## ARTICLE

# Experiments with a Dark Pedagogy: Learning from/through Temporality, Climate Change and Species Extinction (…and Ghosts)

Scott Jukes[1] and Kathryn Riley[2]

[1]Institute of Education, Arts and Community, Federation University Australia, Berwick, Victoria, Australia and [2]University of Manitoba, Winnipeg, MB, Canada
**Corresponding author:** Scott Jukes; Email: s.jukes@federation.edu.au

**Abstract**

In this article, we experiment with a form of dark pedagogy, a pedagogy that confronts haunting pasts~presents~futures in environmental education. We offer a conceptualisation of ghosts that enables us to creatively explore the duration of things and consider the relationality of time. We examine this through two situated contexts, engaging with entangled, yet differentiated, socioecological issues. The first issue involves the cascading impacts of climate change on the Australian Alps, including intensifying bushfires and threats to the iconic snow gum. The second issue involves the reordering of human/animal relations through processes of settler colonialism that continue to transform land into a commodity, with a significant cultural and material consequence of such colonial harm resulting in the extermination of free-ranging bison herds in the Canadian prairies. Both are unique issues, but both involve impacts of colonisation, loss and natural-cultural hegemony. The dark elements of these Place-specific stories involve noticing and confronting loss and related injustices. In our case, we diffract such confrontations by thinking through these challenging issues and working towards ethical ways of living and learning. In this article, we (re)member ghosts and ponder practices for fostering anticolonial response-abilities and affirmative human/Earth futures.

**Keywords:** Duration; ghosts; multispecies entanglements; bushfires; snow gums; bison

## Introduction: Purpose

This article emerges from a joint concern, and hope, for time and the times we are in. We live in a precarious social and ecological present, intersecting with damaging capitalist and colonial pasts and signs of apocalyptic capitalist and colonial futures. Each of us — Scott and Kat — live with fear, guilt, sorrow and hope, in relation to particular places,[1] issues, and earthly kin. Some of Scott's recent work has found value in exploring stories that confront and embrace troubling realities and evoke responses (Jukes, 2023a). Kat's recent work has investigated (re)storying human/Earth relationships in efforts to de/reconstruct anthropocentric logics and colonial hegemony (Riley, 2023). We have found a commonality in both values, theories, and practices, also discovering we grew up in neighbouring small coastal towns on Bunurong/Boonwurrung Country, or what Settler Australia refers to as the Mornington Peninsula in Victoria. The purpose of our combination in this article is to further our practices of knowing, thinking, doing, being and feeling differently in environmental education, to consider new ways (at least for us) of conceiving and practising pedagogy for multispecies justice. Time — that thing we always seem to be short

of — is the conceptual knot we look to unravel, playing with conceptions in the contexts of the worlds we live and work. We consider entangled past~present~future(s)[2] in situated contexts, asking *what might we learn from the past in the present for the future?* This problem takes us through some murky and dark histories.[3] Hence, this problem presents a need for a pedagogy that is up to the challenge, as we explore possible ways of grappling with the present and in efforts to world an affirmative future… yet to come. In this spirit, our article is a relational experiment with time.

As we collide with the concept of time, we draw upon the figuration of ghosts. Specifically, this article is partly a story of learning from ghosts. Some of you, reading this right now, might not believe in ghosts. But we assure you, by the end of this paper you will see what we mean ;-). After all, ghosts are all around you, if you know where and how to look. This is not a matter of belief or faith, but a matter of conception. For us, ghosts are a sign of the past. But a past actualising in the present. As Gan et al. (2017) suggest, ghosts point to past tracks and traces, to earlier entanglements, to the multiple histories of life and death that have made a Place what it is. In this conception, we draw upon Bergson's (1998) idea of duration, where change is a constant and the past is always conveying something into the present. Such a past "gnaws into the future and which swells as it advances" (Bergson, 1998, p. 4). We will continue to articulate the idea of ghosts (and how this is influenced by Bergson's process philosophy and Indigenous conceptions of time) shortly, as these ideas assist in our conceptions of dark pedagogy.

Dark pedagogy has emerged as both a theoretical and practical concept for environmental education (Lysgaard et al., 2019; Lysgaard & Bengtsson, 2020; Saari & Mullen, 2020). Lysgaard and Bengtsson (2020), drawing upon theories of new materialism and speculative realism, conceive dark pedagogy as a way to "constructively and reflexively engage with the complexity and wickedness of sustainability in an educational context" (p. 1454). Saari and Mullen (2020) draw on Timothy Morton's (2016) concepts of *dark ecology* to suggest that the spectre of global warming is not an abstract and distant event framed through biological and geographical discourses but something that is already "in" us. As these authors claim, global warming "does something to places that our concepts of it are not prepared for: it haunts" (p. 1467). For us, the concept "dark" involves shadows, the unknown and uncertainty surrounding wicked problems such as social and ecological collapse. However, while we are grounded in pedagogical implications of dark past~present~future(s), we differ from Lysgaard and Bengtsson's dark pedagogy that rests on a notion of issues being "hard to grasp" or remaining "in the dark" (p. 1454) and align more with Saari and Mullen's (2020) articulations of darkness to think about how to live with hope and collaborative action in dark Places. For us, dark pedagogy is both a philosophical effort to consider ways to notice and confront ecological collapse and its related colonial histories, and a practical effort to explore matters of concern in Places we have come to care about. Simply, we take up the challenge of exploring and sharing some terrible stories we have encountered, whilst analysing this process and considering ways of working through, and with, educational challenges to confront ecological collapse.

## Temporality and duration

Time cannot be understood without relations (Fell, 2012, p. 4).

Environmental education research and broader environmental literature is increasingly grappling with notions of time (e.g., Bawaka Country et al., 2020; Edensor et al., 2020; Grauer et al., 2022; Poelina et al. 2022). Discussions of epochs such as the Anthropocene abound, along with declarations of urgency in the face of climate change, talk of the finality of extinction and concern for uncertain futures. Our intention in this section is to contribute some theoretical grappling with

different conceptions of time in relation to issues of concern in environmental education research, which we then put to work in our thinking in this article.

To build our understandings of time and temporality, we draw upon Bergson and Bergsonian ideas relating to the concept of duration. As Rousell & Peñaloza-Caicedo (2022) explain, duration "implies immersion in the ceaseless movement of time through which life creatively advances and differentiates" (p. 434). But as Fell (2012) delineates, duration is both a psychological and biological process which can involve movement of a physical body and an "all-embracing duration that includes all worldly processes" (p. 5). For us, duration involves motion and change, or as Deleuze (1988) describes, a transition and "a becoming that endures" (p. 37). Thus, duration is underpinned by multiplicities and creative processes of divergence (Lundy, 2018). In some of Bergson's earlier works, duration was depicted as psychological experience (Deleuze, 1988; Fell, 2012). However, later works present a broader conception of duration as manifestations of being. As Fell (2012) writes, "what the term 'duration' achieves is to weld motion onto being and demonstrate that being cannot be regarded in any other way than as being in motion, the being that is history" (p. 4).

We also find Indigenous conceptions of time important to acknowledge and recognise, as they illustrate the "on-going creation of the world" (Rose, 1996, p. 26). As Yunkaporta (2019) explains, Aboriginal notions of time are non-linear and regenerate creation in endless cycles (p. 52). He remarks that "Creation time isn't a 'long, long ago' event, because creation is still unfolding now, and will continue if we know how to know it . . . Creation is in a constant state of motion" (pp. 44–45). Poelina et al. (2022) also work with non-linear time, articulating that "time is co-becoming" and "time is relational in that it co-emerges with clouds, rain, weather, seasons, rivers, ecosystems and people" (p. 400). They don't "banish the past to 'the past'" but recognise:

> the richness of the present, which is inclusive of the past in knowledge, memories, repeated actions and habits, and constantly allows for the eventualities of the future. A linear, narrow view of time ignores historical injustices ('the past is the past') and denies the continuing invasive unjust developments such as extractive colonisation of Indigenous Lands and Waters. (p. 400)

Bawaka Country et al., (2020) echo similar ideas, explaining that relegating the past to the past "ignores the many enduring violences of colonialism and concurrent efforts to nurture [multi-temporal] relationships of belonging and care" (p. 296). Bawaka Country advocates that it is more-than-human relationality that co-constitutes people, place and time.

Acknowledging some of the above Indigenous conceptions of time, we consider a posthuman orientation to the concept of duration. Deleuze (1988) writes that "things participate directly in duration itself. If qualities exist in things no less than they do in consciousness, if there is a movement of qualities outside myself, things must, of necessity, endure in their own way" (p. 48). Thus, our aim with a posthuman conception of duration is to open a discussion on the duration of things and consider how things *endure in their own way*. Such contemplations encounter more-than-human memories, where memory is a "virtual coexistence" (Deleuze, 1988, p. 51). In concrete terms, we aim to think-with multispecies beings — to open ourselves to others/relations/co-constitutive forces — in a practice of speculative immersion. In doing so, we counter any notion of the past being a disembodied temporal reality separate from the present. Rather, past events actualise the present, with past events being recognisable and readable in the material present. We will depict this through storied examples shortly to show how past~present~future entanglements of *colonial durations* mark and scar multispecies bodies. Such examples show how time is relational, and duration is ontological, where past, present and future are never separate, but constantly shaping realities and the conditions of the future. This leaves open a future yet to come, where we can work to generate ethical horizons of hope and affirmation (Stengers, 2017).

## Haunting stories

In the sections that follow, we explore some encounters we have had with ghosts, to see where their story takes us. We aim to correspond with ghosts in order to grasp what we can learn from them, demonstrating dark pedagogy in action. We explore two examples of loss and social and ecological precarity, uncovering nebulous layers along the way. We envision our writing as an emergent process of inquiry, where we think-with things and their relations (for more on this elsewhere, see Jukes, 2023b). This approach eschews rigid research design and clear positivist outcomes, instead allowing us to become immersed in the process and responsive to what materialises/matters. In our quest to explore the question *what might we learn from the past in the present for the future?* we draw upon (intra)personal stories/memories, affective encounters with ghosts, photographs, multispecies ethnographic observations and relevant literature within emplaced and specific contexts. We diffract these empirical materials from our contexts to re/story examples of dark pedagogy in action.

### *Stories of a dark pedagogy, part 1 — Ghost forests (Facing ecological collapse) — from Scott*

It was mid-semester break, and the mountains were calling. I met my friend Dave on route as we headed towards Mount Hotham. It was unseasonably warm. *Is this climate change?* I was in the mountains a few weeks earlier with students and our ski tour was part bushwalk due to lack of snow cover. This should have been peak winter conditions. Still, Dave and I pushed on with a hope of finding some snow in the backcountry before returning and taking part in the Victorian Backcountry Festival. Pessimistic posts on social media were clouding the viability of the festival. How can we go backcountry skiing at a backcountry skiing festival without snow? How can we do any skiing? Is this what Australian winters will be like in an era of climate change? *Most likely.* As I drive up the hill, I ponder Nadegger's (2023) argument that alpine skiing is troubled by its capitalist, extractive and exploitative relations with the natural world. She notes that alpine skiing "commodifies natural habitats for human pleasure and experiences while utilising limited resources for travel and leisure. These practices are frequently carried out without regard for the impacts on ecosystems, animals and many other more-than-humans" (Nadegger, 2023, p. 3). I try not to let it get me down. *At least I'm not using the lifts,* I meekly try proffering to myself.

We camped, walked, skied, chatted and enjoyed the mountains for a few days (see Figure 1), before heading to the backcountry festival. Dave was presenting something on wilderness first aid. I was lured into signing up for a snow gum walk, organised by *Friends of the Earth Melbourne* and *Protect our Winters*. Cam Walker, an environmental activist, mountain enthusiast, volunteer firefighter, skier and founder of the backcountry festival was leading the walk, focusing on how the iconic snow gums are being affected by our warming climate, bushfires and infestation from longicorn beetles. This was an issue I had been dwelling on, writing about (see Jukes, 2023a, c) and grappling with in my teaching. In the early spring following the backcountry festival, I was heading back to the mountains with students on a 7-day bushwalk. My hope was that this walk could give me some inspiration in how to tackle climate change and the threat of extinction in my learning and teaching practices.

The brown dreary grass of JB Plain absorbed my attention as I waited for the tour to start. More people arrived, commenting how this grass is 'normally' covered by snow this time of year. People awkwardly agreed. I shifted from foot to foot, hands warm in pockets. Cam arrived, rushing about with his dreadlocks flapping. Then he settled and started talking, acknowledging Country — Gunaikurnai Country. A measured seriousness and respect came from his eyes. *This man cares for these mountains and highly values Traditional owners.* I looked around as he spoke, noting others listening attentively and nodding in approval. As we walked towards Tabletop Mountain, Cam pointed out healthy forest and nearby forest impacted by multiple recent bushfires. As he exclaimed, this was a forest in ecological collapse; these were ghost forests.

**Figure 1.** Questionable backcountry skiing conditions in late Winter, 2023. (Jaithmathang Country). Photo by Scott Jukes.

### Environmental prelude

In 2003, a large bushfire engulfed large portions of the Australian Alps, including the Bogong High Plains[4]. I don't recall this fire, but I do remember the fires 3 years later, known as the Great Divide Fires. I was a student in my undergraduate degree and was hooked on bushwalking, skiing and outdoor education. The fires impacted Places I was falling in love with, and I became concerned about the prevalence of bushfires. More fires hit in 2014 and 2019/2020. As Fairman, Bennett, Tupper and Nitschke[5] (2017) explain, higher incidences of bushfire, likely caused by climate change, are devastating the Australian Alps. Still, it is only now, 20 years on from the 03' fires that I am beginning to understand the ramifications of these and subsequent bushfires (see Figure 2).

### Ghost forests

Recently, Cam Walker (2023), the grey bearded dreadlocked man guiding the snow gum walk, described snow gum forests of the Victorian Alps as ghost forests. He likens widespread snow gum death, caused from increased bushfires and infestation from longicorn beetle larvae — in short, climate change — to the coral bleaching of the Great Barrier Reef. As he states, "Ridge after ridge of bleached grey "ghost forests' [see Figures 2 and 3] are replacing the snow gum forests we know and love. This is climate change in real time" (Walker, 2023, para. 12). Climate change, on a global scale, is a complex picture. But if we zoom in and explore the ecological impacts of climate change on the Australian Alps alone, the complexity does not necessarily reduce.

Over 90% of Victorian snow gums have been burned since 2003 (Fairman et al., 2017). During this time, some fires have burned the same snow gums multiple times. This is of particular concern

**Figure 2.** 'Ghost forests' across the Australian Alps. (Jaithmathang Country). Photos by Scott Jukes.



**Figure 3.** Snow gums near Mount Bogong/Warkwoolowler burned in the 2003 fires (right) and looking eastward from near Falls Creek (left). (Jaithmathang Country). Photos by Scott Jukes.

because, although snow gums have adapted to fire, they are not well adapted to multiple fires in quick succession. As Fairman et al. (2017) explain, snow gum limbs will often die in a fire, but they regrow from lignotubers (their bulbous bases where energy reserves are kept and where buds lie dormant), starting again with small shoots (e.g. see Figure 4). However, multiple fires in quick succession kill off lignotuberous growth, ultimately killing the tree. Furthering this issue, new seedlings may regenerate after one fire, but are killed off after multiple fires in quick succession.

**Figure 4.** A snow patch and recovering snow gums under Mount Nelse (Jaithmathang Country). Photo by Scott Jukes.

The same also goes for surrounding shrubbery, leaving ghost forests, invasive grasses and a landscape less able to retain snow. Possibly worst of all, is that in these particular forests, with these types of trees, older forests produce less fire, but more fire leads to more fire (Zylstra, 2013). Rose's (2012) concept of *double death* resonates here, where it is not just death of an individual, but also death of ongoingness and the ability for an ecological collective to regenerate itself.

As Cam pointed out to us on our walk, some snow gum forests are not just facing ecological collapse, they are in ecological collapse, and a more fire-prone landscape is what remains (see Figure 5). Some local firefighters were on the walk and spoke of the 2019/2020 fire near Dinner Plain in the Victorian Alps. This started as a small fire, in a somewhat remote area. However, as numerous other blazes raged during that black summer, resources were scarce. Forest fire management procedures, wanting to ensure the safety of firefighters, prevented under-resourced crews from attending. Furthermore, temperatures were too hot and the altitude too high for older helicopters to fly, preventing aerial water bombing. As the blaze grew more unwieldy, it burned recently burnt forest, resulting in localised ecological collapse — double death.

As I realised on the walk at the Backcountry festival, and as I continued to dwell on since, the collapse of snow gums is not just an ecological issue, it is also a cultural and logistical issue. In another related issue in the Australian Alps, Slattery and Worboys (2020) explain that the grazing of livestock following European settlement led to the degradation and desertification of parts of the Australian Alps. The legacy of colonial mindsets has continued for decades, with colonial views and pervasive folklore perpetuating in contemporary debates about the belongingness of introduced (feral) horses (see Jukes, 2021). In other words, colonialism is not just a thing of the past, colonialism endures, impacting the present, playing a role in ecological damage (Alpine

**Figure 5.** Dense regrowth of Alpine Ash — a more fire prone landscape (Jaithmathang Country). Photo by Scott Jukes.

wetlands in this case). Worldviews collide when the Alps are considered. Many people value the Alps, but for different reasons; commodity, resource, wilderness, recreational amenity, home, kinscape and much more. The Alps are a boiling pot, mixing together biological processes and enduring material manifestations of colonial and capitalist pressures, all with a natural facade. But there is hope in these mountains, too, with people caring, acting and fighting for them in numerous ways (e.g., passionate activists, land managers, fire fighters, educators and more, performing little acts of care every day).

As I envision the concept of ghost forests, flickering images traverse my mind: increased tree mortality, decreased tree regeneration, positive feedback loops of fire, changing climate, pyrocumulous clouds forming over fire grounds, creating lightning sparking more fire, reduced capacity for forests to store carbon, stretched resources, the prioritisation of human infrastructure, capitalism vying for a niche, vast distances, policy, procedure, funding, politics, limited volunteers, apathy and ambivalence. An enduring mess. A more-than-human mess. How can I grapple with these complexities in my teaching? As I have learnt throughout this project, one valuable strategy involves working in solidarity with others that also care, learning from them and fuelling each other's hopes and passion towards collaborative action. My passion was fuelled on the snow gum walk described above and was something, along with care and collaborative action, I hoped to foster in the educational events described below.

### *The Octopus tree and a pesky beetle* . . . *or the unravelling details of a changing climate*

Fast forward to the scene in Figure 6. These images come from a 7-day bushwalking journey through the Victorian Alps from Mount Hotham, across the Bogong High Plains and over Mount

**Figure 6.** The octopus tree — an ancient tree fighting a new challenge … the longicorn beetle (Jaithmathang Country). Photos by Scott Jukes.

Bogong. The students are in their 2nd year of their undergraduate studies in an outdoor education unit I teach. We are exploring the concept~practice of journeying whilst attempting to decolonise our practice by paying attention to the land we are travelling with and through (see Riley, 2021; Stewart, 2004, for an in-depth discussion on decolonising outdoor education). Students are leading peers as they become outdoor educators, while also exploring Place-specific topics. Flora, fauna, history and culture were topics among climate change and bushfire impacts. The students' goal was to investigate a topic and share some insights. My goal was to weave the complex web of relations between the various topics, showing, that in reality, they are all entwined. For me, a key goal was to highlight the relations between climate change, bushfire and snow gum death as a practical dark pedagogy that links pasts~presents~futures and the non-human duration of things. To help enact this strategy, I aim to stay alert to pedagogic moments, such as the moment in Figure 6.

Reader, meet the octopus tree (Figure 6). I can assure you this "gathering together of the threads of life" (Ingold, 2010, p. 4) is much more impressive in 'real life' (whatever that is). On the recent journey in the moment mentioned above, I introduced this eco-socio-cultural construction (known as a tree) to the students. Its life is speculatively over 600 years old. Its existence predates European settlement (colonisation of this country and Country). It survived that colonisation, but by extension, is facing another colonisation — of the beetle kind — which it likely won't endure. The longicorn beetle (also 'longhorn') lay their eggs on snow gums and their larvae bore within the bark and cambium layer, often around the trunk (Figure 7). Due to reduced snowfall and higher temperatures, snow gums are facing greater moisture stress (NSW Government, 2019, p. 15). This stress makes them more susceptible to infestation from longicorn beetle larvae. A report[6] from New South Wales Parks and Wildlife service noted that the longicorn beetle prefer moisture stressed trees and complete their life cycle as much as 75% faster in warmer weather (NSW Government, 2019).

When we visited the tree — which I often take students to — the students and I sat and speculated on its story (for another example of this, see Jukes & Reeves, 2020). Ingold (2021) writes that it is "only when we appreciate things as their stories can we begin to correspond with

**Figure 7.** Snow gum dieback (Jaithmathang Country). Photo by Scott Jukes.

them" (p. 7). Correspondence (the action of reading and receiving) seemed an apt way of describing our relationship with the tree, as we enjoyed its shade, rested and conversed. As a group, we discussed the fate of the snow gums, impacts of fire and changing climate. This was an ongoing discussion from the onset of the trip, which continued throughout (and which I hope endures). "I get why we come out here for such a long time now", mentioned a student later in the journey. As we discussed, it takes time to shift attention from home, just as it takes time to become immersed in the present, and it takes time to develop a bond with a Place — to have its story seep into yours. The duration of the trip, the duration of the landscapes enduring more-than-human characters, ghost forests, spectres of past fires and colonialist memories trickled into, through and extended awareness, dissolving individual humanist borders.

Part of my educational praxis is about facing loss, confronting colonial pasts and conceiving life and death. But, for me, dark pedagogy must also involve the affective aspects, the moments of

sitting in the shade under an ancient tree; it involves learning to care, learning to sit with discomfort, telling difficult stories and cultivating hope (Verlie, 2019). As Verlie (2019) argues, hoping "generates difference, creates alternatives and strives to do things otherwise" (p. 757). One of the most difficult aspects of such a pedagogy is that there are no simple easy answers. However, I cannot see a future without grappling with our entangled past and noticing the scars it bears on the present. For me, there is something generative in facing potential loss, supporting students who want to do the same and speculating on how we may assist each other to live better on our damaged planet.

### Stories of a dark pedagogy, part 2 — The bison: Whose conversation do you want to be a part of? — from Kat

Hurtling along a dusty and potholed backroad fringed with golden yellow canola fields, wind whipped through the car in fervent gusts as my husband and I continued to complain about the broken air-conditioning in this mid-summer heat. We were making our way to Buffalo Pound Provincial Park located in the Qu'Appelle Valley of southern Saskatchewan, Canada. Buffalo Pound primarily consists of a prairie lake formed from glaciation about 10,000 years ago, the marshlands of Nicolle Flats, a trout pond, beachgoers and fishing, biking and hiking recreators (this time of year!), *and* a captive herd of bison! By 1890, fewer than 1000 bison remained in North America and in 1906 as an effort to *save the bison*, the Canadian government purchased the last surviving bison herd in Montana. Called the *Pablo herd*, they were moved to Elk Island National Park east of present-day Edmonton, Alberta, and then in 1972, 12 bison came to Buffalo Pound Provincial Park.

Commonly referred to as the buffalo, bison are the largest North American land mammal weighing up to 2200 pounds at maturity and living up to twenty years. It is thought that some 60 million bison roamed North America before the arrival of Columbus in 1492, travelling in herds of up to 20,000 animals (Law, 2021). Since time immemorial, Indigenous peoples from across the North American Plains[7] have shared a deep and intimate relationship with the bison, not only as a source of food, clothing, tools and shelter, but as a partner, as kin, in sustaining balance in the natural world. To Indigenous peoples, bison are seen as relatives, in which human/bison relationships are imbued with relational reciprocity. Such worldview stands in stark contrast to binary classifications and hierarchical human/animal positionings as characteristic of Western, colonial culture; derived from the European Enlightenment period and scientific revolutions that generated practical knowledge allowing humans to achieve greater control and dominion over nature (Oetelaar, 2014). Bison were traditionally hunted by Indigenous peoples through sophisticated mass killing strategies that obeyed the natural laws of conservation without overhunting (Law, 2021). While bison herds thrived in their millions on the rich abundance of the tall-grass prairies that the Plains provided, herd numbers began to drastically dwindle throughout the 1850s–1870s resulting from colonial invasion and European settlement taking hold across what is now known as the Canadian prairies. Settlers hunted bison for their hides, food and for sport, with such acts often set in political pursuits that sought to eradicate local Indigenous populations (Oetelaar, 2014). For instance, during the days of the bison hunt frenzy, Colonel Richard Irving Dodge, who served in the U.S. Army from 1848 to 1891, said, "kill every buffalo you can. Every Buffalo Dead is an Indian gone literally overnight" (Law, 2021, n.p).

Human domination over the world shifted from observation to exploitation by 1850 through an emphasis on resource potential of the New World (Oetelaar, 2014). Thus, the inevitable end to the bison economy came to a head by the mid-1870s with the disappearance of wild bison deemed as, "the single greatest environmental catastrophe to strike human populations on the plains" (Daschuk, 2019, p. 99). Without bison herds, Indigenous peoples could no longer sustain their freedom and the Plains were thrust into widespread hunger forcing the conversion of Indigenous populations to agriculture and settlement of the prairies with European farmers (Caverhill &

**Figure 8.** Bison signs. Photo by Kat Riley.

Thomson, 2022; Daschuk, 2019; Mueller, Spengler, Glenn & Lama 2021). Thus, the fate of the bison, and their associated kin networks with Indigenous peoples, exemplifies landscapes of decay and oppression, death and destruction and extinction and extraction at the hands of preoccupation with "progress" in human cultural and economic development (Belcourt, 2015; Braidotti, 2013; Bubandt, 2017; Oetelaar, 2014). Understood through necropolitics (e.g., Mbembé & Meintjes, 2003; Mbembé, 2008), the consumptive and exploitative sovereignty of governments fuel the perennial warfare of settler colonialism and asymmetrical social relations. Entering the periphery of Buffalo Pound Provincial Park in a plume of dust, we pulled over to come face-to-face with our first bison. Not the living, fleshy, breathing kind, but a remnant of what was, and what still might be, boldly and unapologetically emblazoned on the park's entrance sign (see Figure 8). As the sign resembled the possibilities and potentialities of seeing these creatures roam the park (albeit not wild but alive), we grew more and more excited as we continued along the dusty dirt road to our campsite.

Along the way, we saw advertisements for craft workshops, beachfront markets and more family camping and many gophers darting across the road and scurrying into their underground network of tunnels. It was the Canada-Day long weekend, and the park was teaming with RVs, caravans, campers, tents and people sporting sunburn, ice-cream stained upper-lips and red maple-leaves on their apparel. With all the human commotion and hive of activities, it was strange to think of bison herds roaming nearby and my mind inevitably relegated the bison to some mythical time and place that was far, far removed from the theme park of Buffalo Pound Provincial Park on this Canada-Day long weekend. The colonial imaginary of their wild and thunderous gallop across the immense and undulating plains as their hooves blackened the

**Figure 9.** Bison ghosts. Photo by Kat Riley.

landscape, or their gentle grazing amongst tall prairie grasses alongside the cultural practices of the Cree, Dakota, Dené, Lakota and Saulteaux First Nations of Saskatchewan, were not commensurate with the bustle of Canada-Day fanfare.

Alas, immediately after setting up camp, we continued upon our quest to *see* the bison and drove the additional 5 km to the car park of the Nicolle Flats marshland. Here, we could walk the *Bison View Interpretive Trail* that follows the paddock's fence line intersecting prairie grasses, wildflowers and groves of poplars. Along with a sign telling us to protect ourselves from the sun, to take water on the hike and to take rest along the benches provided along the way, we also saw more statues and memorabilia that signalled we were present amongst the bison. But really, we were present amongst the gaps in ecologies and missing creatures that have left etchings upon the landscape: we were chasing ghosts (see Figure 9).
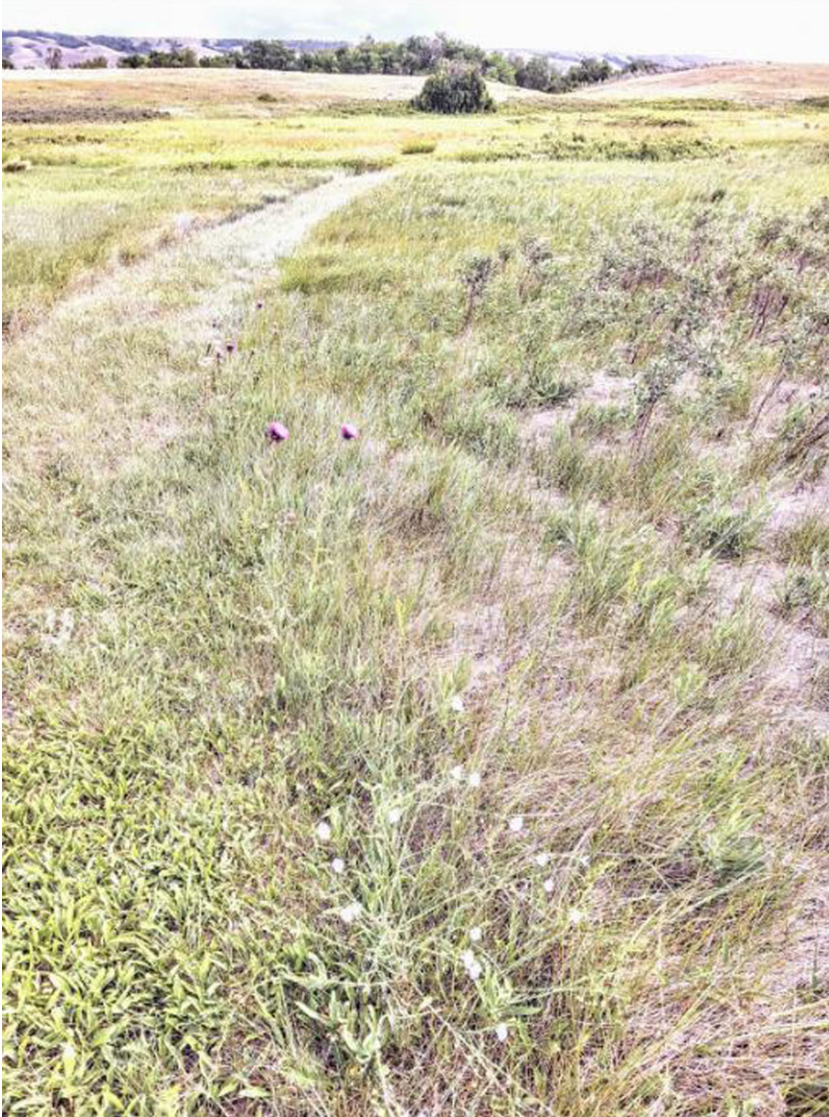
**Figure 10.** Bison shimmers. Photo by Kat Riley.

Here at Buffalo Pound Provincial Park, like many P/places across the North American prairies, we dwelled with ghostly necropolitics (Mbembé & Meintjes, 2003; Mbembé, 2008); living at the juncture of contemporary social and ecological P/place(s) implicated by settler colonialism and government sovereignty that continues to fuel society's negative passions that justify Indigenous erasure on stolen lands (Belcourt, 2015; Braidotti, 2013; Mamers, 2019). However, as Barad (2017) reminds us, "Loss is not absence but a marked presence, or rather a marking that troubles the divide between absence and presence" (p. 106). Or for Rose (2017), "Indeed, for power to come forth, it must recede. For shimmer to capture the eye [see Figure 10], there must be an absence of shimmer. To understand how absence brings forth, it must be understood not as lack but as potential" (pp. 54–55). Through knottings of past~present~futures, we move within the tensions of life and extinction, as difference casts a shimmering of what once was, what now is, and what might be (Bubandt, 2017; Malone, Logan, Siegel, Regalado & Wade-Leeuwen 2020). It is the spirit

of the bison that brings forth a renewed politics that refuses present systems and subjectivities; opening us to situated and generative pedagogical possibilities and potentialities through a speculative engendering of imaginaries of *not this*, *not yet* and *what if* (Ashton, 2022). In the shimmer, there is always possibilities of becoming something other through the dynamic flux of changeability (Malone et al., 2020).

As a result of colonial land practices over the past 400 years that have removed Indigenous peoples, built levees and dams, clear cut forests and converted diverse prairie grasslands to agricultural crops and flood plain monocultures (Mueller et al., 2021), prairie landscapes continue to be one of the most threatened and endangered ecosystems in the world (Hisey et al., 2022; Samson et al., 2004). Due to growing public concern for the scarcity of resources during periods of rapid depletion in the industrialisation era, a conservation ethic has existed in Canada since the beginning of the twentieth century. However, some academic commentators, namely, Oetelaar (2014) suggested that the preservation of nature through unmanaged tracts of wild land and sanctuaries for wildlife, including bison, are more sentimental endeavours set in aesthetics rather than grounded social and ecological justice pursuits. In contemporary times, halting the ongoing loss of grasslands is deemed the largest natural opportunity to address climate change in agricultural sectors, while simultaneously benefitting waters, soils, and biodiversity (Fargione et al., 2018). However, given that the prevailing driver of grassland conversion is crop profitability (Claassen, 2012; Wang et al., 2020), serious attention is needed regarding the impacts of colonial invasion and exploitive land management practices (Mueller et al., 2021). For example, the Intergovernmental Panel on Climate Change (IPCC) released its final report in April 2022 naming colonialism as a historical and ongoing driver of the climate crisis (IPCC, 2022). Such colonial land management practices vastly differ from Indigenous people's management of floodplain ecosystems, sustaining a biodiverse, rich, resilient mosaic of prairie-savanna-woodland landscapes across the North American prairies through fire and multispecies interactions since time immemorial. While the simple answer might be to defer to Indigenous peoples as models for land management, discourses of reconciliation are rooted in colonial logics and frameworks. Crucially, therefore, there is a need to reckon-with and (re)conceptualise human/animal relationships *within* impoverished systems of colonial ruins (Mamers, 2019).

Other animals are certainly implicated in colonial violence that reorders human/animal relationships. Yet, as a symbol of Indigenous cosmologies *and* the deleterious effects of colonialism that has resulted in Indigenous physical and cultural dispossession of land, of rights and connections to traditional territories and of spiritual ontologies with land through dislocation and displacement, the bison is a useful figuration to account for power relations, agency, and corporeality. As a method to map differences between normalising and alternative stories, in locating constraining and disciplining, and empowering and affirmative politics of location, figurations offer a collective figure of speech through present and situated expressions (Barad, 2007; Braidotti, 2011, 2013; Dolphijn & Van der Tuin, 2012; Hughes & Lury, 2013). Thus, in efforts to compose a more liveable cosmopolitics in/for environmental education, when we ask *whose conversation do you want to be a part of* (as highlighted at the beginning of this bison story), we seek to generate a worldly community based on a shared morality that expands beyond this story (Braidotti, 2011).

For example, pedagogical inquiry focused on climate justice in an undergraduate Climate Change Education (CCE) course at the University of Manitoba delved into stories of "ghost bison" on the Canadian prairies. A major assessment task in this course involved the artistic creation of a digiexplanation (https://www.digiexplanations.com/), which required students to use digital animation (stock and personal videos and images) and video-maker technologies to explain and provide examples of earth systems phenomena *and* social contexts (Ergler et al., 2016; Land et al., 2019). While students explored a variety of local, national and international socioecological topics, many students submitted digiexplanations that explored colonial and capitalist exploitation of the planet; with one exemplary digiexplanation examining the Plains bison as a symbol of colonial

land practices that have dispossessed Indigenous peoples from land and culture. Thus, the question regarding *what ghosts might teach us about whose conversation we want to be a part of in these dark, but still hopeful times,* lives on through different, but important stories.

## Relationality, ghosts and a dark pedagogy

Relationality underpins the ontology and educational philosophy we have explored in this article. However, a crucial detail — drawing upon Bergson and Deleuze's *Bergsonism* (1988) — is that relationality is not between separate objects.

> What makes something whole, therefore, is not the extent to which it is hermetic but on the contrary the manner in which it opens to an outside – other wholes and the Whole of the universe, which is itself open and unfinished. So described, *relationality* could be said to be the critical characteristic of Bergson's open whole (Lundy, 2018, p. 13).

Openness enables processes of differentiation, which are key to our pedagogical orientations which hope for more liveable futures. As pedagogues, we are open to encounters that change us, that disrupt, provoke and help us become-other to ourselves (Verlie, 2019), generating new ideas for grappling with colonial legacies and contemporary concerns such as climate change and species extinction. In a sense, relationality that embraces an openness is the methodology we deploy in our pedagogical experimentation. As Jackson and Mazzei (2023) explain, "encounters force thought" (p. 4), and our openness to encounters has led us here, to face the notion of ghosts and a dark pedagogy.

 Ghosts are a sign of the past, a memory of something enduring, that once was and still is. There is also an element of loss, a nebulous appearance and persistent temporality to ghosts. We utilise ghosts as a figuration for ecological collapse and species extinction. Such ghosts render visible absences — change comes, whilst also leaving something of the past behind in the future. But why confront such topics in our educational explorations? Rose (2012) says it well:

> Against this vortex [of death], what does one have to offer? Writing is an act of witness; it is an effort not only to testify to the lives of others but to do so in ways that bring into our ken the entanglements that hold the lives of all of us within the skein of life. If we wonder, as many of us often do, if there is any point in telling stories that awaken ethical sensibility in this time when so much is happening so rapidly and seemingly so unstoppably, there is a countervailing dread: if no stories are told, if all the violence goes unremarked, then we are thrust into the world of the doubly violated. Silence, however comfortable it seems at times, is a failure to acknowledge the gravity of violence (p. 139).

 What we take from Rose is that in acknowledging death we are also celebrating life, and the multispecies entanglements immanent to life. By working through the darkness, we work at the juncture of hope and action, by calling out past injustices and bringing together those that care, in an effort to enhance our capacities for acting. This is an affirmative path, something akin to what Verlie (2019, 2021) calls learning to live-with climate change: "a process of *bearing worlds,* as we simultaneously become more attuned to our enmeshment with the more-than-human, mourn those relationships as they are ruptured, act-with them to cultivate the most promising futures possible [original italics]" (p. 752). By (re)membering ghosts and acknowledging past~present patterns of loss and multispecies injustices, there is opportunity to live with hope and collaborative action in planting seeds for differentiated, flourishing future(s).

 The contribution this article makes is to take such conceptual thinking into particular empirical contexts. We have applied the conceptual ideas of duration and non-linear pasts~presents~futures, along with the figuration of ghosts, in specific locations, focusing on particular issues within

our pedagogical thinking~practice. Rather than a purely conceptual endeavour, we have demonstrated our grappling with these concepts and how they have helped us confront place-specific issues in the development of teaching and learning strategies in our professional practice. However, we have also shown how the development of our professional practice is not independent of our personal lives. Our past/s, private and personal worldings and the histories of the places we inhabit, live and work with all coexist. We are of the world, and co-becoming with climate, extinction, colonisation and natural~cultural hegemonies. A dark pedagogy helps us grapple with this present, and thinking through our temporality can empower affirmative relations with multispecies others, such as snow gums and bison. There is clearly more we can say, and even more that can be done. Moreover, we do not have a final solution to the complex issues we face. However, encouraged by Haraway (2016), we choose to stay with the trouble in "particular places and times" (p. 3), to foster caring relationships and communities, to cultivate collective thinking for our shared future.

## Notes

**1** A capitalised Place indicates a primary relationship, and as something highly contextualised and specific to one culture, time and place (Liboiron, 2021). Similar to Land (in the North American Indigenous context [Tuck et al., 2014]) and Country (in the Australian Indigenous context [Rose, 1996]), place as a term commonly adopted in Western perspectives (Somerville & Green, 2015), extends beyond the materiality of earth, rocks and waterways to become spiritually infused and grounded in cultural positionings and interdependent relationships (Styres & Zinga, 2013). When place is not capitalised, we refer to it through colonial imaginaries, in which place is generalised, universalised and seen as a blank slate for cultural inscriptions (Liboiron, 2021; Nxumalo & Cedillo, 2017).

**2** We follow Stewart (2015) in using the tilde symbol (~), albeit in a different context. Stewart uses the symbol to depict philosophy and methodology as enmeshed and "always already coexistent" (p. 1182). We use the tilde in this article to depict the enmeshed coexistence of past, present and future.

**3** Thus, this article is a transdisciplinary study combining (environmental) education and history, in which we understand the discipline of history to explore the imprinting of the present onto the past (Friedman, 1992).

**4** See map of bushfire impacted areas here https://theaustralianalpsnationalparks.org/wp-content/uploads/2013/12/bushfires02-03.pdf

**5** Also see Fairman, Bennett & Nitschke (2017).

**6** This report also states that "There are many unknowns about the species and its impacts/interactions, however, with increasing climate change it is expected that the longicorn beetle will continue to increase in numbers and its associated impacts on snow gums will also increase" (p. 15).

**7** For example, but not limited to, linguistic groups of Nêhiyawak (Plains Cree First Nation in Saskatchewan, Canada), Nahkawininiwak (Saulteaux First Nation that covers Ontario, Manitoba, Saskatchewan, Alberta and British Columbia, Canada), Nakota (Assiniboine First Nation that covers Montana and Dakota, USA, and Manitoba, Saskatchewan and Alberta, Canada), Dakota (Sioux First Nation that covers Minnesota, South Dakota and North Dakota, USA, and Manitoba and Saskatchewan, Canada), Lakota (Western Sioux First Nation that covers North Dakota, South Dakota, Nebraska, Minnesota and Montana, USA, and Manitoba and Saskatchewan, Canada) and Denesuline (Dene or Chipewyan First Nation that covers Manitoba, Saskatchewan, Alberta and the Northwest Territories, Canada [Office of the Treaty Commissioner, 2018]).

# References

Ashton, E. (2022). *Anthropocene childhoods: Speculative fiction, racialization, and climate crisis*. Bloomsbury Academic (p. 208).

Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.

Barad, K. (2017). Troubling time/s and ecologies of nothingness: Re-turning, re-membering, and facing the incalculable. *New Formations*, 92(92), 56–86.

Bawaka Country including Wright, S., Suchet-Pearson, S., Lloyd, K., Burarrwanga, L., Ganambarr, R., Ganambarr-Stubbs, M., & Maymuru, D. (2020). Gathering of the clouds: Attending to Indigenous understandings of time and climate through song spirals. *Geoforum*, 108, 295–304.

Belcourt, B.R. (2015). Animal bodies, colonial subjects: (Re)locating animality in decolonial thought. *Societies*, 5(1), 1–11.

Bergson, H. (1998). *Creative evolution*. Dover.

Braidotti, R. (2011). *Nomadic theory: The portable Rosi Braidotti*. Colombia University Press.

Braidotti, R. (2013). *The posthuman*. Polity.

Bubandt, N. (2017). Haunted geologies: Spirits, stones, and the necropolitics of the anthropocene. In A.L. Tsing, N. Bubandt, E. Gan & H.A. Swanson (Eds.), *Arts of living on a damaged planet: Ghosts and monsters of the Anthropocene* (pp. 121–141).

Caverhill, H., & Thomson, C. (2022). Kinscapes, counter histories, and nineteenth-century tintypes. *Victorian Review*, 48(1), 28–32.

Claassen, R. (2012). The future of environmental compliance incentives in US agriculture: The role of commodity, conservation, and crop insurance programs. *USDA-ERS Economic Information Bulletin*, 94, 1–18.

Daschuk, J. (2019). *Clearing the Plains: Disease, politics of starvation, and the loss of Indigenous life*. University of Regina Press.

Deleuze, G. (1988). *Bergsonism*. Zone Books.

Dolphijn, R., & van der Tuin, I. (2012). *New materialism: Interviews & cartographies*. University of Michigan Publishing.

Edensor, T., Head, L., & Kothari, U. (2020). Time, temporality and environmental change. *Geoforum*, 108, 255–258.

Ergler, C.R., Kearns, R., Witten, K., & Porter, G. (2016). Digital methodologies and practices in children's geographies. *Children's Geographies*, 14(2), 129–140. DOI: 10.1080/14733285.2015.1129394.

Fairman, T., Bennett, L., & Nitschke, C. (2017). Recurring fires are threatening the iconic snowgum. *Science Matters*. https://pursuit.unimelb.edu.au/articles/recurring-fires-are-threatening-the-iconic-snow-gum

Fairman, T., Bennett, L., Tupper, S., & Nitschke, C. (2017). Frequent wildfires erode tree persistence and alter stand structure and initial composition of a fire-tolerant sub-alpine forest. *Journal of Vegetation Science*, 28(6), 1151–1165. DOI: 10.1111/jvs.12575.

Fargione, J.E., Bassett, S., Boucher, T., Bridgham, S.D., Conant, R.T., Cook-Patton, S.C., & Griscom, B.W. (2018). Natural climate solutions for the United States. *Science Advances*, 4(11), eaat1869.

Fell, E. (2012). *Duration, temporality, self: Prospects for the future of Bergsonism*. Peter Lang.

Friedman, J. (1992). The past in the future: History and the politics of identity. *American Anthropologist*, 94(4), 837–859. http://www.jstor.org/stable/680224

Gan, E., Tsing, A., Swanson, H., & Bubandt, N. (2017). Introduction: Haunted landscapes of the anthropocene. In A. Tsing, N. Bubandt, E. Gan & H. Swanson (Eds.), *Arts of living on a damaged planet: Ghosts and monsters of the Anthropocene* (pp. G1–G14). University of Minnesota Press.

Grauer, C., Fischer, D., & Frank, P. (2022). Time and sustainability: A missing link in formal education curricula. *The Journal of Environmental Education*, 53(1), 22–41. DOI: 10.1080/00958964.2021.2009429.

Haraway, D. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Duke University Press.

Hisey, F., Heppner, M., & Olive, A. (2022). Supporting native grasslands in Canada: Lessons learned and future management of the Prairie Pastures Conservation Area (PPCA) in Saskatchewan. *The Canadian Geographer/Le Géographe Canadien*, 66(4), 683–695.

Hughes, C., & Lury, C. (2013). Re-turning feminist methodologies: From a social to an ecological epistemology. *Gender and Education*, 25(6), 786–799. DOI: 10.1080/09540253.2013.

Ingold, T. (2010). Bringing things back to life: Creative entanglements in a world of materials. NCRM Working Paper. Realities/Morgan Centre, University of Manchester. Retrieved from https://eprints.ncrm.ac.uk/id/eprint/1306/

IPCC (2022). Climate change 2022: Impacts, adaptation and vulnerability, In: Pörtner, H.-O., Roberts, D.C., Tignor, M., Poloczanska, E.S., Mintenbeck, K., Alegría, A., Craig, M., Langsdorf, S., Löschke, S., Möller, V., Okem, A., Rama, B. (Eds.). *Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 305). Cambridge University Press. doi: 10.1017/9781009325844

Jackson, A., & Mazzei, L. (2023). *Thinking with theory in qualitative research* (2nd ed.). Routledge.

Jukes, S. (2021). Thinking with a landscape: The Australian Alps, horses and pedagogical considerations. *Australian Journal of Environmental Education*, 37(2), 89–107. DOI: 10.1017/aee.2020.26.

Jukes, S. (2023a). *Learning to confront ecological precarity: Engaging with more-than-human worlds*. Springer.

Jukes, S. (2023b). Emergent environmental education inquiry: A methodology of thinking with things. In P. White, R. Tytler, J. Ferguson & J. Cripps Clark. (Eds.), *Contemporary approaches to research in mathematics, science, health & environmental education. Volume 4 – Chapter 11.* (pp. 249–266). Cambridge Scholars Publishing.

Jukes, S. (2023c). Alpine Islands. *Mountain Journal Magazine*, 3, 14–15. https://themountainjournal.com/mountain-journal-magazine/

Jukes, S., & Reeves, Y. (2020). More-than-human stories: Experimental co-productions in outdoor environmental education pedagogy. *Environmental Education Research*, 26(9-10), 1294–1312. DOI: 10.1080/13504622.2019.1699027.

Land, N., Hamm, C., Yazbeck, S.L., Danis, I., Brown, M., & Nelson, N. (2019). Facetiming common worlds: Exchanging digital place stories and crafting pedagogical contact zones. *Children's Geographies*, 18(1), 30–43. DOI: 10.1080/14733285.2019.1574339.

Law, B. (2021). Radio series explores revered relationship between Indigenous peoples and the buffalo. *[Radio broadcast),* CBC. https://www.cbc.ca/radio/ideas/radio-series-explores-revered-relationship-between-indigenous-peoples-and-the-buffalo-1.5735457.

Liboiron, M. (2021). *Pollution is colonialism.* Duke University Press.

Lundy, C. (2018). *Deleuze's Bergsonism.* Edinburgh University Press.

Lysgaard, J.A., & Bengtsson, S. (2020). Dark pedagogy-speculative realism and environmental and sustainability education. *Environmental Education Research*, 26(9-10), 1453–1465.

Lysgaard, J.A., Bengtsson, S., & Laugesen, M.H.L. (2019). *Dark pedagogy: Education, horror and the Anthropocene.* Springer.

Malone, K., Logan, M., Siegel, L., Regalado, J., & Wade-Leeuwen, B. (2020). Shimmering with Deborah Rose: Posthuman theory-making with feminist ecophilosophers and social ecologists. *Australian Journal of Environmental Education*, 36(2), 129–145.

Mamers, D.T. (2019). Human-bison relations as sites of settler colonial violence and decolonial resurgence. *Humanimalia*, 10(2), 10–41.

Mbembé, A. (2008). Necropolitics. In S. Morton & S. Bygrave (Eds.), *Foucault in an age of terror.* Palgrave Macmillan.

Mbembé, J.A., & Meintjes, L. (2003). Necropolitics, *Public Culture*, 15(1), 11–40.

Morton, T. (2016). *Dark ecology: For a logic of future coexistence.* Columbia University Press.

Mueller, N. G., Spengler, R. N., & Lama, K. (2021). Bison, anthropogenic fire, and the origins of agriculture in eastern North America. *The Anthropocene Review*, 8(2), 141–158.

Nadegger, M. (2023). Carving lines through melting lands: A diffractive engagement with troubled and troubling relations of alpine skiing in the Anthropocene. *Leisure Sciences*, 1–23. DOI: 10.1080/01490400.2023.2269159.

NSW Parks and Wildlife Service (2019). Snow gum dieback: Why is this happening?, In *Resort round-up.* State of NSW Department of Planning, Industry and Environment.

Nxumalo, F., & Cedillo, S. (2017). Decolonizing place in early childhood studies: Thinking with Indigenous onto-epistemologies and Black feminist geographies. *Global Studies of Childhood*, 7(2), 99–112. DOI: 10.1177/2043610617703831.

Oetelaar, G.A. (2014). Worldviews and human-animal relations: Critical perspectives on bison-human relations among the Euro-Canadians and Blackfoot. *Critique of Anthropology*, 34(1), 94–112.

Office of the Treaty Commissioner (2018). First Nations in Saskatchewan. http://www.otc.ca/ckfinder/userfiles/files/fnl_1100100020617_eng.pdf.

Poelina, A., Wooltorton, S., Blaise, M., Aniere, C.L., Horwitz, P., White, P.J., & Muecke, S. (2022). Regeneration time: Ancient wisdom for planetary wellbeing. *Australian Journal of Environmental Education*, 38(3-4), 397–414.

Riley, K. (2021). Postcolonial possibilities for outdoor environmental education. In G. Thomas, H. Prince & J. Dyment (Eds.), *Outdoor environmental education in higher education: International perspectives* (pp. 225–234). Springer.

Riley, K. (2023). *(Re)storying human/earth relationships in environmental education: Becoming (partially) posthumanist.* Springer.

Rose, D.B. (1996). *Nourishing terrains: Australian Aboriginal views of landscape and wilderness.* Australian Heritage Commission.

Rose, D.B. (2012). Multispecies knots of ethical time. *Environmental Philosophy*, 9(1), 127–140.

Rose, D.B. (2017). Shimmer: When all you love is being trashed. In A.L. Tsing, N. Bubandt, E. Gan & H.A. Swanson (Eds.), *Arts of living on a damaged planet* (pp. 51–63).

Rousell, D., & Peñaloza-Caicedo, A. (2022). Listening for futures along Birrarung Marr: Speculative immersive experience in environmental education. *Australian Journal of Environmental Education*, 38(3-4), 431–450. DOI: 10.1017/aee.2022.34.

Saari, A., & Mullen, J. (2020). Dark places: Environmental education research in a world of hyper-objects. *Environmental Education Research*, 26(9-10), 1466–1478. DOI: 10.1080/135.

Samson, F.B., Knopf, F.L., & Ostlie, W.R. (2004). Great Plains ecosystems: Past, present, and future. *Wildlife Society Bulletin*, 32(1), 6–15.

Slattery, D., & Worboys, G. (2020). *Kosciuszko: A great national park.* Envirobook.

Somerville, M & Green, M (2015). *Children, place and sustainability.* Palgrave Macmillan.

Stengers, I. (2017). Autonomy and the intrusion of Gaia. *The South Atlantic Quarterly*, 116(2), 381–400.

Stewart, A. (2004). Decolonising encounters with the Murray River: Building place responsive outdoor education. *Journal of Outdoor and Environmental Education*, 8, 46–55.

Stewart, A. (2015). Rhizocurrere: A Deleuzo-Guattarian approach to curriculum autobiography. *International Journal of Qualitative Studies in Education*, 28(10), 1169–1185.

Styres, S., & Zinga, D. (2013). The community-first land-centred theoretical framework: Bringing a good mind to indigenous education research? *Canadian Journal of Education*, 36(2), 284–313.

Tuck, E., McCoy, K., & McKenzie, M. (2014). Land education: Indigenous, post-colonial, and decolonizing perspectives on place and environmental education research. *Environmental Education Research*, 20(1), 1–23. DOI: 10.1080/13504622.2013.877708.

Verlie, B. (2019). Bearing worlds: Learning to live-with climate change. *Environmental Education Research*, 25(5), 751–766.

Verlie, B. (2021). *Learning to live with climate change: From anxiety to transformation*. Taylor & Francis.

Walker, C. (2023). Ghost forests: Australia's iconic snow gums are the bleaching corals of the high country. *Roaring Journals*. https://www.patagonia.com.au/blogs/roaring-journals/ghost-forests-australia-s-iconic-snow-gums-are-the-bleaching-corals-of-the-high-country

Wang, T., Xu, Z., Kolady, D., Ulrich-Schad, J.D., & Clay, D. (2020). Cover-crop usage in South Dakota: Farmer perceived profitability and future adoption decisions. *Journal of Agricultural and Resource Economics*, 46(2), 287–307.

Yunkaporta, T. (2019). *Sand talk: How Indigenous thinking can save the world*. Text Publishing.

Zylstra, P. (2013). The historical influence of fire on the flammability of subalpine snow gum forest and woodland. *The Victorian Naturalist*, 130(6), 232–239.

## Author Biographies

**Scott Jukes (Ph.D.)** is a lecturer in Outdoor Education at Federation University. Always drawn to the mountains, Scott loves sharing his love for these places in his teaching and his research. His research deploys relational and post-anthropocentric approaches for developing pedagogies which grapple with environmental problems. He has also explored how technology functions in outdoor learning contexts. He recently authored the book *Learning to confront ecological precarity: Engaging with more-than-human worlds*.

**Kathryn Riley (Ph.D.)** is a third-generation Settler to Australia and a first-generation uninvited Settler to Treaty 1/Red River Territory in Manitoba, Canada. Kathryn is an Assistant Professor in the Faculty of Education at the University of Manitoba. As a past teacher of Physical, Health and Outdoor Environmental Education, Kathryn's research is primarily focused on relational ways of knowing, being, thinking, doing and feeling, pedagogies for (w)holistic well-being, and an anticolonial praxis for social and ecological justice in response to place-based environmental issues. Kathryn recently published her Ph.D. dissertation as a book titled, *(Re)Storying human/earth relationships in environmental education: Becoming (partially) posthumanist*.