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planning and environment

SOCIAL AND ECOLOGICAL OUTCOMES FROM COMMUNITY-LED CONSERVATION

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EXECUTIVE SUMMARY

Community-led conservation is a burgeoning voluntary activity in New Zealand, with a significant proportion of New Zealanders participating in conservation-related work throughout the country. Philanthropic and government investment into community-led conservation initiatives is correspondingly growing; yet there is considerable uncertainty in terms of the outcomes achieved from this investment, and under what conditions desired outcomes are achieved.

Therefore, the aims of this research project were to:

1. Increase understanding of the social and ecological outcomes that arise from community-led conservation
2. Begin to identify key conditions that lead to positive social and ecological outcomes

This report is underpinned by three primary sources of material to informs these aims:

1. Literature on the outcomes of community-led conservation
2. Twenty-six semi-structured interviews conducted with key informants including experts, stakeholders and leaders in community-led conservation to provide insights into how community-led conservation models can prevent or promote social and ecological outcomes and inform the design of an online survey
3. An online survey targeted at community-led conservation participants, which received 313 responses

Findings

There are significant knowledge gaps. While we found sufficient evidence on which to base a background narrative on which to build this research project, there are significant gaps in publicly available data regarding the outcomes of community-led conservation, and the associated conditions that lead to these. However, an absence of evidence cannot imply that community-led conservation efforts yield a lack of social and ecological outcomes. Neither however, should it be assumed that they do. There is no doubt that this significant gap in knowledge must be filled to both better understand the casual relationship between action and outcomes to develop systems and approaches that enable greater outcomes.

Social and ecological outcomes from community-led conservation are diverse and often inseparable. Community-led conservation is burgeoning in New Zealand, and there is compelling evidence that it leads to many social and ecological outcomes. Notably, there was a common feeling amongst the 26 interviewees that social and ecological outcomes from community-led conservation were heavily entwinned, and the conditions for success are also closely interlinked. This strong relationship between the two domains was supported by data from the online survey for both outcomes from community-led conservation and the conditions leading to positive outcomes. Thus, positive social outcomes can lead to positive ecological outcomes, and vice-versa.

Outcomes from community-led conservation identified by the informant interviews were categorised into six broad themes (Table 3):

- Connectivity
- Health and wellbeing
- Collective impact
- Improved biodiversity matters
- Education and advocacy
- Economic benefits

These broad themes of social and ecological outcomes were supported by data from the online survey. Individual-level benefits identified by survey respondents were summarised into 14 categories reflecting outcomes directly experienced or perceived be individuals at a finer scale. These were again a mix of both social and ecological outcomes as detailed in Table 4 and Figure 6.

The conditions that lead to social and ecological outcomes are complex and varied. Community conservation groups have developed their own systems and approaches that reflect their unique composition and needs. However, a set of categories summarising common conditions of success emerged from the information gathered from the key informant interviews and which are explored in detail in section two:

- Leadership
- Group dynamics
- Ownership and empowerment
- Sustained resourcing
- Technical conditions

The data from the online survey supported these overarching categories as illustrated by the vast majority of survey respondents agreeing with individual-level proxy statements describing key conditions of success (Figure 10).

It is also evident that conditions of success are interdependent and feed-off, and influence, each other and that conditions do not operate in isolation such that conditions commonly need to be right across all dimensions, from governance to implementation to ensure sustained success.

Limitations of the research

Our respondent pool was highly biased towards Pākehā people with advanced degrees. This may reflect characteristics of the communities involved in what western culture traditionally views as community-led conservation, but it is evident that there is clear need to carry out research led by researchers of different backgrounds, with survey methods that suit a diversity of communities. Of particular note, the methods employed here inadequately represents Māori perspectives and therefore the report does not provide any direct discussion on these perspectives. Further dedicated research led by Māori researchers is essential.

Next steps

The research presented here highlights some research gaps, but also highlights the opportunities associated with understanding how social and ecological outcomes are arrived at. We suggest that unpacking these mechanistic pathways may be the key to identifying interventions that support community-led conservation in reaching its social and ecological goals. Exploring how best to promote and support the conditions of success identified here is a key next step to this research.

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OVERVIEW

Community-led conservation is a burgeoning voluntary activity in New Zealand, with a significant proportion of New Zealanders participating in conservation-related work throughout the country. Internationally, the benefits to both the environment and individuals from community-led conservation activities are relatively well described. However, there has been very limited research into the conditions required to achieve positive social and ecological outcomes from such initiatives. Predator Free 2050 Limited therefore commissioned this research to:

1. Increase understanding of the social and ecological outcomes that arise from community-led conservation
2. Begin to identify key conditions that lead to positive social and ecological outcomes

What is community-led conservation?

Internationally, various terms are used to describe public involvement in conservation including: environmental volunteering, civic ecology, civic ecological intervention, and citizen science. In this report we use the term 'community-led conservation', which is defined as:

> ***Community-led conservation*** *initiatives are those that are initiated outside of national and local governance organisations. They may take advice or receive assistance from expert organisations, but they are led by members of the community.*

Thus, community-led conservation is distinct from projects that are agency-led but where citizens provide assistance. However, it is important to note that community-led conservation is a dynamic concept, with proportional leadership and involvement from agencies and the community changing over time.

Report scope and structure

Here we use a mixed-method (existing literature, key informant interviews, and an online survey) approach to begin to examine the positive ecological and social outcomes that arise from community-led conservation initiatives and how they interact. This report focusses on the *identification* of these conditions and exploring how best to *promote and support those conditions* is a key next step to this research. The quantification of ecological outcomes from specific community-led conservation projects, or the evaluation of generalised outcomes against national conservation objectives is also beyond the scope of this research.

Further, the key informant interviews provided a wealth of information and insights on a broad range of factors relevant to community-led conservation but beyond the specific scope of this report. Several topics were particularly evident across the interviews and are clearly front and centre issues for those working in the community-led conservation field. These topics included recognising treaty partners and mana whenua within community-led conservation structures and approaches, the roles and responsibilities of the various players relating to monitoring outcomes, and the variable relationship between community conservation groups and science, research, and innovation. Investigating these and other relevant issues further is worthy of additional research focus.

Critically, the methods used for this report inadequately represent Māori perspectives and therefore the report does not provide any direct discussion on these perspectives. Further dedicated research led by Māori researchers is essential.

The report is structured into three sections:

1. Section 1 sets the scene using narrative to bring together known benefits from community-led conservation as informed by existing literature.
2. Section 2 focuses on the research component of this project and presents the methods and results of qualitative and quantitative data collection and analysis.
3. Section 3 discusses the findings and identifies some key areas for further research.

SECTION ONE
COMMUNITY-LED CONSERVATION IN NEW ZEALAND

INTRODUCTION

The emergence of community-led conservation in New Zealand reflects community acknowledgement of funding constrains for agency-led action, and creates systems through which local people can contribute knowledge, skills and resources to reversing the decline in biodiversity (Jones & Kirk 2018). It is based on the premise that individual- and group-level actions can make genuine differences for species and their habitats, and demonstrates with increasing certainty that individuals are willing, if not eager, to actively participate in tree-planting, pest control, species translocations, monitoring and other tasks to safeguard biodiversity (Brown et al. 2015).

Shifts in public agency approaches towards greater promotion and support of community-led conservation have also brought about change to the sector. This need for a focus on partnering with others for conservation action was reinforced by the Auditor General in 2015 which noted that the Department of Conservation could not win the battle against the threats to New Zealand's indigenous species and habitats alone (Office of the Auditor-General (2012). Now, with the emergence of the Predator Free initiative, over 5000 community groups and iwi have registered to conduct predator control in their communities since late 2016 (Department of Conservation 2020b). Supporting this, a recent survey of Wellington residents indicated around half of all respondents were involved in some form of environmental volunteering over the past year (Shanahan 2020), representing a significant community investment in environmental outcomes. The labours of many communities on private and public land and on the coast and in marine areas are now recognised as being of strategic significance in conservation (Rykers 2019). This contribution from community efforts has also recently been emphasised in the revised biodiversity strategy, Te Mana o te Taiao, the Aotearoa New Zealand Biodiversity Strategy 2020 (Department of Conservation 2020a) and He Kura Koiora I hokia: a discussion document on a proposed National Policy Statement for Indigenous Biodiversity (Ministry for the Environment & Department of Conservation 2019). As such, there is little question that community-led projects are collectively a significant actor in New Zealand conservation (Rykers 2019).

There are a diverse range of settings under which community-led conservation occurs in New Zealand. However, broadly speaking they include communities of people who have a collective focus on ecological restoration in some way (Phipps 2011). There are also 'conservation hubs' – or collaborations between a spectrum of organisations that aim to increase the scale of efforts (see Doole 2020). Generally common to all is a reliance on volunteer input (all or in part), an aim (whether formalised or otherwise) to undertake environmentally focused activities, and a strong link to a geographical unit (a region, a reserve, or a privately owned patch of habitat) drawing support from people with a strong attachment to that place. A study by Peters et al. (2015) provides further useful insight into the variation in community-led conservation groups:

- Two thirds (66.9%) of groups assessed were formalised (trusts or incorporated societies)
- Groups were generally small, with most (72.3%) comprising less than 20 volunteers
- Most volunteers (66.2%) were aged over 51 years

SOCIAL AND ECOLOGICAL OUTCOMES FROM COMMUNITY-LED CONSERVATION – WHAT DO WE ALREADY KNOW?

The potential social and ecological outcomes and associated benefits stemming from community-led conservation are many and varied, and several frameworks exist under which these can be explored. In this review we examine a number of outcomes through the lens of a framework outlined by Brooks et al. (2020), which was developed to conceptualise the social and ecological outcomes of conservation interventions in tropical coastal marine ecosystems. The framework is concise and highlights the direct and indirect effects of conservation interventions on people and ecosystems. This framework also highlights the interlinked nature of some outcomes, as there are a number of complex interactions, mechanistic pathways, and both social and environmental factors in play (Brichieri - Colombi et al. 2018). We have adapted the framework developed by Brooks et al. (2020) to conceptualise the potential social and ecological outcomes from community-led conservation (Figure 1) and use the themes identified in this framework as a foundational basis to further explore and understand potential positive outcomes.

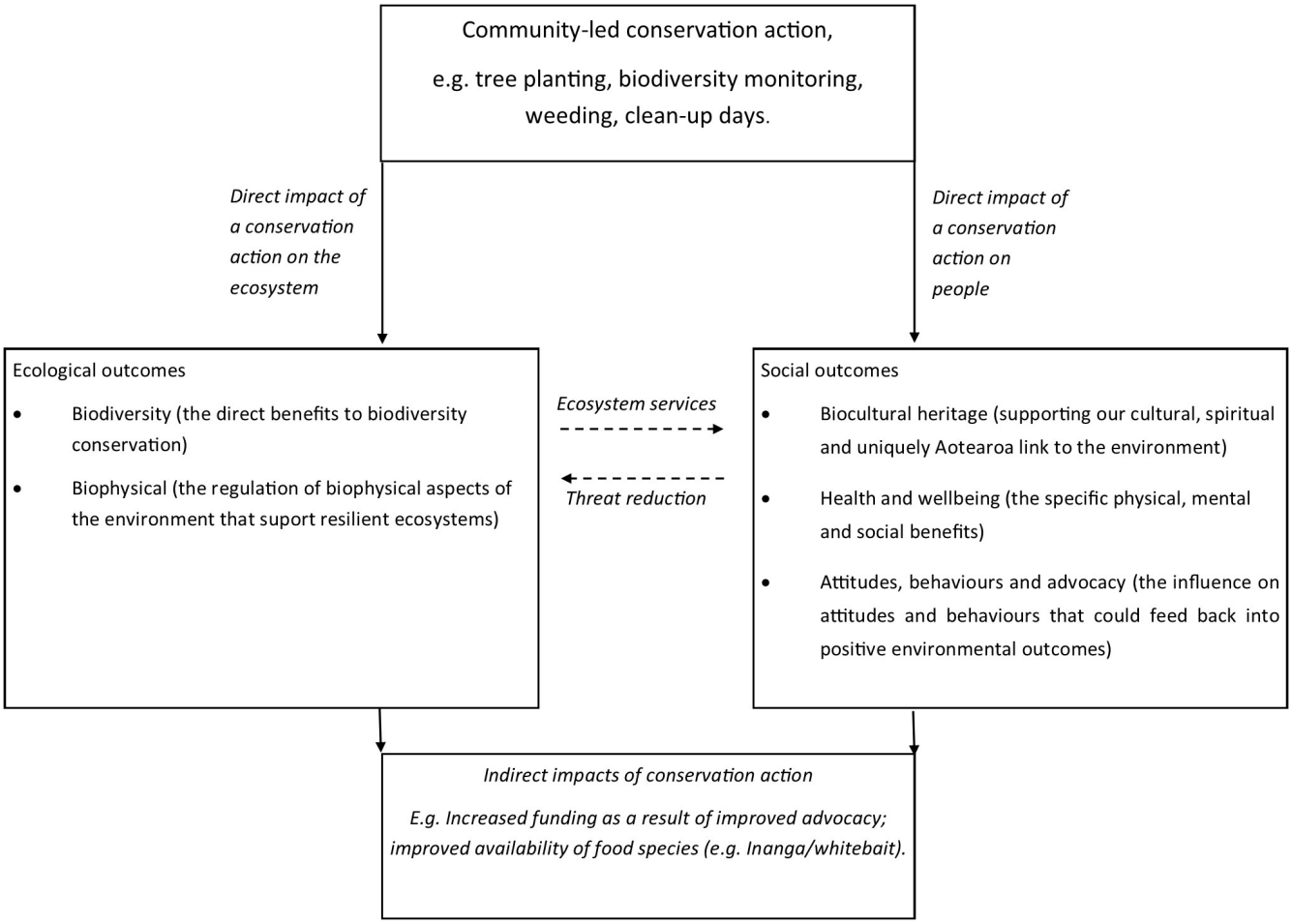

Figure 1. *A framework for conceptualising the social and ecological outcomes that could arise from community-led conservation, adapted from Brooks et al. (2020)*

Below we examine the key social and ecological outcomes identified in Figure 1, exploring the type of outcome, how community-led conservation projects might contribute to those outcomes, and highlight evidence in the literature. While we touch on indirect pathways to outcomes within these sections, the core focus is on outcomes that are directly caused by community-led conservation initiatives.

Biodiversity outcomes

Community-led conservation groups undertake activities across the spectrum of IUCN Conservation Actions Classification Scheme v2.0 categories (IUCN 2021). There is significant *a priori* evidence that these types of actions have the potential to influence outcomes for biodiversity, from the reduction of threats such as predation by introduced species, to the direct enhancement of fauna diversity through reintroductions. However, at the same time there is vast variation in the effectiveness of these actions depending on the level of threat the issue poses in various ecosystems, how they are deployed, the techniques used, coordination among sites, and many other factors (see Table 1). It is this variation that is likely to drive whether biodiversity outcomes arise from community-led conservation action.

Very few published reports or papers specifically measure or identify the outcomes in the state and trend of species or ecosystems arising from community-led conservation efforts. Jones and Kirk (2018) note that community-led conservation data collection is often extremely limited, and can also be generally biased towards collation of input (such as number of traps set) and output data (such as number of rats killed) rather than demonstrating the changes in biodiversity itself. Where agencies are significantly involved in projects, the ecological outcomes are often better tracked (Peters et al. 2015), though we have not discovered any direct comparisons of the efficacy of agency supported versus unsupported community-led biodiversity outcomes per se. As such, how groups monitor and evaluate their activities is poorly understood, and the research that does exist suggests considerable reason to be circumspect about outcomes (Galbraith et al. 2016; Jones & Kirk 2018).

The methods used by community groups to monitor biodiversity outcomes are notable for their variability. For example, some supported methods rely on online instruction sheets and in some instances field courses (e.g., five-minute bird counts, Hartley 2012) and collation of data through publicly available databases such as ebird (New Zealand ebird 2021) or trap.nz (Trap.nz 2021). However, although highly accessible and user-friendly, these sorts of methods are heavily influenced by observer bias, individual motivation to complete data entry, and the habitat and species in question. Therefore, comparability and accuracy of results can be questionable (Hartley 2012). Other approaches involve more coordinated citizen science programmes that aim to connect people with appropriate expertise and methods, such as the NIWA Stream Health Monitoring and Assessment Kit (SHMAK, NIWA 2019).

At a strategic level, local councils primarily identify social outcomes as a key reason for investing in biodiversity promotion; this was a key finding from a study that assessed the biodiversity strategies of cities in the Oceania region (Shanahan et al. 2018). Specially, the provision of ecosystem services was a key outcome area in every strategy analysed, and very few identified biodiversity outcomes as a key objective.

Despite the limitations of outcome monitoring, the published studies that do exist are in many instances compelling. For example, the 1999 fence construction and mammalian pest control at Karori Sanctuary (Zealandia) was demonstrated through five-minute bird count data to have resulted in significant changes in the forest bird community, reflecting increased 'indigenous character' (Miskelly 2018). Other efforts, such as those undertaken by

groups involved with Kiwi Coast, Ōtanewainuku Kiwi Trust, and Parihaka Community Landcare have demonstrated the suppression of pest animal numbers, and have also reported corresponding changes in species diversity and relative abundance over time (Kiwi Coast Trust 2018; Ōtanewainuku Kiwi Trust 2020; Parihaka Community Landcare 2020). Projects such as Predator Free Wellington are also demonstrating how collective action for introduced predator control, supported by an organised multi-agency predator control effort, can significantly impact rat populations in an area (Predator Free Wellington 2019). This type of effort has the potential to deliver considerable outcomes for biodiversity in the long term through the removal of a key threat. Clearly, community-led conservation has the potential to create drastic, wholesale positive changes in biodiversity outcomes; however, given the limited measurement and/or reporting of outcomes, determining the conditions under which they occur remains a considerable challenge.

Table 1: *The types of activities undertaken by community-led conservation groups as identified by Peters et al. (2015), alongside examples of mechanistic pathways to biodiversity outcomes.*

Activity	Approximate proportion (%) of community groups undertaking activity (from Peters et al. 2015)	IUCN Conservation Action category	Examples of mechanisms for delivery of biodiversity outcomes	Examples of factors that could Influence biodiversity outcomes
Weed control	86	Land/water management	Release of potentially weed–bound native plant species; improved native plant diversity	Coordination among sites (or lack thereof); lack of timely intervention or acknowledgement of timeframes involved (Hulme 2020)
Planting natives	85	Land/water management	Improved plant diversity, enhanced speed of restoration	Choice of plants (e.g., lack of mature–phase canopy/emergents) (Forbes et al. 2020), fundamental planning such as timing, pest control, preparation (see for example, Greater Wellington Regional Council 2014), in riparian planting the length and width of buffer strips, among other factors (Collins 2011)
Pest animal control	75	Land/water management	Reduction of predation and browsing threats to native fauna and flora	Baseline biodiversity at the site (which determines what species might rebound); landscape context (which affects animal behaviour) (Russell & Stanley 2018)
Advocacy/education	70	Education and awareness	Behavioural change of people to reduce threats to ecosystems	Framing of the issues, e.g., aligning the audience's attitudes with the message (Anspach & Dragulјić 2019); influence of the person presenting the message (Dalrymple et al. 2013)
Writing submissions	55	Education and awareness	Behavioural change of people, or policy change, to reduce threats to ecosystems or enhance protection	Likely depends on context, type and stage of decision making, strength of argument and other factors. Assessment of effectiveness of action appears to be a major research gap.
Amenity development	52	Education and awareness	Enhanced access for people, promoting awareness of an engagement in environmental outcomes	Proximity between where people live and location (Parks et al. 2003)
Riparian planting	52	Land/water management	Improved rapid habitat enhancement (in stream and on riparian margins)	Nutrient loading in surrounding area, species planted (e.g., wooded vs grasses, Cole et al. 2020)

Activity	Approximate proportion (%) of community groups undertaking activity (from Peters et al. 2015)	IUCN Conservation Action category	Examples of mechanisms for delivery of biodiversity outcomes	Examples of factors that could Influence biodiversity outcomes
Fencing	30	Land/water management	Reduction of grazing or predation threats to native flora	Conditions within the fenced area, e.g. stream shade, area fenced (Doehring et al. 2019)
Covenanting	20	Land/water protection	Growth of protected areas	Management of the covenant or protected area post-establishment, including changes in interest and emphasis over time in covenanted areas (De Vries-Stotijn et al. 2019; Geldmann et al. 2019)
Reintroducing native birds	20	Species management	Promoting more rapid restoration of fauna diversity	Presence of additional threats or competition (Miskelly 2018)
Changing water levels	10	Land/water management	Restoring natural flows, reducing threats posed by artificial in stream structures	Restoration strategies used (e.g., functional vs structural, Palmer et al. 2014); factors such as water supply to the site, levels of fluctuation in wetlands (see for example, Greater Wellington Regional Council 2009)

There are many socio-ecological feedback processes in play in the context of community-led conservation. Of relevance here is that areas with greater biodiversity can have a positive feedback influence on wellbeing outcomes (Fuller et al. 2007; Donovan et al. 2018). This is true at both an individual human level where feelings of restoration and wellbeing outcomes can be greater in more biodiverse environments (Fuller et al. 2007; Cox et al. 2017a), and at a population level, for example, asthma prevalence is lower in people exposed to more biodiverse environments across their lives (Donovan et al. 2018). Given that successful biodiversity outcomes from community-led conservation can drive social outcomes, this effect would be amplified further as more people join the group, or utilise the space for recreation.

There is also the potential for negative feedback loops, and understanding these is crucial to get a clear picture of the potential negative impacts on biodiversity that could arise from community-led conservation. While there is little literature available on such negative effects, an example could be groups undertaking the wrong or potentially damaging actions such as planting species that are not considered site appropriate by many in the conservation community (e.g., pōhutakawa throughout Wellington), or conducting trapping an inappropriate way that results in unintended by-catch. These negative effects of community-led conservation on biodiversity would be worthy of further assessment.

Biophysical outcomes

The biophysical realm is large and complex, and the benefits that arise in this area due to community-led conservation span social and ecological outcome domains. Here we explore these outcomes within the bounds of natural capital and ecosystem service concepts, where ecosystem services are defined as the benefits flowing from natural capital stocks (soils, water, vegetation, species, and including biodiversity) consumed or used by humans to sustain or advance wellbeing (Maseyk et al. 2017). Ecosystem services fall into three types. Provisioning services include the products we obtain from nature (e.g., food supply, raw materials, structural support); regulating services arise from the regulation of ecosystem processes (e.g., mitigated storm impacts, water quality, stable climate); and cultural services which are the non-material benefits and values we obtain from nature (e.g., presence of significant species, habitats, and landscapes; recreation; spiritual enrichment).

In considering the outcomes that arise from the provision of ecosystem services and how that translates to human wellbeing we can look to the landmark philosophical construct of Maslow's hierarchy of needs (Maslow 1943). Simplistically, provisioning and regulating services map to our basic needs (physiological and safety needs) at the bottom of the hierarchy, while cultural services flow to the top tiers of the hierarchy meeting our self-actualisation and esteem needs (self-fulfilment and psychological needs). Thus, the provision of ecosystem services relates to human needs on two levels – physical and non-physical (Dominati et al. 2010).

Although ecosystem services are categorised by type, services are heavily interlinked, and the resulting outcomes and benefits are complimentary and simultaneous. For example, ecosystem function (and the provision of regulatory services) is necessary for the provision of other services, and provisioning services can also contribute to cultural services and wellbeing (e.g., the harvest of culturally important species). Critically, providing for a wide range of services leads to a wider range of benefits (across cultural, environmental, social, and economic values) and wellbeing.

Land use actions and management interventions, such as those undertaken by community-led conservation initiatives, can alter composition, abundance, or ecosystem function, and thus ultimately impact on the capacity of

systems to sustain the provision of services (Nagendra et al. 2013). Further, the quality, quantity, and configuration of biodiversity elements within a landscape are critical components of ecosystem function, and therefore efforts to enhance species and habitats and remove critical threats to them will subsequently enhance ecosystem processes and contribute to the provision of ecosystem services. Community-led conservation actions that may contribute to the provision of regulating ecosystem services and associated benefits include: predator eradication, wetland restoration, planting specific areas to prevent sedimentation and enhance water quality (e.g., riparian areas or highly erodible slopes connected to waterways), pest animal and weed management to restore ecological function (e.g., multi-tier, species diversity, species interactions).

Importantly, the actions undertaken by community-led conservation initiatives contribute to, rather than provide ecosystem services, as other forms of capital (e.g., social, human, and built) are also necessary (Maseyk et al. 2017) and interact with natural capital and each other to bring about ecosystem service provision. Thus, and of particular relevance to community conservation, ecosystem services are brought about due to, and entangled in, complex social-ecological interactions (Krasny et al. 2014). Associated benefits also intersect across social and ecological outcomes. Additional biophysical benefits arising from increased resilience at local and landscape scales brought about by the absence of threats and enhancing ecological infrastructure (as represented by nature and natural capital stocks). Resilience captures both the ability to withstand (resistance) and the ability to recover from disturbances, spanning both scientific concepts of 'bouncing back' and sociological concepts of adaptation and transformation (Ruiz-Mallén & Corbera 2013; Maseyk et al. 2019). Maintaining resilience within social-ecological systems contributes to the sustained provision of ecosystem services (Ruiz-Mallén & Corbera 2013), further highlighting the interconnectedness of benefits within and across ecological and social outcomes.

The contribution of community-led conservation actions to provision of ecosystem services is rarely measured (Krasny et al. 2014) and biophysical benefits are more likely to be cited as additional outcomes (i.e., an added bonus) as opposed to an explicitly intended outcome that is planned and managed for, and measured and reported on. However, restoring or protecting the biophysical environment has been found to be a motivation for partaking in community conservation (e.g., Asah et al. 2014). Krasny et al. (2014) also notes that such practices are often assumed to provide positive outcomes in the form of ecosystem services (including regulating services). Specific examples where evidence for biophysical outcomes from community-led conservation was shown includes microclimate regulation services provided by community managed green spaces in the Greater Manchester area, UK (Dennis & James 2016); and improved water filtration attributed to the 'Rock the Boat' youth programme which undertakes restoration of saltmarsh and oyster reefs, construction of mussel and seaweed rafts to filtrate stormwater releases, and data collection in conjunction with adult community members in the Bronx River watershed, New York City (Krasny et al. 2014).

While we can presume that ecological enhancement achieved through community-led conservation efforts will also contribute (to some degree) to improved performance in flow of regulatory ecosystem services from those areas, the description and measure of both service provision and resultant outcomes arising from this service provision remains a substantial gap.

Biocultural heritage outcomes

The authors of this report are not in a position to assess or evaluate the environmental or social outcomes of community-led conservation for Māori. As such, the following is based on existing literature and from a Tangata Tiriti perspective.

There are important potential outcomes for Aotearoa's biocultural heritage where community-led conservation projects are driven by, or partner meaningfully with, mana whenua and tangata whenua. For example, they may in some instances provide a practical pathway through which Te Tiriti o Waitangi commitments can be realised, specifically for Māori to retain tino rangatiratanga over their taonga. This may also provide an important pathway for people to maintain or restore their connection with the environment, which has special relevance in New Zealand as taonga plant and animal species have central importance with regard to identity and kaitiakitanga (Waitangi Tribunal 2011). Conservation activities have been identified as important opportunities to share and apply mātauranga, tikanga and many other practices, and reinforce the relationships between people and their environment (McAllister et al. 2019; Michel et al. 2019).

An example where a partnership model of community-led conservation is providing positive biocultural outcomes for Pākehā and Māori is through Wellington's Sanctuary to Sea Kia Mouriora te Kaiwharawhara project. This project aims to restore the mouri, or lifeforce, of the Kaiwharawhara catchment (Michel et al. 2019). This project is coordinated by Zealandia, but is founded on a partnership with Taranaki Whānui (mana whenua for the rohe). This partnership has allowed the establishment of restoration goals and activities that are meaningful to mana whenua, and as a result they have facilitated mātauranga to be shared across generations (Michel et al. 2019). Further, the project has provided an opportunity for Pākehā to understand and experience the enhanced biocultural heritage outcomes from taking a partnership-based approach to community-led conservation.

It is important to note that customary conservation interventions will have benefits for nature and for cultural expression and can generate feedback mechanisms such that enhancement of one increases the enhancement of the other (Smith 2007; Lyver et al. 2019a; Lyver et al. 2019b). Lyver et al. (2019b) provide a number of examples of biocultural approaches to conservation that can generate ecological and social outcomes. Cultural health monitoring frameworks provide a mechanism through which iwi can assess the importance of a site for tangata whenua, as well as the mahinga kai values (past, present and future) of an area. Many frameworks that have been developed by iwi across Aotearoa and for different environmental settings (e.g., Ministry for the Environment 2020). The development of these frameworks must be controlled by Māori, with science or other support provided as requested, and their application, including data collection, must also be Māori-led (Bishop 2019). This is an area of specific interest to Māori researchers, and should be the foundation of future collaborations where the outcomes from community-led conservation are explored.

Health and wellbeing outcomes

There is a growing body of evidence that highlights the link between human wellbeing and experiences of nature. The outcomes in this domain are diverse, ranging from reduced mortality cardio-vascular disease (Mitchell & Popham 2008; Donovan et al. 2013), reduced respiratory illness and allergies (Lovasi et al. 2008; Hanski et al. 2012), improved healing times (Ulrich 1984), reduced stress (Van Den Berg & Custers 2011), reduced frequency of poor mental health (Fuller et al. 2007; Dallimer et al. 2012; Mitchell 2013), improved social health (Shinew et al. 2004), and promotion of

positive health behaviours (e.g., physical activity Timperio et al. 2008; Sugiyama et al. 2010; Lee et al. 2013). There are many direct and indirect mechanistic pathways through which the outcomes arise (Shanahan et al. 2016). For example, reduced stress may arise due to 'attention restoration', where less directed cognitive effort is required of individuals in natural environments (Kaplan & Kaplan 1989). Some of the conditions that might promote these types of outcomes include whether or not individuals have an existing connection to nature; as well as socio-demographic factors such as age, level of advantage or disadvantage, and gender (Shanahan et al. 2019). In contrast, other outcomes can arise because of the biophysical changes caused by vegetation; for example, asthma and allergies may occur at lower rates in more diverse landscapes due to the filtering effect of vegetation which leads to reduced air pollution, or due to improvements in environmental microbiomes where people live (Hanski et al. 2012; Donovan et al. 2018). Important conditions that enable such benefits to arise might include the level of exposure an individual has to natural environments, or genetic predispositions to allergies or respiratory diseases.

Being part of a community-led conservation group provides added dimensions to passive experiences of nature, and as such has the potential to not only deliver the afore-listed outcomes, but enhance them. For example, one of the most notable outcomes is higher levels of physical activity in environmental volunteers. Librett et al. (2005) found that environmental volunteers were 2.6 times more likely to meet the Center for Disease Control (CDC) recommendations for physical activity, and several other studies have also made this connection (e.g., Pillemer et al. 2010). Now, green gyms where people are encouraged to participate in environmental volunteering specifically to promote physical activity are a common nature-based intervention used to improve health in many countries (Shanahan et al. 2019). Compelling evidence is now also emerging from New Zealand showing that participating in community-led conservation initiatives can deliver impressive scales of wellbeing benefits. Specifically, early results from Shanahan (2020) have shown that Wellingtonians who participate in trapping non-native predators experience far fewer, and reduced severity of, symptoms of stress and depression.

Attitudes, behaviours and advocacy

There is a common assumption in the conservation community that engaging people with nature through environmental volunteering experiences will generate a pro-environmental ethic that will later feed into political and societal support for conservation itself, as well as behaviours that promote biodiversity (or at least do not contribute to a decline). This assumption is notable in popular literature such as Last Child in the Woods (Louv 2005) and has been identified as a key motivation for supporting conservation action in many city council biodiversity strategies (e.g., Wellington City Council 2015; Shanahan et al. 2018) and in not-for-profit strategies in New Zealand (e.g., Zealandia 2017; Greening Taupō 2020; Urban Wildlife Trust 2020). Reconnecting people with nature is also a goal of Department of Conservation volunteering initiatives (e.g., Department of Conservation 2020a).

There is conflicting evidence regarding the extent to which involvement in community conservation initiatives can actually support the development of pro-environmental attitudes and behaviours, in part because of the extraordinary complexity in social, economic, environmental, and family based factors that influence what a person values and how they behave (McDougle et al. 2011). For example, recent evidence from Australia questions the fundamental assumption that experience of nature is associated with conservation concern, and instead determined that factors such as education and gender had a much higher influence (Dean et al. 2018).

There are many other complexities involved in testing these types of assumptions; for example, environmental volunteering commonly attracts people who already value nature (or at least are not averse to it; 'the converted') and so detecting change in a group that is already highly motivated is difficult. One study conducted by Bell (2003) attempted to assess the value of Department of Conservation volunteering programmes for creating conservation advocacy using focus groups. While the challenge of detecting effects of the activity did exist in this study, there was some indication that participants believed volunteering had a role in raising awareness for conservation, and in particular for supporting the relationship between the public and the Department itself. The study also indicated that people learned about more specific conservation actions through their volunteering work. As such, volunteering likely has a key role in providing people with a tangible mechanism to direct their efforts for the greatest impact, as well as a social environment that encourages or supports pro-environmental behaviours and attitudes.

In some instances, community-led conservation settings provide people with an opportunity to be the advocates themselves, for example, by guiding visitors through a restoration or conservation site (e.g., Zealandia and many other fenced sanctuaries, Tiritiri Matangi Island; (Galbraith 2013), or directly advocating for sites to councils or governments (Peters et al. 2015). These activities could potentially have the opportunity to scale up impact, but again measuring this impact on a longer-term conservation ethic is challenging if not impossible due to the complexities of peoples' lives, and because the tours themselves tend to attract people interested in the outcomes.

Significant research is still required to unpack the role of both experiences of nature and environmental volunteering in creating a conservation ethic. Key advances would be made through longitudinal studies that assist in unpacking how values and ethics with respect to biodiversity and the environment are formed, but also before and after studies that explore how people's attitudes and behaviours change as a result of involvement in community-led conservation initiatives.

Other outcomes

There is significant literature outlining motivations for individuals to carry out environmental volunteering that has emerged from places with a similar cultural context (e.g., Australia). These motivations often reflect social outcomes, such as feeling like you make a difference, improved social networks, and an enhanced sense of place (Gooch 2003, 2005); and ultimately these contribute significantly to social capital (Measham & Barnett 2008). In addition, research from across the globe has shown that community conservation activities create a sense of community and improve connections among people (Gilmour & Saunders 1995; Miles et al. 1998). Indeed, this is commonly why people join organised conservation groups (Measham & Barnett 2008). In New Zealand, a study on predator trappers in Wellington (Shanahan 2020) demonstrated significantly higher levels of social cohesion than those who did not participate. Alongside this type of research, a number of studies have addressed the motivations for engaging with environmental volunteering. These provide hints of the range of positive outcomes that can arise and which include social interaction, personal development, learning, attachment to a place, and a sense of contributing to the community (Measham & Barnett 2008).

Many community-led conservation groups highlight social goals such as creating a sense of unity and promoting recreation through vision or mission statements. Examples of mission statements that illustrate these desired outcomes include 'working together' (Predator Free Hawke's Bay 2021), or 'protect its character as a natural area for recreation and enjoyment of its "wilderness character" by citizens' (Trelissick Park Group 2021). Other groups have specific activities that promote social outcomes such as maintaining heritage in areas they manage (e.g., Aongatete

Forest Project 2021). A cursory analysis of the volunteer group sites listed on DOCs web page for community groups suggests that few, if any groups measure these outcomes specifically. Rather, success in goals such as creating a sense of community and maintaining a resource that local people can access, may be a fundamental determinant of the persistence of the group itself.

Final notes

Critically, there are significant gaps in publicly available data regarding the outcomes of community-led conservation, and the associated conditions that lead to these. However, an absence of evidence cannot imply that community-led conservation efforts yield a lack of benefits to social and ecological outcomes. Neither however, should it be assumed that they do. There is no doubt that this significant gap in knowledge must be filled to both better understand the casual relationship between action and outcomes to develop systems and approaches that enable greater outcomes.

SECTION TWO

EXPANDING UNDERSTANDING OF SOCIAL AND ECOLOGICAL OUTCOMES FROM COMMUNITY-LED CONSERVATION

CONTEXT

As highlighted in Section 1 there is considerable uncertainty around what outcomes arise from community-led conservation and under what conditions. For example, the lack of capability and capacity of community groups to measure outcomes has been noted (Jones & Kirk 2018), but there is limited understanding of the characteristics of groups that do achieve positive outcomes. Here, we begin to explore this knowledge gap. Specifically, this research explores the community-led conservation community's understanding of the social and ecological outcomes that arise from community-led conservation in New Zealand, and the conditions that foster these positive outcomes.

Given the dearth of research in this area to date, we take a mixed-method approach to examine these questions first through qualitative methods involving key informants, and second through a quantitative survey-based method focused on community-led conservation participants.

METHODS

This research programme takes two key approaches:

- Key informant interviews that provide an in-depth exploration of ecological and social outcomes from community-led conservation and the conditions that lead to these
- An online survey focused on participants in community-led conservation to examine the perspectives on outcomes, and characteristics of groups that influence success

This mixed-method research approach has several benefits, and is particularly useful for exploratory research in fields of study such as this where there has been limited attention to date. It enables detailed perspectives from key stakeholder groups to be captured, as well as a snapshot of perspectives from the wider conservation community. It also enables the identification of key areas for future detailed research.

This research was approved by the Victoria University of Wellington Human Ethics Committee #0000028489.

Key informant interviews

Key informant interviews were used to engage in-depth with known experts, stakeholders, and leaders in community conservation. The objective of the interviews was two-fold:

1. Provide insights into how community-led conservation models can prevent or promote social and ecological outcomes,
2. Inform the design of the online survey.

Through this process we sought to gain the perspectives of highly engaged experts. This approach allowed the identification of key themes that could be explored in detail with interviewees, and then tested with the broader

community-led conservation community via the online survey.

A list of potential key informant interviewees was developed by the research team and reviewed by Predator Free 2050, representing a cross section of experts with varying perspectives. Interviewees were selected based on their relevant areas of expertise and based on the following groupings:

- Predator Free 2050 and Department of Conservation
- Regional council staff
- Iwi and hapū kaitiaki
- Community project leaders (non-iwi)
- Subject matter experts and researchers
- Philanthropy funders

Effort was made to achieve equal numbers across the groups although the final list of interviewees was determined by availability of participants. These groupings were not mutually exclusive, with some participants being active in more than one.

To avoid any sense of obligation, potential interviewees were approached in the first instance by the project support administrator (i.e., not one of the research team). The initial email provided detailed explanation of the project, relevant ethics approval information sheets and consent forms, and a scheduling assistant to indicate convenient times for the interview to take place. Interviews were conducted by Dr Fleur Maseyk or Gillian Johnston via Zoom or telephone where video conferencing was not available. To ensure data accuracy, interviews were recorded (unless requested not to be). Informed consent for participation was confirmed at the beginning of each interview.

Interviews were developed in consultation with Predator Free 2050 Ltd. A semi-structured design was used, centred around three broad areas of inquiry that were designed to explore the key conditions underpinning social and ecological outcomes from community-led conservation:

- The role of community conservation in driving social and ecological outcomes
- Insight into conditions that influence ecological outcomes, either positively or negatively, from community conservation initiatives
- Insight on conditions that influence social outcomes, either positively or negatively, from community conservation initiatives

A series of questions relating to each area of inquiry served as starting points for the discussion while allowing for spontaneous flow of conservation. Additional questions related to examples of conditions and engagement strategies that have had positive outcomes in other community initiatives (outside of environmental initiatives), and how (and what sort of) research and information is accessed, used, and by who in terms of informing community-led conservation group activities.

Online survey

An online quantitative survey was developed to explore the social and ecological outcomes from community-led conservation based on the perception of people who are involved. The survey questions were developed based on

the themes arising from the key informant interviews. This online format of the survey was used to reach a larger number of respondents across a range of geographic locations.

The survey invited participation from '*people who are actively involved in a conservation activity*' who were over 18 years old. Respondents were recruited through paid Facebook advertisements, by sharing on conservation Facebook pages (commercial and non-commercial), and via direct email. The survey ran between 22 July and the 7 August 2020.

The survey comprised open-text response questions, Likert scale responses whereby participants were asked the extent to which they agreed or disagreed with a number of statements that articulated potential personal outcomes and project-based outcomes from community-led conservation activities, as well as specific questions that first explored details of the activities people were involved in, such as the type of conservation activities and the number of people involved (the survey questions can be found in Appendix 1). Respondents took an average of 18 minutes to complete the survey.

There are a number of socio-demographic variables that are known to influence an individual's engagement with nature (Lin et al. 2014; Shanahan et al. 2014; Cox et al. 2017b), and as such information was also collected on gender, age, whether the person was in paid conservation work, household income, ethnicity, employment status, and the number of dependent children for potential inclusion in analyses. The short-form version of the Nature Relatedness Scale (Nisbet & Zelenski 2013) was used to provide an indication of each respondent's connection to nature. Participants were also invited to indicate the types of monitoring carried out by the group that was most familiar to them. These data provide an indication of the characteristics of respondents and their involvement in conservation, and it provides a rich dataset for future analysis and exploration.

Data analysis

Key informant interviews

The semi-structured nature of the interviews allowed for the findings to be summarised as a whole in narrative form while also ensuring anonymity of interviewees. The analysis was conducted principally by the two interviewers, with additional cross-checking of the flow of ideas expressed by interviewees to key themes identified during analysis from a third member of the project team. The process included the following steps, although the process is iterative rather than step-wise:

1. Interviews were recorded using in-application recording or a handheld device (where permission was granted). Recorded interviews were then transcribed using automated software (Otter).
2. Raw data (from the recordings and transcriptions) were compiled into a single Excel workbook to create an 'analysis grid'. The analysis grid was organised to correspond to the structure of the interviews, enabling raw data describing distinct ideas to be collated against each area of inquiry. Collated data was tagged to the relevant group to which the participant primarily belonged, but individual identifiers were removed.
3. The ideas emerging from the collated raw data were then grouped into categories. Categories describe the broader concept expressed by the raw data, thus allowing for similar ideas to be grouped together. Similar categories were then in turn grouped into themes. The identification of categories and themes was inductive (informed by the responses themselves).

This analysis allowed for narrative reflection of the findings within each theme, as informed by the raw data and illustrated by verbatim quotes; and an interpretive summary of common ideas as expressed by the categorisation of raw data.

Online survey

Exploratory graphs were created to examine the characteristics of the respondent pool (gender, age categories, location, dependent children, ethnicity, disability, household income, employment, and highest qualification). Aspects of each respondent's involvement in conservation activities were also explored graphically to provide a snapshot of the characteristics of the surveyed community's efforts; this included time spent on conservation activities, the person's role, the size of the project they were involved with, where on the rural/urban spectrum the project was located, and the nature of their involvement.

Two of the open-text response questions asked the reasons why people became involved in community-led conservation in the first instance, and the benefits (here benefits can be considered a type of positive outcome that arises from community-led conservation) that individuals receive from continuing to participate. The responses to these two questions were analysed using thematic analysis; verbatim raw data was first read to provide a general sense of the response, following which each distinct idea within each of the responses was identified and coded to 1 of 14 categories. The categories were informed by other studies of positive outcomes from volunteering (Clary et al. 1998; Caissie & Halpenny 2003) adapted to best reflect the responses themselves. Supporting this, a second question provided pre-determined potential social and environmental outcomes (informed by the key informant interviews) to which participants were invited to note the extent of agreement on a five-point Likert scale.

To explore the extent to which communities measure outcomes we examined the percentage of survey participants that indicated their group monitored outputs, actions, or human involvement in activities. We also examined the types of activities the groups carried out.

Finally, we assessed agreement with a number of 'condition' statements that were identified through the qualitative interviews that might lead to better (or worse) social and ecological outcomes for groups. These include, for example, whether the group is well funded, or whether it had access to sufficient support. This aspect of the research provides insights into the perception of the state of these conditions.

We explored whether further statistical analyses (specifically, a drivers analysis and correlative modelling) were appropriate to assess the relationship between the conditions and the outcomes reported by survey respondents. We have not reported on these results due to limited variation in the data set which meant the power of the results for many variables was in some instances very low. This is addressed further in the discussion section.

RESULTS

Key informant interview findings

A total of 26 interviews (ranging in length from 0.5 to 1.5 hours) were conducted between 29 May and 29 June 2020. The number of interviewees by group is provided in Table 2.

***Table 2**: Number of interviewees by group*

Group	Number of interviewees
Predator Free 2050 / Department of Conservation	4
Regional council staff	3
Iwi and hapū kaitiaki	6
Community project leaders (non-iwi)	5
Science and research organisations	3
Subject matter experts/researchers	5
Philanthropy funders	1
TOTAL	26

The grouping of interviewees is indicative rather than definitive as some interviewees could also be categorised in other sectors. For example, several kaitiaki were researchers and many of the researchers/subject experts were employed in science and research organisations.

It is important to note in considering these findings that they reflect a very informed and engaged group by virtue of the fact that interviewees are known experts in this subject matter and were therefore deliberately targeted for participation. However, engaging with key experts was an appropriate and important first step into research on the conditions that support social and ecological outcomes. Further, as experts, their insights could be used with confidence to inform the design of the online survey.

Key outcomes from community-led conservation

There was strong commonality across the interviewees that the outcomes from community-led conservation were a mixture of both ecological and social. However, none of the interviewees saw a clear differentiation between social and ecological outcomes and the importance of the interplay between the two was commonly recognised; for example: '*It's an intertwining, a weaving of all of the strands into one strand because they play off and complement each other*'; and another noting '*Wellbeing is better if the project has a successful social component and they both complement each other'*.

While this perception was common across all sectors, there was a difference in its articulation between Māori and non-Māori interviewees. Māori interviewees did not conceptually separate between social and ecological outcomes *'One begets the other I think the sort of Cartesian Western, you know, reductionist approach is created the separation, it will kind of articulate in the lexicon, and we need to and separate that in bringing far more systems or indigenous values-based approach to these things.'* In contrast, non-Māori interviewees perceived strong interplay between

ecological and social outcomes, using words such as 'holistic' and 'mixture' to describe the relationship. In any case, the strong interdependence between social and ecological factors was well recognised, with one interviewee stating: '*it's definitely an intertwining of all of those …a weaving of all of those strands into one strength because they play off each other and complement each other*'.

One interviewee noted that ecological factors served as motivations to start participating in community conservation, but social benefits became the primary reason people continued to participate – '*I don't think people generally go in and say I'm going to join that group and plant trees because I need company. That's not the motivation. But it could be the social side that makes them go back'*; also noting that specific outcomes were often not the driver in establishing projects or community groups and often '*just sort of happen'*.

Ideas describing the social and ecological outcomes from community-led conservation identified from the interview findings could be grouped into 32 categories across six themes (Table 3).

***Table 3**: Categories summarising similar ideas expressed by interviewees when asked to describe their perceptions of social and ecological outcomes from community-led conservation, grouped by theme.*

Theme	Categories describing similar ideas
Connectivity	Re-establishing connection of people-nature interdependency Looking after your backyard / local people engaged in their local place Belonging to place Being with like-minded people Community cohesion and resilience Kinship Creating a sense of identity
Health and wellbeing	Restoration of human systems alongside ecological systems Empowerment of people / feeling valued Sense of ownership Expressing kaitiakitanga Feeling of belonging Spiritual revitalisation Improved physical and mental health
Collective impact	Contributing to something bigger Joint participation in a shared goal
Improved ecological measures	Restoring mauri Reducing invasive species Recovery of native species Increasing habitat Revegetation Increasing ecosystem health Species translocations Native dominance Reconnection of native food-webs
Education and advocacy	Environmental advocacy Sharing of knowledge Developing pro-environment behaviours Upskilling and job creation
Economic benefits	Employment Reduction in health costs Innovation

These themes are not always independent of each other and the boundaries between them are 'fuzzy' rather than rigid. For example, the health and wellbeing benefits from participating in community conservation flow from individuals experiencing enhanced or sustained connections to people and to nature; ideas captured within the connectivity theme.

While there was unanimous agreement that social outcomes were many and varied, it was generally felt that the exact extent of the associated benefits is unknown as they are currently not measured (or not measured well).

We expand on each of the six themes below.

Connectivity

Connectivity was a major outcome from community-led conservation identified by the key informants. This included both connection and reconnection, spanning several concepts in both the social and ecological space including: (re)connecting people to place; connecting the past and future; (re)connecting individuals to their sense of self and self-worth, and understanding of their place in the world; and reconnecting ecological networks.

The social benefits that flowed from increased connectivity (across all dimensions) were commonly considered (across all groups of interviewees) to be substantial, albeit largely intangible and currently not measured well. Throughout the interview conversations the most common outcome mentioned was bringing communities together as articulated by the following ideas:

- Sense of community
- Getting to know and being engaged with neighbours
- Increase in community cohesion
- Connection between people that wouldn't commonly connect

Connectivity in local communities has many social benefits including sense of belonging (e.g., '*a sense of love and understanding and where you live in the natural world*'), kinship, and increasing community-minded behaviour – '*what we are finding is socially people are getting to know their immediate communities a lot more because they have a combined cause for what they are trying to achieve*'. The idea that enhancing community connections also increased preparedness for emergencies was also raised, but much less commonly.

Building community cohesion and resilience included forming communities within communities; bringing together people from diverse walks of life; providing opportunities for marginalised communities to engage and connect (e.g., those on lower incomes, ethnically diverse, or those with disabilities); community pride and shared sense of achievement. '*It's something anyone can do in their backyard that links them to their neighbour, their suburb, their community. So, there is that real sense from individual action to outcomes*.'

The observations regarding community building extended to rebuilding lost connections, including across space and time, as well as finding new ones: '*while the focus is on the environment, it's often really about rebuilding social relationships and maybe even bringing people back from urban areas into places and spaces that will have ancestral connections too so it's a sort of a connection or reconnecting of relationships of current peoples, but also people through the generations through time and space*.'

One interviewee summarised it succinctly as '*reconnecting is a powerful thing*'.

Health and wellbeing

The majority of interviewees linked improved wellbeing (physical and mental) with participation in conservation projects. This was most commonly expressed through connecting people and nature and being outdoors. The value of nature generally to health and wellbeing was also described by one interviewee as: '*environments are key to the health of people*' and another as '*there's all sorts of things around mental health resilience for a community, supporting or just being aware of other people in the community in ways you wouldn't normally*'.

A feeling of belonging with likeminded people, feeling valued, and having a sense of purpose were also commonly recognised as key benefits from participating in community conservation that contributed to health and wellbeing. One interviewee described it as: '*people coming together and working together gives people a sense of purpose*'.

The benefits of enhancing the environment for the physical and mental health of people was also recognised by Māori interviewees as critical for spiritual revitalisation and enhancing mauri ora: *'you're accessing medicine cabinets and you're having a good look around in the rongoā cabinet, if you like of nature cabinet. And some of us that are a little bit more seasoned with knowing the difference can help explain that, and it's an empowering thing. What's happening now is a reclamation of sovereignty in that space in terms of the nature world, in terms of its benefits on health, generally, it's meditative powers when you're there. All the different opportunities at different resources can procedure in terms of food, and medicine, there's a major movement going on for a little while now, a reclamation of that rangatiratanga'*.

Collective impact

A key outcome for participants commonly mentioned by interviewees was '*being part of something bigger*'. The concept of collective impact also has strong linkages to the themes of connectivity and improved health and wellbeing. The key themes that came through were in coming together, people '*…feel like they are doing something bigger for the environment*'. Making a contribution, sharing knowledge, and working towards a shared goal or vision were also identified as key social benefits experienced by participants. The collective impact of individuals working together was key: '*an empowerment is actually being able to do something to make a positive change. It can get so overwhelming if you think about the crisis, we face whether that be climate change or biodiversity loss. Being able to be involved in practical actions that make a difference*'.

Improved ecological measures

While examples of ecological outcomes could readily be provided by the majority of interviewees, there was a common acknowledgement that significant ecological gains are not made across all projects ('*some groups are awesome but other groups aren't*'; '*depends on who is doing the work'*), and that the monitoring data to inform outcomes is often lacking ('*across the board there is not a lot of monitoring happening and where there is it's not very standardised between groups*'; '*we don't know how effective it is because the monitoring is so poor'*). However, it was frequently noted that even if the actual ecological gains achieved by community groups were small, the social benefits derived from this focus on nature were manifest. There was general consensus amongst the interviewees that these social benefits were so important as to be enough in of themselves (e.g., '*…sometimes that social aspect becomes more important …than the biodiversity goal*').

Scientifically robust data is necessary to inform on progress towards outcomes and validate conservation interventions. However, the issue of whose role is it to collect, collate, and analyse data was frequently raised. It was also commonly noted that we cannot know the extent of the outcomes from community conservation in the absence of monitoring; '*otherwise you keep giving money to community groups and saying its great you have planted x trees, but how many have survived? We know these groups make a difference, but we can't actually put numbers on a page to demonstrate it'*. Several hurdles were raised as prohibiting or compromising the collection of robust data including the practicality and cost, lack of national vision, lack of capability and capacity, and ultimately monitoring is simply not '*everyone's cup of tea'* with many people who join community conservation groups. For hapū and marae-based projects, it was noted by one interviewee that it was about '*their whakapapa, not about data'*; reflecting that for Māori, approaches to evaluating success will look different to western science.

Despite the intertwined aspects of ecological and social outcomes many tangible ecological outcomes were articulated for example, forest and wetland health, proliferation and recovery of native species, restoration of trophic levels, reconnecting food webs, restoration of ecological processes, native dominance, gain in deep endemic species, more habitat, regeneration, revegetation of farmland areas. A number of conservation actions delivering these outcomes were also identified including pest control, weed control, tree planting, species translocations, and restoration.

Less commonly mentioned were the reconnection and restoration of ecological networks, such as native food webs, habitat types and biomes; but the connection between environmental and social health was also observed: '*there are three things, health of the environment, health of the people, because the environment is healthy. People are reliant on kai moana and social connections*.'

Advocacy and education

Advocacy and education involve developing and evolving communities to become pro-environment and ecologically focused. Interviewees considered that opportunities for education and advocacy for nature covered the spectrum of age groups from kindergarten through to career development and elderly education. The key areas for opportunity raised during the interviews spanned:

- Increasing environmental advocacy (from kindergarten through to aged care)
- Environmental history education
- Upskilling and career creation
- Employment within communities
- Skills based learning

Several interviewees felt that education and advocacy resulted in communities that care more about the environment, and helped guide industries/ farmers that want to be proactive rather than reactive environmentally (e.g., cleaner water, more sustainable forest blocks). One interviewee noted, '*raising awareness is the first stage towards the intention to do something.*'

Engagement in community conservation can provide learning opportunities that school is not otherwise providing for some children, open minds to potential career opportunities, and create sparks for future innovations: '*young people who might not be doing that well in school we find when they get themselves into some trap building it gives a lot of them more purpose and direction, something for them to go into career wise. We have all kinds of young people that*

have come up with remote sensors/ traps tech and IT based gadgets. It's giving it a real focus at schools as well as the more biological sciences.'

Economic benefits

Economic benefits were considered an important outcome, but one we do not understand or measure well, and several interviewees (from different expert groups) considered this an untapped opportunity. Economic benefits raised during the interviews spanned topics such as reduction in healthcare requirements because of improved health, for example, '*there is data coming out showing the restoration of nature has economic benefits that come from things like health of the population in an area, the role of green spaces in reducing asthma and lung conditions*.'

Other economic benefits identified included increased tourism, spend on existing predator control, and job creation. Several interviewees noted the importance of job creation both for an individual's sense of worth (e.g., '*having a job is a big social outcome*'), but also more generally for smaller or remote communities, and especially for iwi (e.g., '*bringing people home and giving them a reason to stay*'.

The economic benefits from the conservation industry were also recognised: '*over the years they would have received about $2.5–$3 million in funding to do work so that's money that will be used to benefit the community through employment. Out of the two or three fencers one will get the work, building capacity and capability*.'

Key conditions influencing outcomes from community-led conservation

The most commonly expressed conditions that were critical for success were related to social aspects of community-led conservation. It was frequently noted that getting the social conditions right had a major influence on both ecological and social outcomes. Buy-in (e.g., '*we cannot achieve these goals without permission, endorsement and enthusiasm of community*') and support of the community (e.g., '*the reason things do happen or don't happen is because people do or don't support a thing. This is about people*.') were considered critical to successful outcomes.

A myriad of conditions influencing success were raised during the interviews which largely centred around the following overarching key conditions:

- Leadership
- Group dynamics
- Ownership and empowerment
- Sustained resourcing
- Technical conditions

These themes were used to develop the Likert-scale statements used within the online survey exploring participants (dis)agreement on conditions influencing social and ecological outcomes of community-led conservation. We expand on the ideas and concepts within each theme below. For conceptual simplicity we have presented frequently mentioned views on conditions within these five themes, but note that it all conditions are interdependent and feed-off, and influence, each other. It was also noted that conditions need to be right across all dimensions, from

governance to implementation: '*community governance, community project management, and community technical skills to deliver actual restoration elements*'.

Leadership

Repeatedly, and across all expert groups, those projects that were considered successful were typically those that had a well-resourced coordinator, facilitator, or leader. The personal traits and mode of operating of those in these roles were also commonly cited as having a major impact on the group dynamic and capacity for success. Key positive traits commonly mentioned included:

- Passion and commitment '*having a key person, someone who has commitment and passion to start it up'*
- Creates momentum and movement '*his enthusiasm is infectious*'
- Transparent and accountable '*stand up and own it*'
- Connected, good at networking, and has influence '*a networker so they know who to pull into help them'*; '*have the connections*'
- Inclusive of a wide variety of people and enabling '*says I'd love you to be a part of it*'
- Charismatic and personable '*is charismatic and energetic*'; '*the quality of being*'
- Transcends cultural boundaries '*empathetic leadership and people who can transcend social and cultural boundaries*'
- Organised with good project management skills '*management of the day-to-day stuff*'; '*well organised'*

The following quote captures the difference a good leader makes to the success of a community group: '*they take groups from someone mucking round the fringes to turning the dial'*.

Group Dynamics

Having a positive group dynamic was commonly identified as key factor of success. It was also noted that this culture was often nurtured by a leader or a group way of doing things – thus, there was strong interplay between the characteristics of the leader and the group dynamics. Inclusiveness, collaboration, and a shared vision were all frequently raised as key elements for a positive group dynamic. In contrast, strong complex personalities were often the reason groups fell flat; as one interviewee put it: '*complex individuals and personalities can kill a group*'.

The concept of enjoyment was raised frequently in the interviews and was seen as the crux of the value proposition for those volunteering their time. Ultimately, if individuals were not enjoying themselves, they wouldn't stay – '*people need to enjoy what they do, they are not paid so why would they bother otherwise*' – and the group dynamic was seen as fundamental to enjoyment levels ('*more often than not it boils down to personalities who are involved*'). Therefore, maintaining enjoyment for individuals within a group is key to the group's longevity, ability to maintain volunteers and ability to obtain good conservation outcomes. Further, it generates positive energy for the group as those extracting enjoyment tend to invest more back into the group. Themes that fell out under maintaining enjoyment are acknowledgement these are volunteer positions, valuing volunteers, expectation about what is achievable, realism about the tasks and providing support where required (i.e., easing the burden).

Practical considerations such as having the necessary mixture of skills and capacity and getting the '*right person on the right job*' was also recognised as important factors contributing to a positive group dynamic. However, practical considerations were raised much less often than social considerations.

Ownership and empowerment

The ability for the community to have ownership and be at the '*top of the power pyramid*' as a condition for success was noted by several interviewees. One interviewee noted the lack of power can undermine achieving good outcomes: '*often it's the people in power that are the blockages when it comes to making progress on your work. It's about who has control, who has power, who has the resources and who makes the decisions and who pays what for what*'. It was also noted that it was crucial for funders and support agencies to act as enablers, nurturers, and supporters to enable groups to deliver on their own vision and purpose; and not to enforce their external viewpoint, or subject them to organisational agendas. One interviewee linked these concepts to those of community groups largely comprising individuals who are volunteering their time and are there for their own reasons, not those of the funders, '*forcing organisational agendas onto volunteers in service, not tying them up in monitoring requirements, just letting them go and get on with the stuff that they like, the stuff that's fun'*.

It was also felt that funders and support agencies should provide the space and ability for community groups to challenge the assumptions (e.g., philosophies on monitoring protocols) and not assume that something will not work or is a wrong approach (especially in situations when '*you have incomplete information which makes it harder to do the job*'), or that they have all the answers. This is especially pertinent for hapū and marae-based activities where the ability to express kaitiakitanga and self-determination in accordance with mātauranga Māori and their own tikanga is paramount.

It was noted that many groups have sprung from an observable conservation need in the absence of anyone else (including Department of Conservation) being active in their patch; and it was a frustration for many groups to then be compelled to bend to bureaucracy or be pushed into operating in a way, or to an agenda, that is not driven by them. Owning the problems empowers community groups to own the solutions: '*there are a lot of the people wanting to do reviews and come up with frameworks often you find the strong engagement is already happening on the ground, looking at our projects I have a hard time seeing what top-down intervention would be better than what is happening from the bottom up*'.

Equality and engagement of the wider community

There was recognition that to achieve broader conservation goals there was a need to make conservation a mainstream activity that anyone can see themselves being a part of. Moving away from the environmental stereotype to be inclusive of different cultures, age groups, socio-economic groups, industries (e.g., farmers) and physical abilities. One interviewee captured the 'socks and sandals' stereotype like this: '*It's about social connectiveness so you don't have to join a granny group with long socks and sandals that are hardcore, it's local, it's in my backyard*'. Part of breaking down these stereotypes is gaining permission, endorsement, and enthusiasm of the community; the other part is attracting a broader range of volunteers '*what does a conservationist look like? If we are serious about achieving these ambitious goals, we need to speak beyond the converted*'.

Support and buy-in from landowners, businesses, and local communities is fundamental in achieving long-term goals. One interviewee discussed the importance of engagement style: '*it's the way you approach people. Engaging the unengaged is a challenge. How you design your messaging*', and another talked about importance of trust and

neutrality: '*if we approached farmers with a DOC or City Council uniform they would have told us to go away. When you come wearing these uniforms you represent bureaucracy. At any point our key landowners could pull out, it's all about trust*'.

Development of a strategic approach to communicate and attract those outside the converted was seen as key. Having the ability to tailor and pivot communication to meet individual community drivers and communicate in a positive way comes into play. Currently the return of wildlife to suburban areas and high profile ecosanctuaries such as Zealandia play a part in engaging the local community – '*native birds used to be something you went somewhere else to see. Now in Western suburbs you see kākā*'.

Several interviewees noted there is the recognition that more needs to be done in the right way to involve marginalised communities and that inequality effects ability to participate as volunteers. As one interviewee put it: '*the disabled community are often left out of the situation big time. The social outcome for engaging those communities in the space is huge…*'.

Sustained resourcing

Support networks, agencies (e.g., councils, DOC, PF2050 Ltd., umbrella organisations), and funders were, by and large, considered important players in achieving good outcomes, but the way these agencies operated was critical to this. First and foremost, as enablers and nurturers, but not as controllers or assuming they know best – '*if you go in there from the start and say boy do we have a deal for you. You are going to be saying here is the objectives for the project, here is the idea, the vision. They are going to be saying that's nice but that's your vision it's not ours*'.

Key conditions for positive relationships with funders and support networks identified by interviewees included:

- The provision of support and resourcing without taking control and inflicting outside agendas on groups, in a manner that was responsive to individual group needs
- The development of long-lasting relationships that started with building trust and respect
- Setting aside assumptions and being open to understanding the groups' vision, goals and objectives, and way of being and doing
- Having access to a key support person
- Acknowledging and appreciating efforts of community groups
- Supplying the necessary tools and networking to get the job done
- All agencies pulling together in the same direction and not having opposing agendas

It was evident from the interviews that a fundamental and long-standing barrier for community groups continues to be securing sustained and consistent funding. The time and expertise required to obtain funding is resource intensive and requires expertise. The criteria and stipulations for funding often mean groups are applying for funding for initiatives that are not in their best interest. For example, one interviewer noted '*in many cases, the impact of pest control will be far greater for the often hundreds or even thousands of species that are already present. Getting people and getting funding agencies to recognise the value of just protecting a site versus doing something flash like a translocation*'. Additionally, '*a group might be encouraged to apply for a fund but then not get the funding and have to rearrange what they do to meet different resource requirements*'.

It was noted that successfully obtaining funding one year could mean failure to obtain funding in following years in cases where funders have a preference not to fund the same project repeatedly – '*you start to get told, we only fund a project once'* and '*the only reason they are getting turned down is because they have been funded before by that agency*'. It was highlighted that as more and more community groups spring up, this will increasingly become a problem. Furthermore, one interviewee noted that securing initial funding for a 'flash' conservation project (such as a translocation) was easier than securing funding to maintain pest control long-term; '*easy to do something flash like a translocation. It's really hard to get money to maintain in the long run*'. This is a critical consideration in the context of both securing ecological outcomes long-term which requires more than '*one-off fixes*', and to not '*loose the investment*'. Like all aspects of conservation, the demand for community-led conservation resourcing is greater than the supply.

Technical conditions

Several practical or technically focused conditions were raised during the interviews, including correct and smart use of tools and restoration methods ('best practice'), matching the right action to the desired outcome, and deploying trap networks to maximum effect. For example, '*sometimes you get groups on the mainland that slap in a few bait stations and all the rest, thinking they are going to get kōkako and saddlebacks there the next day often they find that out quickly but sometimes they don't find that out for a really long time, it can be really disheartening*'.

Other key considerations raised included:

- Understanding visions, goals, and objectives as a common agenda within a community conservation group and knowing how (which actions, how, when) to achieve these
- Having a simple and clear vision with a focus on outcomes (as opposed to outputs)
- Realism and expectation about what the site can achieve from the outset regarding the time and effort, funding, support, environmental conditions, location of the site, and site characteristics required to achieve goals

It was recognised that '*groups do need that technical support behind them, they need that expert technical advice to know what actions make a difference*' and this included, for example, having the right equipment available when required (traps and baits) and knowing how to use tools correctly to achieve desired outcomes. There is a clear need for assistance and support from agencies and funders to ensure necessary technical conditions are in place.

QUANTITATIVE SURVEY RESULTS

A total of 313 people completed the online survey. Respondents were 46% male, 53% female, and 1% gender diverse (Figure 2). Respondents were primarily Pākehā with only 7% identifying as Māori. More Wellington region residents completed the survey than any other area (19%), with Marlborough being the least represented region (2%; Figure 2).

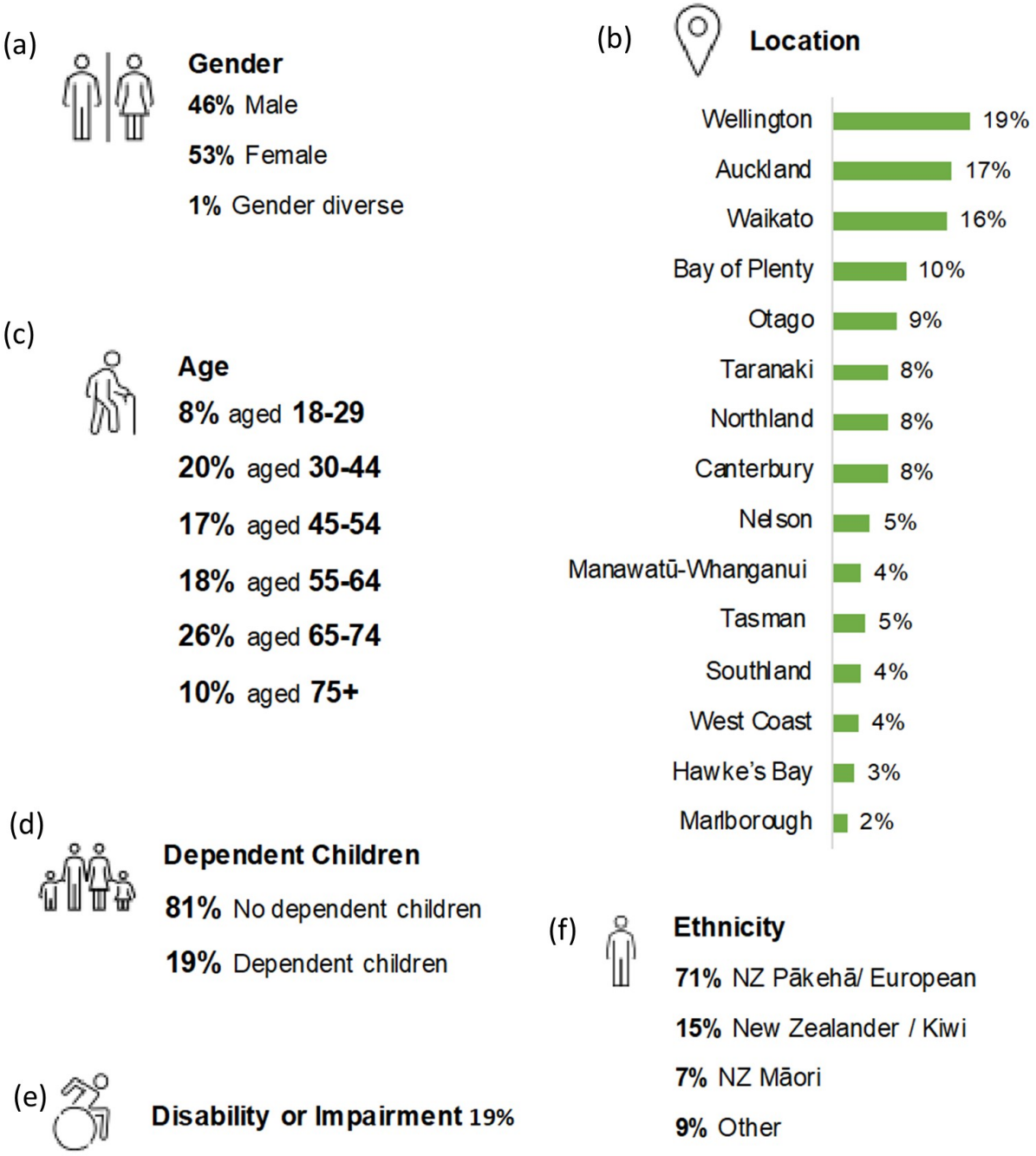

Figure 2: *Demographic profile of the survey respondents, in response to the questions: (a)' Which of the following best describes you?' (male, female, gender diverse); (b)'Which region/ regions were these activities in?' (referring to the activities discussed in the survey); (c) 'Which of the below age groups do you fall into?'; (d) 'How many dependent children live in your household?'; (e) 'Do you have a health disability or impairment?'; (f) 'What ethnic groups do you identify with?' n=313.*

A total of 44% of respondents reported having post-graduate qualifications (Figure 3). A large proportion of respondents were retired (33%), and the median household income of $60,000–$79,999 per annum (Figure 3)

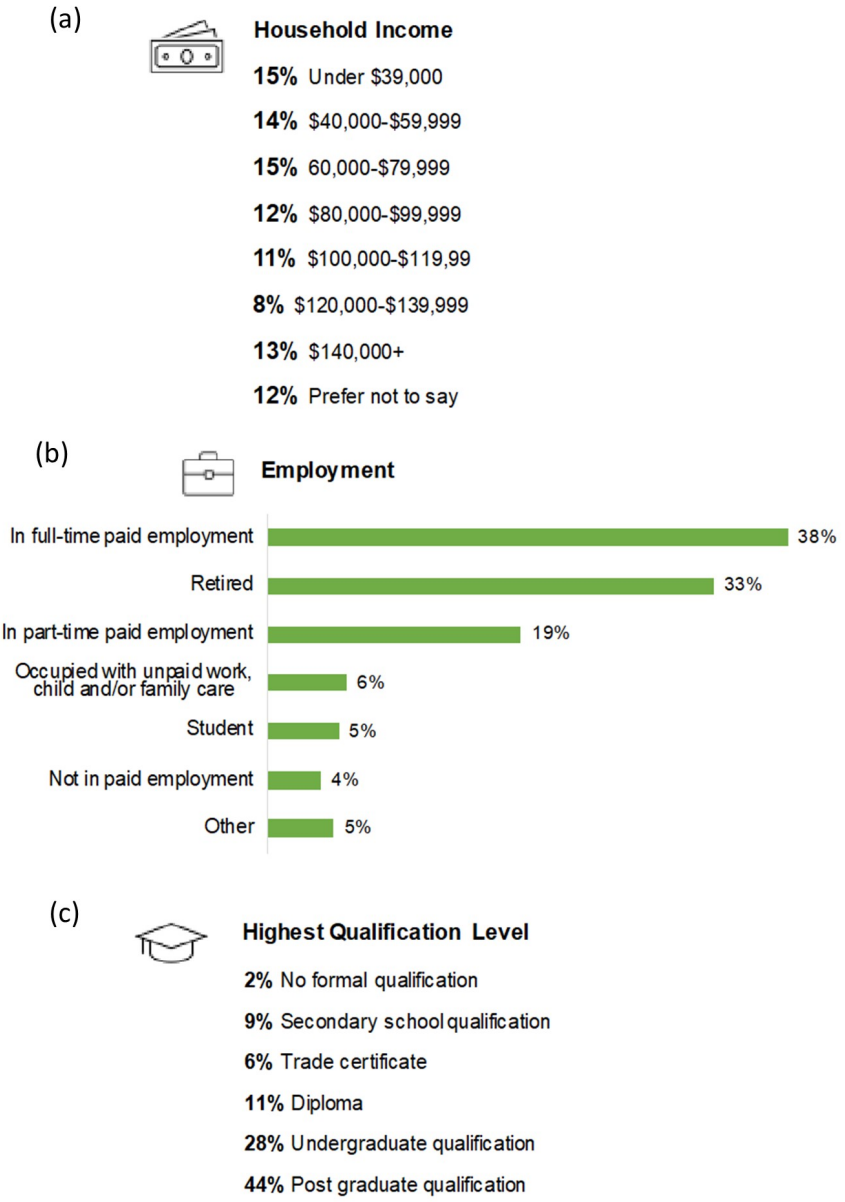

Figure 3: *Socio-economic snapshot of survey respondents in response to questions: (a) 'Which of the following best describes your annual household income?'; (b) 'Which of the following best describes you?'; (c) 'Which of the following best describes your highest qualification level?' n = 313.*

A total of 20% of respondents reported having a leadership role in community-led conservation, and 23% were employed in the conservation sector.

Nature of survey respondents' involvement in conservation

A total of 84% of the respondent pool were involved in unpaid conservation activities, and 25% in paid conservation activity; as such these groups were not mutually exclusive, with 62% of paid individuals also involved in unpaid work (Figure 4).

The respondent pool spent considerable time on conservation activities, with 74% indicating they spent 50 hours or more over the last year (Figure 4). When summed, the minimum contribution of this respondent pool of 313 people amounted to 13,083 hours. A total of 70% of respondents reported participating in conservation activities about once a week or more. Regarding the project respondents were most familiar with, most were small (<10 participants) and in rural locations (Figure 5).

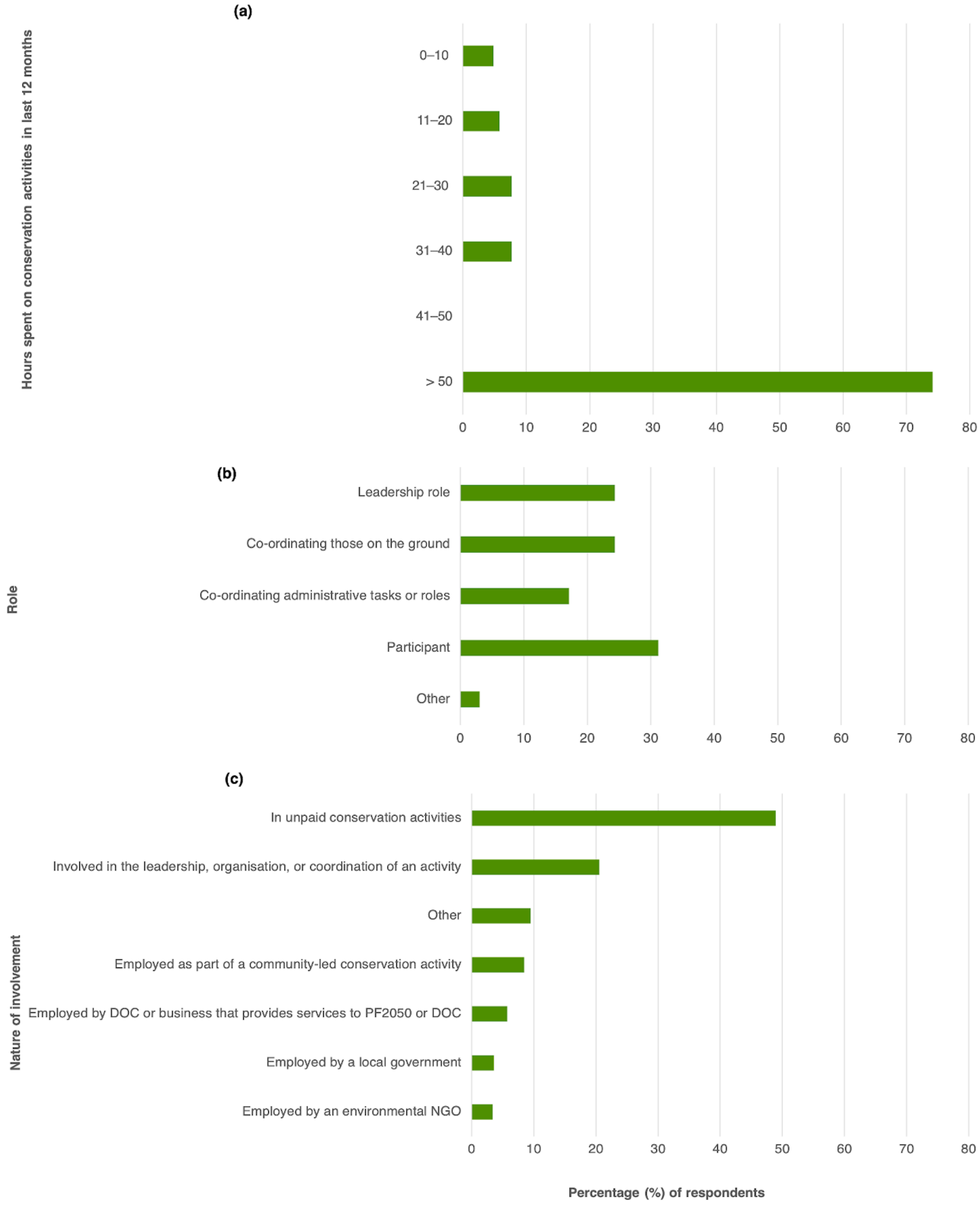

Figure 4: *Nature of survey participants involvement in conservation. Responses are to the following questions: (a) 'Over the past 12 months approximately how many hours have you spent doing conservation activities? (n = 313)'; (b) 'Which best describes your role?' (n = 263); (c) 'Can you please let us know if you are?' (n = 313).*

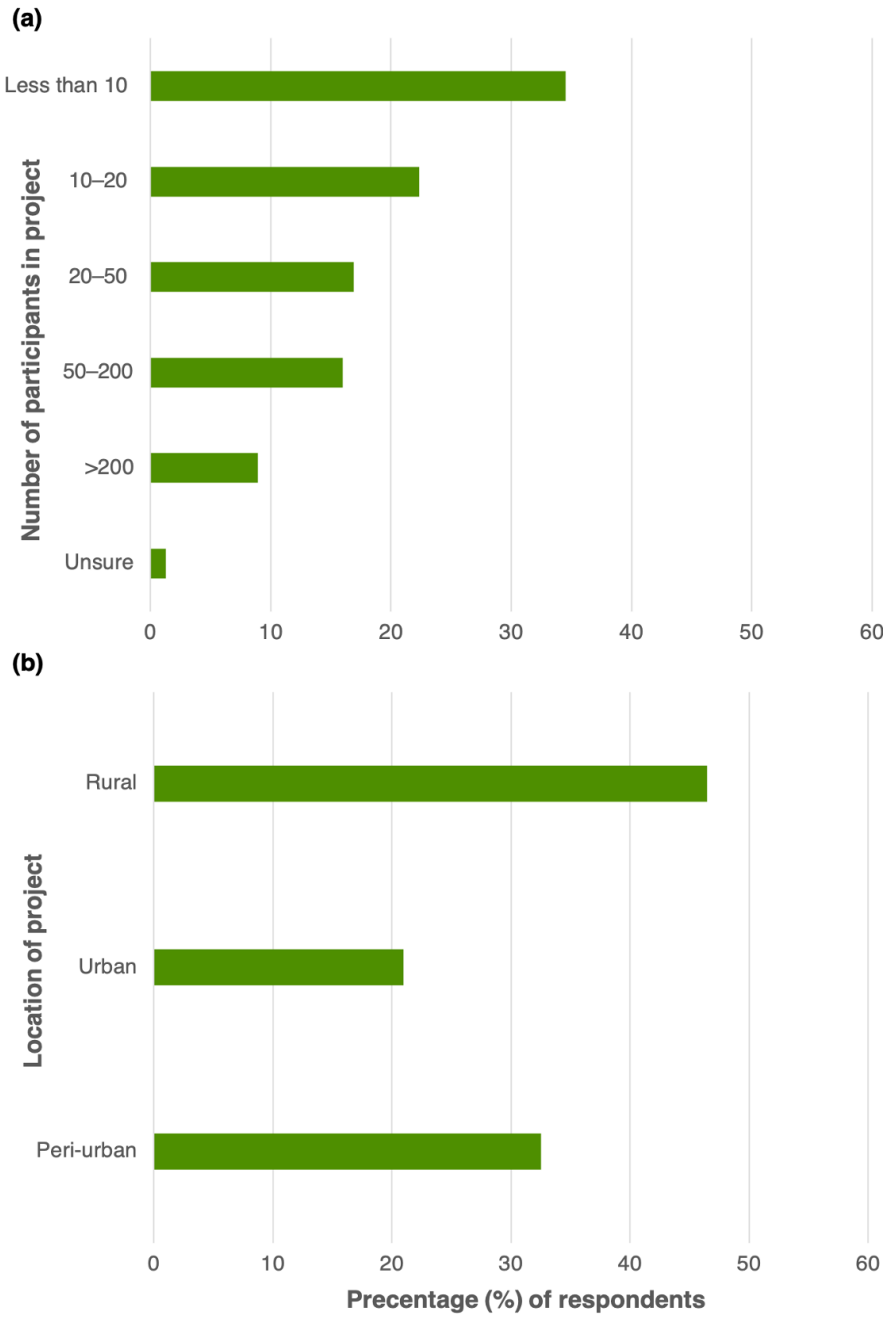

Figure 5: *The size and location of the community-led conservation project respondents were most familiar with. Responses are to the following questions: (a) 'Which best describes the size of the project you are most familiar with?'; (b) And, 'was the project / activity located in a rural, urban, or peri-urban area?' Peri-urban = located in an area immediately adjacent to a city or urban area. n = 313.*

Social and ecological outcomes from community-led conservation

The survey respondents provided a total of 453 reasons for initially participating in conservation projects and 698 benefits from continuing to participate. At an individual level and collectively these responses represent a wide range of reasons and benefits, which can be used as proxies for outcomes from community-led conservation. Each of these ideas were coded into 1 of 14 categories that broadly summarises the motivations and benefits and which reflect a desire to achieve social and ecological outcomes (Table 4). Ideas that were not similar enough to other ideas to create a category were classed as 'Other'.

***Table 4**: Categories describing reasons for participating in conservation projects or benefits from doing so. Categories are used to group similar ideas expressed in responses to the survey questions 'Thinking back to when you initially started participating what were the reasons for this?' and 'Describe the benefits you get from continuing to participate'*

Category	Ideas expressed by survey participants included in category
Awareness *Awareness of and concern about conservation issue motivates participation*	Aware of issues; Aware of conservation project
Availability *Participation was enabled by time availability, proximity of project, being offered an opportunity, or having the land to work on*	Have the time; Project is local/close by, in neighbourhood; Community group active in the neighbourhood; Own property; Offered a role
Career/work experience *Involvement is a pathway to gain experience, or employment or is part of current employment*	To get a job; To gain experience/skills; Work is part of current employment
Conserving/protecting nature *Motivation is to protect and enhance nature/biodiversity includes concepts of altruism for nature, contributing to conservation efforts, and expressing kaitiakitanga*	To improve/protect/enhance/restore/change; To undertake conservation actions (kill invasive species, plant trees, weeding); Duty of kaitiaki; Expressing altruism for nature; Assisting/contributing to wider conservation efforts
Enjoyment/interest *Participation is driven by personal enjoyment or interest in the natural world; includes strongly expressed emotions*	It is fun; Enjoy/like or obtain pleasure from participation; Interest in conservation; Mentally stimulating; Have a passion/desire/love for nature/environment
Health and wellbeing *Benefits of participation are connected to health and wellbeing*	Physical health; Mental health; Wellbeing; Keeping fit/keeping active/getting exercise
Identity *Obtaining a sense of identity through engaging in conservation*	Sense of belonging; Provides a purpose; Sense of self; Be a part of something/something worthwhile
Interacting with nature *Benefits are described as connections and relationship between people and nature*	Interacting with nature or the environment; Connection/relationship with nature; Attachment to place; Being outdoors; Access to special and unique places
Improved nature *Participation is motivated from seeing the results*	Observing improved or enhanced nature; Increase in bird species/plants; Decrease in invasive species (e.g., rodents, weeds)

Category	Ideas expressed by survey participants included in category
Legacy *Desire to leave something for future generations and to make a difference*	For the next generations to enjoy; Duty from ancestors; Leaving the environment in better state than found it; Making a difference
Learning/education/advocacy *Benefits flow from learning or teaching about the environment or place*	Learning about nature and place; Teaching others about nature and place; Raising awareness on issues
Sense of satisfaction/achievement *Personal satisfaction and sense of achievement*	Personal satisfaction; Sense of achieving something; Feel good/fulfilled; It is rewarding; Doing some good; Sharing a common goal
Social connections *Social interactions and being part of a community*	Friendship; Interactions with people; Being part of community; Community connectedness; Looking out for others; Spending time with like-minded people
Values *Personal values and belief systems*	Driven by a concern for nature; Personal beliefs believe in work; Giving back; The work is important; Moral obligations; Being part of something meaningful
Other	Helping with our business; Legal requirement; Improve health of the farm; Providing food

Reasons that were categorised as 'conserving or protecting nature' were the most common type of response for initially becoming involved in a community-led conservation project with 35% of total responses falling into this category, highlighting a motivation to contribute to ecological outcomes. In comparison this category accounted for only 11% of all benefits given for continuing to participate in community-led conservation projects. However, 11% of benefits from continued participation fell within the 'improved nature' category, suggesting a shift from a motivation to help nature to experiencing a benefit from a positive ecological outcome (perceived or known) that served as motivation to continue participation (Figure 6).

Other notable differences between initial reasons for participation compared with benefits from continued participation include an increase in responses within the 'social connections' category which increased from 5% of reasons for initial participation to 19% of benefits from continued participation. Health benefits (14%) and benefits associated with a sense of satisfaction (12%) were also frequently cited benefits from continued participation but which did not feature as a common reason for initial participation. This further indicates that the outcomes from community-led conservation shift overtime and supports the importance of social outcomes as experienced by individuals through participation in community-led conservation (Figure 6).

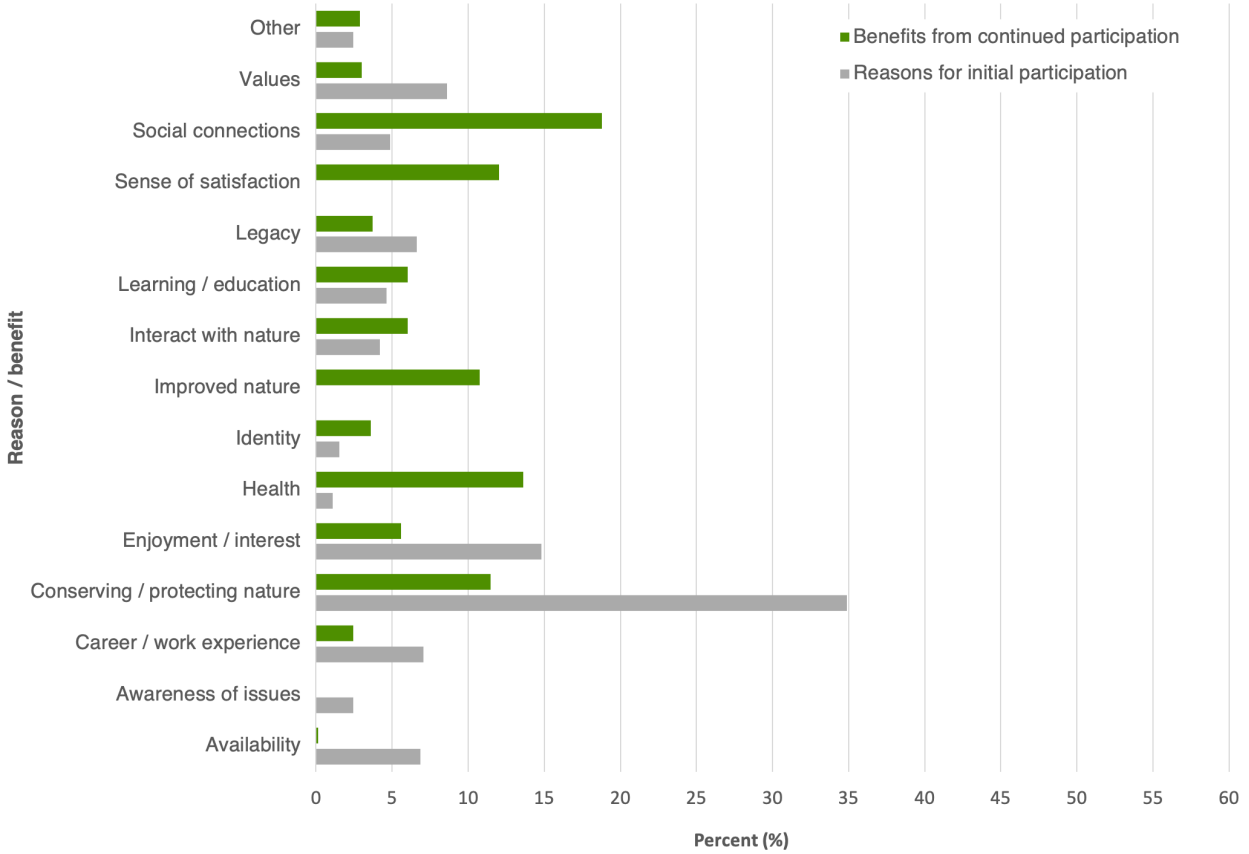

***Figure 6**. Percentage within each category of reasons (n = 453; grey bars) and stated benefits (n = 698; green bars) provided by survey respondents when answering the questions 'Thinking back to when you initially started participating what were the reasons for this?' and 'Describe the benefits you get from continuing to participate?'.*

Survey respondents were asked to agree or disagree with 12 statements that describe individual feelings and perceptions associated with the conservation project/activity they were most familiar with. These statements effectively serve as proxies for social outcomes from engagement in community conservation initiatives as experienced at an individual level. Over 70% of respondents agreed or strongly agreed with all of the twelve statements (Figure 7). This highlights that at the individual level the social outcomes are diverse, and widely felt across the surveyed conservation community.

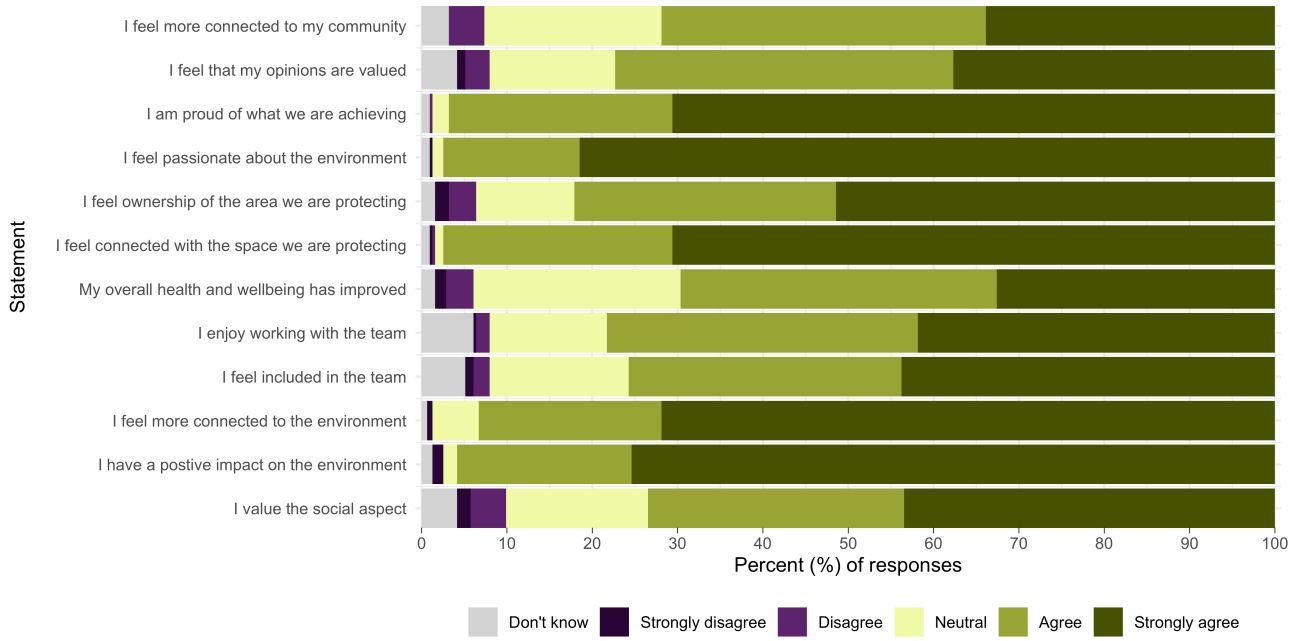

Figure 7. *Individual-level social outcomes from community-led conservation, in response to the question: 'Thinking about the project/ activity more generally, how much do you agree or disagree with the following?' Responses were provided against a 5-point Likert agreement scale. n = 313.*

The respondents reported that the groups they were most familiar with monitored a range of factors associated with their work. However, only 42% of these were actual ecological outcomes (e.g., species diversity measures) as opposed to input of level of activity (e.g., number of rats caught, number of people attending events (Figure 8).

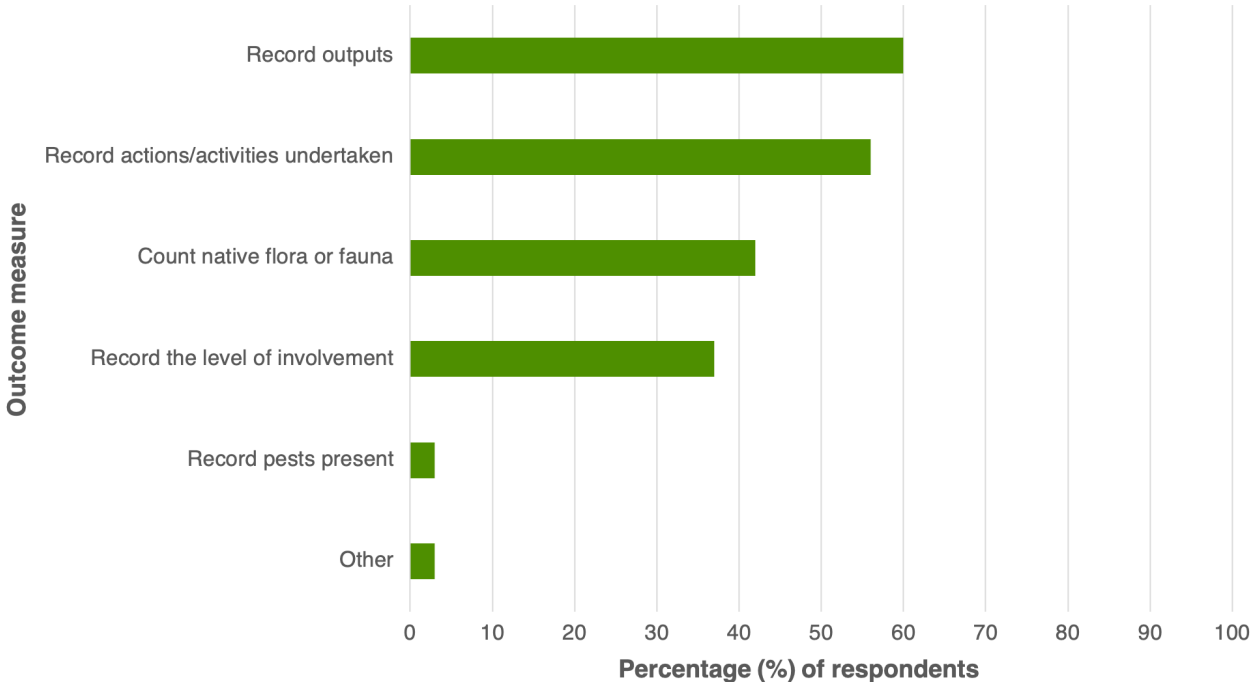

Figure 8: Percentage of respondents that indicated the types of outcome measures that the group they were most familiar with were undertaking. Responses were to the question, 'Still thinking about the project/ activity you are most familiar with, are the outcomes monitored?' n = 313. Examples in each category include: outputs = number of pests (e.g., rats or possums) killed, area of weeds controlled; actions/activities = number of traps deployed, number of trees planted; Counts of flora and fauna = 5-minute bird counts, lizard counts, kiwi counts; level of involvement = number of people attending planting days, number of school visits, number of members in backyard trapping programme.

Despite the fact that fewer than half of all respondents reported monitoring ecological outcomes, all reported activities for which there is considerable evidence in New Zealand that can lead to such outcomes (Figure 9). Efforts to control populations of introduced predators were by far the most common activity carried out by the online survey respondent pool over the previous 12 months; 68% of respondents indicated they participated in backyard trapping in the last 12 months. However, when considering the community-led conservation projects they were involved in, trapping in public spaces and then baiting for predators were the most common activities (Figure 9). The median number of activities participants had been involved in was six, indicating that the respondent pool was involved in many facets of conservation activity. The respondent pool reported involvement in a total of 451 different community-led conservation projects, or specific locations, that they were involved in, with many involved in more than one.

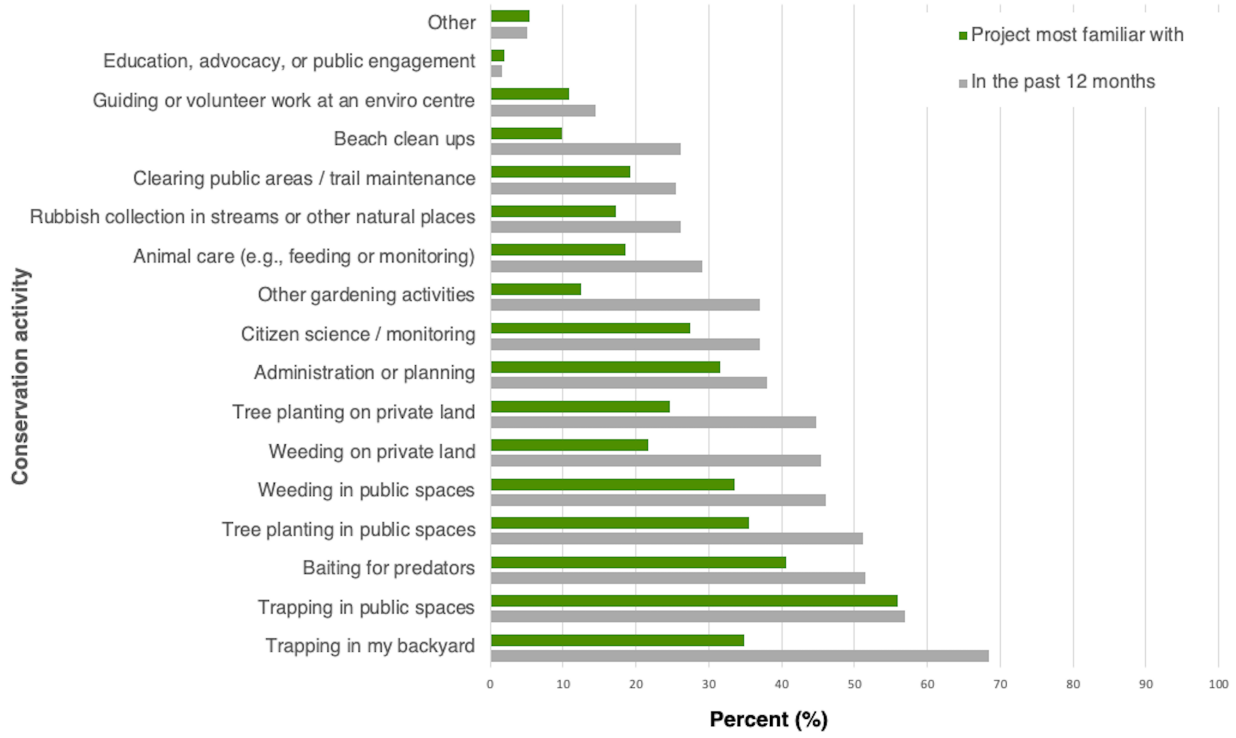

Figure 9: *The conservation activities that online survey respondents (n = 313) participated in, responding to the questions: 'In the past 12 months, which of the following activities have you been involved with?' (grey bars); 'Thinking about the project you are most familiar with, which of the following activities did that project include?' (green bars).*

Conditions influencing social and ecological outcomes

Survey respondents were asked to agree or disagree with 22 statements that describe conditions that can influence the success of community conservation groups. These statements were informed by the expert interviews. There was generally a very high level of agreement among respondents with statements about the conditions within their group (Figure 10), suggesting that respondents considered many aspects of their group were going well. The statement 'Our group is adequately funded to get the job done' achieved the lowest agreement of all statements, and 'Our group leader demonstrates passion, commitment and creates movement' the highest levels of agreement. A high proportion (84%) of respondents gave a 'Don't know/ Not applicable' response to the statement 'We communicate well with the wider community' (Figure 10).

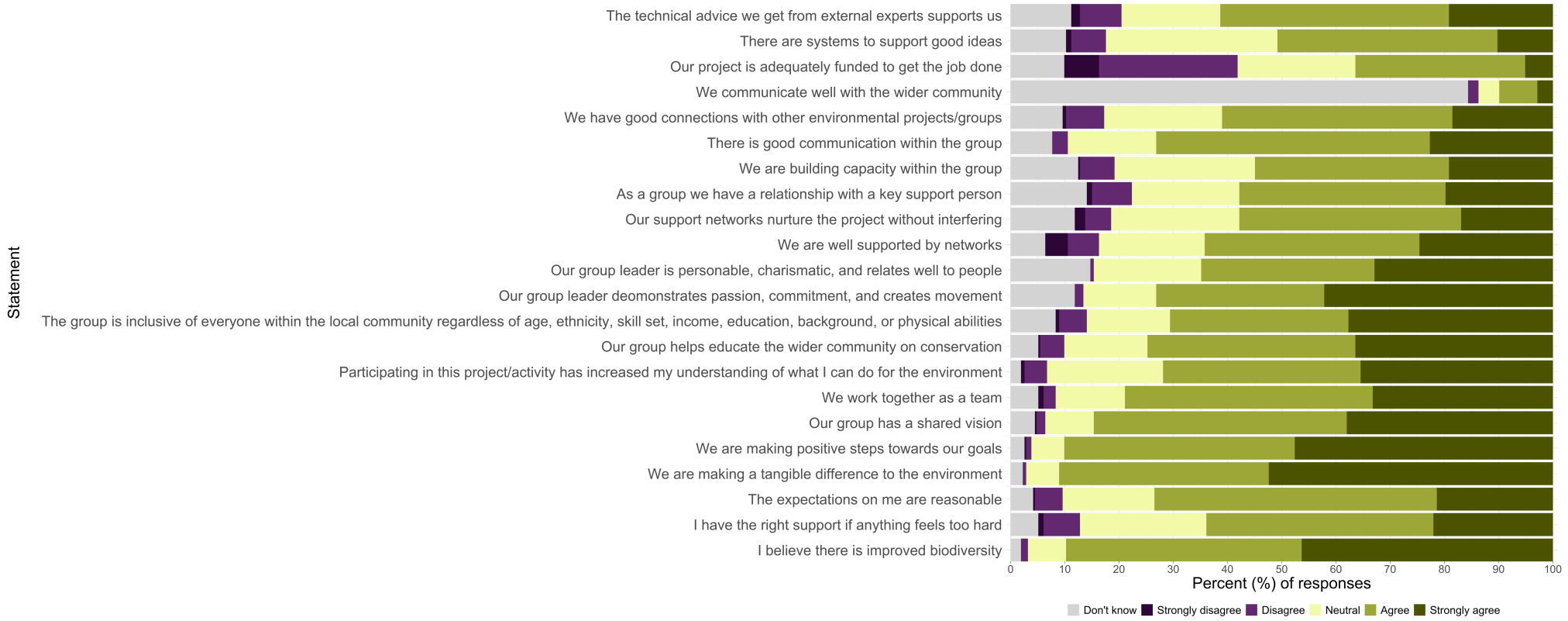

Figure 10: *The levels of agreement with various statements regarding group characteristics from the online survey.*

DISCUSSION

This research takes important first steps towards broadening the understanding of the conditions under which social and ecological outcomes arise from community-led conservation in New Zealand. First, the work identifies a suite of outcomes that were considered important in the existing literature, and by key informants and community-led conservation participants. Specifically, connectivity (in particular, between people and place, and within communities); improved health and wellbeing of people; enhanced collective impact; improved ecological measures; and enhanced nature education and advocacy were all considered common outcomes.

Outcomes from community-led conservation

While no outcome theme identified in the research was unexpected, the multi-dimensionality of perceived and experienced outcomes was notable. In particular, the interlinked nature of many social and ecological outcomes was consistently highlighted within the interviews and reinforced from the survey findings. This interconnection between social and ecological outcomes is not a new discovery, nor is it limited to New Zealand. In fact, identifying and planning according to where and how social and ecological systems interact is considered key to achieving successful management of natural resources particularly in human dominated landscapes (Ban et al. 2013; Zambrano et al. 2019). In practice, this could be done in several different ways in the context of enhancing community-led conservation outcomes. Examples of possible approaches include unpacking causal links through mechanistic modelling or causal loop diagrams, which can be used to explain or predict causal relationships among social and ecological elements (Rissman & Gillon 2017); this approach may be most effective in locations where limited quantitative data is available.

Additional social and ecological outcomes beyond those highlighted in this report no doubt arise for people and ecosystems affected by community-led conservation, and it is important to note that different outcomes might vary in relevance and scale for different communities. However, the exploration of themes shown here provides insights into where community-focused research might begin to explore outcomes and the conditions under which they arise in greater depth, and such work could inform value-add programmes, promotional efforts, and support for specific communities.

A notable outcome from the online survey research presented here was that respondents indicated ecological outcomes were measured by their groups less than half of the time, with most monitoring instead measuring inputs, outputs or the state of a threat (e.g., number of pest animals killed, number of traps deployed, level of involvement, pest densities). Yet, almost all believed that their group was making a tangible difference to the environment. Unfortunately, people generally perform poorly when estimating ecological outcomes (Dallimer et al. 2012), and this could be exacerbated where people's understanding of what a healthy environment and ecosystem looks like is limited, and where experiences of nature might have declined to the point where people's baselines are degraded environments (Soga & Gaston 2016). The interview group also commonly noted the lack of outcome monitoring, as well as the potential for very limited actual impact where groups work at a small scale. This research finding is consistent with many previous studies which have consistently shown that where data collection does occur it is biased towards collation of input and output data rather than demonstrating the changes in the environment that

interventions have generated (Jones & Kirk 2018). Further, Peters et al. (2016) demonstrated that even where monitoring toolkits are provided to community groups, they are often not used and that a lack of funding, people power, and lack of capability were the key barriers identified by the groups themselves. In contrast, groups managing large areas and with medium to high support from partner agencies (e.g., DOC and councils) were the most likely to be undertaking monitoring. The interviewees broadly concurred with these findings, noting that a key reason for the lack of outcome measurements was the lack of access to expertise.

Limited consistent social and ecological outcome monitoring presents significant challenges for quantifying the conditions under which they can be achieved from a western science perspective. However, despite the lack of such monitoring it should not be assumed that no gains are being made. For example, while published reports or papers on the state and trend of species and ecosystems resulting from community efforts are uncommon, there is little doubt that the suppression of pest animal numbers can cause corresponding changes in native species diversity over time (e.g., as demonstrated by Ōtanewainuku Kiwi Trust, Parihaka Landcare). Indeed, the activities undertaken by groups outlined by the online survey data are broadly understood to improve ecological outcomes, albeit there will be variation based on how, for how long, and where the activity is undertaken. Given the issue of outcome monitoring is not new, it may now be more useful to explore different ways of predicting and assessing outcomes for community-led conservation. For example, this might be done through a mechanistic framework that examines how, under what protocol, and where activities are being undertaken. Further, there appears to be a significant opportunity to assess or examine outcomes through te ao Māori rather than western science; this could offer alternative methodologies for evaluating outcomes.

Conditions required for generating positive outcomes

A number of group-level conditions required for generating social and ecological outcomes were highlighted as important throughout the interviews (such as group communication, access to support and technical advice), and the online surveys of community-led conservation participants broadly noted that these were all areas of generally high function within the groups that respondents were involved in.

The online survey respondents in this research predominantly reported leadership dynamics were functioning well in their groups. However, it is important to note here that those surveyed tended towards heavy involvement in conservation projects and as such may represent already successful groups. Given this, a useful area for future research would be to unpack the importance of leadership and group dynamics in causing projects to end. For example, a number of interviewees highlighted that many groups '*live and die*' by their leadership, and smaller groups in particular can lack the redundancy to ride out personality clashes and team difficulties. The extent to which these issues limit community-led conservation would be worthy of further exploration.

The findings in this research can provide insights into interventions that support better outcomes from community-led conservation across both social and ecological domains. For example, there was a reported link in the interviews between leadership quality and social dynamics on group function; that is, where positive social outcomes are occurring within groups people tend to remain involved, potentially creating greater longer-term ecological outcomes as the group persists and remains active. In contrast, a group with conflict may be unlikely to survive, undermining its impact. These results suggest that investing in leadership skills for communities could be a useful approach to further promote sustained activity and longevity of groups, thus driving better long-term ecological outcomes. This is consistent with international conservation research which highlights the critical importance of leadership in a

professional conservation management context; indeed, it has been considered it is the one thing that should not be left to chance (Dietz et al. 2004; Manolis et al. 2009; Sutherland et al. 2009; Black et al. 2011).

Limitations of this study and opportunities for future researchers

Our respondent pool was highly biased towards Pākehā people with advanced degrees. This may reflect characteristics of the communities involved in what western science traditional views as community-led conservation; many studies have shown that people with higher formal education levels tend to engage in nature-based activities at a higher rate (Luck et al. 2009; Shanahan et al. 2016; Cox et al. 2017b; Shanahan et al. 2017; Dean et al. 2018). However, rather than showing differences in actual involvement, this finding could also simply reflect biases in research practice (e.g., online surveys may not reach all demographics). There is a clear need to carry out research led by researchers of different backgrounds, with survey methods that suit a diversity of communities, and in different languages.

This research was led by Pākehā researchers, and as such does not address Māori perspectives in detail including how iwi, hapū, and whānau can be supported in realising their obligations as kaitiaki. Several key informants noted that interpreting the role of kaitiaki in delivering social and ecological outcomes is a question most suited to be addressed by Māori researchers. We recommend this gap is addressed with urgency.

Concluding remarks

Community-led conservation is burgeoning in New Zealand, and there is compelling evidence that it leads to many social and ecological outcomes. These outcomes are often interlinked, with positive social outcomes likely to lead to positive ecological outcomes, and vice-versa. The research presented here highlights some knowledge gaps, but also highlights the opportunities associated with understanding how social and ecological outcomes are arrived at. We suggest that unpacking these mechanistic pathways may be the key to identifying interventions that support community-led conservation in reaching its social and ecological goals.

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APPENDIX ONE

The online survey used to gather perspectives from community-led conservation participants

PART 1: SCREENING

SINGLE CODE

1. Which of the below age groups do you fall into?

1	Under 16 Thank & close
2	16-17 Thank & close
3	18-24 CHECK QUOTA MIN 30 UNDER 30
4	25-29 CHECK QUOTA MIN 30 UNDER 30
5	30-44 CHECK QUOTA MIN 30 AGED 30-65
6	45-54 CHECK QUOTA MIN 30 AGED 30-65
7	55-64 CHECK QUOTA MIN 30 AGED 30-65
8	65-74 CHECK QUOTA MIN 30 AGED 65+
9	75 and over CHECK QUOTA MIN 30 AGED 65+
99	Prefer not to say

MULTIPLE CODE

2. Firstly, can you please let us know if you are…
You may select more than one option

1	Employed by the Department of Conservation
2	Employed as a business that provides services PF2050 or DOC
3	Employed by a city or regional council
4	Employed as part of a community led conservation activity
5	Provide paid on the ground support to conservation activity
6	In unpaid conservation activities
7	Involved in the leadership, organisation, or coordination of an activity
8	Other: Please specify your involvement in conservation activities

MULTIPLE CODE ASK Q2 CODE 7 ONLY

3. Which best describes your role?
You may select more than one option

1	Leadership role
2	Co-ordinating those on the ground
3	Co-ordinating administrative tasks or roles
4	Participant
5	Other: Please specify

MULTIPLE CODE

4. In the past 12 months, which of the following activities have you been involved with?

1 Tree planting in public spaces
2 Tree planting on private land
3 Weeding in public spaces
4 Weeding on private land
5 Clearing public areas/ trail maintenance
6 Other gardening activities
7 Trapping in public spaces
8 Trapping in my backyard
9 Baiting for predators
10 Citizen science/monitoring
11 Beach clean ups
12 Rubbish collection in streams or other natural places
13 Animal care (e.g. feeding or monitoring)
14 Guiding or general volunteer work at an environmental centre (e.g. Zealandia, Tiritiri Matangi Open Sanctuary)
15 Administration or planning
16 Other, please specify:
17 None of the above Thank & close

In some of the following questions we ask about the project you are most **familiar** with; this might be a **recent conservation activity** where the **majority** of your **time** was spent. When answering these questions, we are asking you to think about a specific project or activity and keep the same project in mind for all questions.

MULTI CODE

5. Thinking about the project you are most familiar with, which of the following activities did that project include?

1 Tree planting in public spaces
2 Tree planting on private land
3 Weeding in public spaces
4 Weeding on private land
5 Clearing public areas/ trail maintenance
6 Other gardening activities
7 Trapping in public spaces
8 Trapping in my backyard
9 Baiting for predators
10 Citizen science/monitoring
11 Beach clean ups
12 Rubbish collection in streams or other natural places
13 Animal care (e.g. feeding or monitoring)

14 Guiding or general volunteer work at an environmental centre (e.g. Zealandia, Tiritiri Matangi Open Sanctuary)
15 Administration or planning
16 Other, please specify:

SINGLE CODE

6. Do you intend to participate in conservation activities in the future?

1 Yes
2 No
3 Not sure

SINGLE CODE

7. Over the past 12 months approximately how many hours have you spent doing conservation activities?

1 0-10 hours
2 11-20 hours
3 21-30 hours
4 31-40 hours
5 50 hours or more

SINGLE CODE

8. Which best describes how often you participate in conservation activities?

1 Daily
2 About once a week
3 About every two weeks
4 About once a month
5 About every couple of months
6 Once or twice this year
7 Less often
8 Other: Please specify

MULTI CODE

9. Which region/ regions were these activities in?

1 Northland Region
2 Auckland Region
3 Waikato Region
4 Bay of Plenty Region
5 Gisborne Region
6 Hawke's Bay Region
7 Taranaki Region
8 Manawatū-Whanganui Region
9 Wellington Region

10 Tasman Region
11 Nelson Region
12 Marlborough Region
13 West Coast Region
14 Canterbury Region
15 Otago Region
16 Southland Region
17 Other: Please specify

MULTI CODE

10. And, was the project/activity located in a rural, urban, or peri-urban area?

1 Rural
2 Urban
3 Peri-urban
4 Don't know, please explain the area:

OPEN END

11. If the conservation activities you are involved in have a name e.g. Predator Free Miramar, please list the names of the activities you were involved in in the last 12 months?

PART 2: REASONS FOR INVOLVEMENT

OPEN RESPONSE

12. Thinking back to when you initially started participating what were the reasons for this?

OPEN RESPONSE -DO NOT ASK Q7 CODE 2 WILL NOT PARTICIPATE IN THE FUTURE

13. Describe the benefits you get from continuing to participate?

OPEN RESPONSE- ASK Q7 CODE 2 WILL NOT PARTICIPATE IN THE FUTURE

14. What are the reasons you do not intend to participate in the future?

Please list these below.

PART 3: SOCIAL AND ECOLOGICAL BENIFITS

For the next section we will ask more detail about the project you are most **familiar** with.

SINGLE CODE

15. Which best describes the size of the project you are most familiar with?

1 Less than 50 participants

2 50-200 participants

3 Several hundred participants

4 Other: Please specify

SINGLE CODE PER ROW

16. Thinking about the benefits you get from participating in this project/activity how much do you agree or disagree with the following statements?

	(1) Strongly disagree	(2) Disagree	(3) Neither agree nor disagree	(4) Agree	(5) Strongly agree	(99) Don't know/not applicable
I value the social aspect of being part of this project/ activity						
I have a positive impact on the environment						
I feel more connected to the environment						
I feel included in the team						
I enjoy working with the team						
My overall health and wellbeing has improved						
I feel connected with the space we are protecting						
I feel ownership of the area we are protecting						
I feel passionate about the environment						
I am proud of what we are achieving						
I feel that my opinions are valued						
I feel more connected to my community						

SINGLE CODE PER ROW

17. Thinking about the project/activity more generally, how much do you agree or disagree with the following?

	(1) Strongly disagree	(2) Disagree	(3) Neither agree nor disagree	(4) Agree	(5) Strongly agree	(99) Don't know/not applicable
I believe there is improved biodiversity						
I have the right support if anything feels too hard						
The expectations on me are reasonable						
We are making a tangible difference to the environment						
We are making positive steps towards our goals						
Our group has a shared vision – we all know what we are trying to achieve						
We work together as a team						
Participating in this project /activity has increased my understanding of what I can do in my daily life for the environment						
Our group helps educate the wider community on conservation						
The group is inclusive of everyone within the local community regardless of age, ethnicity, skill set, income, education, background or physical abilities						
Our group leader has mana and passion						
We are well supported by networks (DOC, Predator Free, councils, community hubs)						
Our support networks nurture the project without interfering						
As a group we have a relationship with a key support person						
We are building capacity within the group						
There is good communication within the group						
We have good connections with other environmental projects / groups						
We communicate well with the wider community						
Our project is adequately funded to get the job done						
There are systems to support good ideas						
The technical advice we get from external experts supports us						

SINGLE CODE

18. Still thinking about the project/ activity you are most familiar with, are the outcomes monitored?

1 Yes
2 No
3 Unsure

MULTI RESPONSE-ONLY ASK Q19 YES

19. Which of the following best describes the type of monitoring you do?

1 Count native flora or fauna (e.g., 5-minute bird counts; lizard counts; kiwi counts)
2 Record the actions/activities taken (e.g., number of traps deployed, number of trees planted)
3 Record outputs (e.g., number of rats/ possums killed, area of weeds controlled)
4 Record the level of involvement (e.g., number people attending planting days, number of school visits, number of members in a backyard trapping programme)
99 Other please specify

OPEN RESPONSE

20. What other benefits do you get out of participating in conservation activities?

Can't think of anything

OPEN RESPONSE

21. What are the barriers that you experience that may prevent you from further participation in conservation activities?

Can't think of anything

PART 4: PROFILING

MULTICODE

22. What ethnic groups do you identify with?

SINGLE CODE

23. Which of the following best describes you?

1 Male
2 Female
3 Gender-diverse
4 Prefer not to say

SINGLE CODE

24. How many adults live in your household?

1 1
2 2
3 3
4 4 or more

SINGLE CODE

25. How many dependent children live in your household?

1 0
2 1
3 2
4 3
5 4 or more

MULTI CODE

26. Which of the following best describes you?

1 In full-time paid employment
2 In part-time paid employment
3 Not in paid employment
4 Retired
5 Occupied with unpaid work, child and/or family care
6 Student
7 Other

SINGLE CODE

27. Which of the following best describes your highest qualification level?

1 No formal qualification
2 Secondary school qualification
3 Trade certificate
4 Diploma
5 Undergraduate qualification
6 Post graduate qualification
7 Other: Please specify

SINGLE CODE

28. And, which of the following best describes your annual household income?

- ○ Under $39,999
- ○ $40,000-$59,999
- ○ $60,000-$79,999
- ○ $80,000-$99,999
- ○ $100,000-$119,999

- ○ $120,000-$139,999
- ○ $140,000-$159,999
- ○ $160,000+
- ○ Prefer not to say

SINGLE CODE

29. Do you have a health disability or impairment?

1 Yes
2 No
3 Prefer not to say

SINGLE CODE PER ROW

30. Finally, for each of the following, please rate the extent to which you agree with each statement. Please respond as you really feel, rather than how you think "most people" feel.

	(1) Strongly disagree	(2) Disagree	(3) Neither agree nor disagree	(4) Agree	(5) Strongly agree
My ideal holiday spot would be a remote, wilderness area					
I always think about how my actions affect the environment					
My connection to nature and the environment is a part of my spirituality					
I take notice of wildlife wherever I am					
My relationship to nature is an important part of who I am					
I feel very connected to all living things and the earth					

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