

Research

The role of hope and conservation attitudes in current conservation actions and future conservation intentions

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Received: 26 August 2023 / Accepted: 18 January 2024

Published online: 23 January 2024

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Abstract

Current community-led conservation (CLC) actions support present and future biodiversity. Present-day conservation volunteer efforts are measurable; however, future CLC activity is uncertain. Understanding what motivates volunteers to take part in CLC activities is therefore essential. This study investigates the relationships between hope, conservation attitudes, current conservation action, and future conservation intention. We use Snyder's adult hope state scale to explore the relationship between hope, conservation attitudes, self-reported current conservation actions, and future conservation intentions (planting, weeding, predator control) of 243 adult Aotearoa New Zealand participants. The relationship of hope and conservation attitudes to current conservation action and future conservation intention is complex. Specifically, hope relates to future conservation intention but is not associated with current conservation action. Furthermore, hope negatively correlated with intending volunteer belief that nature could heal itself. Volunteers with future conservation intentions hold conservation attitudes that actively connect people to nature and other people and show commitment to the natural world. Intending volunteers also feel able to help others learn about the natural world, value scientific and technological interventions, and the relative importance of individual effort, teamwork, and collaboration. Volunteers currently active in conservation solely held attitudes of connection to nature, connection to other people, commitment to the natural world, and helping others learn about the natural world. Understanding what motivates volunteers to undertake conservation action is critical to designing sustainable CLC projects that deliver positive outcomes for biodiversity in the long term.

1 Introduction

Global biodiversity change is one of the most pressing environmental issues of our time [1]. Community-led conservation (CLC) group biodiversity restoration efforts reduce biodiversity decline [2–4]. Successful biodiversity restoration entails planned, sustained actions, including controlling invasive alien species (IAS) (e.g., possums, rats, mustelids, and feral cats), planting endemic species, and removing invasive exotic plants (weeding). Consequently, CLC group members are active predator controllers, planters, and weeders [5–9]. Without future commitment by individuals to the long-term sustainability of present-day conservation actions, CLC achievements, by implication, are uncertain. Despite such uncertainty, conservation volunteers, who may neither see nor experience the results of their actions,

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s43621-024-00186-6>.

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continue investing time, commitment, and effort. It is important to understand what motivates CLC volunteers to undertake conservation actions now and what might motivate them to act in the future. Understanding ways of improving the long-term sustainability of CLC are vital in stemming worldwide biodiversity decline [10].

Encouraging and sustaining conservation volunteer efforts is important but understanding how to do so is complicated. Joy [11] describes volunteering as “a sustained and planned behaviour that entails enduring psychological traits”. While Long et al. [12] has identified volunteering as a relatively modest predictor of an individual’s subsequent hope. Correlations have been identified between action, attitudes, and hope levels of individuals, e.g., those with schizophrenia [13].

Conservation volunteers are motivated to act through a variety of psychological and physical connections to the natural world, including a sense of community based on shared environmental values, nature connectedness and willingness to engage, positive childhood experiences of the natural world, opportunities to increase individual wellbeing, and, for some, career development [14–21].

While motivations underlying volunteer actions for nature vary, common conservation attitudes may exist, including the importance of conserving nature, personal connection to nature, socialising with those with similar interests, and improving areas that volunteers use for their own recreation [14, 16, 22, 23]. Conservation attitudes tend to be future-focussed, for example, supporting future nature-based recreational and social activities through environmental conservation actions. Thus, anticipatory psychological traits, such as hope may support a person’s willingness to get involved in conservation volunteering. Hope has been described variously as an emotion, a cognition, and an attitude [24–26]. As defined in Snyder’s Theory of Hope, hope is a cognitive-motivational process contributing to goal achievement by addressing barriers through agency and pathways thinking [27, 28]. A hopeful individual approaches goal attainment by combining a belief in their ability to initiate and sustain actions (agency, i.e., willpower) with the knowledge and capability necessary to generate multiple means of overcoming barriers (pathways thinking i.e., waypower) to reach their goals [27, 29]. CLC biodiversity restoration actions are goal-directed. Consequently, hope’s willpower and waypower constructs may influence current and future CLC biodiversity restoration behaviours.

Snyder’s Hope Theory suggests two hope types, domain-specific (Dispositional) and domain-general (State). The former, domain-specific hope, where much of previous work on environmental action and hope has occurred, measures action and hope in relation to the environment or climate change mitigation behaviours [30, 31]. State hope, in contrast, measures how hopeful participants feel in general, not about a specific area of concern [32, 33]. Biodiversity restoration entails non-trivial current and future-focussed problem-solving efforts (e.g., choosing appropriate planting areas, controlling weeds, preventing IAS reinvasions). These activities attract volunteers knowledgeable and practiced in conservation efforts [9, 16] as well as those without such prior experience [34]. Thus, investigating general rather than specific hope may help determine the role of hope among the general population in terms of current conservation action and future conservation intention [30, 35].

Snyder’s State Hope Scale has been internationally validated across different socio-demographics and translated into numerous languages [36, 37]. Various hope-associated relationships providing personal and social benefits have been explored, including academic prowess [29, 38, 39], problem-solving [40, 41], commitment to physical exercise [41, 42], childhood nature connection [32], and climate change activism [43–45]. Greater hope levels relate to adolescent environmental engagement, pro-environmental behaviours, and subjective well-being [45, 46]. The impact of hope has also been demonstrated through increased climate change education communications and climate action engagement [30, 44, 47]. Other research supports associations between hope and future climate action intentions. For example, climate action intention among informal science learning centre visitors, persuasive climate change communication, environmental studies, cause-related future charity events and entrepreneurial intention [32, 47–51], as well as hope literature more broadly [28, 52].

According to Snyder [29] p251], hopeful thinking “necessitates both pathways and agency thought... they feed each other.” Snyder’s Adult State Hope Scale (ASHS) [53] is an instrument that measures Snyder’s cognitive model of hope on two subscales, (1) agency, which is energy directed towards goals, and (2) pathways, which is associated with planning to accomplish goals, that are then combined to measure an individual level of hope. A review of hope literature indicates that agency and pathways thinking, while distinct constructs, are strongly correlated [30, 54]. Previous work on environmental action has measured hope among those already engaged in environmental and climate change action [55, 56]. While some research has found that agency and pathways are two distinct but strongly correlated constructs related to an individual’s level of hope [27, 54, 57, 58], other research has found agency and pathways to be indistinct, with hope considered a single unidimensional construct [59–61].

Other researchers have suggested hope's cognitive components (e.g., expectations, assumptions, anticipatory planning) may provide emotional buffering in negative situations [62–65]. Van Zomeren et al.'s climate change action research [66] expands this approach by proposing two hope-related coping functions: one emotion-focused, the other concerned with problem-solving. Such functions appear to support the individual's resilience in negative situations. While biodiversity restoration is increasingly considered a vital aspect of climate change action [67], the relationships between hope, conservation attitudes, current conservation action, and future conservation intention in adults remain under-investigated [56].

Within the Aotearoa New Zealand context we herein explore hope's relation to conservation attitudes (thoughts framing current and future engagement related to the natural world), current conservation action, and future conservation intention. We hypothesise that: (1) Hope will positively correlate with conservation attitudes, (2) Hope and conservation attitudes will relate to current conservation action, and (3) Hope and conservation attitudes will associate with future conservation intention.

2 Methods

2.1 Survey design

A face-to-face digital survey was conducted at various public locations in the Bay of Islands, Aotearoa New Zealand, between December 2019 and February 2020. A convenience sample of every tenth adult (over 18 years) was invited to take part. Following any refusal to participate, the next tenth person was approached. This approach was conducted to limit potential response bias regarding families and social groups. Of the 246 Aotearoa New Zealand resident adults approached, 243 completed an 8-min survey. The introductory description invited participants to complete a short survey designed to improve understanding of the relationships between hope, conservation attitudes, and conservation action. Specifically, the survey assessed participant self-reported levels of hope, conservation attitudes, whether they currently undertook specific conservation actions (e.g., planting, weeding, or predator control), and whether they intended to undertake these actions in the future.

The survey incorporated six hope items from the Adult State Hope Scale [53] (see Supplemental Appendix 1) of which three assessed agency thinking (for example, "At this time, I am meeting the goals I have set for myself") and three pathway items (for example, "I can think of many ways to reach my current goals"). The survey also incorporated 12 conservation attitudes that have previously been identified as relevant for how people think about the current-day and future environment in Aotearoa New Zealand [23]. Hope and attitude items were measured using an 8-point Likert scale from "Definitely false" to "Definitely true". Participants indicated how much they agreed with twelve conservation attitude items [23] (Table 1) and their current self-reported conservation actions and future conservation intentions.

The conservation actions/intentions (e.g., planting, weeding, and predator control) were those most commonly associated with Aotearoa New Zealand CLC efforts [9]. All three conservation actions/intentions were open to interpretation by the survey participants. Weeding, for example, could be in their own private garden or on public reserves as CLC group

Table 1 Conservation attitude items [23]

Conservation attitude items	
1	I feel connected to the natural world
2	I feel connected to other people
3	The actions of the individual are important for the future of the natural world
4	The actions of groups are important for the future of the natural world
5	I am committed to looking after the natural world
6	Looking after the natural world takes effort
7	There is always more to learn about the natural world
8	I can help others learn about the natural world
9	I believe that nature will heal itself
10	I believe nature needs our help to heal
11	I believe that science and technology are important for finding solutions to future problems
12	I believe teamwork and collaboration are important for finding solutions to future problems

volunteers. Thus survey conservation action/intention questions recorded CLC-compatible participant behaviours. Participant socio-economic information was also collected (Supplemental Appendix 1). This research was approved by the Auckland University of Technology Ethics Committee (AUTEC Reference number 18/406).

2.2 Data analysis

To evaluate the factorability of the Adult State Hope Scale (ASHS) questionnaire, Kaiser–Meyer–Olkin and Bartlett’s test of sphericity were conducted using Jamovi v2.3 [68]. Construct validity of the instrument was explored via Exploratory Factor Analysis (Extraction = Maximum Likelihood; Rotation = Oblimin) with Horn’s parallel analysis, using Jamovi. Confirmatory Factor Analysis was conducted in Jamovi to verify dimensionality, adopting root mean square error of approximation (RMSEA) and comparative fit index (CFI) as measures of model fit. The Cronbach’s alpha coefficient was subsequently used to assess internal consistency of the ASHS items.

Non-parametric Spearman’s rank correlation determined the relationships and effect sizes among participants’ hope levels and conservation attitudes; correlations were considered statistically significant at $p < 0.004$ following Bonferoni adjustment for hope-based comparisons. Principal Component Analysis (PCA) enabled visual assessment of the major sources of variation in participant responses. PCA uses the correlation matrix of the variables as input then reduces a high number of interrelated variables into a smaller set of linearly uncorrelated variables while preserving as much variance as possible in the original dataset [68–72]. Projection of the data matrix onto a lower-dimensional space can help understand the correlation structure among the original variables and discern trends and patterns in the data. Non-parametric Mann–Whitney tests determined whether differences in participants’ hope, and conservation attitudes are associated with current conservation actions and future conservation intentions (i.e., planting, weeding, and predator control). The independent variables were binary-coded actions; the dependent variables were the Likert scale attitudes. Fisher’s exact tests of independence examined the relationships between current conservation action and future conservation intention. Unless stated otherwise, data were analysed with XLSTAT v2020.5.1 [73].

3 Results

For the Adult State Hope Scale (ASHS) questionnaire, the Kaiser–Meyer–Olkin value of 0.895 indicated suitable sample adequacy and the Bartlett’s test of sphericity value was significant ($\chi^2 = 763$; $df = 15$; $p < 0.001$); evidencing appropriateness for Exploratory Factor Analysis (EFA). Construct validity of the instrument via EFA solved a unidimensional structure. Confirmatory Factor Analysis verified this dimensionality (one factor model: RMSEA = 0.08, CFI = 0.98; two factor model: RMSEA = 0.09, CFI = 0.98). Based on analysis of this study’s particular data, a single construct of hope was established which combines agency and pathways thinking. The internal consistency (Cronbach’s $\alpha = 0.96$) of the ASHS items in an Aotearoa New Zealand context indicated good reliability.

Hope was positively correlated with all but one of the conservation attitudes investigated, sharing between a third and two-thirds of their variance (Table 2). The remaining conservation attitude item, “I believe that nature will heal itself”, was negatively correlated with hope ($r_s = -0.326$, $p < 0.001$) (Table 2). The sole conservation attitude item that did not correlate with hope related to a person’s belief that they can help others learn about the natural world ($r_s = 0.155$, $p < 0.05$).

Principal component analysis of the hope and attitude data revealed how participants clustered based on the similarity/dissimilarity of their responses to the survey questions (Fig. 1).

The first two principal components captured 57.81% of the variation, and the overlaid loadings uncovered three natural groupings (represented by manually input indicative ellipses) based on the underlying correlation structure (Fig. 1). Group I consisted of a single attitude, “nature will heal itself”, and stood apart from Groups II and III. The greater than 90° angle between this attitude and those in Group III (including hope score and “nature needs our help to heal”) indicate negative associations [74]. Group II attitudes that shared correlation structure comprised those associated with commitment and connection to the natural world and other people, and helping others learn about the natural world. Group II attitudes appeared to have limited association with the hope score.

Group III loadings were primarily responsible for the scores’ variation and positively associated attitudes involving ongoing learning, scientific and technological approaches, and individual action. Attitudes closely associated with the hope score were teamwork and collaboration, nature needing our help, the belief that such help is effortful, and the importance of group action for the future of the natural world.

Table 2 Spearman rank correlations (r_s) among hope and conservation attitudes

Participant response variables		A	1	2	3	4	5	6	7	8	9	10	11
Hope	A Hope score	–											
Conservation attitudes	1 I feel connected to the natural world	0.33 ^{***}	–										
	2 I feel connected to other people	0.49 ^{***}	0.50 ^{***}	–									
	3 The actions of individuals are important for the future of the natural world	0.54 ^{***}	0.32 ^{***}	0.35 ^{***}	–								
	4 The actions of groups are important for the future of the natural world	0.59 ^{***}	0.33 ^{***}	0.36 ^{***}	0.61 ^{***}	–							
	5 I am committed to looking after the natural world	0.34 ^{***}	0.52 ^{***}	0.51 ^{***}	0.39 ^{***}	0.31 ^{***}	–						
	6 Looking after the natural world takes effort	0.51 ^{***}	0.27 ^{***}	0.34 ^{***}	0.40 ^{***}	0.49 ^{***}	0.24 ^{***}	–					
	7 There is always more to learn about the natural world	0.54 ^{***}	0.24 ^{***}	0.23 ^{***}	0.49 ^{***}	0.54 ^{***}	0.22 ^{***}	0.54 ^{***}	–				
	8 I can help others learn about the natural world	0.15 [*]	0.47 ^{***}	0.45 ^{***}	0.21 ^{**}	0.01	0.52 ^{***}	0.08	0.06	–			
	9 I believe that nature will heal itself	–0.33 ^{***}	0.14 [*]	0.03	–0.11	–0.21 ^{**}	0.14 [*]	–0.11	–0.16 [*]	0.24 ^{***}	–		
	10 I believe nature needs our help to heal	0.55 ^{***}	0.25 ^{***}	0.42 ^{***}	0.44 ^{***}	0.57 ^{***}	0.32 ^{***}	0.50 ^{***}	0.39 ^{***}	0.18 ^{**}	–0.23 ^{***}	–	
	11 I believe that science and technology are important for finding solutions to future problems	0.62 ^{***}	0.19 ^{**}	0.36 ^{***}	0.48 ^{***}	0.62 ^{***}	0.28 ^{***}	0.42 ^{***}	0.44 ^{***}	0.01	–0.26 ^{***}	0.56 ^{***}	–
	12 I believe teamwork and collaboration are important for finding solutions to future problems	0.57 ^{***}	0.30 ^{***}	0.38 ^{***}	0.51 ^{***}	0.53 ^{***}	0.29 ^{***}	0.57 ^{***}	0.44 ^{***}	0.16 [*]	–0.15 [*]	0.50 ^{***}	0.48 ^{***}

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

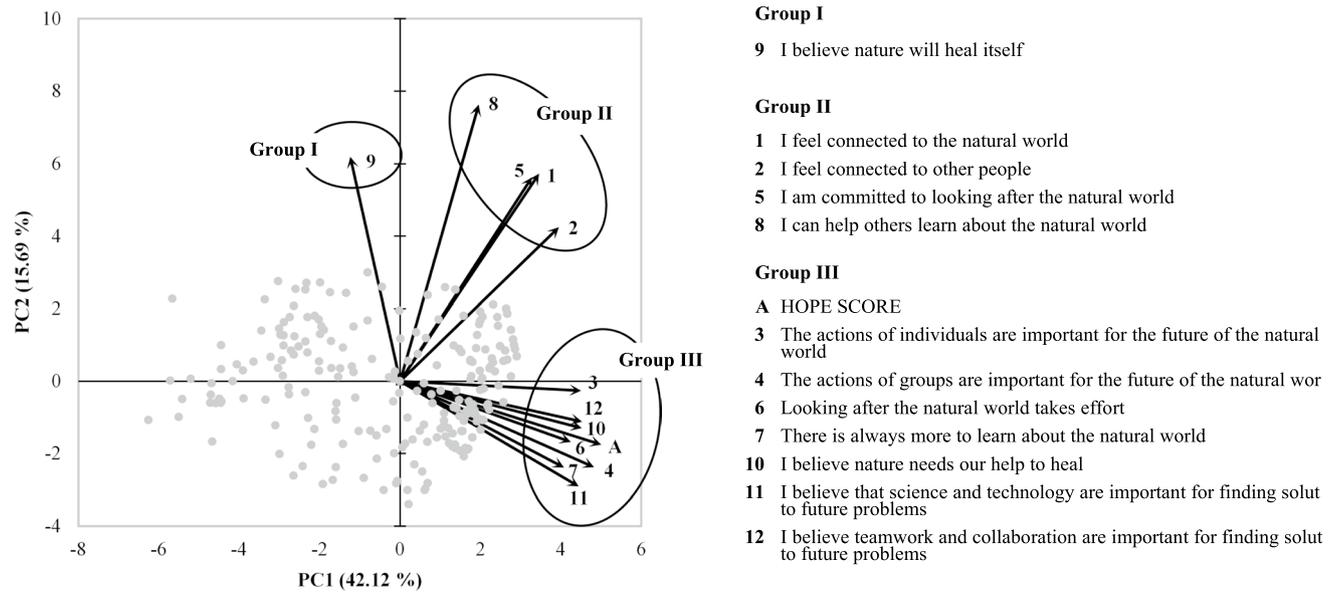


Fig. 1 Biplot of the principal components analysis (PC1 vs PC2) describing variation in the scores and relationships between loadings (i.e. participants' hope and conservation attitudes)

Relationships between participants' current or intended conservation involvement with their hope scores and conservation attitudes were assessed (Table 3). Hope scores were similar between those who do current conservation actions and those who do not currently perform a conservation action (Mann–Whitney U tests; p -values > 0.05). However, those who currently plant, weed, or control predators generally had more positive attitudes towards connection with other people, connection and commitment to the natural world, and helping others learn (Mann–Whitney U tests; p -values < 0.05).

In contrast, respondents with conservation intentions had higher hope scores on average than those without such goals (Mann–Whitney U tests; p -values < 0.001) (Table 3). Furthermore, those with intent to act generally had more positive attitudes across almost all attitude items (Mann–Whitney U tests; p -values < 0.05) (Table 3). Interestingly, regardless of participants' current conservation actions or future conservation intentions, the belief that “nature will heal itself” received the lowest survey-wide score.

Fisher's exact tests of independence were performed on a series of 2×2 contingency tables (Table 4) to examine pairwise relationships between current conservation actions (planting, weeding, predator control) and the future intention to act within these areas. Relationships between all variables were significant (Fisher's p -values < 0.001), demonstrating that people who currently undertake conservation actions also intend to undertake conservation actions in the future.

While around 49% of respondents currently undertake planting activities, 59% stated they intend to plant in the future (Table 4). Similarly, 51% of respondents currently weed while 60% intend to weed in the future, and 41% of respondents currently undertake predator control, while 46% intend to undertake predator control. These findings suggest that respondents intend to undertake more conservation actions in the future than they are currently undertaking.

Approximately 8–10% of respondents who do not currently plant intend to plant, weed, or control predators in the future. Of those who do not currently weed, 10% intend to weed in the future, 15% intend to plant, and 9% intend to control predators. Of those who do not currently control predators, only 9% intend to control predators in the future, while 38% intend to plant and 33% intend to weed in the future.

4 Discussion

Our intention was to understand whether hope and conservation attitudes relate to specific goal-directed biodiversity restoration behaviours as current conservation actions or future conservation intentions. The research was situated at a single timepoint thus providing a snapshot of correlations within a population of actual and potential biodiversity restoration volunteers at the between-person level. This research was a preliminary approach to understanding these potentially complex relationships. Future conservation intentions were shown to relate to hope as well as a number

Table 3 Comparisons of participant hope metric and conservation attitudes based on self-reported current conservation actions and future conservation intentions in terms of planting, weeding, and predator control

		Planting						Weeding						Predator control					
		Current		Intended		No		Current		Intended		No		Current		Intended		No	
		Yes	No	Yes	No	Yes	No	Yes	No										
Hope	A	37.5 (6.7)	37.7 (8.9)	42.2 (7.0)	36.3 (9.3)	37.7 (7.2)	37.9 (8.9)	42.4 (6.8)	36.3 (9.3)	40.9 (7.3)	39.4 (8.6)	42.5 (6.5)	38.3 (8.8)						
		$p=0.529$		$p<0.0001$		$p=0.588$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p=0.0001$		$p=0.0001$	
Conser- vation attitudes	I feel connected to the natural world	6.8 (1.3)	6.1 (1.3)	7.1 (1.1)	5.8 (1.2)	6.8 (1.3)	6.1 (1.3)	7.2 (1.0)	5.7 (1.3)	7.1 (1.0)	6.4 (1.3)	7.4 (0.9)	6.2 (1.3)						
		$p<0.0001$		$p<0.0001$		$p=0.002$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$	
	I feel connected to other people	6.4 (1.6)	5.7 (1.8)	6.8 (1.2)	5.3 (1.8)	6.3 (1.6)	5.6 (1.7)	6.9 (1.2)	5.2 (1.8)	6.7 (1.2)	6.1 (1.6)	7.0 (1.2)	5.9 (1.7)						
		$p=0.040$		$p<0.0001$		$p=0.027$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$	
	The actions of the individual are important for the future of the natural world	7.0 (1.7)	6.9 (1.6)	7.5 (1.1)	6.3 (1.9)	7.0 (1.7)	6.8 (1.6)	7.5 (1.1)	6.5 (1.8)	7.2 (1.5)	7.2 (1.4)	7.5 (1.1)	6.9 (1.6)						
		$p=0.442$		$p<0.0001$		$p=0.433$		$p<0.0001$		$p=0.433$		$p<0.0001$		$p=0.0003$		$p=0.0003$		$p=0.0003$	
	The actions of groups are important for the future of the natural world	6.9 (1.5)	6.7 (1.9)	7.4 (1.3)	6.1 (2.0)	7.0 (1.4)	6.6 (1.9)	7.5 (1.2)	6.2 (2.0)	7.3 (1.1)	6.9 (1.8)	7.5 (1.2)	6.7 (1.8)						
		$p=0.887$		$p<0.0001$		$p=0.301$		$p<0.0001$		$p=0.301$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$	
	I am committed to looking after the natural world	6.4 (2.0)	5.8 (1.5)	6.9 (1.4)	5.8 (1.3)	6.6 (1.7)	5.7 (1.6)	7.0 (1.4)	5.8 (1.5)	7.0 (1.3)	6.1 (1.5)	7.1 (1.4)	6.2 (1.4)						
		$p=0.013$		$p<0.0001$		$p=0.001$		$p<0.0001$		$p=0.001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$	
	Looking after the natural world takes effort	7.1 (1.5)	7.1 (1.4)	7.7 (0.8)	6.8 (1.8)	7.2 (1.4)	7.2 (1.4)	7.7 (0.8)	6.9 (1.7)	7.4 (1.3)	7.3 (1.3)	7.7 (0.8)	7.2 (1.5)						
		$p=0.842$		$p<0.0002$		$p=0.815$		$p<0.0001$		$p=0.815$		$p<0.0001$		$p=0.006$		$p=0.006$		$p=0.006$	
	There is always more to learn about the natural world	7.4 (1.3)	7.1 (1.5)	7.7 (0.7)	6.7 (1.9)	7.4 (1.2)	7.2 (1.4)	7.7 (0.7)	6.8 (1.8)	7.5 (1.2)	7.4 (1.2)	7.8 (0.7)	7.2 (1.5)						
		$p=0.567$		$p<0.0001$		$p=0.438$		$p<0.0001$		$p=0.438$		$p<0.0001$		$p=0.0005$		$p=0.0005$		$p=0.0005$	
	I can help others learn about the natural world	6.9 (1.4)	5.3 (2.0)	6.8 (1.3)	5.1 (2.1)	6.7 (1.4)	5.3 (2.0)	7.0 (1.1)	5.0 (2.1)	7.0 (1.1)	6.0 (1.6)	7.1 (1.2)	5.8 (1.9)						
		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$		$p<0.0001$	
	I believe that nature will heal itself	5.5 (1.9)	3.6 (2.3)	4.4 (2.2)	3.6 (2.3)	5.5 (1.8)	3.5 (2.2)	4.4 (2.2)	3.6 (2.3)	4.8 (2.1)	3.8 (2.2)	4.7 (2.2)	3.8 (2.3)						
		$p<0.0001$		$p=0.065$		$p<0.0001$		$p=0.043$		$p=0.043$		$p=0.006$		$p=0.006$		$p=0.006$		$p=0.006$	
	I believe nature needs our help to heal	6.7 (1.8)	6.8 (1.8)	7.5 (1.2)	6.3 (1.9)	6.9 (1.5)	6.8 (1.8)	7.5 (1.1)	6.4 (2.0)	7.5 (1.0)	7.0 (1.6)	7.5 (1.2)	6.9 (1.3)						
		$p=0.789$		$p<0.0001$		$p=0.793$		$p<0.0001$		$p=0.793$		$p<0.0001$		$p=0.001$		$p=0.001$		$p=0.001$	

Table 3 (continued)

Participant response variables	Planting		Weeding		Predator control	
	Current		Current		Current	
	Yes	No	Yes	No	Yes	No
I believe that science and technology are important for finding solutions to future problems	6.7 (1.3)	6.9 (1.3)	6.8 (1.3)	6.9 (1.3)	7.2 (1.2)	7.1 (1.2)
	$p = 0.332$	$p = < 0.0001$	$p = 0.792$	$p = < 0.0002$	$p = < 0.0002$	$p = 0.013$
I believe teamwork and collaboration are important for finding solutions to future problems	7.1 (1.3)	6.8 (1.5)	7.1 (1.3)	6.8 (1.4)	7.5 (1.0)	7.1 (1.3)
	$p = 0.484$	$p = < 0.0001$	$p = 0.310$	$p = < 0.0001$	$p = < 0.0001$	$p = 0.001$

Data represents group means (\pm SD) with the corresponding p -value (Mann–Whitney U tests) centred below each pair

Table 4 Cross-tabulation of current conservation actions (planting, weeding, and predator control) and future conservation intentions (planting, weeding, and predator control)

			Future conservation intention					
			Planting		Weeding		Predator control	
			Yes	No	Yes	No	Yes	No
Current conservation action	Planting	Yes	42	1	40	3	33	7
		No	9	35	9	37	7	40
	Weeding	Yes	52	1	52	2	39	13
		No	16	35	11	41	7	44
	Predator Control	Yes	59	1	60	2	55	5
		No	58	35	50	41	13	74

Fisher's p -values < 0.001 for all pairwise comparisons

of conservation attitudes. Current conservation actions related to a subset of conversation attitudes but not to hope. Associations between current conservation actions and future conservation intentions were also observed.

4.1 Hope

Our particular data results support hope being a single-construct model. This is in contrast to Snyder's Theory of Hope as a multi-dimensional construct [27, 57]. Babyak et al. [75], however, propose that the total hope score while consisting of two constructs (agency and pathways), has a single underlying latent variable [74, p91] and other research has also found that hope is unidimensional [59–61] as in this study. The findings suggest that hope should be integrated as a single construct in this research.

4.2 Hope and conservation attitudes

The research results supported our hypothesis that hope would positively correlate with conservation attitudes. Hope had a positive correlation with eleven of twelve separate conservation attitudes tested: valuing individual and group action, the role of teamwork and collaboration, connecting to others, the desire to learn more while also helping others learn, connecting with others and the natural world, nature needing our help, and such action taking effort. Dutch conservation volunteers expressed similar conservation attitude relationships (contributing to nature conservation, being connected to, and learning more about nature, and working with others) as important motivational factors for action [14].

Snyder's Theory of Hope describes a hopeful person as approaching goal achievement through a combination of willpower and waypower [27, 29]. Hope also appears related to a person's willingness to get involved in climate action [44, 47, 50]. In the current study, hope is negatively correlated with the twelfth attitude, "I believe nature will heal itself". One interpretation, that human intervention is necessary for nature to heal, is possible, particularly in light of the positively correlated attitude, "nature needs our help". This interpretation may relate to hope's agentic and goal-related aspects. This future-focussed attitude may also support those with future conservation intention to become active in future conservation activities.

The participants' individual attitudinal responses (Fig. 1) grouped differently in relation to hope. As previously noted, hope was negatively associated with the attitude "nature will heal itself" (Group I). While this may imply an attitude that nature cannot heal on its own, the current research did not define the source nor type of assistance needed to facilitate such healing. However, hope and "nature needs our help" were strongly related (cf Group III), suggesting that nature may need human intervention. Group II appears to have a limited association with hope. This attitude grouping appears to be more at the individual participant level, associating personal connection with the natural world, to other people, commitment to looking after nature, and helping others do likewise. Enabling volunteers to express conservation attitudes such as connectivity and commitment to the natural world and other people may facilitate agency expression and other conservation actions including education and advocacy. Testing the long-term positive contribution of these conservation attitudes to conservation volunteering could benefit volunteer biodiversity restoration contributions. Furthermore, community groups might benefit by adopting commitment and connectedness attitudes in their recruitment communications. The third attitude grouping related positively to hope and is strongly future focussed, positive, and action-based. This grouping associated practical

strategies aligned with caring for the world (e.g., working and collaborating individually and with others, recognising the effort involved, science and technological solutions, and the need for continual learning). Attitudinal groupings II and III suggest two separate but linked strategies for engendering general public engagement with the natural world; (1) developing individual nature connectedness (Group II) [76, 77] and (2) promoting practical strategies that help people move beyond connectedness and commitment to action (Group III) [76, 78].

4.3 Hope, conservation attitudes, and future conservation intention

We hypothesised that hope and conservation attitudes would associate with future conservation intention. The current research showed strong correlations between hope and future conservation intention for all biodiversity restoration behaviours tested. These results support Snyder's conception of hope as future focussed. Furthermore, participants reported similar responses to hope in relation to conservation attitudes. Hopefulness may be a necessary prerequisite for those intending to support future biodiversity restoration goals. [9, 79, 80]. Furthermore, this study's hope and conservation intention results are supported by associations reported by Bury et al. [47]; Chadwick [48]; Geiger et al. [50] between hope and future climate action intention.

Eleven of the 12 conservation attitudes correlated positively with those intending to plant, weed or control predator. These attitudes are similar to those expressed by environmental stewardship volunteers e.g., helping the environment and on-going learning [81]. However, the twelfth attitude in the current study, "I believe nature will heal itself", as with hope and conservation attitudes, correlated negatively with biodiversity restoration intentions. Conservation effort intentions may be more aligned with a belief that nature needs external assistance to heal. Enabling potential conservation volunteers to provide such external assistance may entail closer matches between volunteer motivations and participation [81].

Interactions between conservation attitudes and intention to act for the natural world are complex. In our research this relationship, while significant, is of low effect. Other research, including Portuguese birdwatchers funding environmental improvements, indicate that pro-environmental attitudes do not translate readily into pro-environmental behavioural intentions, [82]. In Australia, the predicted likelihood of koala-beneficial native vegetation restoration appears influenced by positive attitudes towards koalas and perceptions that valued others also protect this specie [83]. While Gillis and Swim's research [84] investigating predictive native planting behaviours among American householders, advocate a more nuanced understanding and contextualisation of the relationship between goal-based attitudes and resultant behaviours.

4.4 Hope, conservation attitudes, and current conservation action

Hope has been promoted as necessary for conservation action [85–88]. Conservation attitudes are also associated with conservation action [16, 22]. We hypothesised that hope and conservation attitudes would relate to current conservation action.

In the current research however, hope did not relate to current conservation action. One possibility for this unexpected result may be the relationship between time perspectives, a person's experiences and conceptions of past, present, and future time, with pro-environmental behaviours. In a meta-analysis of more than 6300 participants from seven countries future time perspective and proenvironmental behaviour relationships were "strong and nontrivial" while near-term (current) time perspectives had a "significant but trivial effect" on pro-environmental behaviours [89], p 330). The relationship between hope and pro-environmental behaviour temporality (current and future) would benefit from further exploration. Furthermore, exploring the relationship between conservation actions other than planting, weeding and predator control including education, advocacy, and fundraising might be fruitful.

While hope was not related to current conservation action, positive correlations emerged between such action and four of the twelve conservation attitudes (i.e., commitment and connection to nature, connection to other people, and a desire to teach others about the natural world). These attitudes may be similar to the positive connectedness to nature found in pro-environmental attitudes and conservation volunteering research [15, 76], the influence of the environment on volunteer participation frequency [90], social and environmental value orientations [91].

4.5 Hope, conservation attitudes, current conservation action and future conservation intention

Our study identifies links between current hope state and future conservation intention. Long et al. [12] identified volunteering as predicting an individual's subsequent hope. CLC volunteering may thus support future participant hopefulness. CLC groups could benefit from hope's role in future conservation intention by increasing success-oriented behaviour by partnering with school-based programmes that foster hope development [35, 92, 93]. Hope-increasing interventions employing success-related behaviours could support biodiversity restoration solutions [93–96]. This strategy could also inform community-based adult education programmes that might develop into active reciprocal partnerships between educators, students, the as-yet-unengaged public, current conservation volunteers, and those with future conservation intentions through real-life experiences and expertise development [94, 97–99]. Such programmes might enable participants to express various conservation attitudes including emotional commitment and connection with the natural world and each other and engage potential volunteers in experiences that may move their future conservation intention into current conservation action [21, 32, 100–102].

CLC programme funders and group leaders could consider a two-pronged complementary approach that retains existing volunteers while encouraging the future conservation intentions of those currently inactive. Initiatives could emphasise and enhance conservation attitudes such as connection to others through social group activities, connection and commitment to nature, teaching others by direct association with the conservation activity [15, 81, 90, 103–105].

Practical CLC volunteer engagement entry points are needed. Conservation-based activities attended by friends or family of the unengaged may build on the social connectedness of these natural world learning opportunities [97, 106–108]. Consequently, we recommend that CLC and government agencies adopt a more holistic approach to conservation activities by developing activities that strengthen human-nature connections, such as connecting and collaborating with, then learning from, each other across different conservation opportunities [109]. Visibility of such cross-functional activities may further entice the as-yet unengaged public to imitate these conservation behaviours [110].

This research indicated that current planters, weeders, and predator controllers most often intend future involvement in their chosen activities. These results partly support Volunteering New Zealand (2020) survey results [111] where 82.3% of volunteers have a long-term commitment to their current volunteering role. Our results also suggest that participants intend to undertake more conservation actions in the future than they do currently. Those who are currently planting and weeding intend planting and weeding in the future, but around ten per cent of those currently planting or weeding did not intend controlling predators. While the total proportion of respondents who were currently controlling predators was lower than those currently planting or weeding, participants currently controlling predators demonstrated similar intentions around predator control, planting, or weeding in the future. Conservation programmes promoting a wholistic approach to biodiversity restoration may support volunteers to undertake actions of interest and introduce them to other actions they may not have been aware. Our study has thus highlighted some potential roles of hope and conservation attitudes on current conservation action and future conservation intention.

A convenience sample of the Aotearoa New Zealand adult public was utilised as a cost- and time-effective sampling method suitable for the exploratory nature of this research. However, we recognise that research findings based on a convenience sample cannot be generalised to a broader national or international population [112, 113]. Thus, this research should be repeated with a representative sample in Aotearoa New Zealand and different countries worldwide. Furthermore, participant self-reporting may not accurately reflect current conservation action or future conservation intention; thus, further research comparing self-reporting with behavioural outcomes is necessary [114, 115]. A repeated-measure study could investigate the stability of these results over time while addressing the current study's single timepoint design limitations [cf [30]].

Despite these limitations, Snyder's Adult State Hope Scale identified correlations between hope, conservation attitudes, and future conservation intention. One area for further exploration is the stepwise pathway of these associations. For example, volunteers may first connect with each other and then to the natural world, before committing to the natural world through conservation actions.

The relative influence of hope or conservation attitudes on conservation actions or intention to act is also unclear. Some conservation attitudes might have a greater influence on an individual's hope levels; high-hope people for example, may be predisposed to espouse certain conservation attitudes. Furthermore, the current research did not identify hope nor conservation attitude directionality associated with initiating and sustaining biodiversity restoration

behaviour. A hopeful CLC volunteer, for example, may utilise their hopefulness to address biodiversity restoration barriers (e.g., learning, then applying, various predator control measures). Another may be motivated to act as a result of their attitude that nature needs help. A more nuanced understanding of the multi-directional relationships between conservation attitudes and hope may help explain the motivations enhancing future conservation intention. Future research could also untangle whether certain conservation attitudes underpin current conservation action, action enhances conservation attitudes, or each might reinforce the other.

In relation to the current research, an unanswered question remains over the other motivational states or attributes, situations or normative influences that may also contribute to an individual's current conservation action or future intention to act [83, 84, 116]. Consequently, future research could explore these relationships in more depth.

The current research proposes changes to CLC and government agency programmes and project design, recruitment and retention communications, conservation education, practice, and policy. However, further work is needed to understand the complex and multi-faceted relationships between hope, conservation attitudes, current conservation action, and future conservation intention. Nevertheless, this study provided important insights into the positive relationship between those currently active in conservation highlighting their commitment and connectedness to the natural world, connectedness to other people, and desire to teach others about the natural world. Furthermore, the relationship of hope and future conservation intention may make a practical contribution to biodiversity restoration.

5 Conclusion

Community-led conservation is one vital component that addresses global biodiversity and ecosystem degradation. Understanding the relationships between hope, volunteer conservation attitudes, current conservation action, and future conservation intention is critical to supporting and delivering positive, sustainable outcomes for CLC, long-term biodiversity restoration. The current research provides important insights for those concerned with encouraging current conservation action and future conservation intention. This study suggests that those who currently carry out conservation actions intend to do so in the future. They are hopeful and express this cognitive approach through problem-solving intentions. Attitudes of commitment and connection to the natural world, connection to others, and teaching others about nature are also related to current conservation action and future conservation intention. We suggest enhancing current conservation volunteering by incorporating these attitudes into CLC communication, engagement, school- and community-based environmental education, and project design. Future conservation intention could benefit from fostering hope-related thinking. Such mechanisms could enhance current conservation action and future conservation intention, thus supporting greater delivery of positive biodiversity restoration through increased CLC volunteering.

Author contributions Helen Ough Dealy, Rebecca Jarvis and Michael Petterson contributed to the study conception and design. Helen Ough Dealy prepared the material. Kushaal Maharaj collected the data. Tim Young and Helen Ough Dealy analysed the data. Helen Ough Dealy wrote the first draft of the manuscript, and all authors commented on previous versions. All authors read and approved the final manuscript.

Funding Kushaal Maharaj received an AUT (Auckland University of Technology) summer internship.

Data availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Code availability Not applicable.

Declarations

Ethics approval and consent to participate This research was approved by the Auckland University of Technology Ethics Committee (AUTEK Reference number 18/406). Informed consent was obtained from all individual participants included in the study.

Competing interests The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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