Factors Influencing Public Responses To Kauri Dieback Control Measures

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Executive summary

Forest visitor compliance with the kauri dieback control recommendations has been increasing but is still short of perfect. Previous research has suggested differences between user groups in knowledge of, attitudes towards, and compliance with management efforts. Messaging has traditionally attempted to change behaviour by influencing attitudes, perceived social norms and perceived restrictions on behaviour. Current research in behavioural psychology, however, suggests that the roles and identities a person hold may bias how they respond to new messages and behaviour change requests. This research was intended to identify which factors and motivations influence whether forest users comply with the dieback control recommendations and to provide knowledge that will allow managers to develop more effective messaging strategies.

Surveys (n=747) and interviews (n=9) were carried out onsite among visitors to seven kauri forest locations in the Waitakere and Hunua Ranges and online among activity club members. Overall, participants report high levels of awareness (75.7%) and past compliance with cleaning stations (88.9%) and track usage (78.2%). Knowledge of humans being a vector for the disease and the use of cleaning stations was high, but other aspects were less well known or misunderstood. Awareness and compliance were generally lower among younger visitors, those with less education, those residing outside of Auckland, and those of Asian, Māori or Pacific ethnicities; however, lower rates of awareness did not necessarily translate to lower compliance.

Reported motivations for and against compliance were more likely positive (n=220) than negative (n=116) with most participants referencing a desire to protect kauri and New Zealand's natural heritage. Negative motivations were varied, but participants cited a lack of information, difficulties with stations, feelings of restriction, effort, doubt and uncertainty. Of particular concern, participants expressed feelings of frustration and resignation with control efforts. Self-reported intentions to comply with cleaning stations and track usage were high and attitudes about the recommendations were largely positive. However, perceptions about the effectiveness of cleaning and the likelihood of others complying were areas of weakness.

Contrary to expectations, identification with any particular activities or places showed few clear direct associations with perceived threat, knowledge, attitudes or behaviour. However, people who perceived the recommendations as a threat to their activities expressed greater doubts, had less positive attitudes overall, and were less likely to comply. Those who perceived a greater threat to valued places showed the opposite tendencies. Knowledge was only weakly related to compliance and appeared to have conflicting effects on beliefs and attitudes about the control, particularly as knowledge was associated with lower perceptions of effectiveness and compliance. Trust in the various management partners was generally high, but was only minimally correlated with knowledge, attitudes and beliefs, or intentions.

It is recommended that managers focus on positive messages and publicize compliance rates to reduce skepticism and demonstrate a positive social norm. Education should focus on clear, practical directions and information. Care should be taken to minimize the perceived threat to activities by raising the salience of alternative identities and by portraying these activities positively.

Introduction

Rationale

The effectiveness of kauri dieback control efforts relies on high levels of voluntary compliance with the control recommendations by forest visitors, yet compliance is not yet complete. Previous survey and focus group research has suggested variations in awareness, attitudes and rates of compliance between kauri forest user groups. This is supported by overseas research in similar forest management issues where participants in disruptive or harmful activities were unaware of the negative effects their activities caused (Sterl, Brandenburg, & Arnberger, 2008) or even blamed other activities as the source of impacts (Taylor & Knight, 2003). Given that forest visitors have been largely exposed to the same signage, advertisements and messages, other factors must influence how users respond to management messages and behaviour requests.

Theoretical model

The dominant theories of behavioural decision-making focus on attitude about a behaviour, perceived social norms, and perceived controls or restrictions on that behaviour. Briefly stated, attitudes refer to beliefs about what outcomes the behaviour will cause and whether that outcome is considered desirable. Social norms are perceptions about whether the action is normal or socially approved and whether a person feels compelled to conform to that norm. Perceived behavioural controls refer to whether the action is viewed as difficult to accomplish and whether a person feels in control of their decision. Under this model, behaviour change is accomplished by influencing these perceptions. Research into similar biosecurity issues using this theory have identified the belief that controls are ineffective, the perception that compliance is not a social norm or government priority, and the perception that the control measures are inconvenient or difficult as key barriers to action (Prinbeck, Lach, & Chan, 2011). These theories, however, do not fully explain the variation in perceptions between different user groups.

Other researchers have suggested that roles and identities may influence how people perceive information and bias their decision-making process. Specifically, information or messages that are perceived as positively reinforcing identities are accepted more readily while those that are perceived as threatening or denigrating are treated skeptically or ignored. Identity-protective biases have been previously shown to have a strong influence in ranchers' attitudes towards rangeland conservation (Opotow & Brook, 2003) and public beliefs about the science behind climate change (Kahan, 2013; Kahan, Wittlin, et al., 2011), nuclear power and gun control (Kahan, Jenkins-Smith, & Braman, 2011). These effects are argued to be largely unconscious, influencing behavious indirectly by biasing the formation of attitudes, perceptions of social norms and perceptions of behavioural controls. Under this theory, more information or new messages may be ineffectual or even counter-productive if they are perceived as threats (Hart & Nisbet, 2011; Nyhan et al., 2009).

A better understanding of both the conscious motivations and unconscious biases behind public responses is necessary to inform effective messaging and management. Therefore, this research attempted to decipher if and how identities associate with place or activity and perceived threats to these identities influence perceptions of kauri dieback. Specifically, this research was intended to answer:

- What factors influence people's responses to and compliance with kauri dieback controls and behaviour change requests?
- How do identities related to places and activities influence people's perceptions of and attitudes towards the kauri dieback control behaviours?
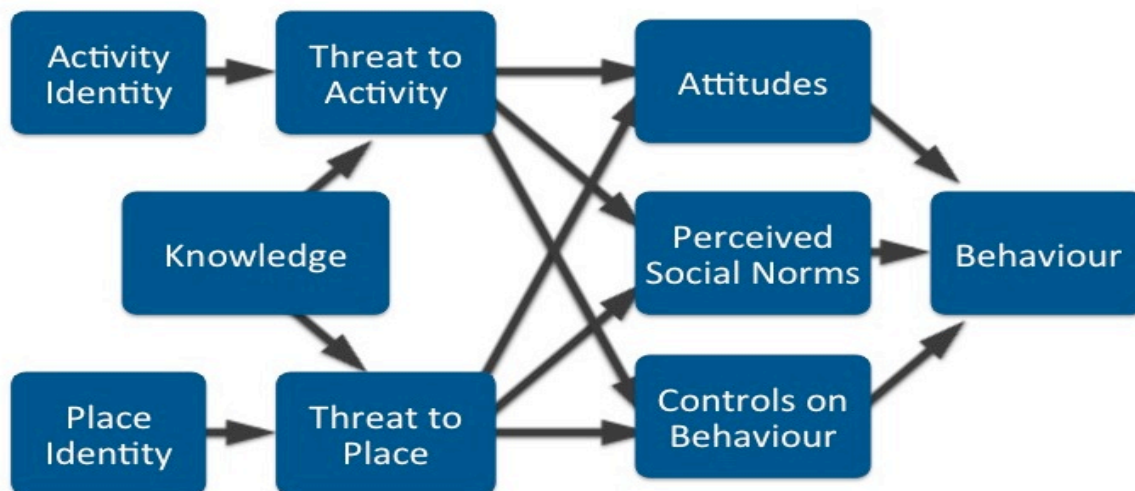

Figure 1. Theoretical model of influencial factors

Methods

Forest users were surveyed at trailheads in seven kauri forest locations around the Waitakere and Hunua Ranges. The sites were selected after consultation with Council staff and intended to capture visitors engaging in a variety of activities with a variety of experience levels. The locations were: Cascades Kauri, Fairy Falls, Hunua Falls, Karamatura, Kitekite Falls, Upper Mangatawhiri, and Waharau. Each site was surveyed on a rotating schedule during one weekday and one weekend day between 8:30am and 6:00pm over 14 days during January and February of 2014. All adult visitors were approached upon exiting the trailheads and asked to participate. Children under 16 and those who entered the park area but did not enter the forests were excluded. Visitors who initially declined were offered the option to complete the survey online. An additional online survey invitation was emailed to regional activity clubs and associations representing likely kauri forest users. Participants responding to the email invitation were excluded from demographic analysis as they represented a separate non-random sample but included in analysis of motivations, identities and trust. In addition to surveys, in-depth interviews were conducted with volunteers solicited simultaneously with the survey.

Participants in both the survey and interviews were asked qualitative and quantitative questions concerning:

- kauri forests they frequent,
- activities in the forests,
- identification with these places and activities,
- awareness of and knowledge about kauri dieback and kauri dieback control,
- past behaviours and the likelihood of future compliance,

- beliefs and attitudes about the management efforts,
- perceived threats to their identities, and
- trust in the management partners.

In total, 700 onsite visitors completed the survey with a response rate of 62.7%. An additional 47 people participated via the email invitation and 9 participated in interviews. While those who refused to participate were not asked for a reason, spontaneously offered reasons were recorded. Of these, 43 people declined due to language, 50 because they had not previously visited kauri forests, and 20 because of having small children present. These refusals may have introduced a degree of response bias, particularly with regard to overseas visitors or those from elsewhere in New Zealand. However, the majority of those who named language as a reason for refusal were accompanied by English-speaking companions who did participate in the survey. Therefore, the effect of these language barriers on awareness and compliance may be less than otherwise assumed. It is also important to note that mountain bikers may be affect by a sampling bias. Upper Mangatawhiri, the location where most mountain bikers were encountered, has multiple track entrances but only one entrance has a cleaning station. Those less inclined to support the controls may have chosen to use alternative parking areas and, therefore, avoided the survey site. Thus, the rate of compliance among mountain bikers may be over-represented.

Survey participants were most likely to be Auckland residents, of New Zealand European ethnicity, aged 26-35, and with a tertiary or postgraduate education (Figure 2). Tramping was the most commonly reported activity with 94.9% participants having engaged in tramping (including hiking and walking) at least once in the past year. Picnicking, running and camping were the next more commonly reported activities. Importantly, 68.2% reported having visited two or more kauri forests within the past year (Figure 4). Of those who had visited the Hunua Ranges, for example, 78.5% also reported visiting the Waitakere Ranges and 49.5% reported visiting Northland kauri forests –regions where kauri dieback is widespread. Similarly, most of those who had visited Coromandel forests had also visited forests in the Waitakeres (85.3%) or Northland (53.4%).

Location	Approached	Missed	Ineligible	Responses	Rate
Cascades	318	11	12	199	65.0%
Fairy Falls	111	3	0	80	72.1%
Hunua Falls	383	2	214	101	59.8%
Karamatura	106	6	0	61	57.5%
Kitekite Falls	348	6	0	169	48.6%
Mangatawhiri	42	2	8	29	85.3%
Waharau	43	0	0	38	88.4%
Online by flyer				23	
Total Onsite	**1351**	**30**	**234**	**700**	**62.7%**
Online by email				47	
Total Overall				**747**	

Table 1. Survey site data

Survey participants by demographic

Demographic	Value
Female	359
Male	368
NZ European	467
Māori	13
Pacific Islander	13
Asian	61
European	99
Other	33
Muliple	43
55+	118
46-55	131
36-45	160
26-35	171
16-25	151
Postgraduate	219
Tertiary	327
Vocational	26
High School	131
Some High School	10
Auckland	640
Other North Island	33
Other New Zealand	8
Overseas	50
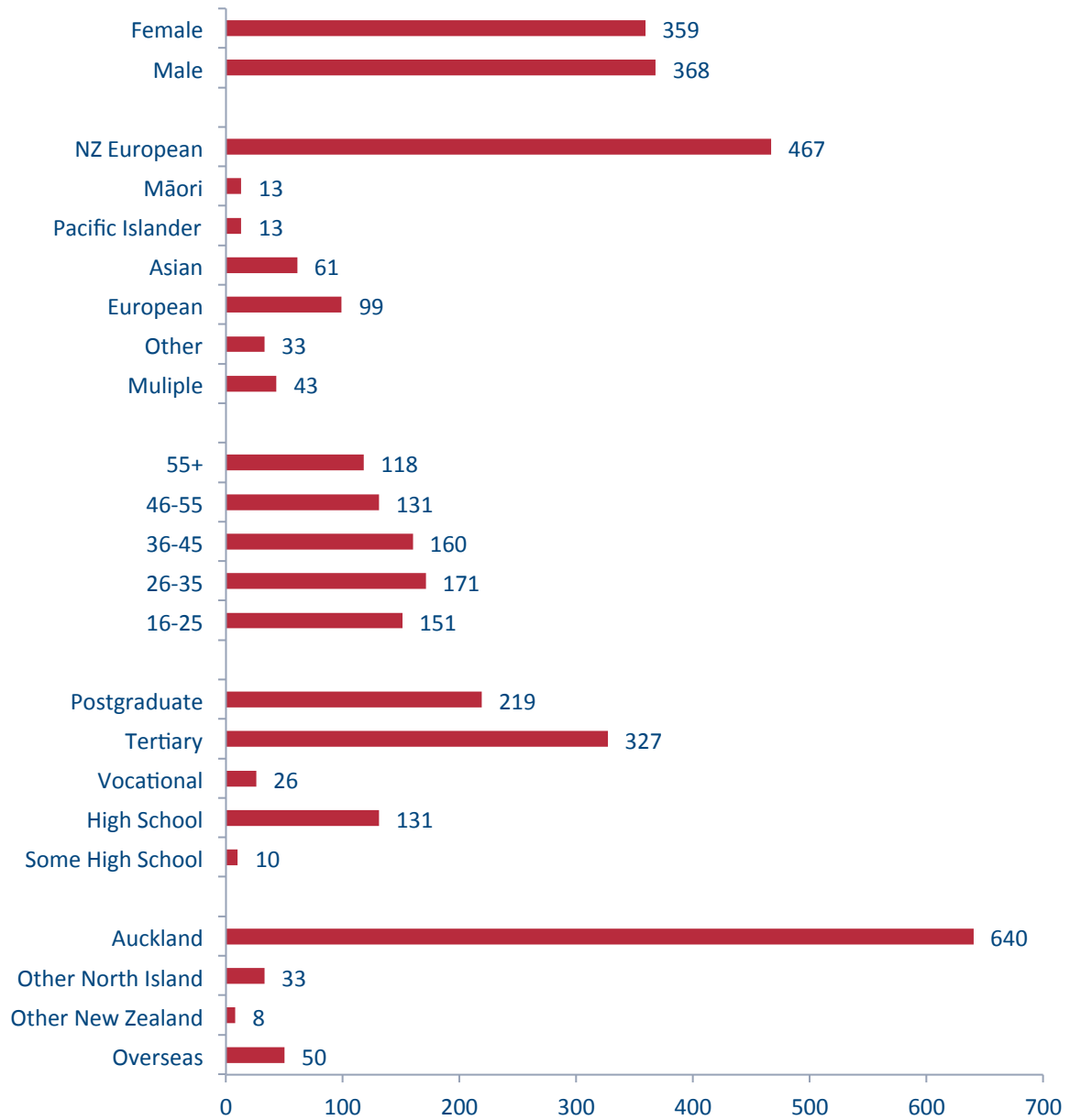
Figure 2. Onsite survey participant demographics by gender, ethnicity, age, education attainment, and place of residence.

Forests visited within the last year

Forest	Percentage
Waitakere Ranges	80.5%
Hunua Ranges	39.9%
Coromandel	36.8%
Northland Forests	26.9%
Waiheke	22.8%
Tawharanui	15.9%
Great Barrier Island	8.4%
Other	8.0%
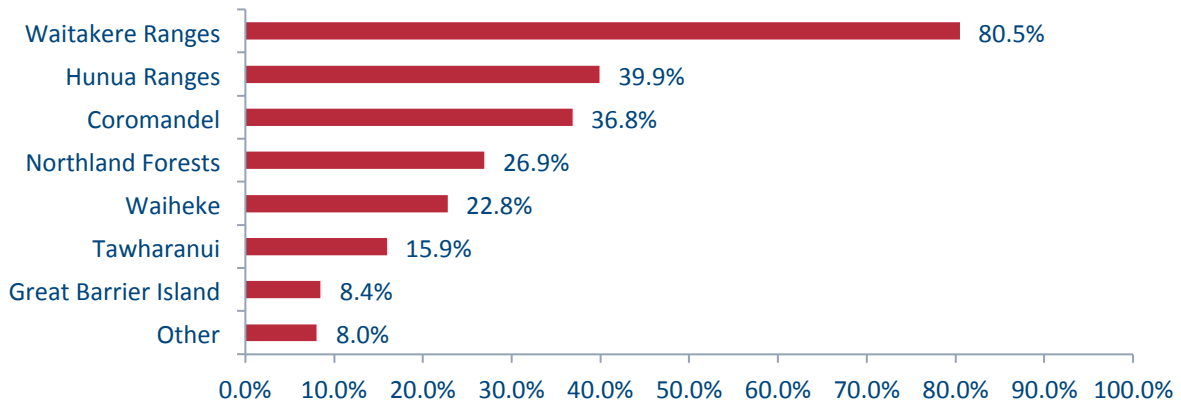
Figure 3. Percentage of respondents who reported having visited each kauri forest area within the past year.

Number of forests visited in the past year

Number	Percentage
1	31.8%
2	26.4%
3	17.8%
4	12.8%
5	7.2%
6	2.7%
7	1.4%
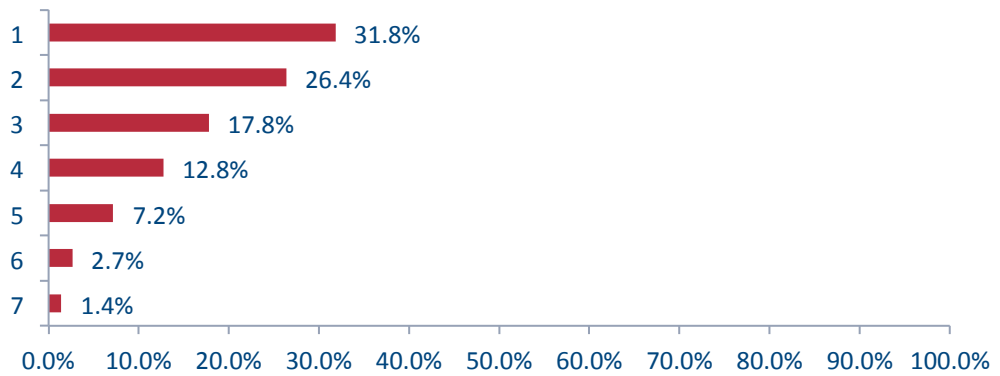
Figure 4. Number of kauri forests areas that participants reported having visited within the past year.

Activity participation within the last year

Activity	Percentage
Tramping	94.9%
Picnicking	47.3%
Running	32.1%
Camping	25.3%
Dogwalking	17.4%
Mountain Biking	13.6%
Work	9.6%
Other	4.9%
Hunting	3.4%

Figure 5. Percentage of respondents who reported having engaged in each activity within the past year.

Key Findings

Awareness and knowledge

Awareness of both kauri dieback and the control measures was high but far from complete. Most onsite participants had heard of kauri dieback before the survey (75.7%) and were able to identify soil as a source of spores (67.9%), but few identified water as a source (8.6%) and some believed spores were found in air (4.6%).

Overall awareness and knowledge of dieback and control recommendations

"Had you heard about kauri dieback before this survey?"
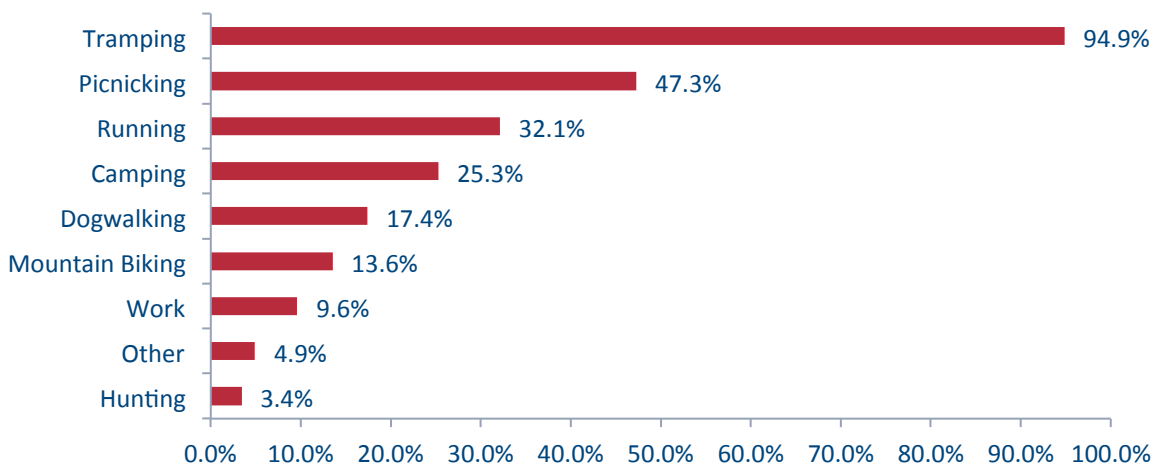- Yes — 75.7%
- No / Unsure — 24.2%

"To the best of our knowledge, where are the disease spores found?"
- Soil — 67.9%
- Water — 8.6%
- Air — 4.6%
- Don't Know / No response — 21.3%

"To the best of our knowledge, which of the following spread the disease?"
- Humans — 69.7%
- Equipment & Tyres — 51.7%
- Dogs — 45.6%
- Wild Animals — 31.4%
- Rivers — 10.3%
- Wind — 8.0%
- Don't Know / No response — 29.5%

"The Kauri Dieback Management partners have asked people to follow four recommendations to prevent the spread of kauri dieback. List the actions you are aware of below."
- Cleaning Stations — 66.1%
- Stay on Tracks — 28.7%
- Stay off Roots — 19.1%
- Clean at Home — 8.3%
- Dogs on Leads — 6.1%
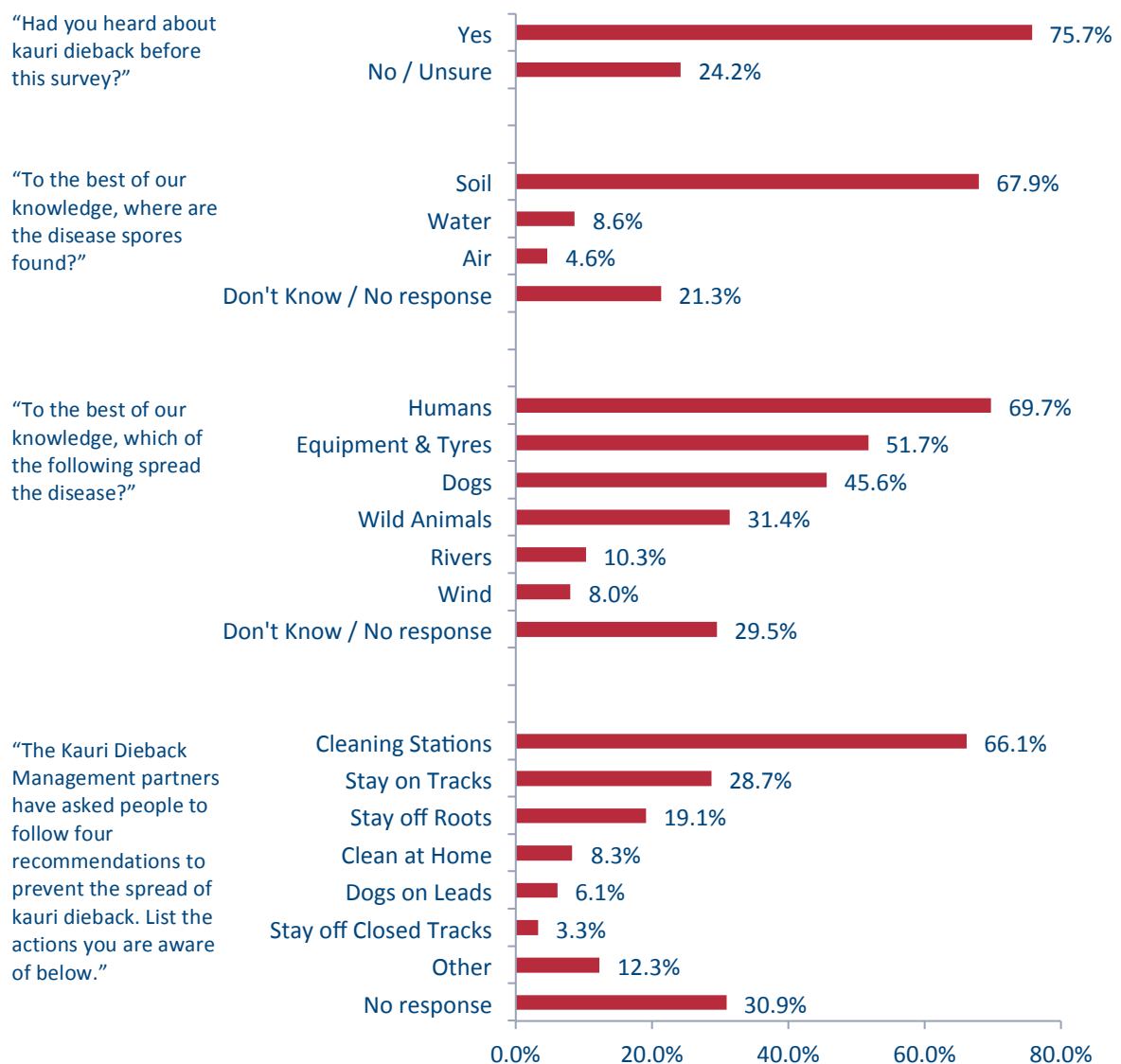- Stay off Closed Tracks — 3.3%
- Other — 12.3%
- No response — 30.9%

Figure 6. Percentage of respondent who identified the above sources and vectors of kauri dieback and kauri dieback control recommendations. Questions regarding sources and vectors of the disease were multiple choice. Questions regarding the control recommendations were open and reflect the behaviours respondents are most conscious of.

Visitors frequently identified humans as a vector for the disease (69.7%) with equipment and tyres (51.7%), dogs (45.6%) and wild animals (31.4%) also commonly reported. However, 8% reported they did not know and 20.1% gave no answer. Most participants (69.1%) identified at least one aspect of the control recommendations without prompting. The most commonly named recommendation was the cleaning of footwear and gear at cleaning stations (66.1%), which was raised more than twice as often as staying on tracks (28.7%), staying off kauri roots (19.1%), keeping dogs on leads (6.1%) or staying off closed tracks (3.3%). However, 30.9% of participants did not name any of the recommendations and 12.3% named activities that are either not part of the official recommendations (e.g. not bringing dogs into forests or avoiding kauri forest areas entirely) or were related to other environmental or biosecurity issues (e.g. not littering or not using camping equipment from overseas). In particular, respondents seemed either unaware or confused about rules concerning dogs and a number of dog owners at the Cascades Kauri site expressed frustration because they believed dogs were banned due to kauri dieback. These figures suggest that, while knowledge about certain aspects of the issue was high, there is an ongoing level of confusion and misunderstanding of the disease and of control efforts.

Compliance

Overall, 88.9% of the onsite sample reported using a cleaning station the last time they saw one and 16.6% reported walking off track during their last visit. It is important to note that the most recent cleaning station encountered would have been the final station upon exiting the track where camera studies have shown compliance is more likely. Future expectations and intentions were also strong with most participants stating they were somewhat likely, likely or very likely to use cleaning stations (91.4%) and to stay on tracks (72.7%). However, only 75.0% and 41.4% respectively answered in the strongest category, suggesting that compliance may be conditional. In particular, participants expressed much weaker expectations and intentions to comply with the request to stay on tracks.

Future intention to comply

"I intend to walk off tracks when I visit kauri forests."
Mean = 2.18
Std. Dev. = 1.77
N = 740

5.4%
3.5%
4.2%
6.6%
5.7%
19.9%
54.7%

"I intend to use the cleaning stations every time I see them."
Mean = 6.47
Std. Dev. = 1.09
N = 743

71.2%
17.1%
5.5%
2.8%
1.3%
1.2%
0.8%

Strongly agree
Agree
Somewhat agree
Neutral
Somewhat disagree
Disagree
Strongly disagree

0.0%   20.0%   40.0%   60.0%   80.0%   100.0%
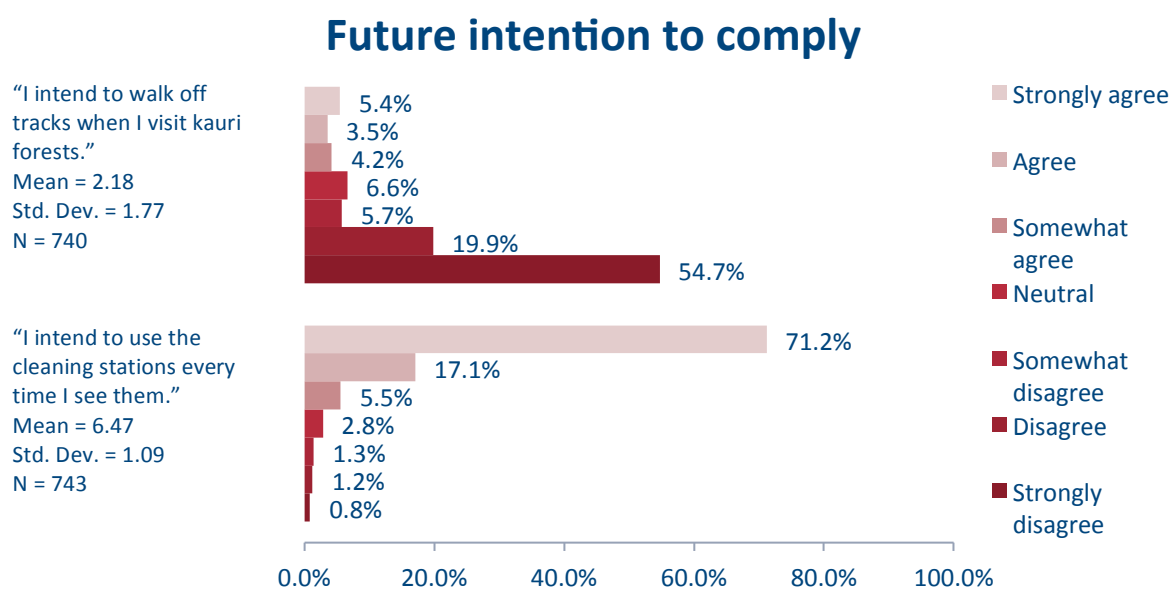
Figure 7. Self-reported intention to use cleaning stations every time and to walk off tracks.

Estimated likelihood of future compliance

"How likely are you to… walk off of designated tracks."
Mean = 2.54
Std. Dev. = 1.806
N = 677

- 4.9%
- 4.1%
- 8.6%
- 9.7%
- 9.5%
- 21.9%
- 41.4%

"How likely are you to…clean your footwear when you see a cleaning station."
Mean = 6.42
Std. Dev. = 1.256
N = 691

- 75.0%
- 10.0%
- 6.4%
- 3.9%
- 2.2%
- 0.7%
- 1.9%

Legend:
- Very likely
- Likely
- Somewhat likely
- Neutral
- Somewhat unlikely
- Unlikely
- Very unlikely

X-axis: 0.0% 20.0% 40.0% 60.0% 80.0% 100.0%

Figure 8. Self-reported likelihood of using cleaning stations and walking off of tracks.

Influential factors and analysis

Demographic variations

Greater knowledge and higher levels of compliance were generally associated with increased age and education though with a slight decrease among those over age 55. People aged 16-25 were far less likely to know about kauri dieback (OR = .133, p < .001) or to name any control behaviours (OR = .267, p < .001) and more than twi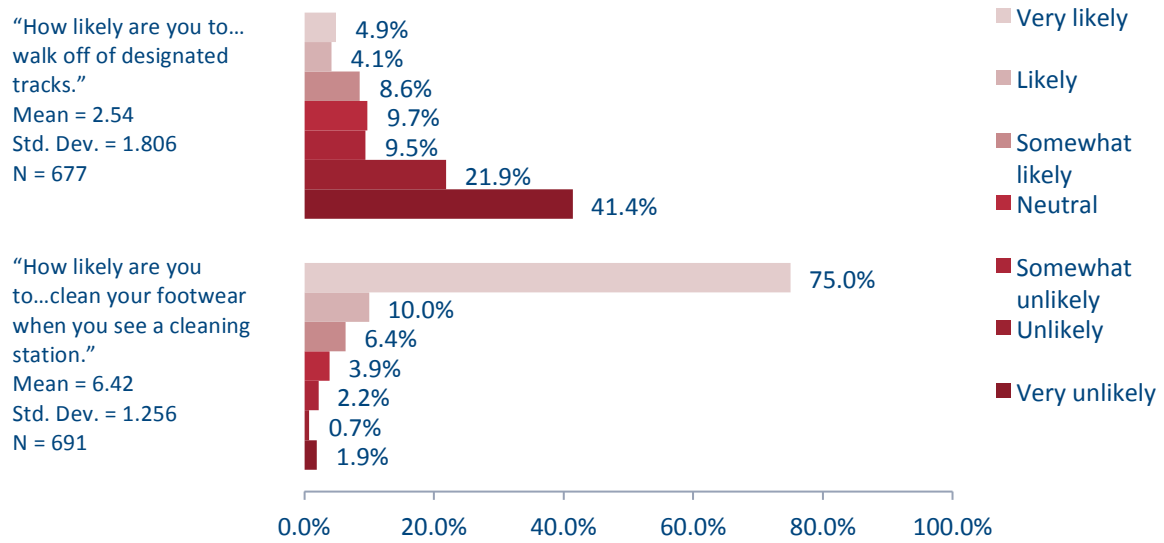ce as likely to walk off tracks (OR = 2.69, p = .003). On average, participants 46 and over were able to correctly answer two more knowledge questions than those 25 or under. Similarly, those with postgraduate degrees answered two more knowledge questions than those with high school education.

Awareness of dieback was significantly higher among those living in the Auckland area (OR = 4.10, p < .001). Auckland residents were also significantly more likely to name at least one control behaviour (OR = 2.666, p = .009). Contrary to popular perception and despite significantly decreased awareness among these groups, reported use of cleaning stations was only slightly lower among overseas visitors (86.3%) and those residing elsewhere in New Zealand (87.5%). Additionally, people from outside Auckland reported walking off tracks (10.2%) less often than Auckland residents (17.6%). As mentioned above, language barriers and inexperience may have caused a degree of bias in the sample with regard to overseas visitors.

New Zealand Europeans, Europeans, and people of other or multiple ethnicities reported higher levels of both knowledge and compliance. In contrast, people of Pacific, Asian, or Māori ethnicity reported lower levels of knowledge and higher rates of walking off tracks. Fewer Asian and Māori visitors reported having used a cleaning station the last time they saw one and were significantly less likely to name any of the control behaviours (OR = .293, p = .014 and OR = .122, p = .011 respectively). Although these ethnic groups combined make up only 12% of the visitors surveyed and interpretation may be complicated by the high number of Māori in the multiple ethnicities category, this difference suggests that messages have not reached all ethnic communities equally.

Knowledge by demographic

Total onsite — 4.17

55+ — 5.19
46-55 — 5.19
36-45 — 4.62
26-35 — 4.01
16-25 — 3.22

Postgraduate qualification — 4.86
Tertiary qualification — 4.50
Vocational training — 4.19
High school — 3.50
Less than high school — 2.00

NZ European — 4.87
European — 3.98
Maori — 2.92
Asian — 2.51
Pacific Islander — 1.31
Other — 3.64
Multiple — 3.91

Auckland — 4.57
Other New Zealand — 3.50
Other North Island — 3.48
Overseas — 2.65

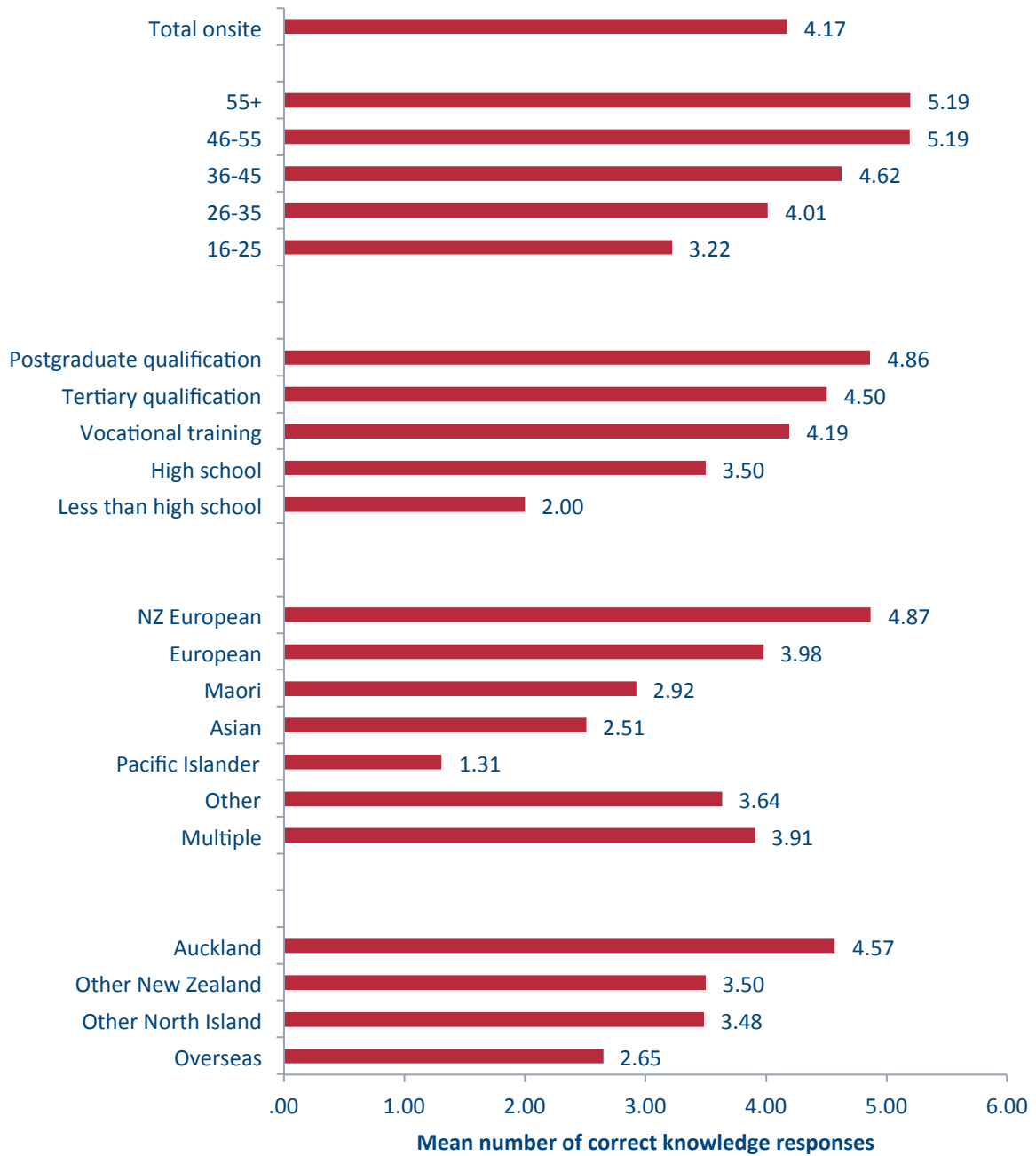X-axis: Mean number of correct knowledge responses (.00, 1.00, 2.00, 3.00, 4.00, 5.00, 6.00)

Figure 9. Mean total number of correct answers to questions regarding knowledge of kauri dieback and the control behaviours by demographic category.
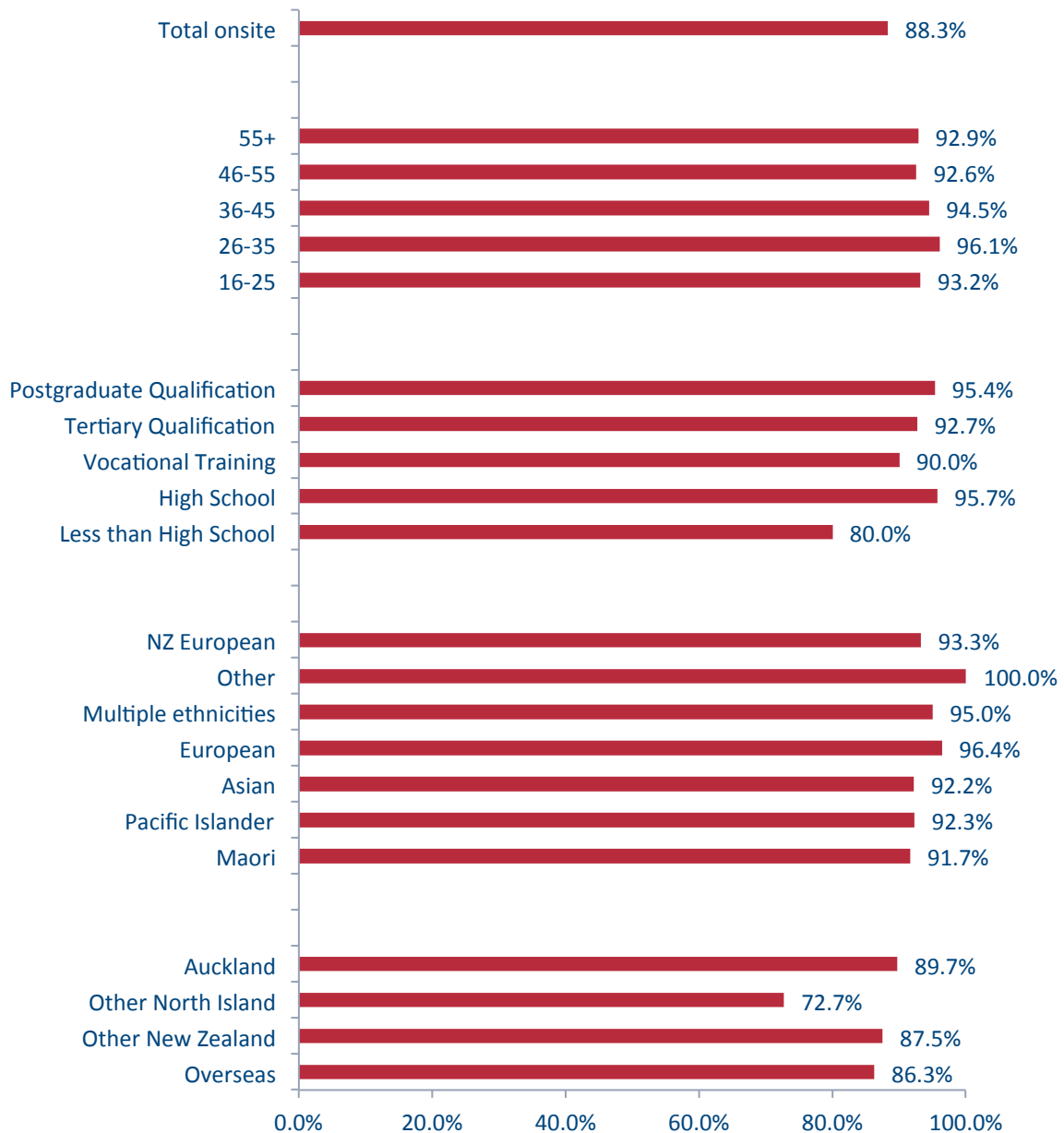
Cleaning station compliance by demographic

Category	Value
Total onsite	88.3%
55+	92.9%
46-55	92.6%
36-45	94.5%
26-35	96.1%
16-25	93.2%
Postgraduate Qualification	95.4%
Tertiary Qualification	92.7%
Vocational Training	90.0%
High School	95.7%
Less than High School	80.0%
NZ European	93.3%
Other	100.0%
Multiple ethnicities	95.0%
European	96.4%
Asian	92.2%
Pacific Islander	92.3%
Maori	91.7%
Auckland	89.7%
Other North Island	72.7%
Other New Zealand	87.5%
Overseas	86.3%

Figure 10. Self-reported compliance at most recent cleaning station encounter by demographic category.

Site-specific factors

Awareness of dieback and dieback control measures varied considerably among the survey locations with the highest awareness at Upper Mangatawhiri (96.6%) and the lowest at Fairy Falls (50%); however, this may reflect variations in experience among visitors more than site specific factors as the awareness at each site was not related to compliance.

Despite significant differences in awareness, self-reported cleaning station use for onsite participants varied less by survey site, ranging between 95.0% at Cascades to 80.2% at

Hunua Falls. Barrel stations may be associated with greater likelihood of cleaning than crate stations, but the relationship was relatively weak and of questionable statistical significance (OR = 1.779, p = .052, 95% CI = .994 - 3.182) and may be influenced by factors other than station type (e.g. station positioning, types of visitors, or signage differences). Qualitative comments showed a clear visitor preference for barrel stations over crate stations.

Awareness of dieback by survey site
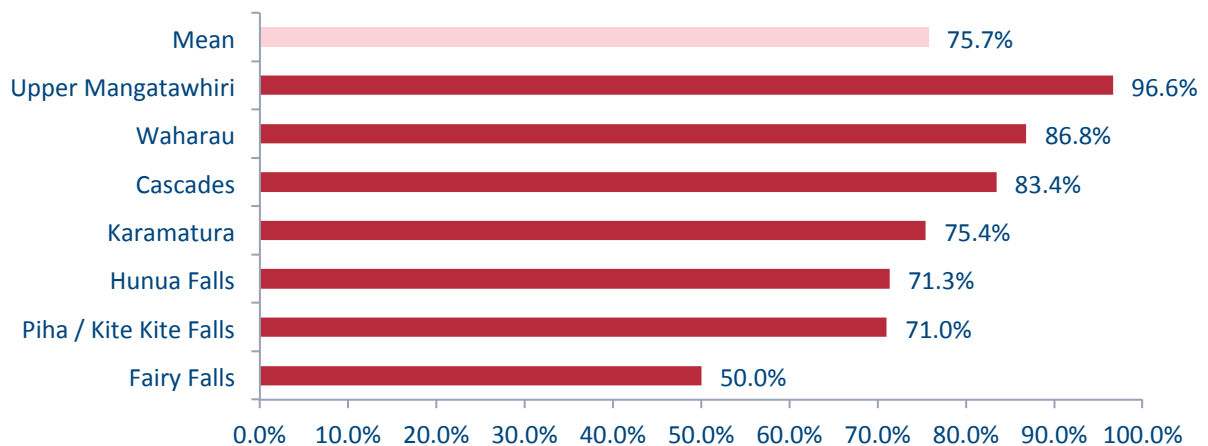
Figure 11. Percentage of people reporting that they had been aware of kauri dieback before taking the survey by survey site.

Reported last cleaning station use by survey site

Figure 12. Self-reported compliance at most recent cleaning station encounter by survey site.

Self-reported motivations and impacts

When asked about their motivations for or against compliance, the majority of responses were positive (n = 220). The most frequently mentioned motive was a desire to protect kauri and New Zealand's natural heritage (n = 135). Others mentioned feelings of obligation

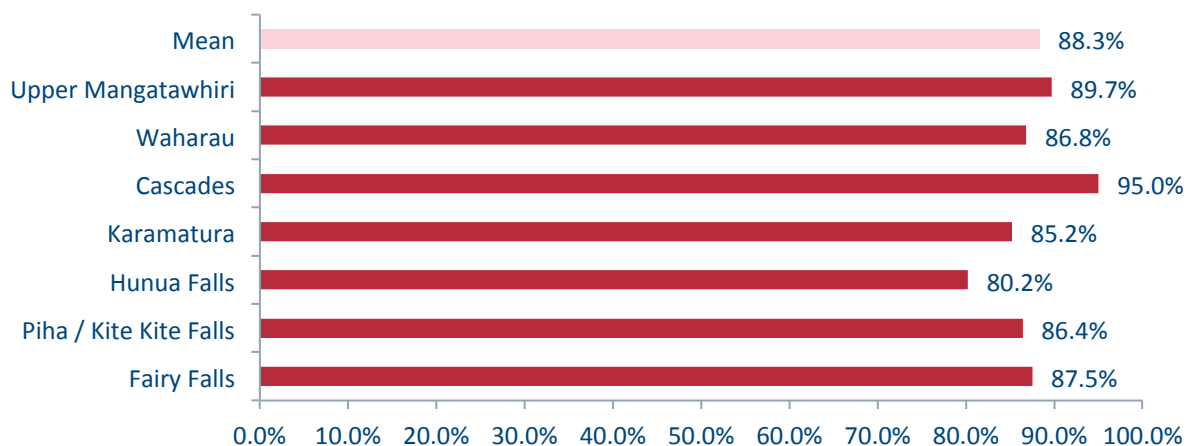or obedience (n = 53), the simplicity of compliance (n = 39) and the presence of visual cues (e.g. signage or dying kauri; n = 19).

Negative motivations (n = 116) were fewer and more varied, but focused around lack of information or understanding (n= 38), difficulties with or complaints about cleaning stations (n = 27), a desire for freedom or access (n = 20), complaints about the effort or nuisance of compliance (n = 17), doubts about effectiveness or distrust of the science (n = 14), and feelings of resignation or hopelessness. The latter was particularly evident in interviews and conversations with survey participants where many commented about the lack of funding for control and expressed frustrations with empty, broken or missing cleaning stations. Others stated they had heard from scientists, park rangers or other management sources that the spread was inevitable or control methods were uncertain and compliance was futile.

An additional group expressed conditional responses to the behaviours. For example, some participants mentioned only visiting the Hunua Ranges or urban areas as a reason for not cleaning footwear. A number of dog owners believed that their dogs were well enough trained to stay on tracks without using a lead. Whether or not these visitors do pose a risk to kauri, they believe that they are complying with the spirit of the controls if not the control behaviours themselves.

Self-reported motivations for and against compliance
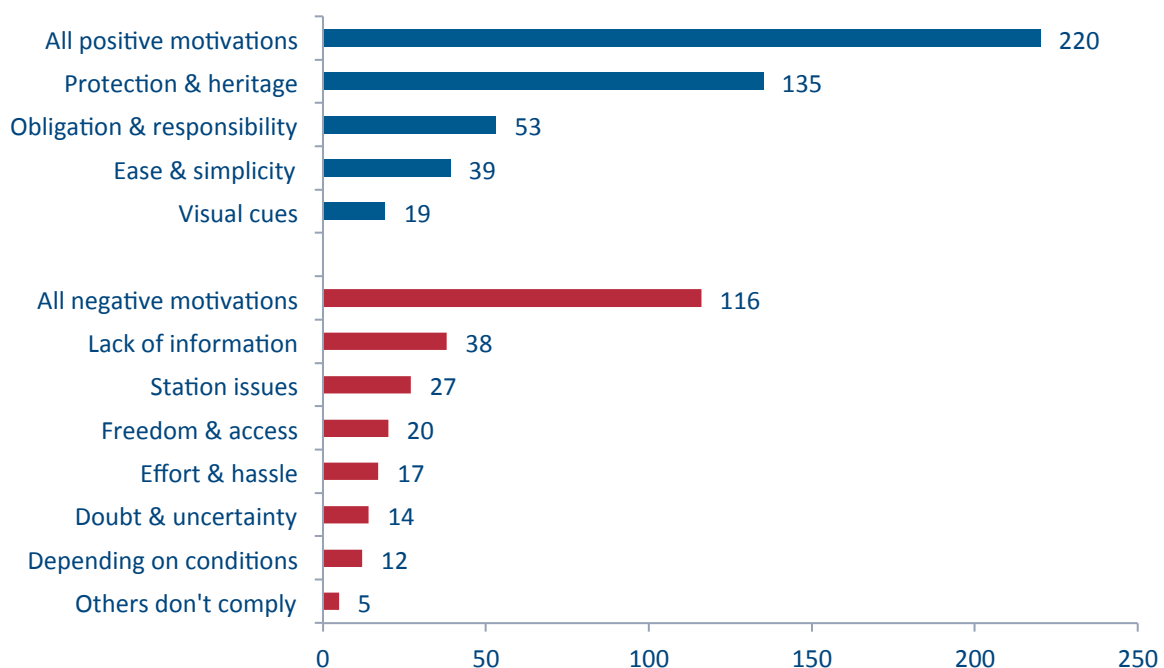

Figure 13. Most frequently mentioned motivations for and against compliance. Reported numbers reflect only written responses to open-ended survey questions and do not include verbal comments made during the survey or responses made during interviews. Certain types of responses, particularly regarding frustration, were common in conversation, but not commonly written responses.
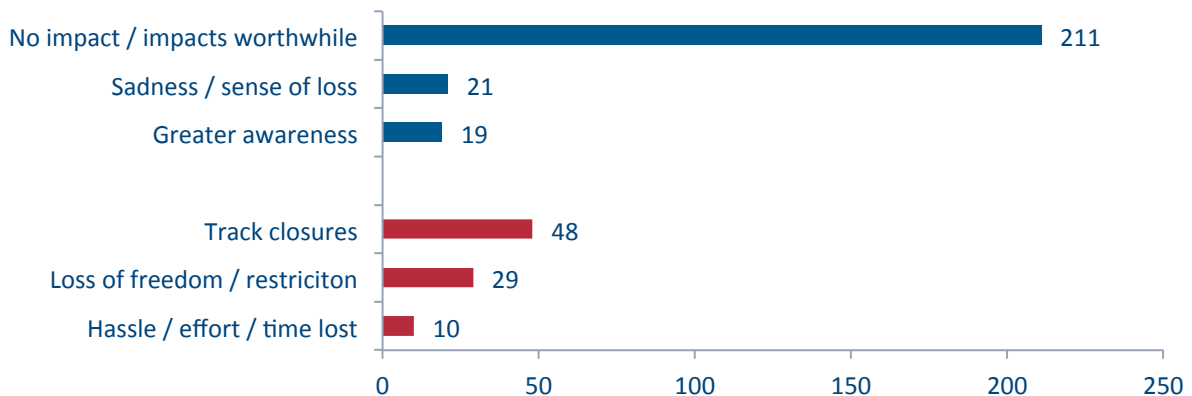
Reported impacts of dieback and control

Figure 14. Most frequently mentioned impacts of the control recommendations and management efforts.

While most commenters reported little or no impact from the control efforts (n = 211), many complained about closed tracks (n = 48) or expressed feelings of lost freedom, constraint and reduced enjoyment (n = 29). Those who reported freedom to wander as a motivation were more than eight times more likely to walk off tracks (OR = 8.121, p = .002).

Positive motivational themes	
Protection & heritage	**Obligation & responsibility**
"The need to protect our native flora + fauna. To ensure our bush for the future." *"I feel obligated to do my part in helping preserve the kauri as part of being a Kiwi."* *"[Kauri forests] belong to our heritage and everything should be done to make them available to future generations."*	*"They are stationed there for a reason, so I figure they should be used."* *"Using the cleaning stations is part of the right of continuing to access the Kauri Forests."* *"I love the forest and will do what I am told to help protect it."* *"It has not occurred to me to question the guidance provided."*
Ease & simplicity	**Visual cues**
"Why not do it? It doesn't take much time or effort so why not help out?" *"Why wouldn't you?"* *"The rules are easy to follow. There are no good reasons not to do so!"* *"People who don't are just lazy!"* *"It has become such a habit that I don't even think about it."*	*"…seeing so many dead kauris around is a constant reminder of how close we are to losing this important NZ tree."* *"More motivated if cleaning station right there and if signs to say to stay on tracks."* *"More motivated when cleaning station is well maintained and there is good signage."*

Negative motivational themes

Lack of information	Station issues
"Knowledge of why I am doing it -that it could make a difference." I feel less inclined because I am not too sure how to use it properly." "More informative signage & instructions." "Make clearer signage at control stations. People were confused about when to clean shoes - going in or going out? Hard for those who can't bend down."	"I often find there are no bottles -> it annoys me!" The bottles the detergent is in do not work very well (the spraying mechanism specifically) which makes using them difficult…" "More motivated when cleaning station is well maintained and there is good signage."
Freedom & access	**Effort & hassle**
"There's some charm to the classic NZ bush bash with compass and topo map in hand." "I don't want to be controlled and restricted in my enjoyment of the bush." "Going off track is fun, we like exploring." "50 years / lifetime past habit of being able to walk off/explore off of the designated track."	"Inconvenience to stop. Sometimes rather keep going." "If running, not wanting to stop = less motivated." "If there are lots of people at a cleaning station I tend to walk past as I can't be bothered waiting." "Cleaning my boots in one area does make me feel less motivated to clean them at the next station."
Doubt & uncertainty	**Frustration**
"…I'm not actually convinced that human activity is the cause." "…no one really knows what is causing it..." "According to most/best recent science studies 'cleaning' stations are useless (except as PR teaching aid)." "I do not always trust in the information given by various groups/Government depts as to the seriousness of the problem."	"The greatest discouragement occurs if the spray bottles are empty –shows authorities are not serious. Therefore, why should I take the problem seriously?" "Someone in government decided it was a lost cause." "Lately the whole scrubbing station is completely gone. It's just gone! I felt quite outraged. I thought 'Good grief, why is there not one here?'" "I don't always (very rarely) see the bottles of spray at the cleaning stations so it was a pleasant surprise to see them there today."

Table 2. Major themes from qualitative responses regarding motivations for and against compliance.

Reported impacts of control		
No impacts / impacts worthwhile	**Sadness**	**Greater awareness**
"They have not really affected it at all. Having to clean gear & shoes is hardly an issue when talking about preserving such a native wonder. These control's have simply made me more aware of the reality of kauri dieback." *"Two minutes of my time to clean shoes, hardly affected at all!"* *"They have not really affected it at all. Having to clean gear & shoes is hardly an issue when talking about preserving such a native wonder."*	*"It makes me sad the see the dead trees & the loss of such beautiful and ancient trees. It is part of being in NZ is seeing there giant living fossils."* *"The dieback of kauri has seen some of my favorite places look a little barren and it's sad to see such massive old trees that have stood for hundreds of years die off so quickly."* *"The controls have not affected me at all, but I would be very sad to lose the kauri."*	*"These control's have simply made me more aware of the reality of kauri dieback."* *"I enjoy them more as I take the time to value the kauri."* *"If anything, [the recommendations] have increased my enjoyment knowing that I can do something to minimize my impact."* *"Made me more aware of my actions when around kauri."*
Hassle / effort / time	**Closed tracks**	**Restriction and loss of enjoyment**
"I have to stop and spray my boots. This is ok if there is just 2 of you but when there is group of 30 (my tramping group) this can take a long time." *"If you are running it slows you down significantly if you have to stop. Sometimes you have run past a cleaning station before you realise it is there. Once I stopped to clean my shoes. It interrupted my rhythm; I badly sprained my ankle a few meters later. If tramping you are going at a slower pace; it doesn't affect you so much. I struggle to contort to spray my own shoes."*	*"Track closures -no signage @parking. 2 hrs into hike and track connecting closed."* *"Closed tracks should be clearly sign-posted at common track starting points. i.e. Don't tramp to a track + then find it's closed."* *"Sometimes planning a days activities can be difficult not knowing what will be available." "Only a little in that we should stay on designated tracks (but we don't, we allow the kids to explore a little)"*	*"Exploring rivers and different parts of the bush isn't always possible if staying on the tracks."* *"Not being able to go off track will stop me from seeing my favourite parts of the kauri forests."* *"I/we are avoiding all tracks that have large numbers of [boardwalks and gravel] - they are no longer tramping tracks."*

Table 3. Major themes from open-ended qualitative responses regarding impacts of the control efforts.

Attitudes and beliefs

Direct measures of attitudes about the control behaviours, perceived social norms and perceived limits on behaviour were well correlated to intention to use cleaning stations and to stay on tracks. Intention to use cleaning stations was most strongly associated with the attitude that cleaning is important or "the right thing to do" ($r = .718$, $p < .001$), the belief that cleaning is easy ($r = .645$, $p < .001$), and the belief that "most people I care about would want me to" ($r = .526$, $p < .001$). Similarly, intention to stay on tracks was correlated with the belief that it is right ($r = .499$, $p < .001$), that kauri should be protected ($r = .309$, $p <$

.001), the belief that it is easy (r = .259, p < .001) or practical (r = .429, p < .001), and the belief that loved ones would approve (r = .419, p < .001).

Most participants agreed to some extent that cleaning stations were effective at stopping dieback (79.9%) and that walking off tracks would spread dieback (73.7%); however, only 33.1% and 32.3% respectively agreed strongly, suggesting some continuing doubts. Whether people believed cleaning and staying on tracks to be effective measures was weak to moderately correlated with following those actions (r = .277, p < .001 and r = .252, p < .001 respectively).

Perceived effectiveness of recommendations
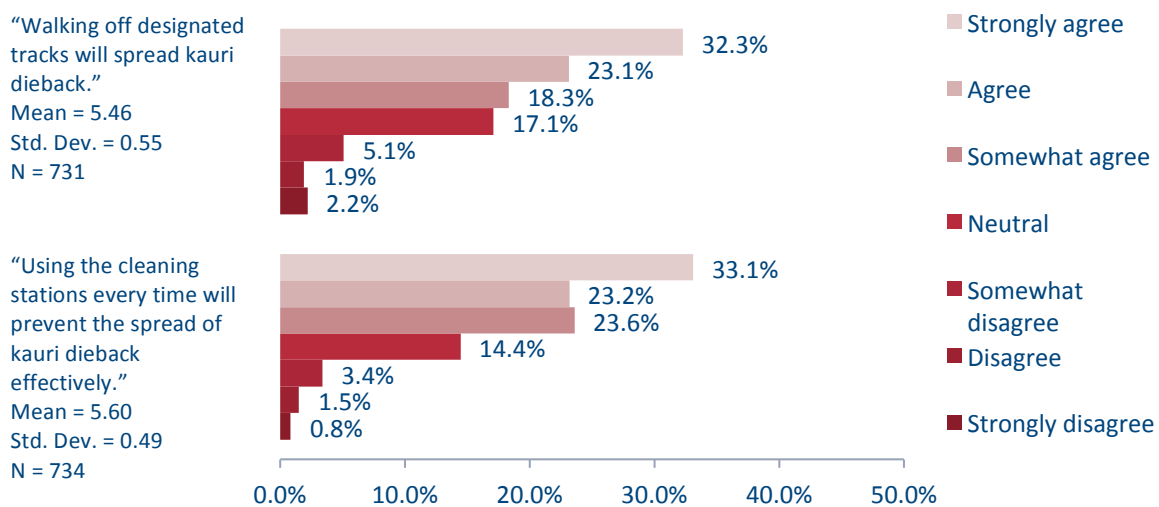
Figure 15. Perceived effectiveness of cleaning station use and perceived effect of walking off tracks.

Overall, social factors showed greater disagreement and weaker associations with behaviour. Participants were divided as to whether others complied and whether they felt social pressure to comply. Only 52.0% of people somewhat agreed, agreed or strongly agreed that "most people use the cleaning stations every time" and only 58.5% believed that most people stay on tracks. While cleaning intention was related to the belief that others comply (r = .235, p < .001), intention to use tracks was not. It must be cautioned, however, that qualitative responses indicated frustration with others for not complying – often placing blame on tourists and overseas visitors. Additionally, people who reported higher estimates of effectiveness and compliance were somewhat less likely to mention negative motivations (OR = .744, p < .001 and OR = .789, p = .003 respectively). Therefore, while statistical correlations are not evident, the perception of ineffectiveness and low compliance may be sources of cynicism and negativity about management.

Perceived social norms
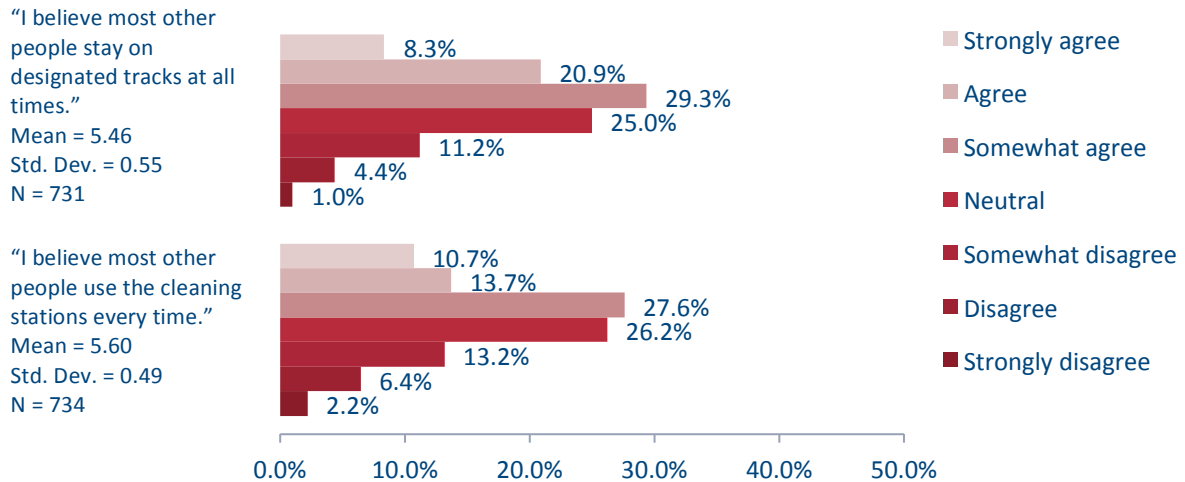
Figure 16. Perceived social norm regarding use of cleaning stations and walking on tracks.

Activity and place identity

Few statistically significant direct correlations were found between place or activity and intention to use cleaning stations or stay on tracks. More frequent visits to all forests were moderately associated with greater knowledge about dieback (r = .468, p < .001) and the control recommendations (r = .394, p < .001), but also with decreased belief in the effectiveness of cleaning (r = -.175, p = .031) and lower belief that others comply (r = -.166, p = .044). Frequency of visit was not related to intention to use cleaning stations and stay on tracks or to self-reported past behaviour. Greater attachment to those forests also had minimal direct relation to either the intention or attitude measures. People who identified more strongly with these places, however, were more likely to perceive dieback as a threat and an indirect effect may exist.

Similarly, frequency of engaging in activities was moderately associated with greater knowledge of dieback and the control efforts, but not directly with attitudes or behaviour. Strength of identification with individual activities also showed minimal effects. One exception was that people who identified strongly with running were somewhat more likely to report intention to use cleaning stations (r = .241, p = .003) and to stay on tracks (r = .197, p = .017).

While activities and places themselves were not clearly related, whether a person perceived the control behaviours as a threat to their activities and places was. Perceived threat to activities was negatively correlated to nearly all measures of intention, attitude and belief. That is, the more people felt restricted or threatened by the controls, the less likely they were to use cleaning stations (r = -.311, p < .001), to stay on tracks (r = -.330, p < .001), to perceive stations as effective (r = -.206, p < .001), to believe kauri need protection (r = -.341, p < .001), or to believe cleaning is practical (r = -.428, p < .001). They were also more likely to report negative motivations and impacts (OR = 1.21, p = .005) and less likely to report positive motivations (OR = 0.808, p = .004). Specifically, they were more likely to express

uncertainty or doubt about the management efforts (OR = 1.42, p = .004) and twice as likely to mention constraints on their freedom and access (OR = 2.03, p < .001). They were also somewhat less likely to express motivation to protect kauri (OR = 0.772, p = .005) or feelings of obligation or responsibility (OR = 0.679, p = .010). Although these effects were not individually strong, together they suggest that skepticism and negativity about the control efforts may in part be motivated by perceived threats to activities. If this is the case, additional information or evidence is unlikely to change their minds.

Conversely, people who perceived dieback as a threat to their favourite places had higher intention to use cleaning stations (r = .285, p < .001) and stay on tracks (r = .172, p < .001) and perceived greater effectiveness (r = .140, p < .001) and practicality (r = .271, p < .001) of cleaning; however, these effects were generally weaker than those of activity threats. These people were also slightly more likely to mention positive motivations (OR = 1.26, p < .001), including desire to protect kauri (OR = 1.33, p < .001) and the ease of compliance (OR = 1.42, p = .015), but also more likely to raise the issue of track closures (OR = 1.75, p < .001). As with activity threat, the effects measured were generally weak given the relatively small number of responses and the complexity of factors involved, but the effects taken together suggest that greater perceived threat to favourite places results in more positive evaluations of the control efforts. Moreover, the perceptions of threat to place and activity were negatively correlated with each other (r = -.237, p < .001) suggesting that the importance of one identity reduces the relative importance of the other.

Identification as a conservationist was also weakly to moderately associated with increased intention to clean (r = .275, p < .001), to stay on tracks (r = .128, p = .001) and most measures of attitude and belief. It was also negatively correlated with perceived threat to activities (r = -.178, p < .001) and positively associated with perceived threat to place (r = .275, p < .001).

Awareness and knowledge

While slightly more people who had previously been aware of dieback reported having used the last cleaning station they encountered (95.3% compared with 93.9% overall), the relationship between past awareness and past compliance did not reach statistical significance. Of those who had not previously been aware of kauri dieback, 88.0% still reported having used the last cleaning station. Similarly, those aware of dieback reported only marginally lower rates of walking off track than those who were not aware or unsure (14.6% and 21.8% respectively). Broad awareness, therefore, is not always necessary for compliance and interaction with the cleaning stations has not always lead to awareness.

Greater depth of knowledge about kauri dieback and the control recommendations show a complex relationship with intention, attitudes, and beliefs. While greater knowledge was weakly associated with greater intention to use cleaning stations (r = .162, p < .001), intention to stay on tracks (r = .144, p < .001) and moderately related to greater belief in the importance of kauri (r = .361, p < .001), it was also negatively correlated with the perceived effectiveness of cleaning stations and staying on tracks (r = -.152, p < .001) and the belief that other people comply (r = -.191, p < .001). This suggests that people with more knowledge about kauri dieback are also more aware of the scientific uncertainties and past low compliance rates, which may indicate problems with messaging.

Qualitative responses suggest a divide into two types of information requests. Many expressed a desire for more clarity in instructions about when or how to use stations: whether cleaning was necessary when entering or exiting forests, whether shoes worn in urban areas needed cleaning, or which tracks were closed. These types of questions were not associated with feelings of threat or intention to use cleaning stations. Comments expressing doubt or distrust, however, were.

Trust

Most people reported higher than neutral trust in the Department of Conservation (DoC) (88.7%), the Ministry for Primary Industries (MPI) (77.2%), and Auckland Council (74%). Identification as a hunter was strongly and negatively correlated to trust (r = -.738, p = .015), but few other significant associations existed. Trust was correlated only minimally with overall knowledge and weakly with intention to use cleaning stations or to stay on tracks. Qualitative responses suggest that, despite the survey being conducted entirely in Auckland Council parks, the control efforts are most strongly associated with DoC and MPI Biosecurity.

Mean reported trust
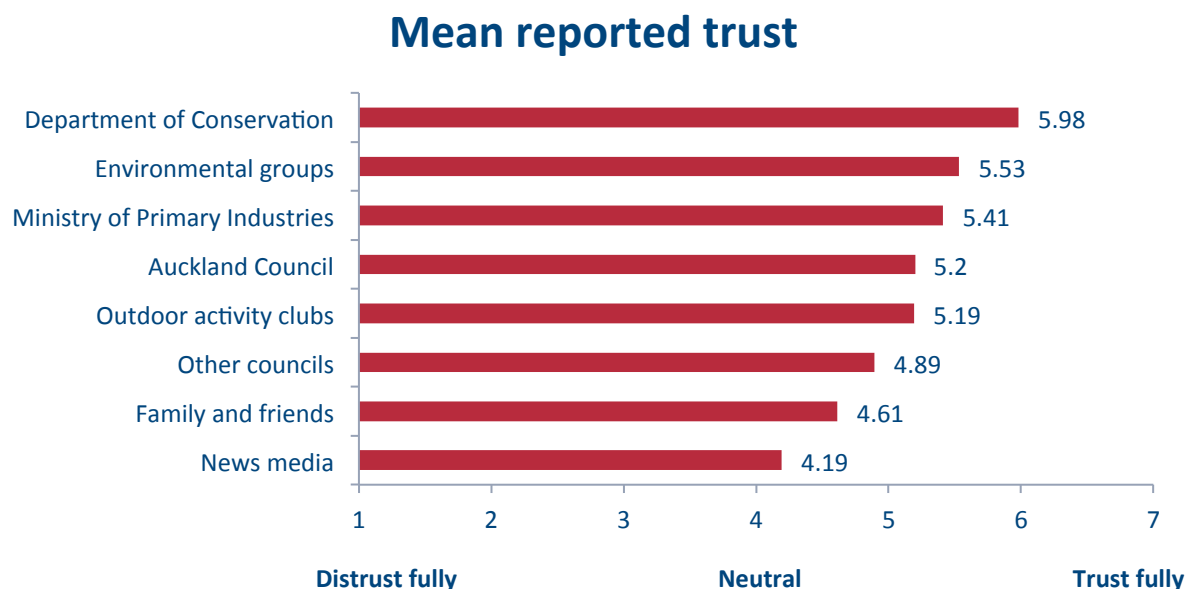
Figure 17. Mean reported level of trust towards sources of information about kauri dieback and other environmental issues.

Recommendations

Education

Education should focus primarily on answering specific practical questions about what behaviours are wanted and when they are necessary and why they are requested. While the primary action of using cleaning stations is well known, far fewer visitors are aware of the importance of staying on tracks and off kauri roots or keeping dogs on leads. Additionally, awareness and knowledge vary widely among demographic groups, indicating a need to target messages to these communities.

Many respondents requested more information about how and why they were being asked to follow the behaviour requests. Yet it is clear that greater knowledge about dieback and the control recommendations does not necessarily translate to greater compliance and messages targeting perceived social norms or highlighting positive identities may have greater influence.

Maintaining positivity

As increased forest experience and increased knowledge about kauri dieback were negatively associated with perceptions about the effectiveness of controls and whether others are likely to comply, it is important to be careful and conscious about the messages used. People involved in management, particularly those interacting directly with the public, must remain positive and not express doubts or frustrations about compliance publicly as these may become self-fulfilling expectations. Though skepticism was only moderately correlated with an individual's intention to comply, both quantitative and qualitative responses show high levels of frustration and pessimism about the compliance of others.

To combat these perceptions, the increasingly higher rates of compliance should be clearly and prominently advertised at cleaning stations to demonstrate a strong positive social norm and reduce cynicism among visitors. Ideally, posted compliance rates should be site specific and updated regularly to provide positive feedback towards the goal of full compliance. It is essential that cleaning stations and signage are prominent and well maintained as visual demonstrations of ongoing commitment to control. Where possible, crate stations should be upgraded. Although evidence for a direct effect on compliance is unclear, qualitative responses show crate stations are perceived as being more difficult to use and indicative of low commitment from management.

Appealing to identities

The degree that users feel the recommendations are a threat to their activities and places has clear and opposite effects on their intentions to comply and their beliefs about the control efforts. Although the research was not able conclusively to associate perceived threat with any particular activity or place, care must be taken to minimize the negative influence of activity threat. As perceived threats to activity are negatively correlated to perceived threats to place and to identity as a conservationist, a possible solution would be to highlight these positive identities and make them more salient. Messages that appeal to visitors' personal identification with local areas or New Zealand natural heritage in general may reduce the perception of the recommendations as a threat to their activities. Another

strategy would be to include user groups in management as much as possible in ways that portray the activities as part of the solution rather than a problem. For example, efforts to include recreational hunters in pig eradication should be continued and publicized in the hunting community. Outdoor groups should be encourage to become more involved in track and cleaning station maintenance. Greater emphasis could also be placed on asking all visitors to report diseased kauri or stations in need of maintenance. Whether or not the additional reports are of use would be less important than providing a clear and easy way for people to become involved positively in control efforts.

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Appendix: Correlation Tables

Correlations: beliefs and attitudes to cleaning station use.

		CLEANINTENT	CLEANRIGHT	CLEANEFFEC	KAURIIMP	KAURIPRO	CLEANOVER	CLEANMOST	CLEANCARE	CLEANPRESS	CLEANEASY	CLEANBAD	CLEANEXT
CLEANINTENT "I intend to use the cleaning stations every time I see them."	Correlation Coefficient	1.000	.734**	.277**	.380**	.348**	.682**	.235**	.526**	.069	.645**	-.517**	.458**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000	.064	.000	.000	.000
	N	743	741	734	735	734	732	728	731	725	729	729	729
CLEANRIGHT "Using the cleaning stations is the right thing to do."	Correlation Coefficient	.734**	1.000	.342**	.354**	.395**	.688**	.183**	.476**	.050	.648**	-.472**	.518**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000	.180	.000	.000	.000
	N	741	741	732	733	732	730	726	730	723	727	727	727
CLEANEFFEC "Using the cleaning stations every time will prevent the spread of kauri dieback"	Correlation Coefficient	.277**	.342**	1.000	.212**	.215**	.320**	.276**	.301**	.042	.295**	-.269**	.251**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	.261	.000	.000	.000
	N	734	732	734	728	727	726	722	724	718	723	723	723
KAURIIMP "Stopping the spread of kauri dieback is important to me."	Correlation Coefficient	.380**	.354**	.212**	1.000	.664**	.435**	.065	.471**	.085*	.352**	-.314**	.285**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.077	.000	.022	.000	.000	.000
	N	735	733	728	736	734	732	729	731	726	728	727	727
KAURIPRO "Kauri trees should be protected from kauri dieback."	Correlation Coefficient	.348**	.395**	.215**	.664**	1.000	.470**	.075*	.413**	.103**	.363**	-.302**	.343**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.044	.000	.006	.000	.000	.000
	N	734	732	727	734	735	731	727	730	724	726	726	726
CLEANOVER "Overall, I think it is important to use the cleaning stations every time I see one."	Correlation Coefficient	.682**	.688**	.320**	.435**	.470**	1.000	.212**	.567**	.096**	.597**	-.475**	.495**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000	.010	.000	.000	.000
	N	732	730	726	732	731	733	725	728	722	724	725	724
CLEANMOST "I believe most other people use the cleaning stations every time."	Correlation Coefficient	.235**	.183**	.276**	.065	.075*	.212**	1.000	.357**	.124**	.306**	-.197**	.127**
	Sig. (2-tailed)	.000	.000	.000	.077	.044	.000	.	.000	.001	.000	.000	.001
	N	728	726	722	729	727	725	729	725	720	721	720	720
CLEANCARE "Most people I care about would expect me to use the cleaning stations every time."	Correlation Coefficient	.526**	.476**	.301**	.471**	.413**	.567**	.357**	1.000	.178**	.526**	-.403**	.357**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.	.000	.000	.000	.000
	N	731	730	724	731	730	728	725	732	723	724	724	724
CLEANPRESS "I feel pressure from others to use the cleaning stations every time."	Correlation Coefficient	.069	.050	.042	.085*	.103**	.096**	.124**	.178**	1.000	.080*	-.003	.084*
	Sig. (2-tailed)	.064	.180	.261	.022	.006	.010	.001	.000	.	.032	.936	.024
	N	725	723	718	726	724	722	720	723	726	720	719	720
CLEANEASY "It is easy for me to use the cleaning stations every time."	Correlation Coefficient	.645**	.648**	.295**	.352**	.363**	.597**	.306**	.526**	.080*	1.000	-.573**	.552**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.032	.	.000	.000
	N	729	727	723	728	726	724	721	724	720	731	728	727
CLEANBAD "Using the cleaning stations every time is impractical and inconvenient."	Correlation Coefficient	-.517**	-.472**	-.269**	-.314**	-.302**	-.475**	-.197**	-.403**	-.003	-.573**	1.000	-.428**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.936	.000	.	.000
	N	729	727	723	727	726	725	720	724	719	728	731	727
CLEANEXT "If I wanted to, I could easily use the cleaning station the next time I see one."	Correlation Coefficient	.458**	.518**	.251**	.285**	.343**	.495**	.127**	.357**	.084*	.552**	-.428**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.001	.000	.024	.000	.000	.
	N	729	727	723	727	726	724	720	724	720	727	727	731

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Correlations: beliefs and attitudes to track use.

		TRACKINTENT	TRACKRIGHT	TRACKEFFEC	KAURIIMP	KAURIPRO	TRACKOVER	TRACKMOST	TRACKCARE	TRACKPRESS	TRACKEASY	TRACKBAD	TRACKNEXT
TRACKINTENT "I intend to walk off the designated track when I visit kauri forests."	Correlation Coefficient	1.000	-.499**	-.252**	-.253**	-.309**	-.516**	-.071	-.419**	-.064	-.478**	.429**	-.377**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.055	.000	.088	.000	.000	.000
	N	740	736	729	733	732	730	730	726	722	730	729	727
TRACKRIGHT "Staying on designated tracks is the right thing to do."	Correlation Coefficient	-.499**	1.000	.463**	.362**	.376**	.767**	.168**	.572**	.148**	.586**	-.460**	.447**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	736	738	726	730	729	729	727	724	721	728	727	725
TRACKEFFEC "Walking off designated tracks will spread kauri dieback."	Correlation Coefficient	-.252**	.463**	1.000	.308**	.300**	.521**	.136**	.412**	.179**	.417**	-.325**	.277**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	729	726	731	726	725	723	724	719	715	724	724	721
KAURIIMP "Stopping the spread of kauri dieback is important to me."	Correlation Coefficient	-.253**	.362**	.308**	1.000	.664**	.429**	.091*	.357**	.091*	.286**	-.230**	.234**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.014	.000	.014	.000	.000	.000
	N	733	730	726	736	734	732	732	729	725	730	729	727
KAURIPRO "Kauri trees should be protected from kauri dieback."	Correlation Coefficient	-.309**	.376**	.300**	.664**	1.000	.466**	.109**	.345**	.106**	.362**	-.297**	.353**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.003	.000	.004	.000	.000	.000
	N	732	729	725	734	735	731	731	727	723	729	728	726
TRACKOVER "Overall, I think it is important to stay on designated tracks at all times."	Correlation Coefficient	-.516**	.767**	.521**	.429**	.466**	1.000	.257**	.646**	.147**	.632**	-.503**	.463**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000
	N	730	729	723	732	731	733	729	726	723	728	727	725
TRACKMOST "I believe most other people stay on designated tracks at all times."	Correlation Coefficient	-.071	.168**	.136**	.091*	.109**	.257**	1.000	.349**	.154**	.229**	-.168**	.107**
	Sig. (2-tailed)	.055	.000	.000	.014	.003	.000		.000	.000	.000	.000	.004
	N	730	727	724	732	731	729	733	726	721	727	726	724
TRACKCARE "Most people I care about would expect me to stay on designated tracks at all times."	Correlation Coefficient	-.419**	.572**	.412**	.357**	.345**	.646**	.349**	1.000	.241**	.577**	-.482**	.384**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	726	724	719	729	727	726	726	729	722	725	724	723
TRACKPRESS "I feel pressure from others to stay on designated tracks at all times."	Correlation Coefficient	-.064	.148**	.179**	.091*	.106**	.147**	.154**	.241**	1.000	.084*	-.028	.060
	Sig. (2-tailed)	.088	.000	.000	.014	.004	.000	.000	.000		.024	.460	.110
	N	722	721	715	725	723	723	721	722	725	721	720	719
TRACKEASY "It is easy for me to stay on designated tracks all times."	Correlation Coefficient	-.478**	.586**	.417**	.286**	.362**	.632**	.229**	.577**	.084*	1.000	-.607**	.577**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.024		.000	.000
	N	730	728	724	730	729	728	727	725	721	734	732	730
TRACKBAD "Staying on designated tracks at all times is impractical and inconvenient."	Correlation Coefficient	.429**	-.460**	-.325**	-.230**	-.297**	-.503**	-.168**	-.482**	-.028	-.607**	1.000	-.463**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.460	.000		.000
	N	729	727	724	729	728	727	726	724	720	732	733	729
TRACKNEXT "If I wanted to, I could easily stay on the track the next time I visit a kauri forest."	Correlation Coefficient	-.377**	.447**	.277**	.234**	.353**	.463**	.107**	.384**	.060	.577**	-.463**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.004	.000	.110	.000	.000	
	N	727	725	721	727	726	725	724	723	719	730	729	731

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

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Correlations: threat, knowledge and identities with beliefs and attitudes to cleaning station use.

		CLEANINTENT	CLEANRIGHT	CLEANEFFEC	KAURIIMP	KAURIPRO	CLEANOVER	CLEANMOST	CLEANCARE	CLEANPRESS	CLEANEASY	CLEANBAD	CLEANNEXT
THREATACT Combined scale of perceived threat to favourite activity	Correlation Coefficient	-.310	-.356	-.201	-.264	-.339	-.328	-.094	-.301	-.023	-.380	.427	-.319
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.013	.000	.544	.000	.000	.000
	N	720	718	714	717	716	714	710	714	710	717	718	718
THREATPLACE Combined scale of perceived threat to favourite place	Correlation Coefficient	.285	.219	.140	.432	.370	.262	.041	.234	.067	.244	-.271	.228
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.273	.000	.074	.000	.000	.000
	N	713	711	707	710	709	707	703	707	704	710	711	711
KNOWLEDGE Total number of correct knowledge answers.	Correlation Coefficient	.162	.158	-.154	.361	.243	.146	-.191	.155	.018	.106	-.117	.136
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.630	.004	.001	.000
	N	743	741	734	736	735	733	729	732	726	731	731	731
IDFCOROSCALE Combined scale of identification with the Coromandel kauri	Correlation Coefficient	.292	.167	.361	.509	.487	.358	.212	.462	.102	.229	.134	.057
	Sig. (2-tailed)	.029	.220	.006	.000	.000	.007	.117	.000	.456	.090	.326	.676
	N	56	56	56	56	56	56	56	56	56	56	56	56
IDFGBISCALE Combined scale of identification with Great Barrier Island kauri	Correlation Coefficient	-.112	.137	-.304	.665	.404	-.075	.181	.629	.426	-.099	-.139	.080
	Sig. (2-tailed)	.668	.599	.235	.004	.108	.773	.488	.007	.088	.706	.595	.760
	N	17	17	17	17	17	17	17	17	17	17	17	17
IDFHUNUASCALE Combined scale of identification with the Hunua Ranges kauri	Correlation Coefficient	.130	.020	-.082	.367	.146	.107	-.060	.106	.006	.129	-.012	.119
	Sig. (2-tailed)	.227	.856	.450	.000	.176	.321	.578	.328	.952	.230	.911	.274
	N	88	86	88	88	88	88	88	87	88	88	87	86
IDFNORTHSCALE Combined scale of identification with Northland kauri	Correlation Coefficient	-.054	-.127	.119	.155	.063	.034	.201	.309	.237	.166	-.096	.091
	Sig. (2-tailed)	.712	.385	.422	.298	.675	.820	.181	.037	.121	.283	.537	.558
	N	49	49	48	47	47	47	46	46	44	44	44	44
IDFTAWHASCALE Combined scale of identification with Tawharanui	Correlation Coefficient	.461		.174	-.134	.033	.038	.532	.190	-.052	.229	-.077	-.021
	Sig. (2-tailed)	.154		.610	.696	.922	.911	.092	.575	.878	.499	.821	.952
	N	11	11	11	11	11	11	11	11	11	11	11	11
IDFWAIHESCALE Combined scale of identification with Waiheke Island kauri	Correlation Coefficient	-.222	-.528	-.345	.197	-.113	-.528	-.412	-.399	-.040	-.390	.170	-.190
	Sig. (2-tailed)	.511	.095	.329	.561	.740	.095	.208	.224	.907	.235	.617	.575
	N	11	11	10	11	11	11	11	11	11	11	11	11
IDFWAITASCALE Combined scale of identification with the Waitakere Ranges kauri	Correlation Coefficient	.151	.126	-.087	.416	.300	.155	-.103	.196	.005	.100	-.080	.078
	Sig. (2-tailed)	.001	.008	.069	.000	.000	.001	.032	.000	.912	.037	.092	.102
	N	442	442	438	439	438	436	433	437	434	438	440	441
IDFALLSCALE Combined scale of identification with multiple forests	Correlation Coefficient	.280	.237	.162	.457	.320	-.008	.118	-.121	-.161	.229	-.309	.458
	Sig. (2-tailed)	.127	.200	.401	.011	.085	.967	.536	.523	.412	.232	.103	.014
	N	31	31	29	30	30	30	30	30	28	29	29	28
IDATRAMPSCALE Combined scale of identification with tramping	Correlation Coefficient	.052	-.009	-.013	.260	.134	.021	-.005	.118	.002	.023	.070	-.031
	Sig. (2-tailed)	.190	.738	.001	.000	.001	.598	.908	.003	.961	.557	.078	.444
	N	638	637	632	634	634	632	628	631	627	630	630	630
IDADOGWSCALE Combined scale of identification with dogwalking	Correlation Coefficient	.156	.065	.172	.281	.175	.002	.093	.230	-.053	.047	-.277	-.151
	Sig. (2-tailed)	.183	.581	.142	.015	.134	.988	.427	.047	.653	.688	.016	.196
	N	74	74	74	75	75	74	75	75	75	75	75	75
IDARUNSCALE Combined scale of identification with running	Correlation Coefficient	.241	.135	.031	.366	.310	.245	.008	.224	.221	.132	-.279	-.048
	Sig. (2-tailed)	.003	.104	.711	.000	.003	.003	.928	.007	.008	.113	.001	.564
	N	147	146	146	146	146	145	146	144	144	146	146	146
IDABIKESCALE Combined scale of identification with mountain biking	Correlation Coefficient	-.127	-.042	-.167	.099	.094	.020	-.020	.007	.302	-.073	.067	.039
	Sig. (2-tailed)	.289	.727	.161	.409	.433	.867	.869	.955	.011	.549	.579	.746
	N	72	70	72	72	72	72	72	70	70	70	71	71
IDAHUNTSCALE Combined scale of identification with hunting	Correlation Coefficient	.617	.165	.222	.453	.702	.540	.262	.893	.190	.808	.182	.307
	Sig. (2-tailed)	.043	.628	.512	.162	.016	.087	.437	.000	.598	.003	.591	.359
	N	11	11	11	11	11	11	11	11	10	11	11	11
IDAPICNICSCALE Combined scale of identification with picnicking	Correlation Coefficient	-.028	-.089	.160	.015	-.034	-.046	.189	.028	.012	-.035	.172	-.153
	Sig. (2-tailed)	.729	.267	.045	.855	.676	.567	.019	.732	.878	.658	.031	.054
	N	159	159	158	157	157	156	154	157	156	158	157	158
IDACAMPSCALE Combined scale of identification with camping	Correlation Coefficient	-.038	.070	.161	.130	.204	.028	.148	.212	.072	.065	-.086	-.045
	Sig. (2-tailed)	.745	.545	.171	.266	.079	.810	.205	.068	.541	.583	.471	.705
	N	76	76	74	75	75	75	75	75	74	73	73	74
IDAWORKSCALE Combined scale of identification with paid or volunteer work	Correlation Coefficient	-.123	.052	.172	.051	.301	.160	.057	.186	-.108	-.016	.020	-.004
	Sig. (2-tailed)	.548	.802	.410	.804	.134	.434	.782	.362	.608	.936	.923	.984
	N	26	26	25	26	26	26	26	26	25	26	26	25
IDAALLSCALE Combined scale of identification with multiple activities	Correlation Coefficient	.233	.247	.498	.498	.489	.391	.293	.556	.051	.345	-.411	.225
	Sig. (2-tailed)	.352	.322	.035	.042	.046	.121	.254	.020	.847	.176	.101	.384
	N	18	18	18	17	17	17	17	17	17	17	17	17
IDAOTHERSCALE Combined scale of identification with other activities	Correlation Coefficient	-.384	-.384	-.347	-.168	-.391	-.391	-.121	.217	.037	-.340	.032	.170
	Sig. (2-tailed)	.095	.095	.134	.479	.088	.088	.621	.357	.878	.154	.895	.474
	N	20	20	20	20	20	20	19	20	20	19	20	20

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Correlations: threat, knowledge and identities with beliefs and attitudes to track use.

		TRACKINTENT	TRACKRIGHT	TRACKEFFEC	KAURIIMP	KAURIPRO	TRACKOVER	TRACKMOST	TRACKCARE	TRACKPRESS	TRACKEASY	TRACKBAD	TRACKNEXT
THREATACT Combined scale of perceived threat to favourite activity	Correlation Coefficient	.330**	-.353**	-.255**	-.264**	-.339**	-.361**	-.136**	-.345**	.011	-.423**	.481**	-.391**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.769	.000	.000	.000
	N	719	716	711	717	716	715	714	713	709	720	719	718
THREATPLACESCALE Combined scale of perceived threat to favourite place	Correlation Coefficient	-.172**	.182**	.237**	.432**	.370**	.225**	.054	.215**	.045	.185**	-.236**	.152**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.150	.000	.234	.000	.000	.000
	N	712	709	704	710	709	708	707	706	702	713	712	712
KNOWLEDGE Total number of correct knowledge answers.	Correlation Coefficient	-.144**	.122**	.100**	.361**	.243**	.089*	-.075*	.066	-.004	.072*	-.045	.052
	Sig. (2-tailed)	.000	.001	.007	.000	.000	.016	.042	.077	.912	.050	.228	.158
	N	740	738	731	736	735	733	733	729	725	734	733	731
IDFCOROSCALE Combined scale of identification with the Coromandel kauri	Correlation Coefficient	-.219	.395**	.334*	.509**	.487**	.438**	.202	.351**	.289*	.223	-.094	.207
	Sig. (2-tailed)	.105	.003	.012	.000	.000	.001	.135	.008	.031	.098	.489	.125
	N	56	56	56	56	56	56	56	56	56	56	56	56
IDFGBISCALE Combined scale of identification with Great Barrier Island kauri	Correlation Coefficient	-.202	.093	.130	.665**	.404	.057	.442	.449	.380	-.341	-.081	.109
	Sig. (2-tailed)	.437	.723	.618	.004	.108	.827	.075	.070	.132	.180	.758	.678
	N	17	17	17	17	17	17	17	17	17	17	17	17
IDFHUNUASCALE Combined scale of identification with the Hunua Ranges kauri	Correlation Coefficient	-.216*	.060	.150	.367**	.146	.077	.067	.161	-.011	.123	-.111	.079
	Sig. (2-tailed)	.044	.578	.165	.000	.176	.474	.535	.136	.920	.253	.301	.470
	N	88	88	87	88	88	88	88	87	88	88	88	85
IDFNORTHSCALE Combined scale of identification with Northland kauri	Correlation Coefficient	-.156	-.009	-.037	.155	.063	.048	.067	.144	.207	-.002	-.023	-.180
	Sig. (2-tailed)	.289	.951	.804	.298	.675	.754	.654	.346	.177	.991	.882	.244
	N	48	48	47	47	47	46	45	45	44	43	43	44
IDFTAWHASCALE Combined scale of identification with Tawharanui	Correlation Coefficient	-.636*	-.223	-.025	-.134	.033	-.033	.743**	.029	-.223	.052	.084	-.021
	Sig. (2-tailed)	.035	.510	.943	.696	.922	.924	.009	.932	.509	.879	.807	.952
	N	11	11	11	11	11	11	11	11	11	11	11	11
IDFWAIHESCALE Combined scale of identification with Waiheke Island kauri	Correlation Coefficient	.473	-.269	-.092	.197	-.113	-.054	-.132	-.298	.213	-.385	.630*	-.501
	Sig. (2-tailed)	.142	.425	.787	.561	.740	.875	.698	.373	.554	.243	.038	.116
	N	11	11	11	11	11	11	11	11	10	11	11	11
IDFWAITASCALE Combined scale of identification with the Waitakere Ranges kauri	Correlation Coefficient	-.050	.154**	.014	.416**	.300**	.120*	-.048	.104*	-.030	-.018	-.019	.033
	Sig. (2-tailed)	.296	.001	.772	.000	.000	.012	.320	.029	.534	.705	.689	.488
	N	440	439	435	439	438	437	436	437	433	442	442	442
IDFALLSCALE Combined scale of identification with multiple forests	Correlation Coefficient	-.226	.160	.201	.457*	.320	.173	.087	-.002	-.051	.132	-.040	.030
	Sig. (2-tailed)	.222	.397	.286	.011	.085	.360	.649	.991	.793	.494	.837	.881
	N	31	30	30	30	30	30	30	28	29	29	29	28
IDATRAMPSCALE Combined scale of identification with tramping	Correlation Coefficient	.014	.096*	.061	.260**	.134*	.086*	.034	.102*	.008	-.026	.038	-.011
	Sig. (2-tailed)	.719	.015	.127	.000	.001	.031	.398	.011	.847	.514	.337	.774
	N	636	635	628	634	634	633	631	628	624	633	632	630
IDADOGWSCALE Combined scale of identification with dogwalking	Correlation Coefficient	.039	-.046	-.110	.281*	.175	-.003	.032	.129	-.050	.002	.014	-.210
	Sig. (2-tailed)	.742	.696	.351	.015	.134	.979	.785	.271	.673	.984	.907	.071
	N	74	74	74	75	75	75	75	75	75	75	75	75
IDARUNSCALE Combined scale of identification with running	Correlation Coefficient	-.197*	.197*	.185*	.366**	.310**	.302**	.155	.244*	.147	.133	-.179	.043
	Sig. (2-tailed)	.017	.017	.026	.000	.000	.000	.062	.003	.078	.109	.031	.607
	N	147	147	145	146	146	145	146	144	144	146	146	146
IDABIKESCALE Combined scale of identification with mountain biking	Correlation Coefficient	-.041	-.034	-.035	.099	.094	.037	.075	-.169	.361**	-.088	.082	.038
	Sig. (2-tailed)	.729	.780	.772	.409	.433	.759	.532	.162	.002	.464	.495	.751
	N	72	72	72	72	72	72	72	70	71	71	71	71
IDAHUNTSCALE Combined scale of identification with hunting	Correlation Coefficient	-.136	.762**	.530**	.453*	.702**	.703**	.463	.067	-.024	.512	.358	.485*
	Sig. (2-tailed)	.691	.010	.094	.162	.016	.016	.151	.846	.945	.107	.280	.131
	N	11	10	11	11	11	11	11	11	11	11	11	11
IDAPICNICSCALE Combined scale of identification with picnicking	Correlation Coefficient	.017	.065	.094	.015	-.034	.098	.165*	.190*	.084	-.097	.026	-.065
	Sig. (2-tailed)	.834	.415	.242	.855	.676	.221	.039	.017	.295	.225	.742	.417
	N	158	158	157	157	157	157	157	157	156	157	157	158
IDACAMPSCALE Combined scale of identification with camping	Correlation Coefficient	-.115	-.002	-.057	.130	.204	.010	.135	.185	.042	.082	-.143	-.035
	Sig. (2-tailed)	.326	.987	.627	.266	.079	.932	.249	.115	.724	.487	.225	.770
	N	75	75	74	75	75	75	75	74	74	74	74	73
IDAWORKSCALE Combined scale of identification with paid or volunteer work	Correlation Coefficient	-.327	.187	-.096	.051	.301	.245	.029	.318	.183	.216	-.386	.177
	Sig. (2-tailed)	.110	.371	.642	.804	.134	.249	.889	.121	.380	.290	.052	.397
	N	25	25	26	26	26	24	26	25	25	26	26	25
IDAALLSCALE Combined scale of identification with multiple activities	Correlation Coefficient	.494*	.576*	.215	.498*	.489*	.555*	.341	.726**	.103	.573*	-.636**	.539*
	Sig. (2-tailed)	.037	.012	.391	.042	.046	.021	.181	.001	.695	.016	.006	.026
	N	18	18	18	17	17	17	17	17	17	17	17	17
IDAOTHERSCALE Combined scale of identification with other activities	Correlation Coefficient	.554*	-.135	-.035	-.168	-.391	-.407	-.230	-.285	.121	-.205	.217	-.254
	Sig. (2-tailed)	.011	.570	.884	.479	.088	.075	.330	.223	.612	.386	.358	.279
	N	20	20	20	20	20	20	20	20	20	20	20	20

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).