphorical listening. It is one thing to elegise and visualise toxic places. Groundwater’s imagined discord and unrest must also be ‘heard’, invited into poems and stories, personified and voiced in uncanny ways. Groundwater, previously hidden in plain sight, thus has the potential to become both subject matter and kin.

I recently attempted a similar but different exercise in poetic ‘kinning’ after diving into the political mess of groundwater extraction in Yugambeh Country, Queensland. My use of the word ‘kin’ derives from Donna Haraway (2016) and Anna Tsing et al. (2017), and these writers’ common ecocritical emphases on forging non-hierarchical relationships with non-human others. This may be one key way in which environmental activist-poets evoke ‘agentic assemblages’ and ‘kinships’ with the so-called natural world, thereby de-emphasising anthropogenic hierarchies.

The Springbrook aquifer near Mount Tamborine is recharged from the northern tip of the Great Artesian Basin, so it has a cousinly physical relationship with the Murray–Darling river system and associated groundwater networks. I wanted to experiment with giving the aquifer voice, a strategy not far distant from Paterson’s alluvial first-person oration. The untitled work in progress opens:

I’m no ‘source’, perpetual, holy,  
but life of a kind, liquid kin.  
The lesser sand plover was not less,  
nor Fleay’s endangered barred frog,  
gentle croaking librarian

of my obscured subterranean.  
 Print their names on a million labels,  
 a valuable educational tool,  
 free water for each pupil,  
 small jugs of me unhomed.

– Johnson (unpublished draft, 2021)

I wrote this start after reading sections of a 2019 report commissioned by the Queensland Government and Queensland University of Technology about the ‘largely unmonitored and unregulated’ extraction of water in Springbrook National Park. The park is located 35 kilometres from Surfers Paradise.<sup>5</sup>

Part of the Gondwana rainforests of Australia, the World Heritage-listed national park has extremely high conservation values and provides habitat for more than 200 rare and threatened plant and animal species. But extinctions there, as elsewhere, are occurring apace. The park’s aquifer once loaded a great waterfall that drew tourists from all over the world. For decades now, water has been trucked down the mountain from illegal bores, past tourist vehicle cavalcades to a nearby bottling plant, to become ‘spring’ water, vastly adding to plastics pollution. Ironically, many of these bottles are brought back up the mountain by tourists. Bottles often float down to the city in the sludgy stream that the formerly annually replenished falls released as a torrent. Even *The Australian* (7 October 2019) newspaper, not famed for environmentalist credentials, ran the article ‘Bottlers reduce falls to a trickle’, citing that it has been scientifically proven that the

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- 5 The Queensland Government’s Business Queensland website notes that it has begun its rehabilitation program of the Great Artesian Basin. Around 150,000 ML of basin water is used annually for livestock and domestic purposes. Historically, 64% of this is lost through evaporation and seepage in open-air drains after extraction from uncapped bores. Thus, uncontrolled water flows have resulted in reduced groundwater pressure and ‘significant environmental challenges’. The government states: ‘The Queensland Government continues to work closely with the Australian Government, landholders, investors and other stakeholders to save water and restore pressure. We aim to make the Basin watertight by 2027, a goal legislated in the Great Artesian Basin and other regional aquifers (GABORA) water plan’ (Business Queensland 2023).

ecologies of Springbrook waterfalls, groundwater and creeks are intricately connected.<sup>6</sup> In addition, several court hearings have culminated in legal action (from 14 February 2022) mounted to protect Springbrook National Park's World Heritage rainforest and wildlife from water mining.<sup>7</sup>



Figure 1. A water carrier passes a tourist bus on Tamborine Mountain  
Source: Save Our Water – Tamborine Mountain. Reproduced with permission.

While protective legislation may be in the offing, environmental lobbyists managed to secure a government moratorium on water mining to protect the Tamborine Mountain and Springbrook

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- 6 The Queensland University of Technology (QUT) will shortly release a new study about groundwater supplies in the region, which will support the proposed phase two investigation (to be carried out by QUT, the Department of Natural Resources, Mines and Energy, Department of Environment and Science, and Seqwater, at a cost of \$1.2 million).
- 7 Revel Pointon (2022) of the Environmental Defenders Office notes that in May 2019 the proponent Hoffmann Drilling applied to the Gold Coast City Council to mine 16 million litres of groundwater per year in the Springbrook area to be bottled and sold as 'spring water'. That application was refused in December 2019, and the related hearing has now begun in the Springbrook water mining appeal from 14 February 2022.

groundwater systems. The moratorium has been extended until late 2024 by the Queensland Minister for Water, Glenn Butcher (Queensland Government 2023).

With the above draft poem fragment I aim, first off, to address the invisibility of the aquifer, articulating kinship with a non-human other. I also thought to have the aquifer interpellate and indict political and corporate leaders whose failures to imagine mutual kinships with non-human others beyond short-term gain continue.

Again, for poets, this is the terrain of elegy and lament, but here it is fused with indictment via direct address:

Don't bore me –  
 Friend, we're all grounded here.  
 Don't subject me to Glad-wrapped  
 planning approvals, streamed files,  
 bottled exports. Don't subject me.  
 I've lost family: ravine orchids,  
 lamington eye-brights,  
 beloved slender milkvines ...  
 woody heartbreakers like  
 smooth-talking davidsonia.  
 I move through sand, grieve slow.

I have taken formal and conceptual pointers from vital materialist and ecocritical scholarship and Europeanist post-pastoral poetries, but have also been influenced by the new generation of Australian First Nations poets, which includes Evelyn Araluen, Alison Whittaker, Ellen Van Neerven, Kirli Saunders, Samuel Wagan Watson, Alexis Wright, Jeanine Leane and others. These poets are producing vigorous poetic portrayals of toxified country as critiques of colonial pastorales, inheriting environmental poetry batons from pre-eminent First Nations poets of Country such as Oodgeroo Noonuccal, Kevin Gilbert and Lionel Fogarty.

Gomeroi woman, Alison Whittaker may be alluding to the unregulated extraction of groundwater when she transposes Dorothea Mackellar's iconic poem 'Core of my heart' into a new work: 'A love like Dorothea's' (Whittaker 2018:5–7). This poem demonstrates continuity with poetic techniques and traditions

drawn from settler poetries, making direct and radical intertextual raids on the Mackellar original in order to build a searing metafictional satire of Mackellar's 'fetish verse':

It burns my eyes to turn to hers, my wide brown land out of  
like hands but traced in fetish verse –  
'I love a sunburnt country' I loved a sunburnt country.  
I loved white nativity  
that digs its roots and ticks to suck the floodplains and  
the sea –  
the love that swept those sweeping plains from Nan, from  
Mum, from me.

– Whittaker, 'A love like Dorothea's' (2018:5)

Here, tropes of a whitened Christian nativity scene are rendered abject, recast through a postcolonial lens. Not only does white nativity signify the birth of Jesus, it signifies a Christian creation myth that has been used to oppress First Nations peoples in myriad ways, not least via dispossession of Country and, hence, of life-giving story. The nativity tableau in its monumental entirety (as reified Western cultural-religious scene) is shown as implicated in the great task of colonial extraction that no mechanical bore could equal, digging roots and ticks into country to 'suck the floodplains and the sea'. Whittaker suggests that any kind of water can be bent to the insatiable extractive will of 'white nativity'. This may be a powerful and poignant example of that which John Kinsella (2018) calls 'negative pastorage', where black humour and parodic quotation work to expose toxicity and cultural, social and environmental dispossession. For Kinsella, this mode of environmental poetry is not an unhelpful one, but links through to postcolonial environmental activism: 'Pastoral in Australia is about confrontation, recognition, conversation, and, one would hope, reconciliation' (2008:132–133).

First Nations poets lead the way here, as I recently reflected in 'Writing ecological disfigurement: First Nations poetry after "the black grass of bitumen"' (Johnson 2021b). But both Aboriginal and settler poets can create imaginatively constructed 'negative pastorales' to reconciliatory and environmentally conscious ends. That is to say, both are tasked with the ethical imagining of new communities that take responsibility for damaged ecologies, even if

restoration can only be partial.

## Conclusion

Rendering groundwater stories necessitates that writers ‘walk the shadow places’ (Muir 2019:201, paraphrasing Plumwood 2008). For Plumwood (2008:146), Indigenous criteria of place can reveal such denied or ‘shadow’ places. The ruined stretches of the Barka or Darling River are a salient example, as are the acidified soils of the Barwon region in Victoria where for decades human-made bores extracted groundwater without sight of consequential damage to wetland and grassland ecosystems. Under-regulated water mining in the Barwon region, as in the Springbrook National Park, has too often come about via ad-hoc and institutionally sanctioned *eco-mord*.

Indigenous stewardship of land also provides settler culture with more than a mere metaphor of care of the land; it enables this care, encouraging ecological awareness and engagement with place, thereby restoring a truthful relationship between exterior landscape (place) and the storyteller’s interior reality (Lopez 1989:63–64). Indigenous writing is intimately implicated in this task, always ‘extending the land and waters and air’, as Bundjalung woman, poet and scholar Evelyn Araluen (2020:45) writes.

In conjunction with direct environmental action, such writing helps us all, under severe ecological pressure, to ‘stay with the trouble’ in Donna Haraway’s (2016) phrase, to confront the shadow places, prepare and survive. A role of environmental creative writers in particular, then, as I see it, is to say the trouble. Poetry is a concise form that offers diverse formal ways in which to imagine the unspoken and to contest the monological economic and political rhetoric masking long histories of colonial extraction. In relation to legacies of under-regulated groundwater exploitation, poetry can quickly go beneath, bore down and evacuate hidden meanings, bringing knowledge and different ways of looking and thinking to the surface.

Now the stock have started dying, for the Lord has sent  
a drought,



But we're sick of prayers and Providence – we're going to do  
 without,  
 With the derricks up above us and the solid earth below,  
 We are waiting at the lever for the word to let her go.  
 Sinking down, deeper down,  
 Oh, we'll sink it deeper down:  
 As the drill is plugging downward at a thousand feet  
 of level,  
 If the Lord won't send us water, oh, we'll get it from  
 the devil;  
 Yes, we'll get it from the devil deeper down.  
 – Paterson, 'Song of the artesian water' (1986)

## References

- Admussen N (2016) 'Six proposals for the reform of literature in the age of climate change', *The Critical Flame*, 42.
- Araluen E (2020) 'Too little, too much', in Whittaker A (ed.) *Fire front: First Nations poetry and power today*, University of Queensland Press, St Lucia, Qld.
- Bayly IAE (1999) 'Review of how Indigenous people managed for water in desert regions of Australia', *Journal of the Royal Society of Western Australia*, 82: 17–25.
- Bennett J (2010) *Vibrant matter: a political ecology of things*, Duke University Press, Durham, NC.
- Business Queensland (2023) *Great Artesian Basin rehabilitation program*, Business Queensland website, accessed 5 February 2024. <https://www.business.qld.gov.au/industries/mining-energy-water/water/catchments-planning/great-artesian-basin/rehabilitation-program>
- Gilmartin D (1994) 'Scientific empire and imperial science: colonialism and irrigation technology in the Indus basin', *Journal of Asian Studies*, 53: 1127–1149.
- Haraway D (2016) *Staying with the trouble: making kin in the Chthulucene*, Duke University Press, Durham, NC.

Johnson AF (2012) *The wind-up birdman of Moorabool Street*, Puncher and Wattmann, Glebe, NSW.

Johnson AF (2021a) *Save as*, Puncher and Wattmann, Glebe, NSW.

Johnson AF (2021b) ‘Writing ecological disfigurement: First Nations poetry after “the black grass of bitumen”’, *TEXT*, 25: 1–25, accessed 5 February 2024. <https://textjournal.scholasticahq.com/article/30985-writing-ecological-disfigurement-first-nations-poetry-after-the-black-grass-of-bitumen>

Kinsella J (2018) ‘Friday essay: species sightings’, *The Conversation*, 16 February, accessed 25 February 2021. <https://theconversation.com/friday-essay-species-sightings-88643>

Lawson H (1899) ‘The song of the Darling River’, *The Bulletin*, 25 March, 3.

Lopez B (1989) ‘Landscape and narrative’, in Lopez B, *Crossing Open Ground*, Random House, New York.

Marshall V (2016) ‘Deconstructing aqua nullius: reclaiming Aboriginal water rights and communal identity in Australia’, *Indigenous Law Bulletin*, 8(26): 9–14.

Moggridge BJ and Thompson RM (2019) ‘Aboriginal voices are missing from the Murray Darling crisis’, *The Conversation*, 31 January.

Muir C (2019) ‘Ghost species and shadow places: seabirds and plastic pollution on Lord Howe Island’, *Griffith Review*, 63: 201–228.

Murray–Darling Basin Authority (2019a) Key facts about groundwater, MDBA website, accessed 18 June 2021. [www.mdba.gov.au/basin-plan-roll-out/groundwater](http://www.mdba.gov.au/basin-plan-roll-out/groundwater)

Murray–Darling Basin Authority (2019b) MDBA welcomes Rene Woods as new Indigenous board member [media release], MDBA website, accessed 18 June 2021. [www.mdba.gov.au/media/mr/mdba-welcomes-rene-woods-new-indigenous-board-member](http://www.mdba.gov.au/media/mr/mdba-welcomes-rene-woods-new-indigenous-board-member)

National Museum of Australia (2021) Federation Drought, NMA website, accessed 4 February 2024. <https://www.nma.gov.au/defining-moments/resources/federation-drought>

Paterson AB (1896) ‘Song of the artesian water’, *The Bulletin*, 12 December, 10.

Plumwood V (2008) ‘Shadow places and the politics of dwelling’, *Australian Humanities Review*, 44: 139–150.

- Powell OC (2012) 'Song of the artesian water: aridity, drought and disputation along Queensland's pastoral frontier in Australia', *Rangeland Journal*, 34(3): 305–317, doi:10.1071/RJ12014.
- Pointon R (2022) 'Update: Springbrook court hearing begins in one week' [Email], Environmental Defenders Office, 7 February.
- Reilly E (2008) 'Broken water', *How2*, 3(2), accessed 18 June 2021. [www.asu.edu/pipercwcenter/how2journal/vol\\_3\\_no\\_2/ecopoetics/reilly.html](http://www.asu.edu/pipercwcenter/how2journal/vol_3_no_2/ecopoetics/reilly.html)
- Thompson D (1975) *Bindibu Country*, Thomas Nelson, Melbourne.
- Tindale NB (1974) *Aboriginal tribes of Australia*, Australian National University Press, Canberra.
- Tsing A, Elaine G, Swanson H and Bubandt N, eds (2017) *Arts of living on a damaged planet*, University of Minnesota Press, Minneapolis.
- Wardle D (2019) *Beneath our feet*, Nature Conservancy website, accessed 18 June 2021. [www.natureaustralia.org.au/content/dam/tnc/nature/en/documents/australia/Beneath-our-feet\\_Deborah-Wardle.pdf](http://www.natureaustralia.org.au/content/dam/tnc/nature/en/documents/australia/Beneath-our-feet_Deborah-Wardle.pdf)
- Whittaker A (2018) *Blakwork*, Magabala Books, Broome, WA.
- Worster, D (1992) *Rivers of empire: water, aridity, and the growth of the American West*, Oxford University Press, New York.

## Acknowledgment:

An abridged version of this article, 'Groundwater stories: Poetry's ecocritical subterrains', is forthcoming in 2024 as a book chapter in *Consent: A Reader*, eds. Annika Aitkin and Kyla McFarlane, Perimeter Editions, Melbourne 2024. Proceedings from the Consent - Interdisciplinary Forum, Ian Potter Museum of Art, University of Melbourne, Nov - Dec 2021.



# Compression blanket

Jane Bartier

After the Barwon Downs excursion the phrase ‘the soil and plants are a compression blanket on water’ became an impetus to return to my loom and weave. New thoughts of fault lines, fissures and erupting groundwater added to my understanding of this landscape. There is a small body of surface water, a billabong, near the place I call home, where I visited as I wove my response to the excursion. The billabong of surface water provided a visual connection for the unseen groundwater that moves below the surface, in rocks and fissures, spaces and unknown places. It was for me a meeting place. The idea of groundwater erupting to meet the air contrasted with the stillness in the billabong. It led the warp and weft in my weaving into a long and loosely woven form. The colours imply subterranean sediments connected to a brightness in surface lives. The weaving process enacted these interactions of water (surface and ground) as expressed in scientific and technical definitions with the ephemeral seasonal water flows and leaf drop of the billabong. Figure 4 is a pencil and charcoal sketch, using wattle bark dye created from a tree close by to the billabong to evoke the richness of new learnings and to signpost how to look again into what you may not see. The slow materiality of the weaving and drawing drew in the pace of groundwater as slow and almost not moving. From the excursion, the new works progressed to evoke learnings of place beyond a time before human footfall and where volcanic plains changed water courses.



Figure 2. *Compression blanket I: Groundwater meeting place*. Jane Bartier 2021. Woven cotton, twine, raffia, wire



Figure 3. Detail, *Compression blanket I: Groundwater meeting place*. Jane Bartier 2021. Woven cotton, twine, raffia, wire



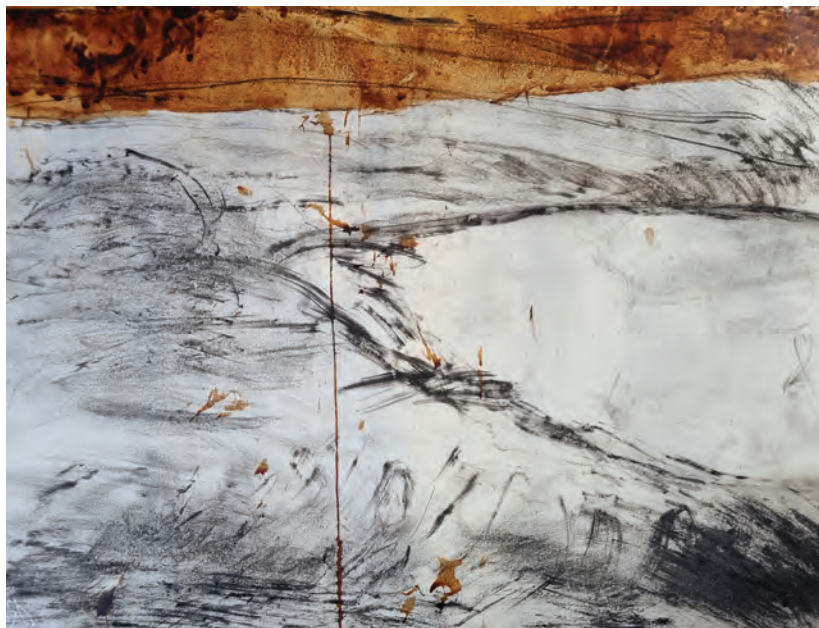


Figure 4. *Groundwater meeting place*. Jane Bartier 2021. Paper, wattle bark dye, pencil, charcoal





# A water story from the edge of the Bambra Fault

Stewart Mathison

## Surface water collection and direction

Water from the Barwon River had sustained communities for unknown generations and as the towns along its course grew a piped supply was instigated. Still drawn from the river within the township of Winchelsea, the water was now pumped to a tank on the hill, so instead of people collecting it from a handpump in the river, the pipes ran into the houses.

A large regional city, Geelong, situated on the estuary of the Barwon River also pumped water from the river. As the city grew and as industry developed, eventually the river water became too salty and polluted and the community started looking for another water source.

The origin of the river was many kilometres distant in the ranges. It started as a gathering of streams flowing through the tree ferns. To supply the city, eighty kilometres of aqueduct was built in 1928, channelling clean, clear water from the distant ranges to the city. Pollution of the river was no longer a concern to the residents, who continued to use it to carry away effluent.

Halfway along this aqueduct a storage was created at a swamp called Wurdi Boluc. This was permanent water used by Indigenous people. European settlers made a water reserve with a well supplying excellent water. My great-grandfather built his first dwelling alongside this swamp when he arrived from Scotland and a great aunt spoke of Wathaurong community members at

the house. In 1910, a school with the same name was built near the swamp which my father attended. I also attended Wurdi Boluc school from 1948 to 1953, by which time the swamp had become water storage for the city. In subsequent years, the capacity of this storage was increased threefold. In 1947 this storage was tapped to supply water to Winchelsea. The people of the town no longer needed to concern themselves with the state of the river.

Then the Barwon stopped flowing. Firstly for 7 days during the record drought of 1982–83. Then 44 days in 2009, 124 in 2016 and 90 days dry in 2018. Has this happened before? Nobody could say. But a chance exchange with an old local character, while discussing another matter altogether, suggested it had because, he said, his grandfather had once loaned an engine to the district Water Trust to drive a pump to bring water into the town from a deep hole upstream.

## The interaction of surface water and groundwater

Why had the river supplied water for all those summers until the twenty-first century? The answer was put very simply by the hydrogeologist Associate Professor Peter Dahlhaus, standing on the Barwon riverbank:

When it is raining, surface water flows into the river and in dry times river flow is maintained by groundwater seeping into the stream. There is always groundwater and it flows slowly through the ground. It can flow down, across and sometimes up but we must imagine the unseen movements beneath our feet. The line between saturated soil and unsaturated soil is called the ‘watertable’. We have all dug a hole in the sand at the beach and watched the water seep in. The flow of water shows we have dug below the water table. The same occurs when we dig a well on land that intersects the water table.

The hydrogeologist took us to a site alongside the borefield looking over the river valley and explained that under our feet was like a layer cake with some porous strata where groundwater can move. So, I had an explanation of why the river stopped flowing in

summer. Something had interfered with the flow of groundwater into the river.

Water bores had been drilled to 400 metres to supplement the increasing demand of Geelong on the river estuary and were used a great deal when drought dried up the surface storages of the city. The pumping from the bores had lowered the water table. Landholders in the district had seen streams and springs dry up, and farm dams that had been permanent now dried up in the summer. The flow of groundwater had changed. No longer was it a dribble oozing from the riverbed. The flow was reversed and the surface water was now replenishing the groundwater.

These changes in the groundwater flow were not visible at the surface. A visible confirmation of the depleted aquifer appeared when a release of water to create environmental flow in the river was made from a dam in the headwaters. A small flow was established from the dam and people watched to see it arrive downstream. When the stream remained dry, it was realised that the water was seeping out of the river into the groundwater until the flow from the dam was increased and there was sufficient flow for the water to move all the way down the river channel.

The underground water must move slowly as it moves through porous strata. There is space for water to travel, but not as a body of water as we think of it in rivers and the ocean. It is not flowing as we imagine surface water moving. I had to learn to think of water seeping through spaces in sediment, buck shot and rock where it can trickle at a non-observable pace. The water table is the junction between saturated strata and unsaturated strata.

River flats at Boundary Creek would originally have been swampy with a high water table near the surface, where often the river flats will be boggy, with water at the surface, and it is where the water gradually filters through the soil. This underground water gradually flows to the river channel where it supports surface flow through summer months. The interaction of groundwater and surface water in a river valley is difficult to observe. The actual water table level can only be determined by observing water in a well or bore that intersects the aquifer layer. Growing pressure from rural and urban water demands leads to more and deeper bores

being pumped and when the water level in the bore falls there is a resultant change in groundwater movement that may have previously been maintaining surface flows. Underground water comes in at all sorts of depths; it can be horizontal in our thinking and parallel to our visual horizon as well as vertical from fractured geological eruptions.

Water for my farm was once obtained from the permanent spring in the Wurdi Boluc swamp which is now a reservoir for Geelong. Bores sunk close to the boundaries of the reservoir to replace this water supply have been unsuccessful. Where the fresh groundwater came from 100 years ago remains a mystery.

# The platypus wars

Malcolm Gardiner

Blackfish have been the most studied animal that lives in the creeks and streams in the Loves Creek and Gellibrand River catchments and have been the major consideration when making recommendations for environmental flows. The assumption is that if the blackfish can survive then all other species should survive as a matter of course. This assumption should no longer be accepted as there is an extremely strong case that the platypus should also be accepted as a major indicator species – if the platypus can survive then all other species will be able to survive.

All water-dependent animals require a permanent supply of water. The platypus is no different in that regard, but it also has the capability to travel overland. However this is often done under duress from foxes and wild cats. The platypus finds refuge in water. Dry this habitat up or pollute the water and the platypus does not survive.

Boundary Creek and other streams in the Barwon River catchment used to have a robust population of platypus until groundwater extraction dried the creek up. This platypus battle was lost.

In the next valley of the upper Gellibrand River catchment the Ten Mile, Yahoo, Porcupine, Loves Creek and Gellibrand River populations of platypus are regularly observed by local landholders and many people have their own 'backyard' sightings. These animals are also under threat from groundwater extraction test pumping at Kwarren. My hope is that these animals in the Kwarren and Gellibrand district do not have to fight this battle for survival by themselves.

## The platypus diaries

To the Editor of the Lake Elizabeth Platypus News, 2021

*Dear Editor,*

*When winding up the watery estate of Olly Platypus formerly of the Yahoo Creek platypus colony at Kawarren, I came across an old diary of Olly's. Thought your readers may be interested in some of the extracts.*

*I know your platypus readers at Lake Elizabeth live in a safe, pristine and relatively isolated part of the Otway Ranges but they should be mindful and watchful for signs of a mysterious decline in our numbers. In his last few entries it had become obvious to Olly that changes were taking place but unfortunately the certainty of the threat to his colony was recognised too late.*

*Hoping this will be helpful to your readers.*

*Spike Platypus Senior*

*(Elder of the Loves Creek platypus colony)*

### Diary entry, 1975

Dear Diary, it was a sad day today when the Dives platypus family had to move on down the creek as the Yahoo population had outgrown the food supply. Someone had to move on. Thankfully word had been passed up the creek that the Gellibrand River had broken its banks in the last flood, creating two branches of the river. This opened up a new stretch of river that was unoccupied and suitable for a new family to move into.

I remember Grandpa and Grandma Platypus telling stories of how the first colony was started in the Yahoo. Apparently way back when the top end of the Ten Mile Creek had become overcrowded their family was asked to move on. It wasn't an easy thing to do, especially with two young pups in tow.

They swam all the way down to the confluence of the Porcupine Creek but found there was no space available. Eventually arriving at Kawarren, they were welcomed in for the night by an old couple of platypus living in amongst the roots of an old dead tree hanging

onto the bank of the creek. Grandpa's family was exhausted by this stage and it crossed his mind that they would never find a vacant stretch of water to call their own.

The next day when Grandpa was out foraging for mussels and other food he felt a change in water temperature and a current pushing him slightly off course. On investigation he found a very small creeklet flowing into the main stream. Pushing through the overhanging undergrowth, Grandpa followed this water source that opened up into what he described as the most wonderful sight he had ever seen: clear water, huge pools and abundant food. But most importantly no other platypus. This was how the Yahoo Creek colony of platypus was first settled.

Anyway, I digress. We wish the Dives family all the best and hope they have the same sort of luck as Grandpa and Grandma many years before.

#### **Diary entry, 1979**

Dear Diary, good news.

Word has just arrived that the Dives family found a new stretch of water in the Gellibrand and have settled in really well.

#### **Diary entry, 1980**

Dear Diary, Doug Echidna passed through today and had some disturbing news. In the adjoining Barwon River catchment, some streams that run into the Barwon have been behaving strangely. In the times of little rainfall that seem to happen once a year, the streams such as Dewings, Callahans and others don't have nearly as much flow. This exposes home entrances, reduces food habitat sources and inhibits recreational activities for the pups. Something has changed over there.

#### **Diary entry, 1983**

Dear Diary, everyone is saying how come there is so much more traffic around the Yahoo area. Animals that usually pop down for a drink and then move on are hanging around in droves. The twins, Duck and Bill, reckon it has something to do with there being no rainfall for some time. But what would they know?

So many animals drinking from the Yahoo is quite strange as there appear to be few if any changes where we live. The water flows. There is plenty of food and the colony prospers. However, I do remember Grandma Platypus saying a similar thing happened in 1965. What a mystery.

### **Diary entry, 1985**

Dear Diary, things are back to where we occasionally see roos, wallabies, various birds, snakes and the like dropping in for a drink and a chat. There has been a warning or two of a fox and a few wild cats being seen in the district and that we should never stray far from home and most definitely never leave the water.

### **Dairy entry, late in 1985**

Chatter, the yellow-tailed cockatoo and her mates, had disturbing news today that Dewings Creek is dry; the platypus colonies had to move on or perish and Boundary Creek had stopped flowing on occasions. What was going on over there? Colonies were isolated in small stretches where there were water holes. Chatter said hunger was setting in with predation a constant threat. Perhaps this explained why the fox and cats had not been seen for some time.

Chatter said next time she came through she would keep us informed but things did not look so good just over the hill in the Barwon River catchment.

### **Diary entry, 1995**

Dear Diary, it would be good to see a little less rain. Floods pouring down the Yahoo have made life a little difficult and unpleasant for a few years now and a return to normal would be welcomed.

### **Diary entry, 1997**

Dear Diary, one must be careful what one asks for. Wally hopped by yesterday followed by any number of different animals in a hurry to move on. Wal, being a good friend, stopped for a chat. I asked him what on earth was going on. He said the top end of the Big Swamp at Yeodene had caught on fire and every animal was afraid the whole area would go up in flames and decided to run for



their lives. That was bad enough, but Wal had even worse news. Flows in Boundary Creek were stopping on numerous occasions and to such a degree that the colonies in the lower reaches were no longer there. No one knew where they had gone. I asked about our cousins up in the top reaches of Boundary Creek, but Wal wasn't sure of the situation there. I hadn't heard from them for some time.

#### **Diary entry, post Big Swamp fire, 1997**

Dear Diary, thank goodness our cousins in the headwaters of Boundary Creek have survived. McDonalds Dam on Boundary Creek up that way was a saviour. Everyone is so relieved. But just the same, there is some concern that flows in this region are also declining. What is happening?

#### **Diary entry, 2000**

Dear Diary, there are indications that things are changing. Russell Snake slithered over from his favourite wetland in a tributary at the top end of Boundary Creek and said he was looking for a new place to live. I had heard from our cousins that wetlands in some of the tributaries of Boundary Creek where they used to be able to forage for food had dried up. Perhaps one of these was Russell's former home.

Travelling overland foraging up these small tributaries was treacherous and some of the platypus from the Boundary Creek Colony had been taken by dogs. None of these were directly related to our Yahoo platypus, thankfully.

It is a relief that the Yahoo Creek does not appear to be affected by springs drying up and flows being reduced. But something is seriously wrong over in the Barwon River catchment and things appear to be getting worse.

#### **Diary entry, 2006**

Dear Diary, today when Kanga was bouncing past she noticed me sunning myself floating on the reeds in the shallows and stopped to show me a photograph she pulled from her pouch. I asked why she was showing me the picture and she said, 'Don't you recognise

it?’ Of course, I thought that was a bit obvious as I was still spinning it around. Kanga told me it was Boundary Creek. I thought it was some kind of sick joke ’cos there was no way anything could live in such a degraded mess.

I said, ‘Go on with it, Kanga, you’re pulling my poisonous spur?’ She didn’t get the joke because kangaroos don’t have spurs and she went on as though I hadn’t said anything. This made me realise that she was serious. I asked if she had any other photographs and she fished around in her pouch and pulled out a few others. I was devastated when she told me that these photos were taken recently and the creek had been dry over many, many summers. My thoughts went back to when I’d get a Christmas card from the rellies along Boundary Creek and it would show the whole family frolicking in a lovely healthy stream. Three Olympic size swimming pools would flow down Boundary Creek every day of the year. That’s heaps more than Yahoo Creek has flowing down it over summer. I couldn’t believe it.

I thought again nothing could live in those sort of conditions let alone all my relatives and friends over there. Suddenly it dawned on me, fell on me like a ton of bricks, and I realised then why none of my Christmas cards, birthday wishes and lengthy letters had been replied to for some years. You know how it is when you get busy with the pups growing up and you lose contact for a while. But this is different. Looking at these photos says there will be no more contact from the Boundary Creek crew.

As a tear rolled down my cheek and Kanga said how sorry she was, she said there was more disturbing news. I looked up and could see the hurt in her eyes. Kanga said it looked like the disease was spreading and could be coming Yahoo Creek’s way. Was it possible? No way, I thought to myself. Everything seems fine here.

### **Diary entry, 2010**

Dear Diary, I didn’t have to be told that the Big Swamp was once again on fire and that this time it was a monster. The plumes of smoke rose to great heights in the air and droves of fleeing animals heading our way told the story. Everyone in our colony is afraid the warning Kanga gave us is coming true and, whatever it is, the menace is heading our way. The Yahoo has started to flow a little

less and for some reason the water feels and tastes different. It is harder to have pups and the dread in our hearts is spreading.

### **Diary entry, 2017**

Dear Diary, Whitey Goshawk has moved from the Barongarook High area down to the Gellibrand River. Whilst perched on a stump by our home today he told us the sad news that there was a trail of dead fish of about 30 kilometres down the Barwon River. Something bad was coming out of the Big Swamp. He hasn't seen anything in this section of the river for ages and fears that his platypus mates have left without saying goodbye. It's a sad, sad day he whistled as he flew off saying he wasn't going back there again.

While munching on a freshwater mussel reflecting on recent times and what Whitey had said, I had to admit that tiny changes were taking place even in our part of the world. Was it time to go west young platypus away from the spreading calamity? I'll think about that.

### **Diary entry, 2018**

Dear Diary, it is early in the year and I don't feel that flash. Some sort of sickness has overtaken our colony. We haven't seen any pups born in the last few years and now our life span seems to be shortening. Some platypus families have moved out, some are too sick to move and others are staying put as there appears to be nowhere to go anyway. Must be off. Have to go around the traps and try to cheer up those that are staying and to keep their bills up.

*Sadly, Editor, this was Olly's last entry.*

*Even sadder is the fact that there are none of our platypus colonies left in the Yahoo Creek precinct.*

*Spike Platypus Senior  
(Elder of the Loves Creek platypus colony)*

**Only when the last tree has died**

And did Chief Seattle say this?

Only when the last tree has died

And the last river

Has been poisoned

And the last fish

Has been caught

Will we realise

That we cannot

Eat money

And those mystical

Animals called platypus

Have all disappeared.

Maybe he didn't but let's make sure nobody ever has to say these words.

# Bunny Sherriff

Jack Kirne

I have been in the business of managing rabbits for five years, long enough to not remember a time before with any clarity. I once hoped to become a great sculptor, but no more. I have grown to tolerate my job, and cannot imagine any other future but the laying of pindone, the patching of fences. I am propelled by the seasons now, which is nice. It is also satisfying to be paid for something the community views as a net good, even if I know the rabbits will always come back. I like to work for local councils, schools and other government sorts: they are simply happy to pay you to show up, lay traps and leave. Private clients, especially the rich ones, are different. They do not respect my role as a natural predator to the rabbits. They expect me to snap my fingers and make them all disappear.

And so there I was, parking at the end of a cul-de-sac and walking to the wooden gate of number eight. We were in the middle of the worst drought since colonisation, but there was no regard for water restrictions here. Woolly bushes dangled over the fence shading the winding path beyond. I wrestled with the latch of the gate, without success. The woman on the phone had warned me, 'You'll need to give it a sharp, hard tug.' Her name was Hillary Boyle, and in our brief conversation she had mentioned her recent trip to Paris twice. Had the drought not thinned the local rabbit population, and by extension the number of people wanting them killed, I would have turned her away.

I was thinking of vaulting the fence when a voice called out from behind me.

'You've got to jiggle it.'

On the opposite side of the road, a pencil-thin woman with

greying hair stood on a vast dying lawn. She wore a Gucci tracksuit and gardening gloves. Behind her, a squat, brick home sagged into the earth. The woman crossed the road, leant over the gate, and grunted as she forced the latch. ‘I keep telling Hillary she needs to replace this’, she said. ‘But no. She’s got too much sense to listen to me.’ She pushed open the gate. ‘So, who are you then?’

‘I’m the Bunny Sheriff.’ I presented her a card from my shirt pocket. She studied the card, then grinned. She tugged off her gloves, and introduced herself as Laura. ‘Be careful of Hillary. She draws her water from the bore.’ Laura cocked her eye, as if to emphasise the gravity of the secret. But it meant little to me.

‘You haven’t seen my dog, have you?’ Laura asked.

I told her I hadn’t.

‘A pity’, she said. ‘She can always tell the good from the bad. She’s quite advanced you know.’

I bit my lips, finding this all delightfully silly. ‘Nice to meet you, Laura.’

Hillary’s house had the airs of a country art gallery. Native trees shadowed the house’s low sandstone walls, and narrow, floor-to-ceiling windows ran along the edge of the house. Coming down the garden path, I was watched by the beady eyes of a pregnant rabbit. If the place was not already overrun, it soon would be. I knocked on the door, twice, and leapt backward as the door thumped. The savage barks of what sounded like a large dog echoed into the house, but the door went unanswered. As my heart steadied, I was overcome by the familiar annoyance of arriving somewhere to discover that the client had gone to visit their sister, or attend a doctor’s appointment. Few offered to compensate me for the wasted time. I knocked again, and when the door continued to go unanswered, took the gravel path to the back of the house. The least I could do was make up a quote.

I spied a patio upon which a middle-aged woman was splayed on a banana lounge. She wore nothing but a silk dressing gown and a chunky pair of cream headphones, and noting my approach she stared at me as if I were naked. I figured that this was Hillary.

'I'm sorry, I tried knocking, but—'

Hillary raised her hand to cut me off. 'I can't hear you.' She sat up and slid the headphones from her head. 'It is a crime to trespass, you do know that?'

'I'm the Bunny Sherriff', I said. 'I tried knocking ...'

Her stare momentarily stopped me.

'You called me. Last week. I'm here to help.'

Hillary's face scrunched in thought. 'That's right, so I did.'

Anxious to smooth things over, I crossed the patio to shake her hand. 'Michael', I said. 'Michael Berry. I'm sorry if I shocked you.' She clasped my wrist firmly, and to my astonishment, used her purchase on my arm to pull herself up. 'Thank you dear', she said as she shuffled toward the house against which a black walking stick leant. She beat the stick against the patio three times, making a loud click-clicking sound. 'Just dusting off the ants.' She pointed to the garden. 'Let's kill some rabbits.'

I followed Hillary along a crushed granite path which snaked down the steep incline of her property. Old sleepers and rustic recycled containers enclosed mulched garden beds packed with dense plantings of kangaroo paws, daises, grevilleas, wattles and more. Here and there, tall trees with black trunks hung over us, bringing about pleasant changes in the light. The plants appeared more watered than any I had seen in the last few years of my job; the soil appeared moist, and easy to dig in. For a rabbit, this was a bona fide Garden of Eden.

'It's awfully green', I said. 'Considering the drought and all.'

Hillary looked to the treetops. 'My late husband was passionate about nature', she said. 'When we bought this place, it was just an old paddock, full of bones, weeds, blackberries.' Hillary pointed at the back fence with her stick, and the dense forest beyond. 'If you're ever down there, you'll see what I mean.' She shook her head. 'My husband wanted to rehabilitate the land, bring it back to what it was like before the Europeans trashed the place. When the government banned the watering of gardens, I couldn't stand to

watch it die. So I sunk a bore. The neighbours hate it, but what else was I supposed to do? This garden is everything to me.'

'So, he planted this then?' I asked.

'What's that?'

'Your husband planted this garden?'

'Oh no, dear', said Hillary. 'We had a landscape architect and a gardener do that. But my husband had the imagination to make this happen.' She tapped her walking stick against the path. 'Not like that woman across the road. You see that? Acres of lawn. Just awful. Provides no nutrients or habitat for the native wildlife having a lawn like that.'

I thought of Laura and how she had jiggled that latch for me. I felt bad for not defending her. But that was typical of me.

'You see this?' Hillary said, slapping her stick against a stub of a bush that had been chewed right down to the earth. 'This is what I have to put up with.'

Eventually, we circled back to the house. I wrote up a grossly inflated quote, which Hillary agreed to pay without hesitation. I almost felt guilty. I try to be fair, but it was looking like I'd make rent without skimping for the first time in a while.

'I've got the people from *Home* magazine coming to profile the place', Hillary said. 'It's a real honour.'

We watched a rabbit hop across her patio.

'Kill every last one of them', she spoke flatly. 'You'll be doing the memory of my husband a great service.'

I spent the following two days laying bait and patching holes in the fence with chicken wire. I did a good job, but not my best. As I moved about the garden, I noticed how vibrant the garden was compared to the bush beyond Hillary's back fence, which was dry, and without an understory. Rabbits are relentless machines that like to eat, fuck and dig, and Hillary's garden was the best source of food and predator cover for miles around. No matter what I did, they would be back, and soon.

While the garden was magnificent to work in, I couldn't shake



the irrational feeling that I ought not to be there. I often feel this way when working for the wealthy. The rich grow their gardens in potting mix crowned from housing developments built for the working class; the water they use so liberally is more precious each year. They build tall fences, and this is what frightens me most of all. They make me feel like a trapped animal. It was with great relief that I collected my cheque from Hillary and left the place for good.

I was watching the Tigers thrash the Crows when Hillary called. I found the game dull, but its steady, boring pace was the perfect background to drink with. I ignored my phone the first time it rang. It was a little after nine on a Friday night, and I knew no good could come from answering. But when it wailed again I shuffled off the scuffed couch to answer.

‘Hello?’ I said, noticing the slight slur in my voice.

‘Michael? Michael Berry?’

The woman’s voice was familiar: it had all the qualities of somebody who thought they were better than you. ‘Oh Hillary’, I said. ‘How are you?’

‘Oh, just terrible. My knees are playing up, I’ve got the neighbours harping on about the bore water, something about a swamp? And my son wants me to give him a hundred and ninety grand so he can expand his roadkill butcher.’

‘His what?’

‘My son runs an ethical butcher. He collects roadkill and cuts it up for his friends about Chewton. He wants to take it mainstream.’

‘Right.’ I tried to perch on the kitchen counter, missed, but managed to catch myself mid-fall.

‘Anyway, that’s not why I called.’ Hillary cleared her throat. ‘Have you cashed that cheque I gave you?’

I admitted that I had not.

‘Well don’t bother. I’ve called the bank to cancel it.’

‘Wait.’ My insides turned to ice. ‘You can’t do that. I need that money for rent.’

‘I can and I have’, snapped Hillary. ‘I paid you an exorbitant

amount to kill my rabbits. When you made that quote, I thought, how steep! He must be the best. But are you? No. I'm looking out my window now, and I can see one, two ... six rabbits! Does that sound like a job well done? The whole place is chewed up! I had the people from *Home* magazine here today. The look on their faces. The photographer called it arcadia for rabbits. As if I wanted there to be rabbits in every damned photo of the place! Well, I can't be having that. What would people think of me? Hillary Boyle, queen of invasive species. I couldn't let that stand. I've begged them to come back in a few weeks, give me another chance.'

The fog was descending, that terrible life tiredness that makes everything heavy. I let myself slide to the floor. 'Listen, Hillary. You've got a garden full of lively green plants, when most things else in the area are dead. You're never going to be rabbit free.'

There was a brief silence. 'What did I pay you for?' said Hillary.

'To kill your rabbits.'

'Well come and do your job', Hillary said, and hung up.

Well damn it. I put my phone on the floor, then held up my right hand to my head, like a gun, and clicked. 'Disappear', I whispered. From the television came the roar of the crowd, the excited gabble of commentators, and then a jingle from Toyota. Somebody had kicked a goal.

Hillary's house was no easier to access than before. The latch was still difficult, and again my knocks on the door went unanswered. I followed the same path around to the patio, half-expecting to find Hillary there, but the banana lounge was unoccupied. I put my hands on my hips, looked around. I couldn't just go home. I needed the money. I drew my phone from my pocket to call Hillary, but stopped when I heard the rustle of bushes on the other side of the patio. An obese rabbit came bounding onto the tiles, stopped, and looked right at me. Before I could do anything, a loud horn pierced my ears, causing me to cower in fright. The rabbit, on the other hand, seemed unphased. It was then that I noticed the hand stuck out the window behind me, holding an airhorn. On the other side of the glass was Hillary. 'Oh', she said. 'It's you.' She beckoned me over to the window. 'I've got a problem.'

'I know you have a problem!' I said, my voice a little raised. 'You scared me half to death.'

Hillary shrugged. 'Sorry.'

Calm, I thought. I couldn't yell at this woman. 'These rabbits', I pointed to the one on the patio, which was at that moment taking the final bite of a nubile potted shrub. 'They don't seem all that afraid of you. I've never seen anything like it.'

Hillary shrugged. 'Oh, that's the least of my problems. I've got a deer.'

'A deer?'

'A dead one. My neighbours called this morning and they said, "Hillary, I hate to tell you this, but there is a dead deer in your garden and its starting to smell. Every time the wind changes, I think I'm going to pass out."'

'Laura said this?'

'No, not Laura.' Hillary's face tightened in disgust. 'It was the neighbours on this side.' She pointed to her left. 'David and ... what's her name. Anyway, it doesn't matter. Honestly, I said to them, look, you've ruined my morning. My nerves flared right up. But then I remembered that you were coming.'

I stared at her in disbelief. 'Me?'

'I called my friend, Jean. He's a vet. He told me to throw the deer over the fence.'

'Some vet.'

'I'll pay you.'

'You didn't do that last time.'

'Double', Hillary said. 'I'll get the first hundred now.' She disappeared and then came back with two fifties, which she shoved through the window.

'Fine.' The notes felt crisp and reassuring in my hands and, unlike the cheque, they could not be taken away from me. Still, I felt that I was making a big mistake.

'I didn't even know deer lived around here', Hillary gazed into

the distance. 'It makes you wonder what else might be out there. They're pests you know.'

The burnt-rubber stench of the deer smacked me in the face well before I found it, maggot-chewed and stiff by the back fence in a bed of agapanthus. The smell was eye-watering. I pulled my shirt over my nose and gave the animal a small kick to test its weight, knocking a few squiggling maggots lose. My stomach heaved, I retched. There was no way I was throwing this animal over the fence – it was too heavy, and besides, if I tried to lift it, the rotting juices would go everywhere. What had I done to deserve this? I rubbed my eyes with the palms of my hands. Keep moving. That's how I'd survived so far, it was how I'd go on now.

Whispering sounds came from behind the trees beyond Hillary's fence. I eased myself toward the voices.

'I'm telling you, it's not my fault', a man said.

Another voice, a woman's, replied quietly. 'How was I supposed to know she'd bolt?'

Again, the whispers.

'Well if she's so smart, why hasn't she come back?'

Whomp.

'Ow!' said the man. 'What did you do that for!'

A yellow blur brushed past me. I yipped in shock, leapt and lost my balance. I held my arms out, trying to steady myself, but down I went, hard onto a fern. Nothing hurt, and stiff with panic, I rolled to find a big, fluffy Labrador burrowing into the stinking deer corpse. My body thrummed with adrenaline. At least nobody had seen me fall.

'Bunny Sherrieff.'

Oh great. I rose to find Laura staring at me from the opposite side of the fence. Behind her stood a small man who could only be described as Santa in camouflage.

'You didn't see that did you?' I said, brushing loose mulch from the seat of my pants.

'No, no', said Laura. 'But we heard you.'

‘Quite the high-pitched scream’, the man said.

‘It was very cruel of Jean-Paul to sneak up on you like that’, Laura said. ‘I assume it was a test.’

I looked at the pair, still shaken. I wanted to defend my masculinity, but what could I do? My chest was cold with shame. ‘A test?’ I asked.

‘I told you, my dog is very discerning. I suppose a formal introduction is in order.’ Laura pointed to the Labrador. ‘Mr Sherriff – Jean Paul.’

The dog gave a single bark, then continued rubbing itself into the deer.

‘Look at that!’ said Laura. ‘You kill animals for a living, and yet she trusts you. That is something.’

At this point, the Santa man, who had been shuffling his feet irritably, spoke up. ‘Excuse me’, he said. ‘I don’t suppose you know what killed this deer do you? Could it have been the pindone?’

‘Not a chance’, I said. ‘It’s been too long since I laid the first round. There isn’t a drop of it on site.’

The man’s beard twitched. ‘That does not bode well’, he said. ‘That does not bode well at all.’ He placed a palm to his chest, and slouched. ‘I’m Rick’, he said.

‘Rick’s a hydrologist’, said Laura.

‘So is Laura’, said Rick.

‘You work with water?’

‘Just about’, said Laura. ‘We’re interested in how water moves through the crust of the earth.’

‘We measure the health of swamps, rivers, lakes’, Rick continued.

‘Right’, I said. I had no idea why they were telling me this. Still, they seemed friendly. ‘I don’t suppose you can help me with this deer, could you? Hillary told me to throw it over the fence, but it’s too big for that.’

Laura and Rick looked at each other, then back to me. ‘We can do that’, Laura said.

‘If we carry her down to the swamp she’ll be easier to bury.’ Rick approached the wire fence, and unclipped it from the post.

‘Well that explains the plague of rabbits’, I said.

Laura laughed. ‘I’ve been letting them in’, she said, as she waltzed into the backyard.

‘Why would you do that?’

Laura looked to her feet. ‘When I first moved here, Hillary invited me over for coffee. I thought she was being nice. But no. She presented me with a letter, co-signed by the neighbourhood. It said my house looked like the Collingwood change rooms. That I needed to plant a garden, make it “blend into the landscape.”’ She shook her head. ‘I’ll be damned if that bitch is getting into *Home* magazine.’

I chuckled, but I did not find this funny. I had the terrible feeling of being stuck in the middle of other people’s conflict, which would inevitably lead to choosing a side, something I avoided.

‘She’s huuuuge!’ Rick shouted. He had his sleeve pressed to his face. ‘Grab the back legs, would you?’

Rick and I dragged the deer through the fence and into the bush. The ground was uneven and the deer was heavy. With each step, Rick’s face turned a deeper shade of beetroot, but it was unclear whether this was due to the deer’s weight or its unholy smell. I began to think bitterly about Laura’s elaborate revenge: how lucky she was, privileged even, to be able to enact such a targeted assault. She had even justified her actions by wrapping her grievances with the bow of ecological vigilantism. My misfortunes always felt so amorphous that I tended to circle the blame and resentment back at myself. Deep down I knew this clear-headed revenge of Laura’s was a pleasure only afforded to the rich and comfortable.

‘Are you sure I can’t help?’ she said.

Her petty war of attrition had cost me time and money. I wanted to yell at her, but I could not open my mouth without retching. The deer’s stench was too much.

We came to the bottom of the hill, and the ground levelled out. The earth was hard and grey with dry moss and the petrified

animal shit that had accumulated with months without rain. Here and there, beds of native grasses and thirsty ferns clung to the shade of the old growth; manna gums and yellow boxes whose trunks were strangled by thick columns of ivy. I kept expecting to hear birdsong or insects, as you do when you near water in the bush, but none came. Rick blew out a pathetic breath and dropped the deer. 'This is far enough', he said.

'But you said we should bury her', Laura said.

Rick walked ten metres from the deer, then lowered himself into the dirt. 'Later.' He fumbled with the pockets of his shirt, from which he produced a packet of cigarettes. He lit up, and then lay down. 'Oh thank God', he said. 'Thank you, thank you God.'

I was grateful too. The sour nicotine smell of the cigarette cut through the rotting flesh, and for the first time in minutes, I felt that I could truly breathe. 'You know Hillary refused to pay me', I said.

'What's that?' said Laura.

'She cancelled the cheque when the rabbits came back. She said that I hadn't done my job.'

'That dirty dog.' Laura shook her head. Jean-Paul turned to us with a sheepish look. 'No, not you', said Laura. 'You're a fair boy, my little angel.'

'He's a mutt and you know it', Rick said.

Laura stuck her tongue out in protest. Then her face turned serious. 'I'll pay you. It's my fault, I can see that. But first, I want to you to do something for me.'

'For us', Rick said.

'For the community, truthfully.'

'Please', I said, 'I just need to get paid.'

'Could you not worry?' Rick said. 'Laura said she'd pay you, so what's the problem?'

'You still haven't told me what you want me to do.'

'It's easier if I show you', said Laura.

'Show me what?' I said, exasperated.

Laura came close to me, spoke softly. 'The big swamp.'

'Well, how much further is it?' I asked.

Rick stabbed out his cigarette into a container of mints, stood, and put his hands on his hips. 'We're in it', he said.

I looked around, confused. I couldn't see any swamp. Just cracked earth, and off in the distance the occasional clump of dried grass. And then I understood. 'It's gone dry with the drought', I said. 'Is that what you wanted to show me?'

Laura gave me a disappointed look. 'How much do you know about groundwater?' she said. 'Do you know how a swamp works? What makes a river flow, even when it hasn't rained in months?' Laura's eyes went wide as she spoke, as if she were about to bestow some great mystery. 'You know, the truth is, we geologists don't know much either.'

Rick laughed. 'Lord Kelvin said that in science there is only physics. All the rest is stamp collecting.'

Laura continued: 'It's true, there's a lot of guesswork in what we do. But there are a few things we know for sure. For instance, you know when you are at the beach, and you dig down to find water? That's groundwater. And it's everywhere. I mean it. Dig deep enough and you'll find it. Swamps, rivers, lakes? That's just where the water is closest to the surface. They're pits in the landscape. And we're at the bottom of a valley here. This swamp should not be dry.'

'Well, why is it dry?'

'It's the damn bore', said Rick. 'Suck the water out of the aquifer faster than it can fill up, and this is what you get. There used to be platypus, blackfish and eels here. No more. And now that the wetlands have dried up, the soil has oxidised and acidified. Now we've got heavy metals seeping into the groundwater. In other places like this, complete dry outs have caused fires that are still burning underground. And even if it does rain, the soil from this swamp will now be so toxic that it will kill anything that comes into contact with it.'

'I'll bet that's what killed the deer', Laura said. 'The grasses are



soaking up the acid, making them toxic.'

'Are you trying to tell me that Hillary is to blame?' I asked. 'She's got one tiny bore. Surely she hasn't drained an entire swamp.'

'She's not helping', said Laura. 'But no, it's not her fault. There's an apple orchard on the other side of the river. They're drawing far more from the aquifer than they should, we're sure of it.'

'All we want from Hillary is for her to sign our petition', Rick said.

Laura nodded in agreement.

'Why are you telling me this?' I asked.

'She owns a share in the orchard', Laura said.

'And the bore', Rick continued.

'Her husband was on the local council', Laura continued. 'Her name would mean something.'

'But she won't listen to us', Rick said. 'She thinks we're mad.'

'You want me to ask her to sign it?

'That's right', they said. Jean-Paul gave two sharp barks.

'It's OK if she says no', Laura said. 'I just think it would be worth a try.'

I was quiet for a while. A feeling was boiling in my chest, and I was suddenly afraid. When I spoke, I did so quietly. 'I don't have time for this.'

'What's that?' Laura asked.

'I said that I don't have time for this', I repeated. 'I'm tired', I said. 'I'm just trying to get by. You think I have time to be running about like this? Do you think I work for fun?' I found that I was crying, without quite knowing why. Why were they doing this to me? The feeling was intense, out of proportion. But I could not make it stop. 'What do you all want from me? Look at me. I'm covered in the stink of dead deer. I kill rabbits for a living. All I want to do is show up, lay traps, and get paid.'

Laura stared at me with the eyes of a startled animal.

'She won't listen to me', I said. 'She'll yell at me. She certainly

won't sign it. Why should I deal with that? That garden is a memory to her husband. She's not going to let it die.'

Laura took an awkward step toward me, and then another. She outstretched her arms, and then gently took me into a hug. I stiffened in her embrace, but it felt nice. Warm. I knew she should not have to carry my emotions. She wasn't to blame for the lack of rain, or Hillary's stinginess, or even the presence of the rabbits, which had been shipped to Australia for game two hundred or so years ago.

All of a sudden I felt ridiculous. I shrugged off the hug, and took a step back. Far up in the sky, an eagle drifted in circles.

'OK', said Laura. 'I'll pay you. I'm sorry.'

We buried the deer together. It took a long time to dig a hole large enough with the shovels that Rick fetched from his truck. He spoke incessantly about the soil types as we stabbed at the dry earth, and why no water was seeping into the hole, but I was not really listening. When we were done Laura passed me her phone so that I could type in my bank details. I charged her less than I had quoted Hillary, but more than the job was worth. 'Are you sure you won't sign the petition?' Laura said. 'Could you at least ask Hillary?' I was disappointed that she asked me. I shook my head. We parted ways.

I found Hillary waiting for me at the hole in her fence. 'I know what you've been up to', she said. 'You, and that woman. What you did to my fence. I knew you were in cahoots! Why would you do that? How much did she pay you?' I walked past her and up toward the house. 'I ought to report you', Hillary shrieked. 'Letting the rabbits in like that! I could write a nasty Google review.' Her voice grew more frantic. 'This is the trouble with the world these days! Nobody looks after one another! The people from *Home* magazine will be here next Thursday! Come back here, you devil!' Her cries grew softer as I rounded the house and vaulted the gate. 'Come back!' I heard, climbing into the seat of my ute. 'Sherriff, come back!'

# An outing

Deborah Wardle

From a hillside Claudia views the wide and low-lying basin that undulates towards hazy hills on a distant horizon. She's learning that geological eras shaped this shallow bowl, surrounded at the edges by aged wrinkles covered in a stubble of forest. She stops to take a photo over a barbed-wire fence. Six black Angus steers crowd a leaky water trough, up to their hocks in mud.

'If you drilled a bore in that basin, only forty or so years ago, the spirt of water would be over twenty feet high', a local farmer grumbles. His name tag reads 'Errol'. His eyes squint into a past he clearly yearns for. She imagines he is remembering and longing for wetter times. The midday light blares.

'Twenty feet, that's about seven metres, right?' she asks.

The farmer nods. 'That's before they took the water for Geelong, pumped many of us dry.'

Who is the us, who are the they in all this, Claudia wonders. She'd signed up for a day-long tour of the district, organised by the Friends of Long Swamp. An intrepid bunch of locals are trying to inform the community about increasing fire risks now that the river and the swamp are drying out. Being new to the district, Claudia wants to meet some kindred spirits, to find out about the geography of the place.

'How far to the swamp?' she asks. Why are the steers standing in mud, she wonders, looking at the elsewhere drying paddock.

'A couple of k's. Not far past the disused pumping station.' Errol

cocks a sceptical eyebrow, and she knows he doesn't think much of the pumping stations. As if reading her mind he continues, 'That water trough runs on bore water mostly. They all leak. Graziers around here had to deepen their bores, to reach the water. We can't all afford to do that. And it doesn't solve the problem. The water table keeps dropping.'

'Do you know much about the fire in the swamp?' she asks. The advertising for the tour had promised discussion of the peat fires that had burnt for months, smogging the region's air last summer. Impossible to extinguish.

'I wanna hear what they're going to tell us.' Errol scratches under his hat, indicating the rest of the group, who are gathering around the main speaker.

Claudia and Errol return to hear the guest hydrogeologist, Chris, explaining how the groundwater had collected beneath the belly of the basin for millions of years. Water seeps through some sort of permeable sandy belt that dips and folds upwards at the edges here on this rise and in the distant hills.

'The water goes in through a narrow strip of sand along here', the hydrogeologist indicates a pale strip near the edge of the dirt road. A stiff breeze is stirring the dust. Chris struggles to hold up a geological map, pressing it to the side of the minibus. He points to a spot. 'And I'll show you the same sedimentary band on the other side, over there', Chris gestures towards the tree-covered hills in the distance. 'It's like a deep-dipping layer cake, the upturned edges catch the rain. Water sits above an impermeable layer of bedrock in an aquifer. The top of the water table is between ten to forty metres below the surface of the basin. Depends on the seasons, how much pumping. It moves up and down a bit.' He gathers his maps.

'Mostly downwards of late.' Errol grumbles. Claudia watches the mood of the group to shift too, imagining it rising and lowering like an aquifer.

'Next, we'll go to the old pumping station, and end up about seven kilometres away, on the other side. Long Swamp is in the forest over there. Where the water table meets the surface.' The audience swing their heads to look toward what could not be seen.

The hydrogeologist rolls up the last hydrogeological map and ushers the group onto the bus.

They stop at a huge, rusted pump station, which spews enormous pipes rivetted together in intestine-like convolutions. The group views the abandoned, government-installed machinery through cyclone fencing, silent and solemn. Magpies warble; the sun heats Claudia's back. Engineering had enabled massive extraction of the aquifer, someone from the Friends explains. 'That is a legacy of hubris,' the person explains. Corroding, the rusted behemoth sags, shamed and unused.

They drive across the belly of the basin through patchworked farmland then up the rim into the forest. The bus pulls up at a juncture of two dirt tracks. The group stands in a circle, the forest thick around them. Chris points out the band of sand that matches the innocuous strip they'd seen previously. This is also where the water enters the aquifer. This is one huge saggy cake. Claudia is getting the idea that landscape scale and eons of time are the parameters.

Two young people wearing khaki uniforms, with Barwon Water signage on their chest pockets, have come along to share information about their Environmental Protection Plan for remediation of Boundary Creek and Long Swamp. Fresh faced and optimistic, they hang on the edge of the group. Their yellowish work boots are clean and clunky. When it's their turn to address the group, community members scuff the ground with their shoes, sceptical faces turn. The well-trained staff explain that they're employed to engineer remediation to the damage caused by the over-extraction of water, and to communicate the plan to communities.

'People are our clients, we have to provide water to the city', the enthusiastic young bureaucrat spouts, as if nothing else could be more important. Claudia listens to the syncopating frogs she can hear in the surrounding forest. They are clearly not the clients.

'Over three hundred thousand people rely on us for water.' The young voice has a slightly desperate tone, a pre-learned script. 'It's our responsibility to provide them water.' She looks around the group, lost for a moment, as weary faces stare her down. 'It has to

come from somewhere.'

'And all this pumping, what's the cost to the land, to the forest, to the swamp? Was it monitored?' asks a tired looking man. He waves his arm to include all the trees and sky. His label reads 'Michael'. He heads up the Friends of Long Swamp. 'The swamp used to be a full ecosystem, filtering water into the creek. It's gone. The peat fires tell the story.'

'How's your engineering going to fix what took thousands of years to create?', another woman speaks up. Claudia feels the group bristle.

A thrum of cicadas vibrates through growing tensions. The two young representatives from the water authority shuffle their boots in the sand. They look sacrificial.

Chris rolls out another map, starts giving figures of recharge rates with current rainfall. 'The aquifer might replenish itself over time.' He coughs, placating. 'A long time.' He's as unsettled as the rest of them.

'My bore pump is still not running. My dairy herd drinks water I have to buy. Tanker loads every day. Money don't come from heaven.' Errol pats his hip pocket.

'And we all know that with climate change, we don't know if heaven will still provide', from across the circle, another person under a deep-brimmed hat pronounces. 'Don't try telling us that you'll fix forty years of damage. Not this year, anyhow.'

A wave of nods and mutters of approval shimmers around the group.

'The aquifers are too low. The swamp has dried up. It's spewing toxic acids into the creek. The fish are dying.' Michael's face reddens to deep beetroot. His fists clench and release.

Dying fish, a deathly marker. Claudia remembers photos in the local newsletter, the outraged letters to the editor. She has much to learn about the district. She feels the gripe between angry farmers, community environmentalists, the hopeful water managers and the stoically informative hydrogeologist. This is a long battle, though not as long as subterranean water flows.

A praying mantis lands on Claudia's shoulder, taking time to fold its golden wings into place. She watches it crawl down her sleeve. A circle of community members standing in a forest, she muses. We're all learning to see the subterranean. Just because aquifers are not readily seen, doesn't mean they're not there. We all imagine them differently. There is so much to learn. Noticing a swamp, thinking about its connectivity to us and to aquifers, is just a start towards considering the importance of aquifers. Claudia remembers the acknowledgement to Country they had listened to at the start of the day. Indigenous custodians know the interdependencies of this landscape. She watches the praying mantis rub its mandibles with claw-like forelegs.

'Back on the bus, then.' The driver looks at his watch, stubs his cigarette into the grey sand. A woman in a flowing dress clucks, points to him to pick up the butt, grimacing in disgust. 'You won't be leaving nicotine here for worms and insects to choke on. Poisons seep, you know.' The woman scowls as the driver picks up the butt.

On the return journey the atmosphere in the bus is thick; unresolved tensions linger. No one speaks for fear of setting off a tinder-dry tirade smouldering in people's minds. So, this is the local community, Claudia thinks. The praying mantis clings to her sleeve. She wants to carry it to her garden.

Back in the carpark, Chris gives a pithy hydrogeological encapsulation of how geology affects subterranean water flows. He touches on the damaged borefield. 'We've made mistakes. We didn't have all the data. Monitoring bores were insufficient. The scientific evidence was not clear at the time, back when decisions to pump were made. We know more about water flows now. Connections between surface water and aquifers.'

A hand shoots up. Claudia recognises the woman in the floral dress as Beryl, the proprietor of the local post office-cum-newsagency-cum-general store-cum-coffee spot. All these services patched together in one rickety building. Beryl of all people knows the district's foibles, and its strengths. The postmistress beams, clearly relieved to be off the bus. 'Aren't we all connected? Us and the frogs and the swamps and the waterways, and the milk from the cows. And even the pipes they used to take away our water. All

connected.' She wipes her forehead. 'Connections, I reckon.'

Errol shakes his head and backs off, muttering, 'All well and good, but connections don't water the cows.'

'But they might save the swamp', Michael says. He and other members of Friends of Long Swamp invite people to join up and sign the current petition. Claudia steps forward to sign up.

The water authority representatives hunch their shoulders as they stride to their cars, clutching their folders.

No one speaks. Some nod, some shake their head. Unresolved disputes simmer. The group stands silent, unsure.

The hydrogeologist, Chris, steps forward, thanks everyone for their attendance with a final flourish of his roll of maps. People disperse to their cars. Claudia thinks they look like dairy cows wandering to the milking bails across a sparse paddock, heads down and caught up in their own swinging thoughts, connected and disconnected. She drives homeward, watching now for the dips that mark small watercourses, hollows where water may seep to deeper places.



# Poems

Carey Walden

## Background

I have long understood that Australia is an arid country and water is vital to life for growing our food and to supply a viable environment for all living beings.

In my childhood we lived on a dairy farm with irrigation in the Wimmera (Murtoa). The transportation of water in the 1950s/1960s for irrigation to the farm was open channels. This meant as much as 90% of this precious resource was lost to evaporation (Dahlhaus, 19 March 2021, Barwon Downs borefield).

My groundwater poetry makes 'invisible groundwater' visible. Both hydrology experts, Tim Peterson and Peter Dahlhaus, made it clear everything is connected in our ecosystem whether it is visible or not. When the earth is saturated, the top part is not saturated as plants absorb the water like a blanket. Groundwater is not a huge underground lake; it seeps through permeable soils of sand and gravel in shards.

It is crucial for rivers and creeks to run, especially in droughts. Groundwater is like a bank: if you have 5% of water going in each year then you should only take out 5% (Dahlhaus, 19 March 2021). The actions of Barwon Water highlight the consequences of pumping too much groundwater from the interconnecting water systems. As the watertable level drops, fool's gold or pyrite/iron sulphide rocks ( $\text{FeS}_2$ ) produce sulphuric acid, which goes through the swamp and into the river (Dahlhaus, 16 March 2021). Deceptively, the water is clear but invisibly toxic so there are no fish, no platypuses, no life.

We cannot see what is underground, we do not know enough, and we can have misconceived ideas about groundwater. Water is

incompressible and once groundwater is used it is gone, once more invisible in its absence.

### **Toxic water song (Barwon Water)**

Water, water, run  
 Invisible and visible  
 Sunlight gleaming  
 Sparkles of light  
 Sparkling and glittering  
 Like a child snickering  
 Secrets I hold in me  
 Innocent and clear  
 Gurgling and murmuring  
 Like a ribbon of light  
 Within my sparking depths  
 My toxic secret flows  
 Killing life in me  
 No fish, no tadpoles  
 No platypus building homes –  
 Here on my banks  
 Clear but dangerous  
 I wend my way  
 Through rocks and stones  
 Gurgling through the swamp  
 Unstoppable calling, calling  
 No birds, no fish  
 Silence, silence, deadly

*Carey Walden 2021*

### **Groundwater**

No cry, no cry  
 Just water and lies  
 Bubbling to the surface  
 A loud burst of spray  
 Sparkling in the sun  
 Exhausting my life  
 No more, no more  
 You drill and dig  
 Finding my secrets

Taking life from the land  
Empty, empty, and gone  
No water, no water  
for life and home.

*Carey Walden 2021*

### **Barwon water and words**

Water and words, water and want  
So many words, so little water  
You plunder my treasures  
Not following measures  
Gurgle and flow, gurgle and slow  
Visible, not visible  
You plunder my artesian depths  
Leaving me empty and hollow  
I wait, sad and dry  
Where are you rain?  
I sit and wait  
A trickle and bare earth  
No life, no life, no life.

*Carey Walden 2021*

### **Water gone**

Where are the birds  
The wind whistles  
Stirring the dust  
Willy-willys circle  
Earth lies hard and cold  
No rain, no rain, no water  
Crop remnants rustle  
Deserted by humans  
Silence, silence of water  
Now long gone.

*Carey Walden 2021*

## Telling groundwater stories

Harsh sun beats down  
Earth hard and dry  
Sheoak trees shiver in the breeze  
Drawing water from the earth  
precious shards trapped in sand and rocks  
We stand in shade water stories swirling in the air  
like willy-willys moving the dusty soil  
Can we save our groundwater precious and ephemeral?

*Carey Walden 2021*

# Acknowledgements

I acknowledge and appreciate the enthusiasm and tenacity of all who participated in the Understanding Aquifers through Groundwater Stories Project, particularly those community members, scholars and students who have contributed to this collection. I express my deep appreciation to the project steering committee: Amanda Johnson and Eddie Paterson (creative writing, University of Melbourne), Peter Dahlhaus (hydrogeologist, Federation University), and Tim Peterson (hydrogeologist, Monash University, formerly University of Melbourne), each of whom provided ongoing support and advice to the project and participated generously in the symposium and excursion in March 2021.

I appreciate greatly the seeding funding supplied by Melbourne Sustainable Society Institute (MSSI) University of Melbourne, to enable this project to proceed. MSSI's replacement at the University of Melbourne, Melbourne Climate Futures, does not make any claim by UoM over the IP of this academic work.

I thank all the contributors for their work in providing the wonderfully diverse material for this collection. While the activities were delayed and necessarily adapted due to the limitations of the COVID-19 pandemic, the resulting symposium and excursion, and the writing that participants developed, illustrate the potential of interdisciplinary engagements and relational thinking.

Three donations were received to fund the publication of the book, as a hard copy and an e-version. I express deep appreciation to the three participants who contributed their own money to enable the project to be completed. Marina Lewis and two anonymous donors enabled the editing, design and printing of this collection. Thank you.

Deep appreciation to Kate Leeson for her keen editorial eye. Thanks also to Lisa Major from Subgreen Design for the layout and design work. The cover illustration by my son, Oliver Wardle, shows his long time support of my thinking about groundwater. Thanks to the staff at Federation University library who assisted in navigating the e-book submission process. The resource is

published as an e-resource on [www.deborahwardle.com](http://www.deborahwardle.com) with the hope that it is useful to a wide audience of readers.

All works are original writing by the author. An abridged version of Amanda Johnson's essay is forthcoming as an article, 'Groundwater stories: Poetry's ecocritical subterrain', as a book chapter in *Consent: A Reading*, Perimeter Publishing, Melbourne 2024. Proceedings from the Consent Interdisciplinary Forum, Ian Potter Museum of Art, University of Melbourne, Nov - Dec 2021.

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