What We Do in Kauri Forests: Exploring the Affective Worlds of 'High Risk' Users of Vulnerable Forest Areas in Aotearoa|New Zealand

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ABSTRACT. Public use and anthropogenic activity are recognised sources of damage and threat to vulnerable forest areas in New Zealand, but also globally, through the spread of pathogens on shoes, tyres and on the paws of their companion adventurers. User experiences of sensitive and spiritual forest areas, however, have not been fully examined, particularly for those who might be considered 'high-risk' users of these areas. Using in-place methods and in-depth interviews with these high-risk users of all types – from pig hunters to mountain bikers, dog walkers to runners, this study focuses on their use of Kauri forests for recreation, sport and other aspects of daily life and invites their reflections on how they might develop biosecurity and stewardship for their 'community.' As such, the

study opens biosecurity management to the messiness and value-laden relationships and affects between users and Kauri forests. The themes of deep connection and loss emerged, challenging the stereotype of public users as facilitators of forest disturbance and wilful inattention. The forest users were not a homogeneous group, but they shared many commonalities. We argue that it is not necessary to overemphasise the impact of user differences from those of scientists and managers and that sometimes affective relationships to the forest are more significant than cultural factors in shaping recreational experiences and biosecurity responses.

Introducing a Social Science for Tree Pathogens

In 2007, crystallising some of her earlier work (Jasonoff, 2003), science and technology studies scholar Sheila Jasonoff argued that science and science policy must practise technologies of humility. Instead of an endless seeking for certainty, we should pay attention to sources of indeterminacy, ambiguity, partiality and complexity. Her hope, among other things, is 'for research on what people value and why they value it. It is a prescription to supplement science with the analysis of those aspects of the human condition that science cannot easily illuminate' (Jasonoff, 2007, p. 33).

Our aim in this paper is to bring this sensibility to the challenge of kauri dieback (KD), a pathogen impacting a keystone tree species in the north of New Zealand. We aim to explore the ways in which people who use the forest for recreation feel about the forest and about biosecurity measures, what they value, why, and how. For the people we have interviewed, the multiple dimensions of their relationships with the forest have been downplayed by biosecurity management. To them, the threads between those responsible for forest management (forest managers) and those who use the forest (forest users) are becoming increasingly frayed due to failures by those in charge to see biosecurity, including the communication of biosecurity measures, as an ongoing process that brings people (and bikes and shoes and other things) into new relationships with trees and their pathogens. It is our thought that the uncertainty of biosecurity management for kauri dieback is brought into focus by the partiality, ambiguity and complexity of users' relationships with kauri forests, and these complex human-forest relationships could be positively recognised and fostered for the benefit of tree health. This is particularly the case as biosecurity policy moves to a model of shared governance

as laid out in Aotearoa|New Zealand's Biosecurity Strategy 2025's Strategic Direction.

The paper sets out these ideas by first explaining the context of kauri dieback disease and the problem of kauri dieback for biosecurity management. We then set out the human condition of interest in our paper – that is, the affective (emotional) experiences of kauri forest users and the role of user experiences in the management of these sensitive places. Here we deal with the question of how recreationists' attachment to their use of kauri forests adds to biosecurity's uncertainty. Adding to this, we consider the idea of and need for shared affective management between forest users and those responsible for forests. The social science methods described (in-place, in-depth interviews) allow us to explore what access to kauri forests means for user groups. Through in-depth analysis, we use these insights to assess the key social and ecological relations between kauri forests and kauri forest users. The overall goal is to supplement biosecurity science with social science perspectives to help us progress in the shared management of vulnerable forests.

The context: Kauri dieback and forest use

New Zealand's ngahere (forests) are facing many threats, largely from invasive pests, weeds and diseases caused by plant pathogens that are having profound effects on the biodiversity of this unique ecosystem (Waipara et al., 2013). The kauri forests studied in this research represent 1% of the pre-European forest that remains. These left-over stands of kauri are largely found in regional and 'city parks' in northern Aotearoa|New Zealand. For example, Waitakere Ranges Regional Park in the west of Auckland, New Zealand's largest city, is an area of 16,000ha of native forest surrounded by towns and coasts. These areas of kauri forest and other ecological features attract visitors and offer specialised and unique outdoor recreational facilities and economic opportunities for local communities, e.g., tourism, hiking and mountain biking, which can conflict with the management of the parks' natural and cultural resources (Swarbrooke, 2012). The impact that kauri dieback has on both people and places cannot be understated. Yet there are many knowledge gaps that surround the pathogen, the disease and the communities it affects (Bradshaw, 2019). The recreationists studied in this paper are one of several groups threatened by, and causing potential threat to, the ngahere.

Kauri dieback surveillance data has highlighted human activity and movement is a major contributor to the spread of the disease. Data collected in 2015/16 showed almost 60% of areas in the Waitakere Rangers Regional Park with significant stands of kauri (above 5 hectares) were showing signs of dieback (Auckland Council, 2017) and importantly, 71% of kauri dieback areas occurred within 50 m of a track or path. The pattern of this spread prompted local iwi Te Kawerau a Maki in 2017 to place a *rāhui* or cultural ban on the area to reduce unauthorised access to the Waitakere forest (Te Wao nui a Tiriwa) with access permissible only to people doing critical forestry management work such as weed

and pest control. This was followed in 2018 by the issuing of controlled area notices for both the Waitakere Ranges and another area (the Hunua Ranges on Auckland's southern border) by the agency responsible for overseeing the management of kauri, using powers granted under the Biosecurity Act (1993). Along with the closure of tracks in high-risk kauri areas of both ranges, forest users could face fines of up to $50,000 (NZD) or 3 months' imprisonment for noncompliance. Where tracks remained open for recreational use, stringent hygiene measures were implemented. Some tracks were upgraded to better protect kauri, but many tracks through vulnerable kauri forests (in the Waitakere Ranges, for example) remain closed to forest visitors, and some may never reopen.

Why it matters to look at (kauri) forest users

Human movement appears to be a facilitator in the progress of tree pathogen outbreaks and therefore is central to its management (Potter & Urquart, 2017, p. 61). Responding to human threats involves a wide range of approaches included under biosecurity science practices and regulations, including the track closures, hygiene measures and fines already mentioned. While biosecurity science has a strong social role in understanding how to regulate or manage human activities that worsen the impact of environmental threats (Burnette et al., 2013; Goldson, 2011), authors of a recent study report that '[t]o date…there has been a paucity of research on the social dimensions of tree health' (Marzano et al., 2017, p. 3318). They identify six understudied social dimensions of tree health, from the role of stakeholders to risk communication and the economic impact of tree disease, necessary for improving the biosecurity management of invasive species and pathogens.

Our interest in this paper is focussed on unpacking one of the key points underlined by Marzano et al. (2017), namely the need to understand and improve 'levels of knowledge and awareness of tree pests and diseases amongst the variety of end-user 'stakeholder' groups, and influences on their attitudes and practices' (p. 3317). This is one of a series of papers published by our group that explains our exploratory social science approach for involving end-user recreationists in biosecurity research and management (see also Martin et al., in progress; McEntee et al., 2023). Research on different user groups may be useful if it can contribute to understanding how users – who also hold and enact societal values about outdoor use and participate in widening access to the outdoors – respond to biodiversity concerns, including where biosecurity efforts should be focused, what kinds of biosecurity actions are preferred by users, and to reveal sources of dissatisfaction with current biosecurity programmes (see also recommendations by Balanovic, 2021). This is an effort to go beyond understanding well-researched motivations for compliance or behavioural change to understand more fundamentally about users' encounters with forest biosecurity and the activities that may be threatened by biosecurity measures (Wenger, 2014) based on what people value and why they value it.

In research on kauri dieback, active, physical and regular users of Kauri forests are perceived as the highest biosecurity risk because of the nature of the pathogen spread (McEntee et al., 2023), but they are least well integrated into shared kauri management plans (Hanrahan et al., 2019; Marzano et al., 2017). There is little information about the motivations and drivers of high-risk groups to use kauri forests, although Wenger (2014) found that those least likely to comply with biosecurity are those who felt that it most directly threatened their activity. Alongside this, while participation in biosecurity actions is promoted as a shared activity, there are likely to be variations in user groups' perceptions of kauri forests and threats. Marzano & Dandy (2012) found that mountain bikers and walkers perceive the threats to protected areas differently. Other research has shown how variations in preference for wooded areas are related to residential and social background, age, sex, education and activity preference (Schroeder, 1990).

In a film study collaborating with our current research, Ng (2022) interviewed dog walkers to understand their characteristics and preferences for using kauri forests, finding that dog walkers prioritised their dog's needs over kauri. Their focus on their 'dogs' best interests' had implications for how they acted and reacted to biosecurity measures present (and/or lacking) in kauri forests. This supports earlier research by MacBride-Stewart (2009a), who found that trail runners' preference for the terrain and features of a biodiverse 'atmosphere' over an urban street meant that they prioritised their health and use over that of the forest. Moreover, preference for the outdoors was an affective and aesthetic response by users who actively sought out places where they could be physically engaged with the sounds, smells, touch, sights and terrains of the forest (MacBride-Stewart, 2019b). Aley & MacDonald (2017) suggests that, for recreational user groups, risk is understood in relation to what the pathogen does (its ecological actions) rather than how it responds to users (their social actions and practices). These studies represent the opportunity to improve understanding of the relationship between users, forest use and pathogens. Furthermore, Balanovic (2021) found that user groups differ in understanding the seriousness of their threat to kauri depending on their level of identification with a particular activity. They noted that hunters, for example, tend to view biosecurity actions as more unachievable and ineffective and were particularly concerned about what impact there might be on hunting rights and access.

A question to ask about the role of user identification and group values in kauri forest management is where it sits within the increased demand for touristic, recreational and wellbeing uses of kauri forests and the possible role of pro-environmental values and affects held by those who benefit from nature use. Despite positive findings in the 'environmental values' literature, a few studies have produced anomalous results. In these cases, positive affects and experiences with nature reduced the sense of responsibility and efforts to fully comply with biosecurity measures (Hall et al., 2020; Marazon Dandy, 2021). Noncompliance and lack of engagement in biosecurity were assumed to reflect a lack of knowledge

or having no public reason to comply, such as being observed or fined (Department of Conservation, 2019). Lindsay et al. (2022) reached a somewhat different conclusion noting that while education had little effect, users' trust in management bodies to manage threats mattered, especially for local users where compliance was linked to longer-term access to the forest. The conclusion reached might be a function of a different understanding of the users in this setting. In the behavioural change setting, the user is considered asocial, and less importance is placed on the role of the forest in everyday life; while in the place-based setting, the user has a social and affective stake in the forest. Thus, although users of kauri forests cite a preference for strategies that engage them through education and participation over closures of forestry areas and exclusion, when asked about the benefits of kauri forest management, users' responses fall into two areas: protection of kauri as a cultural and ecological asset ('responsibilities') (Wenger, 2014) and continued use of kauri forests for direct (running, mountain biking, walking, hunting, and dog walking) or indirect benefits (enjoyment, relaxation, wellbeing), also associated with recreational 'rights' (MacBride-Stewart, 2009b). Thus, limited compliance may be a poor indicator of the value and meaning of kauri, and efforts to improve compliance might miss aspects of users' commitment to biosecurity measures.

Shared management, behaviour change and co-creation
Historically, New Zealand's biosecurity policy has focussed on border control to protect agricultural industries from the arrival of unwanted pests and diseases. Cross-sector partnerships between government and industry groups have successfully established formal arrangements that promote a 'shared responsibility' approach to biosecurity management. However, there has been growing recognition of the need for wider engagement, particularly for post-border control to biosecurity management, that is a 'collective endeavour' supported by collaborations, partnerships, and two-way communication between users and managers (Allen et al., 2016). This requires government agencies to move beyond a purely statutory response to biosecurity management to engage meaningfully with the wide array of stakeholders, incorporating their values or their attachments to the places in which they recreate (McEntee, 2007).

As part of efforts to build a more resilient biosecurity system in New Zealand, the Biosecurity Strategy 2025's Strategic Direction 1 working group proposed creating a team of 4.7 million to ensure that 'individuals, Māori, businesses and communities … be empowered to make and take positive biosecurity decisions and actions.' To achieve this, they recognised that biosecurity must connect with people's values, and engage in collaborations and partnerships, to drive action and change. Values, attitudes and perceptions affect how people respond to biosecurity, and this is particularly acute when people's practices and routines are restricted by biosecurity measures (Urquhart et al., 2018), such as forest closures to prevent the spread of diseases like kauri dieback.

Although a considerable amount has been written directly addressing the need for public involvement and co-creation in forestry management and biosecurity, prior practice and literature have been shaped by the behavioural change approach (Ovenden & Studholme, 2021). As suggested, this has assumed that directing users towards a set of biosecurity actions will improve overall outcomes as the basis for public involvement. However, critical analysis of behaviour change in other settings, like education and public health, suggests that the thinking behind this has been incomplete (Enticott & Franklin, 2012; Mankad, 2016; Sherring, 2021).

Researchers looking at the resistance to behaviour change have presented several psychosocial factors that influence users and that shape their relationships to biosecurity. These include (1) underlying attitudes to biosecurity risk, (2) the role of social norms and other social influences, (3) motivations to engage in protective actions, (4) pre-existing biases and (5) wider context in which decisions must be made (Mankad, 2016). Hall et al. (2020) added to this the values and motivations of recreationists, convenience (time) and trust.

To counter this resistance and better meet stakeholder needs and priorities, more 'adaptive' approaches to biosecurity governance are preferred (Cook, 2010; Reed & Curzon, 2015). Adaptive governance seeks changes in the way institutions operate, through greater understanding, involvement and meaningful responses to different groups of stakeholders in biosecurity planning and guidance. While adaptive governance can be defined in many ways, it represents the social and ecological complexity of any efforts to improve responses to ecological change while taking account of the uncertainty and messiness such changes can produce, particularly when multiple stakeholders and values are included (Chaffin et al., 2014).

Notwithstanding references to justice and rights when considering the role of public participation, the overall emphasis in shared management and adaptive governance has been concerned with understanding the whole range of relationships and institutions involved in biosecurity. In an extreme example of this, biosecurity is deemed to have failed if users do not agree with the strategy set out by scientists and managers. Examining the norms, politics and technologies that shape the relationships between forest users and managers, as well as with the forest and its health, helps explain an alternative emphasis on biosecurity (Uruquhart et al., 2018). Effective biosecurity, therefore, involves coordination between these different groups of stakeholders, their values and practices, and inclusion of different knowledge systems, norms and values, much of which is independent of traditional biosecurity management (Reed & Curzon, 2015).

The literature on co-management is found across many different disciplines and practices, and, as such, relates to multiple theories and methodologies. The phrase co-management is used alongside co-creation, collaboration and inclusion. However, these may or may not explain the same process. Potentially a regressive step from the concept of adaptive management or a practical step supporting its implementation, co-management has emerged as a set of shared principles for forestry co-management. These are described by Chazdon et al. (2020) as

involving stakeholders in management and in the decision-making related to its social, environmental and economic outcomes. Despite the intent, contemporary co-creation approaches to management, however, still point to the lack of translation from the community, bottom-up experiences, whereby co-creation has raised issues of the overly technocratic and science-driven tendencies of a biosecurity approach. There is still a need in co-management approaches for biosecurity approaches to reframe biosecurity delivery to a more community and people-focused approach that frames biosecurity in terms of what matters to communities, such as wellbeing, affect, and human-tree relationships (Uruquhart et al., 2018). A key feature of implementing such processes is that community engagement takes time. Our goal in this paper, then, is to show how applying a community-orientated approach to kauri dieback biosecurity invited users to share their experiences of biosecurity and of forest use, providing us with some revelatory insights into compliance, values and engagement.

Methodology
An in-depth qualitative interview study was conducted with members of 'high risk' groups using both 'go-along' interviews and zoom interviews. The methodology described here is Phase Two of a project where Phase One was used to co-identify with park rangers, high-risk users of Kauri forests. This prior participatory mapping and GIS exercise were conducted with rangers in four park areas to generate a list of the top five high-risk groups in each area. Working with the rangers allowed us to draw on their combined scientific and social knowledge. The methodology and findings from Phase One are outlined in a series of earlier papers (McEntee et al., 2023; Martin et al., in progress). From this, a list of interviewee groups: pig hunters, trail runners, mountain bikers, dog walkers, boundary sharers, was generated, which also represented a diverse understanding of high-risk including groups whose activities largely involved staying on track (trail runners, dog walkers) and others who spent time off-track (such as hunting/trapping/farming). The final list of user groups was confirmed and agreed upon by the research team.

Invitations to participate in the research were sent out via email to known contacts and through social media platforms. Closed Meta/Facebook groups were accessed through an account set up by one of the researchers, and a request to join the group was provided along with specific details about the research processes. In all cases, interested participants who contacted a member of the research team through the email address provided were immediately sent standard information about the study and ethical consent processes. Participants could select their preferred method of interview. In the go-along interview methodology, the researcher accompanied the participant as they went about their normal activity in the forest. Go-along interviews were conducted in a publicly accessible Regional Park area of kauri forest in the North Island of Aotearoa|New Zealand. All of the areas had KD biosecurity measures, although KD disease has been notified in only

some of the parks. All research was conducted in full compliance with KD biosecurity measures. Zoom interviews were conducted by a member of the research team based in the UK.

The 'go-along' and zoom interviews were recorded using a hand-held device or the zoom recording facility. 'Go-along' interviews were conducted with people at a conversational pace as the researcher joined the participant in their activity (Carpiano, 2009; Garcia et al., 2012). The method has been used effectively in research on walking (Evans & Jones, 2011) and trail/off-road running and recreational disturbance (MacBride-Stewart 2019a, 2019b). Recording the discussion at the time, the go-along methodology can capture in situ nuance and can assist in capturing place-sensitive or contextual accounts used to shape experiences and add local detail. Furthermore, the method is consistent with in-place and embodied methodologies where minute-to-minute experiences of the areas and the activities users engage in enrich the overall interview experience.

The 'go-along' interviews allowed us to capture the practices, experiences and attitudes of participants actively engaged in their use of the forest areas. Due to biosecurity closures and covid-restrictions, the zoom interviews capitalised on opportunities to speak to users who may have had limited time or who wanted to talk about trails and forest areas that they could no longer access. Zoom interviews are particularly effective for time-poor participants, but they also give the opportunity for people to be interviewed from their own homes and in a place they feel comfortable. During Zoom interviews, participants were invited to share photos and videos of forest areas that had significance for them, thus allowing kauri forests to hold a more prominent place in the interviews. Both types of interviews used the same four questions, asking about practices, values and attitudes, consequences/impacts (knowledge) and inclusion in kauri forests in the context of KD biosecurity management (see previous research by MacBride-Stewart, 2019b). Ethics was obtained by Otago University (Reference number D21/374).

The analysis was based on the Knowledge Attitudes Practices (KAP) model, also used by Pan & Pan (2020), who propose its use when aligning the KAP triad (asked specifically about in the interviews) between multiple stakeholders and when integrating methodologies that may have variations in 'ontology, axiology and epistemology as the theoretical lens' (p. 1). Our case study analysis of forest users' attitudes, knowledge, and practices within kauri forests in the upper North Island shows some of the complex ways in which a knowledge/attitude/practice triad can work in practice. Balanovic's (2021) review of KD literature concluded that user groups differ in their view of KD seriousness depending on their level of identification with a particular activity but were particularly affected or even put off engagement in biosecurity by any threats to that activity. Our analysis goes further to reflect on their social, political and affective engagement in biosecurity, and reflects how Jasanoff's desire for a more human-centred approach to science brings about a complexity, messiness and opportunity not present in a traditional biosecurity science or behaviour change approach.

Knowledge-Practice-Attitude Findings

Our preliminary findings suggest three aspects of the knowledge/attitude/practice triad that users felt were problematic for the health of the forest and/or where they saw the potential for their group to be involved in KD management. These are in the areas of (1) communication and the lack thereof, (2) attitudes to and emotional connections with forests, in particular, kauri, and (3) action and behaviours in the forest. We find that while there is a differentiation between the user groups as to their experience of communication and their willingness to be involved in positive biosecurity measures, the significant role of forest users' deep affection for the forest – their feelings of connection with the forest and the very real grief they feel when this connection is broken – should be recognised and respected in forest management. Keeping true to our participatory and collaborative approach, we quote our participants at length, giving their words weight in this conversation.

Knowledge and communication

A female trail runner started off our interview by describing what she sees as a frustrating lack of engagement between decision-makers and forest-using recreationists. There has been, she says, a 'total lack of dialogue with, as far as we can tell [with] any forest user group, so it's just great that somebody is actually interacting and somebody might be listening to what we're saying because it's just not happening at the moment, so thanks for that to start with' (P01).

This lack of engagement is seen to be related to the lack of knowledge, or perhaps interest, decision-makers have about the motivations of forest users and the relative risk different user groups pose. One trail runner feels his group's knowledge and understanding about KD is misunderstood, saying, 'we're there because we appreciate the environment … and I think there is a misconception as well, and I have heard from people that trail runners are going off trail, which just isn't true at all, because it does it doesn't make a lot of sense if you're a trail runner to do that' (P02). Another pair of participants, mountain bikers, are wary of being 'lumped in' with other groups perceived to do damage (P03, P04).

The participants here are expressing more than a communication gap. What is being expressed is a nature/culture gap, which Escobar (1998) relates to the cultural politics of the recreational groups and communities in defence of how they engage in concrete nature use, and in defence of other meanings-use that their belonging to a recreational group underscores. The frustrations around the perceived communication and understanding gap have a more sinister side, too: an erosion of the trust that forest users have in the decisions made. This is expressed as scepticism about the data gathering and the data analysis that underpins decisions such as track closures, track upgrades and cleaning stations.

One participant, who has been involved in public meetings and focus groups, said, 'I'm not convinced that the research shows that kauri, the spread of kauri dieback, is due to humans using the tracks. I think that the research that was done with it was flawed in terms of data collection methods' (P01). Another asks, 'so,

one thing that I've always, like, wondered is, like, are those stations effective, like what do we understand, what it is that's actually causing the spread of these diseases?' (P05).

That these meanings-uses also underlie different understandings and practices in relation to the science and data-driven information about users is quite pertinent for understanding biosecurity discussions. Community use of KD areas is felt to have a political aspect, a way to make the argument for continued support for KD measures, where without the backing of the data and hard evidence, forest users would need to trust the decisions made for the forest on their behalf. As one participant puts it: 'Personally, I don't think that they [decision makers] have a connection to, one, the forest and then to any other users, um, that the answers I've seen and interviews and so on, they are really political, and they don't answer the question as such, they talk around the question and sort of promote what they're doing' (P06). Another runner says, 'I'm like if someone told me that running on a track genuinely endangers the Kauri trees then, sure, maybe I would care more but, frankly, if I'm saying on a track and my activity isn't actually impacting the kauri, and it's more – I've got the impression, and again could be being completely bratty – but I've got more the impression that they've closed the tracks as a bit of an optics move, like to look like we're doing something about kauri dieback' (P07). By drawing on the language of refusal and noncompliance, the engagement of recreationists is seen as unimportant, as the benefits of closures are seen to accumulate other forms of social and political capital ('optics').

The cumulative impact of the lack of engagement from the top-down, where consultation is felt to be mere window dressing, is that at least some forest users search for information about kauri dieback that does not come from decision-makers or experts. 'I went back, and most of my friends went back, and we filled in all these questionnaires, and we submitted them, and, then, next thing you know, years later, 90% of forest is still closed, and it just feels like … when the decision has already been made with, consultations are not going to have any effect on the overall decision. And it's, yeah, I know, I noticed with a lot of the people that I run with that they are now searching for alternative facts, you know what I mean (P08). Without saying that ongoing communication with recreational groups is a necessary process for participation in biosecurity, nor that it is appropriate in all biosecurity situations, communication is important enough to support users' investment in the biosecurity process. It is a way of helping users protect their common interest in the forest, especially where it is aligned with biosecurity protections. It builds trust in the investment all stakeholders or users make in biosecurity and in securing knowledge that could contribute to its shared outcomes.

'Wellbeing' and affect

From a discursive perspective, biosecurity is not an absolute science. Rather a discursive view of science proposes that biosecurity is shaped and informed by relationships that also exist between people and nature, politics and meanings,

science and society, leading to multiple and even contradictory understandings of its role in the protection of trees and uses of the forests it protects. Through their practices (evident in what they told us or showed us in their interviews) and discourses, user groups expressed their unique approach to biosecurity. Unique in the sense that it was both contradictory and indeterminant (Jasanoff, 2007). Their understanding and response to biosecurity were couched in terms of recreational rights and value and in terms of emotional connections and affects (MacBride-Stewart, 2019a). When seen from this perspective, particular issues in biosecurity take on a new dimension – they cannot be reduced to improving one-way communication (education about biosecurity), but rather the argument by users is that there is a need to transform relationships between decision-makers and their public through a recognition of and respect for the deep emotional connections forest users can have with the forest. These affective relationships can also be transient and extractive in that they draw from the forest what meets the users' rather than the forest's needs (MacBride-Stewart, 2019b).

Illustrating this connection, one participant showed a photo of a place in the forest taken before kauri dieback became a problem. He said, 'yeah, it's just sadness, looking at it, because I know I know what it's turned into, I know it's boardwalked; there's no connection to the earth anymore. Um, it's still a great spot, and like, in all honesty, when I die, that's where I want my ashes scattered, and that's yeah, that sort of level of connection and specialness to myself.' [P06]. Grief here, often marginal and excluded from biosecurity discussions, articulates an alternative and deeply-connected world between the user and the forest. Yet, the cultural and ecological dimensions of scattering ashes are also avoided in this account (Light et al., 2022).

Another participant expresses frustration that the sense of spiritual connection she feels to the forest is overlooked in comparison to the feelings and connections of mana whenua and tangata whenua. She said, 'And there's a whole lot of people that are massively interested in the ecosystem and that, you know, the spiritual value of the forest [as tauiwi]. I've got huge connections with forests' (P01). Here, entrenched interpretations of the spiritual are the result of practices filtered through the dominant lens of politics and culture, which excludes recreation as a spiritual practice. Opening up other forms of recreational culture and politics shows how for this participant, spirituality and forest engagement may be interconnected. However, making hybrid connections between spirituality and recreation has uncertain long-term consequences for Māori communities seeking to redefine the very nature of kauri as ancestral/spiritual.

Others are less articulate but show that it is not only native or kauri forests that can have this impact on people's emotions. One describes 'sort of sidling around through some really, really tall, big pine trees, and it's just got this massive like dappled light effect, a real vivid sort of, yeah, I don't know, it's, there's just points and places that you, you go, man, this is quite cool. Yeah' (P09, P10). Here, expressions of 'I don't know' and 'this is quite cool' are the immeasurable,

indeterminate discourses connecting deep emotional responses to an activity that is a 'sort of sidling around through' the forest.

Finally, there are participants who bring to the fore the importance of this connection to the forest for their mental wellbeing. One calls it 'green time', which he needs for stress management (P03, P04). Another describes the role the forest had for her mental wellbeing during covid lockdown: 'it's my, you know, my rehab' (P01). Wellbeing and mental health are used to express a connection between users and forests that may be more familiar to us, although, again, the language used highlights a range of possibilities for human wellbeing (restoration/time and rehabilitation) (Von Lindern et al., 2017).

An even more explicit link between connection to the forest and mental wellbeing was made by another participant. 'I would honestly lie awake at night in bed just thinking about trails that I'll never get to do again and the magic times I've had on those trails and some of the, you know, just running in the forest by yourself there's nobody around, beautiful views, and all you can hear it birds and, some of those, like some of those areas that were my favourite areas that were my go-to in times of depression or feeling had enough of the world' (P02). Since research commonly assumes that access to forests can be positively associated with positive mental health (Von Lindern et al., 2017), this user makes explicit what the consequences of a loss of contact with the forest mean when trail-running is invested in as a form of wellbeing.

Moreover, it is not just access to the forest that people mourn, but the earth beneath their feet. Above, we heard one user discuss the place he wants his ashes scattered, where there is 'no connection to the earth anymore' because it has boardwalk laid over it. Another describes her sense of the impact of boardwalks on breaking the connections between forests and humans altogether. 'As soon as you turn something into a more urban style environment, as soon as you take away that connection of the living world around you and be able to physically reach out and grasp it or feel it through your feet, I think that you lose something, I think that we start dying as people, as human beings. We're animals. We need to connect' (P01). One implication of our inclusion of diverse users/uses of the forest fits with the practice of humility to recognise the distinct yet intertwined roles of discourse and meaning and the practices of biosecurity management for the health and wellbeing of these 'high-risk' user groups.

These perspectives resonate with earlier work by MacBride-Stewart (2019b) on the sense of wellbeing generated by off-road running, which is characterised as a set of qualities or positive atmospheres associated with nature: related to the (1) spatial dimensions of openness and space (associated with scenery and view), (2) quality of peace and calmness, (3) quality of beauty or aestheticism and (4) qualities of the terrain. The dynamics of 'atmosphere' relayed here result in important understandings about what biosecurity 'feels like,' precisely because it is attentive to the affective moods produced by the pleasures of being isolated or immersed in nature (MacBride-Stewart, 2019b).

Placing emphasis on diverse attitudes and affects suggests a complex effect of biosecurity away from simple narratives about threats and possible solutions. Indeed, these quotes show that forests play a vital role in people's emotional and spiritual and mental lives. Changes to tracks, closures, installing boardwalks over the forest floor have significant emotional impacts too. However, the recreational groups discussed here are doing more than emotionally responding to the forests and biosecurity practices. Rather, their shared perspective asserts the importance of understanding the cultural politics behind users' expression of their needs and rights to use the forest in the context of biosecurity closures and track redesign. This multi-layered perspective may serve as a more complete theoretical foundation for work to strengthen biosecurity practice.

Some of the detail of this relationship between users, forests and biosecurity has been arrived at by inviting users to reflect on their direct engagement with biosecurity as they recreate. This approach allowed the users to communicate the context and meaning of their practices. Ultimately it creates an indeterminate and complex view of the affective dimensions of biosecurity engagement. This complexity is often lacking in traditional biosecurity strategies, which distil biosecurity into actions and outcomes and limit sociocultural and affective dimensions of that engagement.

It seems important, however, to include the messiness and uncertainty of affect and meaning. Failure to recognise the role of forest users' feelings in biosecurity can lead to a complex severing of emotional ties to kauri. As one runner put it, 'Forests with kauri? Honestly, like in all honesty, I think I've got so much kind of resentment about the restrictions that kauri have meant we've all had to deal with that I, I honestly, have completely dissociated. I hear, and I'm, like, oh, that sounds inconvenient, how annoying, *not*. […] I hope that forest doesn't have any so I can go run in it' (P07). Conserving the links between biosecurity restrictions and the protection of forest environments may be important motives for those working in the biosecurity field, but the protection of users' wellbeing and positive affects could be seen by some as more valuable for promoting a sense of immediate personal benefit than protecting against a sense of future forest loss.

Behaviour and biosecurity practices

If biosecurity is to be thought of as a multi-layered series of users, practices, behaviours, emotional investments, timeframes, and atmospheres that can emerge in a forest and in response to KD, then this provides an opportunity for re-orientating biosecurity. One such challenge is that high-risk users and biosecurity managers may have incompatible practical goals. On the whole, however, we see a far greater potential for producing a collective understanding of biosecurity in relation to these many elements and the relationships between these elements. Clearly, the interviews were with participants who felt their time would be well spent discussing their use, values, behaviours, and desires for kauri forests. They are engaged in this problem, and, even though their reflections on biosecurity were

largely self-referential (i.e., represented reflections on what biosecurity meant *they* could lose), given the space to talk about what mattered to them, interdependencies between behaviours and practices that served to constrain biosecurity did arise.

Biosecurity, it appeared, was not just something that existed 'out there', but it was articulated as part of everyday routines and rituals. As biosecurity pragmatically emerged in relation to their time, their geography and their value, users admitted to not always being assiduous at following biosecurity measures. One describes cleaning his shoes at a wash station prior to entering kauri forest. 'Now I just quick, I'll just give them a quick brush and spray. In the back of my mind is always, like, how effective is this anyway? Like, does this really make a huge difference? It just becomes kind of performative' (P03). Another, who runs, traps and cycles in the forest, admits, 'trying to get mud out is incredibly difficult, so, it's, like, oh, I don't want to be bothered with it, so that that's not why they're riding, to clean the bike. I do that afterwards' (P06). As it stands, behaviour change research has done little to address the implication that one person's struggle with time and efficiency is a collective problem. However, the rangers' inclusion of themselves and contracted workers in the high-risk groups, based on time constraints, suggests that it is.

Another pair whom we interviewed together connects this lack of cleaning to the lack of practice and pragmatics with what biosecurity involves. 'People aren't afraid of admin if they know what it is that needs doing. It's just that it comes to [the other interviewee's] point, if you don't know what is actually required, then you're, kind of, like, well, I don't know? Do I do this thing that I don't know if it has any value or not? Yeah, you've got … you've got to be brought into the fact that it's making a difference' (P06).

His words help us make an important point. These people would happily do more to support the health of the forest if it involves the respect and inclusion of everyday local actions. This calls for a recognition of the different means by which local users' knowledge, attitudes and practices can be included in forestry management. As an example of this, a number of runners and cyclists who had been affected by forest closures had taken up pest trapping as a way to spend time in the forest while helping it thrive. One also collects seedlings from parks to reforest his property (P06). Others suggest 'dig days,' organised for mountain bikers to plant trees and maintain bio-secure tracks. A third remembers that forest-using groups such as runners, trampers and bikers used to be welcome to do track maintenance and wishes that were still allowed. With biosecurity measures actively fragmenting users' engagement in forest protection, many people find it difficult to find other ways to relationally connect with the forest. This may diminish the common understanding that forest protection is everyone's responsibility, despite active campaigns ('Team of 4.7 million') telling people that this should be so.

In other words, recreational users construct their relation to biosecurity through a certain doubleness. On the one hand is a willingness among recreational users to be involved in shared forest management, rooted in the idea of shared cultural

practices and the need for a common good approach to KD. This conception has played an important role in the reasoning of co-management and involves a potential rediscovery of recreational cultures that lends itself to the experience of forests as places for human use as well as conservation. On the other hand, biosecurity is seen in terms of the potential threat to recreation as it is practised and experienced in everyday lives. Under such circumstances, some users may prioritise the renewal of relational approaches and the actions that take account of the needs of both biosecurity and high-risk users. This aspect of biosecurity emphasises biosecurity as a process and as a set of relations. It reflects the doubleness seen in the practices and discourses described by recreational users and may be useful for articulating alternatives to biosecurity. However, existing trade-offs between biosecurity practices and the disengagement of users at the level of behaviours and actions need further study, as do the broader implications for recreational access and use in forests where kauri may be under threat.

Discussion: Supporting High-Risk Users in Co-Management
In the preceding analysis of interview data, we have drawn out three intertwined threads that tie users to biosecurity measures. One is informational and knowledge-based, based on the claim that knowledge supports biosecurity outcomes, which supports high-risk users in improving their relationship with biosecurity. This is a thread that is looking somewhat frayed as users begin to see biosecurity measures as political rather than good for kauri. The second is affective or emotional, based on the processes of relating to kauri producing the right (protective) behaviours. Yet as the data shows, sometimes intense feelings of connection to the forest did, in at least one case, lead to the unintentional severing of the relationship between users and kauri. The third is the thread that ties action, or potential actions, to forest health based on assumptions about how actions are related to values and beliefs about the importance of biosecurity. This thread, too, looks a little weak because actions are also largely determined by levels of trust in public bodies responsible for biosecurity and in actions that meet individual needs for health and wellbeing.

To create a more co-managed and multi-layered approach to biosecurity is right at the heart of our research, which suggests a change in approach to recreational users and kauri forests. Beyond the opportunity to include users as stakeholders in biosecurity, there are other cultural and pragmatic considerations, particularly the extent to which users' knowledge, attitudes and practices entail different ways of experiencing forests and engaging with biosecurity. Biosecurity processes tend to focus on the sense that people do not know and do not comply with the information provided. If we are to move beyond the consequences of this, where high-risk users feel that their connections to the forest are devalued and have become less willing to engage in the biosecurity measures to which they are expected to comply, then we need to re-invest in each thread identified above: communication, affect, and practice.

This reinvestment aligns with Jasanoff's (2007) technologies of humility, which can be translated as paying attention to the question of 'what is the purpose?'; 'who/what will be harmed?'; 'who benefits?'; and 'how can we know?' The main objective then has been to attend to the opinions that high-risk users express about biosecurity and how biosecurity has been largely determined by policies and actions beyond the recreational sector, with users finding that their interests have been reduced to technocratic solutions, including behaviour change. By this, we mean to point to two core assumptions in the biosecurity management of kauri dieback. One is the idea that biosecurity solutions, once established, will be fixed and final. The building of boardwalks is an example (and a metaphor) of a technology that swoops over areas of concern, giving people a singular option for how they relate to the forest, rendering the problem (recreation and KD) supposedly solved for good. The second is the idea that people's behaviour in kauri forests is a problem to be solved rather than part of a complex of relationships, potentially nurtured for the good of kauri and forest users. Instead of aiming to 'make people do the right thing,' the aim could be to create biosecurity solutions that allow users to lead active, healthy lives and to experience the wellbeing and quality of life provided by having healthy forests. This is not to point the finger at the biosecurity science and practices informing kauri dieback management, for management processes tend to focus on enabling the longevity of kauri forests in the context of practices and values encouraging forest protection. Rather it is to highlight where the ethos can change, where shifts in thinking towards a better understanding of current harms, unintended consequences and opportunities for shared processes can make real differences to forest users and, hopefully, forest health.

Our belief is the need to invest more in multi-dimensional communication with forest users, to hear and care about people's feelings for the forest and about biosecurity, and practices that help kauri to be better supported and more highly valued. These will be vital if a model of shared governance can be effective for better forest management, as laid out in the Biosecurity Strategy 2025's Strategic Direction documents. While we acknowledge that a relational approach to communicating with and caring for the users and forests can be resource intensive, particularly in staffing costs, we suggest it could enhance the effectiveness of measures already taken by engaging with more people, recognising their feelings, and valuing their efforts.

Conclusion

In this paper, we have argued for the need for biosecurity decision-makers to be attentive to the forest users, in particular, those deemed 'high risk' due to their frequent recreational uses of the kauri forests, such as trail runners and mountain bikers. For our research participants, we have argued, forests are important not only as places to recreate but also for mental health, and emotional and spiritual wellbeing, and there are important consequences for them when forests are closed to them. These include grief but also emotional dissociation from kauri.

These are forest users, however, who would be willing to do more work towards forest health in a shared and adaptive governance approach, and, if only for this practical reason, work should be done to ensure they remain willing partners. Their contribution, too, will come from the ways in which they 'construct' biosecurity in strikingly different ways from behavioural science and the ways in which high-risk recreational users use kauri forests in quite specific ways.

There is, of course, no unified view of what constitutes a high-risk user or a shared-governance approach that would remove the recreational threat to kauri. Jasanoff's (2007) incitement to humility is a diagnostic tool to address gaps at each level of biosecurity practice. To stop pathogen spread is beyond the scope of this paper, suffice to say that, while it remains that recreationists are one of the most accepted sources of KD spread – and that as the matter is urgent – many biosecurity approaches still rely on a strict separation between actions, emotions and knowledges. User involvement often adds uncertainty, partiality and complexity (Jasonoff, 2007) because their experiences and relationship to the forest are embedded in political, environmental, and cultural relationships that cannot be reduced to behaviourist terms. In other words, for the good of the forest and the good of forest users, we need to spend more time supporting the users for whom biosecurity measures are intended. A failure to fully recognise the deep value forests have for people prevents us from harnessing that energy for the good of forests. But this must be done sensitively, recognising the differences between the activities different groups do in the forest, their various motivations and values and the ways that they are able to show they care.

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Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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