

COMMUNICATION

# Conservation education in Aotearoa-New Zealand: a values perspective

Sally Birdsall<sup>1</sup>  and Tim Kelly<sup>2,\*</sup> 

<sup>1</sup>School of Curriculum and Pedagogy, Faculty of Education and Social Work, The University of Auckland, Auckland, New Zealand and <sup>2</sup>Department of Psychology, University of Canterbury, Christchurch, New Zealand

\*Corresponding author. E-mail: [tim.kelly@canterbury.ac.nz](mailto:tim.kelly@canterbury.ac.nz)

(Received 03 October 2021; revised 03 April 2022; accepted 03 April 2022; first published online 30 May 2022)

## Abstract

Throughout the world, Aotearoa-New Zealand is recognised for its extraordinary biodiversity. However, many species that make up this distinctive biodiversity are under threat of extinction due to human impacts, such as the ill-considered introduction of particular animals. Many New Zealanders participate in the protection and restoration of their environment, which involves the lethal control of these introduced animals. Primary school children (5–13 years old) engage in conservation education as part of their learning, which aims to develop their abilities to take informed action to protect and restore our environment, sometimes including lethal control of introduced animals. Recently, concerns have been raised that children learning about the lethal control of introduced animals does not align with the values that should be explored and encouraged according to Aotearoa-New Zealand's national curriculum. We argue that conservation education, including learning about the lethal control of introduced animals, encourages children to explore and encourage these values, namely valuing the diversity in their heritages, ecological sustainability, participation for the common good, equity, innovation, and respect for others.

**Keywords:** New Zealand; children; conservation; values; non-native mammals

## Introduction

Aotearoa-New Zealand has a rich and unique biodiversity. It defines us as New Zealanders (Wright, 2011) and is recognised as valuable and significant by the international body, the Organisation for Economic Cooperation and Development (OECD, 2007). Unfortunately, many of the plants and animals that are unique to Aotearoa-New Zealand are highly vulnerable to extinction. This situation is largely due to human impacts, including uninformed decisions made in the past regarding the introduction of exotic animal species (Wright, 2011). Supported by governmental funding, Predator Free 2050 ([www.pf2050.co.nz](http://www.pf2050.co.nz)) has been established to enable New Zealanders to help protect our ecosystems through the elimination of human-introduced, non-native predator animals.

The conservation of Aotearoa-New Zealand's ecosystems is also a growing focus within the country's formal education sector. For example, since its beginnings in 1993, the Enviroschools programme has grown to include over 1403 early childhood centres and schools across Aotearoa-New Zealand (Enviroschools, n.d.), with a focus on environmental learning and action that is specific to each school's locality. In response to the goal of restoring and maintaining Aotearoa-New Zealand's unique ecosystems, many primary school children (aged 5–13 years) take part in conservation learning within their formal education. Conservation learning is a particular form of environmental education that focuses on taking action to protect the environment

(Thomas, Teel, Bruyere & Laurence, 2019). At times, these conservation education programmes involve learning about, and sometimes partaking in, the lethal control of introduced animal species. Recently, concerns have been raised about the effects on children of their involvement in this aspect of conservation programmes (Morris, 2021). In particular, it has been claimed that when children engage in programmes related to the lethal control of introduced animals, their learning does not align with the values that should be encouraged, modelled, and explored as part of *The New Zealand Curriculum* (Ministry of Education (MoE), 2007). In this article we address this claim by asserting that, contrary to the concerns that have been raised, conservation education that includes learning about the lethal control of introduced animals can in fact help learners develop the values espoused in Aotearoa-New Zealand's national curriculum document. We argue that when Aotearoa-New Zealand primary school children engage in conservation education programmes, the values stated in *The New Zealand Curriculum* can be encouraged, modelled and explored, helping these children to make informed decisions about the actions they take as part of their learning about and caring for Aotearoa-New Zealand's unique biodiversity.

We begin by explaining the importance of values and discussing the purpose and components of conservation education. Each of the relevant values articulated in *The New Zealand Curriculum* is then discussed in terms of how it can be explored and encouraged through conservation education, which includes the management of introduced animal species.

### What are values?

Values are 'desirable trans-situational goals, varying in importance, which serve as guiding principles in the life of a person' (Schwartz, 1992). Unlike attitudes, values are not situation specific, but rather they are more broad feelings that provide a basis for decision-making, and as such make decision-making easier. For example, when it comes to undertaking a particular behaviour that can impact on the environment, the extent to which we value environmentalism will initially guide our decision, and if the behaviour seems consistent with our values, then other factors, such as norms, will finalise the decision (Stern, 2000; van der Werff, Steg, & Keizer, 2013).

Although our culture is characterised by particular values that society deems desirable, a person will ultimately define his or her own personal values as he or she matures. Some people may give priority to self-enhancement values, such as power or achievement, whereas others may prioritise values that are self-transcendent, such as benevolence or universalism (Schwartz, 1992; Schwartz et al., 2017). Similarly, people may value openness to change more than conservatism, or vice versa. Values are formed during our youth, and by adulthood they have become quite stable and resistant to change (Stern, Dietz, & Guagnano, 1995; Thøgersen & Ölander, 2002).

Given that our values guide our actions (Schwartz, 1992; Stern, 2000), the values that society deems most important for its citizens to embrace must be encouraged when we are children. At present the formal education sector in Aotearoa-New Zealand takes a role in educating students about a society's desired values. Hence it is a specific role of our teachers to 'encourage, model, and explore' these values (Ministry of Education, 2007, p. 10). *The New Zealand Curriculum* mandates the learning content in Aotearoa-New Zealand schools where teaching and learning is delivered in English, and this national curriculum is very specific about which values teachers *will* encourage students to value. These values and their explanation are shown in Figure 1.

### What is conservation education?

Conservation education is both a philosophy and a social movement focused on protecting natural heritage (Bioethics-Panel, 2019). Content that aligns with conservation education, such as learning about local plants, animals, and waterways, engaging in tree-planting, and studying

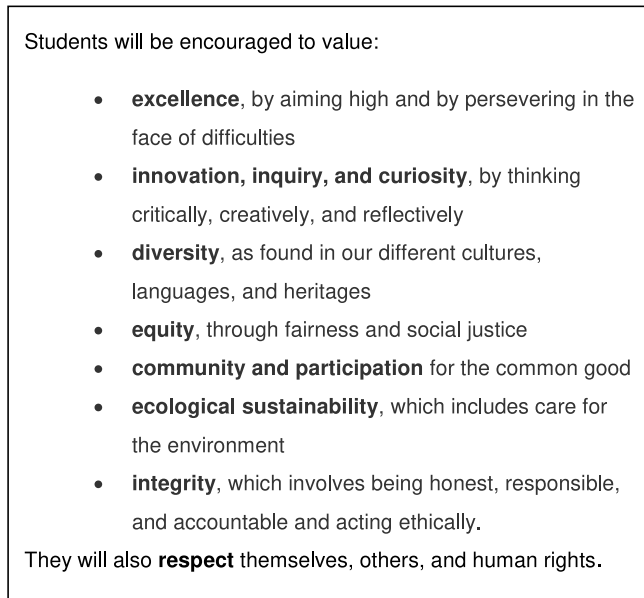


Figure 1. The values and their given explanations in *The New Zealand Curriculum*.

the local bush area, are frequently selected topics in Aotearoa-New Zealand schools (Bolstad, Joyce, & Hipkins, 2015)

Conservation education's emergence can be traced to the late 19<sup>th</sup> century (Wals & Benavot, 2017), when it was the first educational response to the ever-increasing degradation of Earth's biosphere and loss of biological diversity (biodiversity). Conservation education is one of the many discourses within environmental education (Sauvé, 2005) and has a specific niche (Thomas, Teel, Bruyere, & Laurence, 2019); its goal is to inspire people to undertake actions that will protect biodiversity (Thomas et al., 2019), which includes people connecting with nature and understanding the interrelationships between living organisms in ecosystems (Wals & Benavot, 2017). In acknowledging that humans both caused the problem and are able to provide solutions, it has a very strong advocacy component. Effective conservation education endeavours to develop learners' pro-environmental values while they actively work to improve the environment (Thomas et al., 2019).

Within Aotearoa-New Zealand, conservation education most commonly tackles domestic issues such as the impact of introduced animals and plants on our ecosystems, the impact of human activities on our aquatic systems, and the loss of plant diversity from certain landscapes. To make conservation more personally relevant, conservation education often enables learners to take actions in their communities (Eames, Cowie, & Bolstad, 2008), such as planting trees and building feeding stations for native birds. Conservation education is most effective when students are learning in local nature and taking action to improve biodiversity in their communities. In this way, learning becomes more personally relevant, which enhances students' motivation and feelings of connection to their 'place', and leads to increased engagement and action-taking (Tilbury, 1995; Reid, Dillon, Ardoin, & Ferreira, 2021).

While many Aotearoa-New Zealand primary school students (aged 5–13 years) engage in conservation activities such as planting native trees and shrubs, some schools include the killing of introduced animals as part of conservation education. This element is contentious for some people (Ram, 2018). There is a small minority (Russell, 2014) within Aotearoa-New Zealand who believe that it is unnecessary to control the populations of predatory animals that have been

introduced to Aotearoa-New Zealand, and others who argue that even if some control is necessary, children should not be taught about killing animals (Morris, 2021). In the present article we examine whether conservation education that has a focus on the lethal control of non-native mammals can develop the values that teachers are expected to encourage in their learners.

The development of pro-environmental values is integral in environmental (Reid, Dillon, Ardoin, & Ferreira, 2021; Tilbury, 1995; Wals & Benavot, 2017) and conservation education (Thomas et al., 2019), as these values provide the basis for pro-environmental behaviour (Stern, 2000). Childhood and adolescence are the most important times for the development of values such as equity and environmental sustainability (for example Stern et al., 1995; Schwartz et al., 2001; Thøgersen & Ölander, 2002; Ciecuch, Davidov, & Wysz, 2016; Manfredo et al., 2017; De Dominicis, Schultz, & Bonaiuto, 2017) and teachers have an obligation to encourage children to examine their personal values positions and reflect on why and how they hold such values. For example, the issue of controlling introduced animals gives teachers an opportunity to help children carry out this values exploration, and to go further by examining the different values positions that other people hold about this issue. By engaging in this type of activity, not only can children clarify their own values position, but they can gain an appreciation of the values of others, helping them to arrive at a decision regarding their own actions (Tilbury, 1995; Kelly, 2020). The central positioning of values in people's lives and in conservation education warrants an examination of how the values espoused in *The New Zealand Curriculum* align with, and can be taught through, conservation education, justifying the inclusion of the lethal control of introduced animals.

### To value 'diversity, as found in our ... heritages'

The first of *The New Zealand Curriculum's* values that we discuss in relation to conservation education is 'diversity, as found in our ... heritages' (Ministry of Education, 2007, p. 10). We argue that learning about Aotearoa-New Zealand's natural heritage is important for several reasons:

Aotearoa-New Zealand's natural heritage is an outstanding feature and recognised worldwide. Ten percent of mainland Aotearoa-New Zealand's total land mass comprises a natural World Heritage site, Te Wahipounamu, encompassing Fiordland, Mount Aspiring, Mount Cook, and Westland National Parks (UNESCO, 2021). Our natural heritage is a diverse and spectacular range of landscapes, each of which hosts a unique biological diversity.

Aotearoa-New Zealand's biodiversity is distinctive and extraordinary, as parts of it show us what the world would have looked like had the dinosaurs and mammals become extinct 65 million years ago, leaving the birds to proliferate and dominate ecosystems (Flannery, 1994). Our biodiversity is unique as a result of Aotearoa-New Zealand's long geographic isolation and island biogeography (Brockie, 2013), which has created plants and animals that are unusual and found nowhere else on our planet (Wright, 2011). With no terrestrial mammals, apart from three species of bat, a unique avifauna has evolved in Aotearoa-New Zealand with birds, reptiles, and invertebrates occupying all ecological niches (Valente, Etienne, & Garcia-R., 2019). Approximately 80% of Aotearoa-New Zealand's flora is native (Department of Conservation, 2013), and of the 245 species of birds found in Aotearoa-New Zealand before the arrival of humans, 71% were endemic (i.e., found only in Aotearoa-New Zealand) (Brockie, 2013). Our unique biodiversity has been recognised as highly significant and valuable by the OECD; their *Global Performance Review* stated that Aotearoa-New Zealand has a 'special responsibility for biodiversity conservation, since a high percentage of its 90,000 native species are endemic and unique' (OECD, 2007, p. 5).

Furthermore, Aotearoa-New Zealand's natural heritage is closely tied to its bi-cultural heritage; Māori consider themselves to be part of the natural environment with all flora and fauna, together as part of a 'series of ordered genealogical webs' (Harmsworth & Awatere, 2012, p. 274). These

webs are referred to as whakapapa, and through whakapapa Māori trace their ancestors back to Ranginui (father), Papatūānuku (mother) and their children, who include the wind, seas, plants, rivers, and animals. People were created by these children and, due to this interconnectedness, Māori believe they have a responsibility and obligation to sustain the wellbeing of Papatūānuku and their people (Harmsworth & Awatere, 2012). Thus, conservation of Aotearoa-New Zealand's natural heritage is synonymous with the preservation of Māori heritage. Under Aotearoa-New Zealand's founding document, Te Tiriti o Waitangi, New Zealanders must work together in equal partnership when engaging in ecosystem restoration. Consequently, Māori philosophical beliefs need to remain central, and Māori must be able to fully engage in decision-making, thus ensuring both social and environmental justice (Bioethics-Panel, 2019).

Given the importance of Aotearoa-New Zealand's natural and cultural diversity, teachers have an obligation to develop learners' awareness of the many aspects of our natural heritage. When learning about the diversity of our heritages, conservation education can help teachers to raise learners' awareness that our unique biodiversity is at risk and is unsustainable without human intervention (Bioethics-Panel, 2019; Wright, 2011). Therefore, through teaching children to value our heritages, Aotearoa-New Zealand students can learn about the importance of the natural heritage they will inherit and be encouraged to maintain and protect it, developing pro-environmental values in an informed manner.

### To value 'ecological sustainability'

To value ecological sustainability is to 'care for the environment' (Ministry of Education, 2007, p. 10). This value aligns perfectly with the goal of conservation education, which is to encourage people to undertake conservation actions that will protect biodiversity (Thomas et al., 2019).

The need for human intervention to protect the unique biodiversity of Aotearoa-New Zealand's heritages is an unfortunate reality. Our extinction rates are among the highest in the world, with the OCED noting in 2017 that '... roughly a third of mammals, birds, fish and reptiles are under threat [of extinction]' (p. 24). The OECD report was supported by Dr Jan Wright, the then Parliamentary Commissioner for the Environment, who reported that of the 168 native bird species remaining in Aotearoa-New Zealand, 80% are at risk of extinction, and 93 of these species are endemic (Wright, 2017). For example, the orange-fronted parakeet, or kākāriki karaka (*Cyanoramphus malherbi*), has a remaining estimated wild population in 2021 of only 360 birds (Department of Conservation, personal communication, 2021) and is at serious risk of extinction due to predation by introduced animals (Department of Conservation, n.d.).

The biggest and most immediate threat to Aotearoa-New Zealand's ecological sustainability is posed by three species of introduced animals: possums (*Trichosurus vulpecula*), rats (*Rattus sp.*), and mustelids (*Mustela sp.*), especially stoats (*Mustela erminea*) (Wright, 2011). The term 'non-native mammals' when used in the present article refers to these human-introduced predator species only. These non-native mammals are widespread throughout Aotearoa-New Zealand and present the greatest risk for the survival of birds in particular (Wright, 2011). There is a vast body of research which provides evidence for the negative impact of these non-native mammals on New Zealand's native flora and fauna (Binny et al., 2021; Russell, Innes, Brown, & Byrom, 2015). For example, these three non-native mammals, along with cats (*Felis catus*), are estimated to kill around 25 million native birds a year (Department of Conservation, 2018), as well as feed on native reptiles and invertebrates (Wright, 2017). Indeed, an icon of our natural heritage, the kiwi (*Apteryx sp.*), is in decline primarily as a result of predation by these non-native mammals (Germano et al., 2018).

Conservation education resources in Aotearoa-New Zealand often focus on the negative impact of the brushtail possum, and have been criticised in recent publications for both advocating the lethal control of possums (Morris, 2020, 2021) and speciesism or discrimination between species

by valuing one species over others (Ram, 2018). However, the destructive impact on our biodiversity of the brushtail possum, a mammal introduced to Aotearoa-New Zealand in 1857, should not be underestimated. Due to a lack of natural predators, the possum population in Aotearoa-New Zealand is substantial and was estimated to be around 30 million in 2009 (Warburton, Cowan, & Shepard, 2009). There is ample evidence of the substantial negative impact these mammals have on New Zealand's native flora. This non-native mammal is a specialised browser and degrades Aotearoa-New Zealand's unique biodiversity by feeding on foliage and seeds (Nugent, Sweetapple, Coleman, & Suisted, 2000), at times changing the very composition and structure of native forests (Nugent, Whitford, Sweetapple, Duncan, & Holland, 2010). This change comes about because possums prefer to eat fruit, flowers, and leaf buds, disrupting the formation of seedlings and the succession of Aotearoa-New Zealand's forests. They also compete with many native fauna for food and habitat, destroying the nests of birds such as kererū (*Hemiphaga novaeseelandiae*) (Powlesland, Dilks, Flux, Grant, & Tisdall, 1997) and kōkako (*Callaeas wilsoni*) (Innes et al., 1999). Possums have been recorded killing and eating tītī (*Ardenna grisea*), piwakawaka (*Rhipidura fuliginosa*), and tāiko (*Pterodroma magenta*), both the adult birds and chicks (Sadlier, 2000).

*The New Zealand Curriculum* states that teachers must encourage the valuing of ecological sustainability, which involves caring for the environment. Such care is taught through conservation education, where children can learn how to restore and protect Aotearoa-New Zealand's biodiversity, in part by controlling these non-native mammals. Without human intervention, many, if not all, of the species that are currently at risk of extinction will go extinct. Given the complexity of the food webs in our ecosystems, the extinction of one native species in a food web can cause a knock-on effect resulting in the extinction of other species, resulting in further loss of biodiversity. Many species have already gone extinct in Aotearoa-New Zealand, primarily as a result of predation by these human-introduced non-native mammals (Wright, 2017). By learning about the value of ecological sustainability, and acting on this value, students can explore the value we place on Aotearoa-New Zealand's natural heritage and be encouraged to care for and protect it.

### To value 'participation for the common good'

The next value we examine is that of 'participation for the common good' (Ministry of Education, 2007, p. 10). The exploration and encouragement of this value entails discussions that establish what is the common good. We argue that given the fragility of our unique biodiversity that includes species of plants and animals that are found nowhere else in the world, participating for the common good includes learning why we should care for our natural heritage, and acting on this concern.

We assert that adopting a *laissez-faire* approach to our natural heritage is not consistent with the value of participation for the common good. Despite the fact that more than half of Aotearoa-New Zealand's landmass is now subject to some type of introduced predator management (Z. Carter, University of Auckland, personal communication, March 2022), more protection from introduced predators is required, as many species remain critically endangered (for example, kākāpō (*Strigops habroptilus*) and kōtuku (*Ardea alba modesta*)), or vulnerable and in decline (for example, korukoru (*Peraxilla colensoi*) and pekapeka (*Mystacina tuberculata*)). New Zealanders are increasingly rising to the challenge of protecting the unique biodiversity found in Aotearoa-New Zealand and are working towards protecting native and endemic species and restoring ecosystems. Their support is illustrated in a 2017 survey which found that 84% of New Zealanders view non-native mammals as a significant conservation problem that needs to be actively managed (Department of Conservation, 2017). This sense of responsibility has culminated in the establishment of Predator Free 2050, which aims to 'enhance the recovery and resilience of native biodiversity and ecosystems' (Bioethics-Panel, 2019, p. 3). Predator Free 2050 is a

social movement and government-sponsored initiative (Bioethics-Panel, 2019) that takes a multi-faceted approach to elimination of non-native mammals in Aotearoa-New Zealand. The success of Predator Free 2050 is in part dependent on the New Zealand-Aotearoa public becoming actively involved in the control of non-native mammals (Bioethics-Panel, 2019) and is fully dependent on our society continuing to value ecological sustainability and the diversity of our natural heritage. This participation for the common good is developed through conservation education, which can include the control of non-native mammals.

For those participating in preserving Aotearoa-New Zealand's natural heritage, there are a variety of methods used to control non-native mammals. These methods primarily include trapping and the use of toxins, often on a landscape scale (Russell et al., 2015). For example, the use of toxins on a landscape scale (6,130 hectares) over a three-and-a-half-month period in the Perth River Valley in South Westland, Aotearoa-New Zealand resulted in the reduction of possum and rat numbers to near zero levels (Nichols, Nathan, & Mulgan, 2020). Despite the demonstrated success of these methods, opponents of the lethal control of non-native mammals have suggested that instead of killing non-native mammals, other approaches should be used (Morris, 2021).

The use of predator proof fencing, which is used to create mainland sanctuaries for our unique species, has been suggested as an alternative to killing non-native mammals (Morris, 2021), but this argument neglects to consider that to be effective, these sanctuaries are dependent on the elimination of the non-native mammals in that area (Binny et al., 2021). While effective, this type of control is expensive to erect and maintain and cannot be used to protect large areas. Very large protected areas are required to allow threatened species to proliferate by establishing adequate home ranges for feeding and breeding. For example, each breeding pair of great spotted kiwi (*Apteryx haastii*) requires its own minimum home range of 20–35 hectares (Keye, Roschak, & Ross, 2011).

Native animal translocation, such as that carried out by Operation Nest Egg, has also been suggested as an alternative to killing introduced non-native mammals (Morris, 2021). However, vulnerable animals can only be translocated to the limited areas that are intensively predator controlled (The Kiwi Trust, 2021). Large scale translocation of species out of an area is in itself damaging, as the removal of a species from an ecosystem disrupts the delicate balance of feeding relationships in that system. In any event, ecosanctuaries are not a solution for at-risk birds that can fly (Fitzgerald, Innes, & Greene, 2021), and translocation of all the at-risk species from a vulnerable area to a sanctuary is not physically possible.

Other suggested alternatives to killing non-native mammals include the use of technological interventions that are still being researched, such as gene drives to induce sterility (Morris, 2021). While gene drives perhaps offer the ultimate solution for Aotearoa-New Zealand's non-native mammal issue, these technologies will require a change in government policy to be implemented (Wright, 2017) and are unlikely to be developed for many years, if at all (Rodger, 2019). To suspend lethal control of non-native mammals in the meantime, in the hope of a future technological solution, would place sensitive species and ecosystems at too much risk.

Thus, as part of conservation education, children need to develop an awareness of both the fragility of Aotearoa-New Zealand's biodiversity and the range of options available for controlling non-native mammals. In this way they can be encouraged to participate for the common good of maintaining and protecting our precious natural heritage.

### To value 'equity'

Equity 'through fairness ...' is another value that teachers must model and encourage in their learners, according to *The New Zealand Curriculum* (Ministry of Education, 2007, p. 10). When equity is discussed in terms of animal rights, these arguments typically focus on the right to life of the animal and the sentience of the individual animal (Bioethics-Panel, 2019). When considering the situation in Aotearoa-New Zealand, we argue that equity for all animals is simply not possible.

A choice has to be made between our biodiversity and non-native mammals, with one valued over the other. Both cannot co-exist and conservation education affords opportunities for discussion and consideration of this fraught issue.

Opponents of the lethal control of non-native mammals argue that killing these animals is inequitable (Morris, 2021). However, protecting the right to life of New Zealand's non-native mammals will result in the unnatural loss of life, and ultimate extinction in the wild, of much of our native fauna and flora through predation and consumption (Wright, 2017). Instead, the vast majority of New Zealanders are in favour of *restoring* equity for our threatened native animals and plants, by removing non-native mammals, and thus maintaining ecological sustainability and natural and cultural diversity (Department of Conservation, 2017; Russell, 2014).

Balancing the harms to non-native mammals against the harms to Aotearoa-New Zealand's unique flora and fauna needs to involve acknowledging a variety of viewpoints and realising there is no one simple solution (Parke & Russell, 2018). Simply considering whether or not to kill non-native mammals does not confer the degree of critical thinking and reflection this issue warrants. Instead, Aotearoa-New Zealand's teachers and children need to explore this relevant issue in a deeper manner (Bioethics-Panel, 2019), and to be encouraged to value equity that is compatible with valuing ecological sustainability and our heritages.

### To value 'integrity, which involves . . . acting ethically'

A further value of relevance to conservation education in *The New Zealand Curriculum* is that of 'integrity, which involves . . . acting ethically' (Ministry of Education, 2007, p. 10). Learning how to act ethically involves critically examining how and why people decide what is good/right or bad/wrong when considering issues in their lives (Hodson, 2011). This type of learning helps people decide what is ethically just in a society. Learning about ethics forms part of conservation education as it enables children to extend their decisions about what is good/right or bad/wrong beyond themselves (an individualistic positioning) to a 'life-centred ethics' position (Hodson, 2011, p. 210) where environmental justice can be considered. This life-centred ethical positioning involves acting ethically and respecting all living things.

By encouraging a life-centred ethics position as part of conservation education, we argue that children will learn to consider the ethics of their conservation behaviours, and act humanely when participating in environmental protection involving the control of non-native mammals. Acting in a humane manner is a legal requirement, as any lethal control of non-native mammals that is undertaken must adhere to the regulations stipulated in The Animal Welfare Act (1999). This legislation states that any practice, including trapping or hunting, considered to be causing unreasonable pain or distress to any animal is unacceptable (Fisher, Warburton, Morgan, Cowan, & Duckworth, 2008). Furthermore, New Zealanders cannot be considered immune to the welfare of these non-native mammals because when surveyed, 88% of New Zealanders wanted lethal pest control methods to have a minimum standard of humaneness (Fraser, 2001). We acknowledge that the minimum standard for lethal control may not meet the expectations of some animal rights proponents who believe that any killing of non-native mammals is inhumane (Morris, 2021). However, this viewpoint fails to acknowledge that the unnatural predation of our native species by those non-native mammals causes suffering for those animals that are preyed, and as such, privileging non-native mammals over native animals is ethically inconsistent.

Acting ethically with respect for others also involves taking responsibility for and nurturing our relationship with our environment; a responsibility that many New Zealanders have accepted. This relationship can be viewed from a Māori perspective and from a Pākehā (Western) perspective. From a Pākehā perspective, our relationship with the environment involves moral agents and moral patients (Bioethics-Panel, 2019). People are the moral agents who make the decisions that affect the environment and animals. As regards conservation, there are two perspectives on who



the moral patient is: this can be the individual animal or the whole ecosystem. Individual animals can be considered sentient moral patients, and as such killing non-native mammals presents a moral dilemma. However, by allowing these animals to become dominant in our ecosystems, we neglect to care for a greater moral patient, which is the ecosystem as a whole. The majority of New Zealanders favour the greater ecosystem over the individual animal as the moral patient (Russell, 2014), despite caring for the welfare of both. Therefore, in order to maintain and nurture the wellbeing of our ecosystems, ethical decisions are made in favour of the ecosystem rather than individual animals that are threatening its overall health. In this way, the killing of non-native mammals is regrettable but necessary, provided it is carried out as humanely as possible.

Aotearoa-New Zealand's founding document, Te Tiriti o Waitangi, requires equal partnerships between Pākehā and Māori when nurturing a relationship with our environment. For Māori, the principles of *kaitiakitanga* and *manaakitanga* encapsulate this responsibility. *Kaitiakitanga* is concerned with guardianship, viewing our natural heritage as a socio-environmental resource that needs to be carefully managed because of its relationships with people, including their ancestors, and with all elements in an ecosystem, biotic and abiotic. *Manaakitanga* is caring for and serving all within an ecosystem because of their interdependence. Thus, the relationship is one where everything is interconnected (Bioethics-Panel, 2019). Because of this interconnectedness, the lethal control of non-native animals is congruent with Māori culture, since without it, native ecosystems would collapse, endangering relationships with each other, our ancestors, and all of an ecosystem's elements.

### To value 'innovation, inquiry, and curiosity'

Valuing 'innovation, inquiry, and curiosity by thinking critically, creatively and reflectively' (Ministry of Education, 2007, p. 10) is an important value to instil in our learners if we hope to attain Predator Free 2050. Conservation education is an excellent medium for exploring this value. Aotearoa-New Zealand is a leader in the field of conservation innovation (Russell & Broome, 2016); our conservation experts are frequently recruited by other countries to manage their pest mammal eradication programmes (for example, [www.wmil.co.nz](http://www.wmil.co.nz)), and we lead the world in the design of animal monitoring systems (for example, [www.cacophony.org.nz](http://www.cacophony.org.nz)) and humane traps (for example, [www.goodnature.co.nz](http://www.goodnature.co.nz)). Aotearoa-New Zealand has also pioneered successful species translocation programmes, such as Operation Nest Egg, as an adjunct to introduced predator management (for example, [www.savethekiwi.nz](http://www.savethekiwi.nz)). Conservation education provides a stimulating context for children to consider further technological advances that are required to solve our biodiversity challenges and engage in the design thinking process.

Designing innovative traps is part of this brief and is sometimes the focus of conservation education teaching resources (Morris, 2021). While designing traps can encourage the value of innovation, inquiry, and curiosity, we believe that children should not be encouraged to *test* traps that they have designed and built themselves, as these traps are likely to be ineffective and can result in injury or slow death for the animal involved. There is, however, much value in facilitating students to design and test their own trap *lures* as a way of encouraging innovation and design thinking in an environmental context, without the risk of causing animal suffering.

### To 'respect ... others'

We have argued that conservation education that includes the lethal control of non-native mammals can develop the values espoused in *The New Zealand Curriculum*. While that is the case, the question of its effects on children remains. A philosophical argument has been made that exposure of children to killing non-native mammals can lead to these children becoming abusers of both animals and humans later in life (Morris, 2021), which is contrary to *The New Zealand Curriculum's* value that children should be encouraged to respect others.

This argument is based on the work of Baldry (2003), Gullone (2014), and Randour, Smith-Blackmore, Blaney, DeSousa, & Guyony (2019), which investigated the impact on children of witnessing wanton cruelty towards animals, such as household pets. These authors argue that there is a correlation between children being cruel to animals and witnessing or being subject to violent behaviour. These violent behaviours include domestic violence, corporal punishment, and bullying, in addition to wanton cruelty towards animals. When considering these findings, it is important to acknowledge that none of this research has established a causal factor for animal cruelty by children, but rather has identified associations that may or may not be causative.

However, as we have argued, in Aotearoa-New Zealand the choice is stark; it is the native animals and plants, or the non-native mammals — we cannot have both. We believe that teachers need to model the value of respect for others, including non-native mammals, and that when these mammals need to be killed, it must be done as humanely as possible. Traps that children use should have passed Aotearoa-New Zealand's National Animal Welfare Advisory Committee (NAWAC) standards, and thus align with The Animal Welfare Act, 1999. These traps include the commonly used DOC200 for stoats and rats, which is designed to deliver instant death. We recommend that children not use live capture traps, as the capabilities required to dispatch the animal are beyond many children, and as such could result in undue distress for both the target animal and the child. Importantly, when teachers model the value of respecting others by undertaking conservation behaviours ethically and humanely, children will be predisposed to copy these behaviours (Bandura, 1983), rather than adopt abusive behaviours towards others.

A recent analysis of the many New Zealand-Aotearoa conservation education resources, particularly those aimed at school children, showed that these resources highlighted the importance of instilling respect for the non-native mammals in question, along with the importance of a humane death (Morris, 2021). This is not merely lip service, as alleged by some (Morris, 2021); teaching children to value their environment, which includes ensuring the survival of our unique ecosystems, does not preclude teachers and students from valuing animal welfare.

We acknowledge that historically there have been cases identified in the media in which children have been encouraged by adults to be disrespectful to dead non-native mammals, for example throwing possum carcasses for competition (South, 2010), but we argue that this supports the need for teacher education that includes strategies to teach about non-native mammal control, so that children can learn about the need to protect our native species in ways that are as humane as possible, and that emphasise respect for all animals.

Finally, recognition must be given to the necessity of dealing with death and loss in conservation education. Death and loss are uncomfortable and difficult concepts in a primary classroom because we tend to insulate ourselves from our own mortality and that of others (Affifi & Christie, 2018). Too often when engaging in conservation education teachers focus on knowledge and the technical aspects, which neglects to engage children's emotions. Rather, when emotions are engaged, it is often to nurture feelings of hope or wonder. However, shrouding death and loss in mystery does not help children, because the more death is veiled, the less prepared children are to deal with it and the more they retreat from confronting it. Consequently, children do not learn about the fragility and impermanence of life for all living things, making it difficult to deal with environmental degradation, species extinctions, and the lethal control of invasive animals (Affifi & Christie, 2018). We argue that conservation education that involves the lethal control of non-native mammals should open up discussions about mortality, enabling children to consider the transience of life and our interconnectedness with our environment.

## Conclusion

Given the precarious state of Aotearoa-New Zealand's distinctive biodiversity as a result of predation and consumption by non-native mammals, we have argued that the majority

of New Zealanders have made a choice to protect and restore their natural heritage by supporting the control of non-native mammals. Thus, learning about the control of non-native mammals is an important and legitimate aspect of conservation education in Aotearoa-New Zealand's primary schools. Despite some concerns raised in previous research, we assert that conservation education that includes lethal control of non-native mammals enables children to explore, and be encouraged to develop, the values espoused in *The New Zealand Curriculum*.

Through exploring the unique biodiversity found in Aotearoa-New Zealand, children can learn to value the diversity of its natural heritage. Children can further be encouraged to develop the value of ecological sustainability through exploring the effects that non-native mammals have on the natural heritage they will inherit, and valuing participation for the common good can lead to participation in informed actions that will help restore and protect this natural heritage. Through discussions, children can explore the value of restoring equity to Aotearoa-New Zealand's native animals and plants by protecting them from non-native mammals, in a humane and ethical manner. The lethal control of non-native mammals can be done in a way that encourages respect for the animal, and there is no evidence to show that such behaviour will lead to children behaving abusively towards others, particularly when educators continue to model humaneness. Finally, in order to ultimately solve the issue of non-native mammals and their impact on Aotearoa-New Zealand's natural heritage, technological advances will need to be made, and such advances are dependent on New Zealanders learning to value innovation in the context of environmental conservation.

Learning that involves the nurturing of values in conservation education has wider implications for children. Through carefully considering what plants and animals they would like to see their local area in the future, they can work towards restoring Aotearoa-New Zealand's unique ecosystems in partnership with other community members. Not only will they learn about the flora and fauna unique to their place, but they will also envisage probable futures and learn to appreciate a diversity of viewpoints as they decide upon which species to nurture. These types of learning involve critical thinking and the development of values as children make informed decisions about their choices. In their exploration of their place as they work with local iwi, children will embrace a bi-cultural perspective and learn about the Māori heritage distinctive to their locality. In this way, not only will conservation education with a values perspective help children to become lifelong learners who wish care for the environment throughout their lives, it will help them to contribute to a flourishing environment for all.

**Acknowledgements.** None.

**Conflicts of Interest.** None.

**Financial Support.** This research received no specific grant from any funding agency, commercial, or not-for-profit sectors.

**Ethical Standards.** Nothing to note.

## References

- Affifi, R., & Christie, B. (2018). Facing loss: Pedagogy of death. *Environmental Education Research*, 25(8), 1143–1157. DOI 10.1080/13504622.2018.144651.
- Animal Welfare Act** (1999). Retrieved from <https://www.legislation.govt.nz/act/public/1999/0142/latest/DLM49664.html>
- Baldry, A.C. (2003). Animal abuse and exposure to interparental violence in Italian youth. *Journal of Interpersonal Violence*, 18, 258–281.
- Bandura, A.** (1983). Psychological mechanisms of aggression. In R.G. Geen & E.I. Donnerstein (Eds.), *Aggression: Theoretical and empirical reviews* (Vol. 1, pp. 1–40). New York, NY: Academic Press.
- Binny, R.N., Innes, J., Fitzgerald, N., Pech, R., James, A., Price, R., . . . Byrom, A.E.** (2021). Long-term biodiversity trajectories for pest-managed ecological restorations: Eradication vs. suppression. *Ecological Monographs*, 91(2), 1–18. DOI 10.1002/ecm.1439.

- Bioethics-Panel** (2019). Predator Free New Zealand: Social, cultural, and ethical challenges. *BioHeritage Challenge* (26pp). Retrieved from <https://bioheritage.nz/wp-content/uploads/2019/04/2019-MAY-Bioethics-Report.pdf>
- Bolstad, R., Joyce, C., & Hipkins, R.** (2015). *Environmental education in New Zealand schools: Research update 2015*. Wellington, New Zealand: Ministry of Education.
- Brockie, B.** (2013). Native plants and animals-overview. In J. Phillips (Ed.), *Te Ara: The encyclopedia of New Zealand*. Retrieved from <https://www.TeAra.govt.nz/en/native-plants-and-animals-overview/print>
- Cieciuch, J., Davidov, E., & Wyszy, C.S.** (2016). The stability and change of value structure and priorities in childhood: A longitudinal study. *Social Development*, 25(3), 503–528. DOI 10.1111/sode.12147.
- De Dominicis, S., Schultz, P.W., & Bonaiuto, M.** (2017). Protecting the environment for self-interested reasons: Altruism is not the only pathway to sustainability. *Frontiers in Psychology*, 8, 1–13. DOI 10.3389/fpsyg.2017.01065.
- Department of Conservation** (2013). Conservation education. Retrieved from <https://www.doc.govt.nz/get-involved/conservation-education/>
- Department of Conservation** (2017). Research shows most New Zealanders support pest control. Retrieved from <http://www.doc.govt.nz/news/media-releases/2017>
- Department of Conservation** (2018). *Why we use 1080*. Retrieved from <https://www.doc.govt.nz/nature/pests-and-threats/methods-of-control/1080/why-we-use-1080/>
- Department of Conservation** (n.d.). Orange-fronted parakeet/kakariki karaka. Retrieved from <https://www.doc.govt.nz/nature/native-animals/birds/birds-a-z/nz-parakeet-kakariki/orange-fronted-parakeet/>
- Eames, C., Cowie, B., & Bolstad, R.** (2008). An evaluation of characteristics of environmental education practice in New Zealand schools. *Environmental Education Research*, 14(1), 35–51. DOI 10.1080/13504620701843343.
- Enviroschools** (n.d.). *Nau mai ki Enviroschools*. Retrieved from <https://enviroschools.org.nz/>
- Fisher, P., Warburton, B., Morgan, D., Cowan, P., & Duckworth, J.** (2008). Animal welfare in vertebrate pest management and research in New Zealand. In: *Blue sky to deep water: The reality and the promise. Proceedings of the ANZCCART Conference* (pp. 89–94). Auckland, New Zealand, 29 June–01 July 2008.
- Fitzgerald, N., Innes, J., & Greene, T.** (2021). Wandering Waikato kākā. In: *Kararehe Kino – Animal pest research* (Vol. 34). Lincoln, New Zealand: Manaaki Whenua Press.
- Flannery, T.** (1994). *The future eaters*. London, United Kingdom: New Holland Press.
- Fraser, W.** (2001). Introduced wildlife in New Zealand: A survey of general public views. In: *Landcare research science series* (Vol. 23, 45p). Lincoln, New Zealand: Manaaki Whenua Press.
- Germano, J., Barlow, S., Castro, I., Colbourne, R., Cox, M., Gillies, C., . . . Yong, S.** (2018). *Kiwi recovery plan 2018-2029: Mahere whakaora kiwi 2018-2028*. Wellington, New Zealand: Department of Conservation.
- Gullone, E.** (2014). Risk factors for the development of animal cruelty. *Journal of Animal Ethics*, 4, 61–79.
- Harmsworth, G., & Awatere, S.** (2012). Indigenous Māori knowledge and perspectives of ecosystems. In J.R. Dymond (Ed.), *Ecosystem services in New Zealand: Conditions and trends* (pp. 274–286). Lincoln, New Zealand: Manaaki Whenua Press.
- Hodson, D.** (2011). *Looking to the future: Building a curriculum for social activism*. Rotterdam, The Netherlands: Sense Publishers.
- Innes, J., Hay, R., Flux, I., Bradfield, P., Speed, H., & Jansen, P.** (1999). Successful recovery of North Island kōkako (*Callaeas cinerea wilsoni*) populations, by adaptive management. *Biological Conservation*, 87(2), 201–214. DOI 10.1016/S0006-3207(98)00053-6.
- Kelly, T.** (2020). The role of basic human values in determining teenagers' pro-environmental behaviour (Doctoral dissertation). University of Canterbury.
- Keye, C., Roschak, C., & Ross, J.** (2011). Summer home range size and population density of great spotted kiwi (*Apteryx haastii*) in the north branch of the Hurunui River, New Zealand. *Notornis*, 58(1), 22–30.
- Manfredo, M.J., Bruskotter, J.T., Teel, T.L., Fulton, D., Schwartz, S.H., Arlinghaus, R., . . . Sullivan, L.** (2017). Why social values cannot be changed for the sake of conservation. *Conservation Biology*, 31(4), 772–780. DOI 10.1111/cobi.12855.
- Ministry of Education** (2007). *The New Zealand curriculum for English-medium teaching and learning in years* (pp. 1–13). Wellington, New Zealand: Learning Media.
- Morris, M.C.** (2020). Predator free New Zealand and the 'War' on pests: Is it a just war? *Journal of Agricultural and Environmental Ethics*, 33(1), 93–110. DOI 10.1007/s10806-019-09815-x.
- Morris, M.C.** (2021). Primary school education resources on conservation in New Zealand over-emphasise killing of non-native animals. *Australian Journal of Environmental Education*, 1–10. DOI 10.1017/ae.2021.19.
- Nichols, M., Nathan, H., & Mulgan, N.** (2020). Dual aerial 1080 baiting operation removes predators at a large scale. *New Zealand Journal of Ecology*, 45(1), 1–10. DOI 10.20417/nzjecol.45.14.
- Nugent, G., Sweetapple, P., Coleman, J., & Suisted, P.** (2000). Possum feeding patterns: Dietary tactics of a reluctant folivore. In T.L. Montague (Ed.), *The Brushtail Possum: Biology, impact and management of an introduced marsupial* (pp. 10–23). Lincoln, New Zealand: Manaaki Whenua Press.
- Nugent, G., Whitford, J., Sweetapple, P., Duncan, R., & Holland, P.** (2010). Effect of one-hit control on the density of possums (*Trichosurus vulpecula*) and their impacts on native forests. Retrieved from <https://www.doc.govt.nz/documents/science-and-technical/sfc304entire.pdf>

- Organisation for Economic Cooperation and Development (OECD)** (2007). OECD environmental performance reviews: New Zealand 2007. Retrieved from [https://www.oecd-ilibrary.org/environment/oecd-environmental-performance-reviews-new-zealand-2007\\_9789264030589-en](https://www.oecd-ilibrary.org/environment/oecd-environmental-performance-reviews-new-zealand-2007_9789264030589-en)
- Organisation for Economic Cooperation and Development (OECD)** (2017). OECD environmental performance reviews: New Zealand 2017. Paris, France: OECD Publishing. Retrieved from <https://www.oecd.org/newzealand/oecd-environmental-performance-reviews-new-zealand-2017-9789264268203-en.htm>
- Parke, E., & Russell, J.C.** (2018). Ethical responsibilities in invasion biology. *The Ecological Citizen*, 2(1), 17–19. Retrieved from <https://www.ecologicalcitizen.net/article.php?t=ethical-responsibilities-invasion-biology>
- Powlesland, R.G., Dilks, P.J., Flux, I.A., Grant, A.D., & Tisdall, C.J.** (1997). Impact of food abundance, diet and food quality on the breeding of the fruit pigeon, *Parea Hemiphaga novaeseelandiae chathamensis*, on Chatham Island, New Zealand. *Ibis*, 139, 353–365.
- Ram, R.** (2018). No country for possums: Young people's nativist views. *Australian Journal of Environmental Education*, 35(1), 12–27. DOI [10.1017/ae.2018.52](https://doi.org/10.1017/ae.2018.52).
- Randour, M.L., Smith-Blackmore, M., Blaney, N., DeSousa, D., & Guyony, A.-A.** (2019). Animal abuse as a type of trauma: Lessons for human and animal service professionals. *Trauma Violence and Abuse*, 22(2), 277–288. DOI [10.1177/1524838019843197](https://doi.org/10.1177/1524838019843197).
- Reid, A., Dillon, J., Ardoin, N., & Ferreira, J.** (2021). Scientists' warnings and the need to reimagine, recreate, and restore environmental education. *Environmental Education Research*, 27(6), 783–795. DOI [10.1080/13504622.2021.1937577](https://doi.org/10.1080/13504622.2021.1937577).
- Rodger, J.C.** (2019). Marsupials: Progress and prospects. *Advances in Experimental Medicine and Biology*, 1200, 309–325. DOI [10.1007/978-3-030-23633-5\\_11](https://doi.org/10.1007/978-3-030-23633-5_11).
- Russell, J.C.** (2014). A comparison of attitudes towards introduced wildlife in New Zealand in 1994 and 2012. *Journal of The Royal Society of New Zealand*, 44(4), 136–151. DOI [10.1080/03036758.2014.944192](https://doi.org/10.1080/03036758.2014.944192).
- Russell, J.C., & Broome, K.G.** (2016). Fifty years of rodent eradications in New Zealand: Another decade of advances. *New Zealand Journal of Ecology*, 40, 197–204.
- Russell, J.C., Innes, J.G., Brown, P.H., & Byrom, A.E.** (2015). Predator-free New Zealand: Conservation country. *Bioscience*, 65(5), 520–525. DOI [10.1093/biosci/biv012](https://doi.org/10.1093/biosci/biv012).
- Sadlier, R.** (2000). Evidence of possums as predators of native animals. In T.L. Montague (Ed.), *The brushtail possum: Biology, impact and management of an introduced marsupial* (pp. 126–131). Lincoln: Manaaki Whenua Press.
- Sauvé, L.** (2005). Currents in environmental education: Mapping a complex and evolving pedagogical field. *Canadian Journal of Environmental Education*, 10, 11–37.
- Schwartz, S.H.** (1992). Universals in the content and structure of values. *Advances in Experimental Social Psychology*, 25(C), 1–65. DOI [10.1016/S0065-2601\(08\)60281-6](https://doi.org/10.1016/S0065-2601(08)60281-6).
- Schwartz, S.H., Cieciuch, J., Vecchione, M., Torres, C., Dirilen-gumus, O., & Butenko, T.** (2017). Value tradeoffs propel and inhibit behavior: Validating the 19 refined values in four countries. *European Journal of Social Psychology*, 47(3), 241–258.
- Schwartz, S.H., Melech, G., Lehmann, A., Burgess, S., Harris, M., & Owens, V.** (2001). Extending the cross-cultural validity of the theory of basic human values with a different method of measurement. *Journal of Cross-Cultural Psychology*, 32(5), 519–542. DOI [10.1177/0022022101032005001](https://doi.org/10.1177/0022022101032005001).
- South, K.** (2010). *Possum throwing 'immoral' – SPCA*. Retrieved from <http://www.stuff.co.nz/national/4155269/Possum-throwing-immoral-SPCA>
- Stern, P.C.** (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407–424.
- Stern, P.C., Dietz, T., & Guagnano, G.A.** (1995). The new ecological paradigm in social-psychological context. *Environment and Behavior*, 27(6), 723–743. DOI [10.1177/0013916595276001](https://doi.org/10.1177/0013916595276001).
- The Kiwi Trust.** (2021). *Kiwis for Kiwi*. Retrieved from <https://www.kiwiforkiwi.org/what-we-do/how-were-saving-kiwi/learn-more-about-operation-nest-egg/>
- Thøgersen, J., & Ölander, F.** (2002). Human values and the emergence of a sustainable consumption pattern: A panel study. *Journal of Economic Psychology*, 23(5), 605–630. DOI [10.1016/S0167-4870\(02\)00120-4](https://doi.org/10.1016/S0167-4870(02)00120-4).
- Thomas, R.E.W., Teel, T., Bruyere, B., & Laurence, S.** (2019). Metrics and outcomes of conservation education: A quarter century of lessons learned. *Environmental Education Research*, 25(2), 172–192. DOI [10.1080/13504622.2018.1450849](https://doi.org/10.1080/13504622.2018.1450849).
- Tilbury, D.** (1995). Environmental education for sustainability: Defining the new focus of environmental education in the 1990s. *Environmental Education Research*, 1(2), 195–212. DOI [10.1080/1350462950010206](https://doi.org/10.1080/1350462950010206).
- UNESCO World Heritage Sites** (2021). <https://whc.unesco.org/en/list/551>
- Valente, L., Etienne, R.S., & Garcia-R., J.C.** (2019). Deep macroevolutionary impact of humans on New Zealand's unique avifauna. *Current Biology*, 29(15), 2564–2569. Retrieved from <https://www.sciencedirect.com/science/article/pii/S0960982219307857>
- van der Werff, E., Steg, L., & Keizer, K.** (2013). The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. *Journal of Environmental Psychology*, 34(3), 55–63. DOI [10.1016/j.jenvp.2012.12.006](https://doi.org/10.1016/j.jenvp.2012.12.006).

- Wals, A.E.J., & Benavot, A.** (2017). Can we meet the sustainability challenges? The role of education and lifelong learning. *European Journal of Education*, 52, 404–413. DOI [10.1111/ejed.12250](https://doi.org/10.1111/ejed.12250).
- Warburton, B., Cowan, P., & Shepard, J.** (2009). How many possums are now in New Zealand following control and how many would there be without it? Landcare Research report for Northland Regional Council (15pp).
- Wright, J.** (2011). Evaluating the use of 1080: Predators, poisons and silent forests. Retrieved from <https://www.pce.parliament.nz/media/1294/evaluating-the-use-of-1080.pdf>
- Wright, J.** (2017). Taonga of an island nation: Saving New Zealand's birds. Retrieved from <http://www.pce.parliament.nz/media/1695/taonga-of-a-island-nation-web-final-small.pdf>

**Sally Birdsall** is a Senior Lecturer in science and sustainability education at the University of Auckland, New Zealand. She teaches in undergraduate and postgraduate teacher education programmes, along with supervising postgraduate students. Her research focuses on science and sustainability education, with an emphasis on ways in which teachers and students learn about contentious issues, come to appreciate differing viewpoints, develop emotional resilience, and take informed actions, both individually and collectively. Sally's current research is in the contexts of declining biodiversity and the climate emergency.

**Tim Kelly** is an adjunct fellow of the University of Canterbury and also works at a rural composite school teaching science and agriculture. His research focuses on the values and motivations underpinning behaviour, particularly adolescent and environmental behaviours.