

Original Research



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Nature-Based Community Recovery Post-Natural Disaster: Black Summer Bushfires

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Abstract

Objective: Natural disasters can cause widespread death and extensive physical devastation, but also harmfully impact individual and community health following a disaster event. Nature-based recovery approach can positively influence the mental health of people and community's post-natural disasters. In response to the Australian bushfire season of 2019–2020, Zoos Victoria, in partnership with the Arthur Rylah Institute, worked with local communities in East Gippsland to support people's recovery through experiencing, supporting, and witnessing nature's recovery.

Methods: This mixed-method study explored how nature improved the recovery of remote and rural communities affected by the Black Summer bushfires in East Gippsland. The research studied the individuals' feelings about being involved in nature-based community events and their lived experiences. Data were collected from June to September 2023 through a nature-based community recovery project survey and community interviews.

Results: The findings demonstrated that engagement with natural environments promotes positive psychological, mental, and general well-being of people from bushfire-affected communities. Positive feedback from participants indicated the success of the Nature-Based Community Recovery Project in East Gippsland after the Black Summer bushfire.

Conclusions: This research provides insights for future recovery projects and ensures that sustainable nature-based recovery solutions for bushfire-impacted communities can be established.

Introduction

Wildfires (or bushfires, as they are called in Australia) are one of the most common forms of natural disasters in many regions around the world such as California, British Columbia, Siberia, and Australia.¹ The extreme wildfire events in the last decade have resulted in substantial social, economic, and environmental impacts. In Australia, 3 well-known bushfires (the Ash Wednesday bushfires, Black Saturday bushfires, and Black Summer bushfires) were all caused by high temperatures and dryness.² The Australian Black Summer bushfires of 2019/2020 devastated Victoria and New South Wales, burning 35.8 million hectares of land, destroying more than 3000 homes, killing 33 people, and killing or displacing an estimated 3 billion local animals.^{3,4}

The bushfires not only have devastating impacts in terms of widespread human, material, or environmental losses, but also result in severe health effects, including new or the deterioration of existing physical and mental health conditions.^{2,5} The evidence suggests that bushfire-impacted local communities experienced significant personal trauma, particularly those who were on the front line of disaster management.^{2,6} An Australian bushfire analysis² by demonstrated that post a bushfire event, psychological distress is prevalent in 14% of the general population, and long-term mental health issues 2–7 years post-bushfire are evident in approximately 28%–47.6% of firefighters. Findings also suggested that the prevalence of mental health concerns correlated with the degree of fire impact, and this impact decreased with time.² When exploring the direct impact of the Black Summer bushfires, 66 300 people were directly involved in firefighting, of which 53 200 were local and interstate volunteers.⁷ Of these personnel, 31% of volunteers and 25% of employees believed that their life was in danger at some point during their service. A total of 4.6% of volunteers and 5.5% of employees displayed very high psychological distress indicative of serious mental illness, and 4.6% of volunteers and 4.9% of employees demonstrated suicidal ideations post the bushfires.⁷

Recovery is identified as coming to terms with the changes to the environment and a new way of living, whilst being recovered is being able to live a full and enriching life despite the environment looking or functioning differently than it did before.⁸ The Australian government committed over 2 billion dollars to support communities most impacted by the Black Summer bushfires, to support their healing and rebuilding post-disaster.⁶ The National Bushfire Recovery

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Fund supported communities through the supply of immediate disaster relief payments, temporary housing, repairs, mental health support, infrastructure and tourism rebuilding support, and natural wildlife regeneration support.⁹

Bushfire Recovery Victoria introduced a state-wide recovery plan that set out various challenges and responses to recovery post the Black Summer bushfires. Mention was made to the importance of environment and biodiversity recovery, with Aboriginal and Torres Strait Islander Traditional Owners and community members a part of this recovery.¹⁰ The report highlighted the community's capacity to contribute to environmental recovery, outlining that this collaborative approach may improve both the environmental recovery and the recovery of affected individuals and communities. Furthermore, incorporating the knowledge of Traditional Owners in recovery efforts may improve environmental recovery and aid the healing of deep trauma experienced by Traditional Owners during the bushfires.¹⁰

Emerging collaborative work between the Arthur Rylah Institute and Zoos Victoria suggests that individuals and communities may increase their healing post a traumatic natural disaster by engaging in nature-led recovery and seeing their environment regenerate.¹¹ Nature-led recovery is defined as social, economic, and environmental recovery through activities that connect people and their communities to nature and their natural environment post-disaster.⁵ Whilst seeing the environment devastated by a natural disaster can be an initial symbol of loss, connecting with nature through regenerative processes fosters community connection and a sense of longer-term healing.⁵ During the Black Summer bushfire recovery, a number of locally designed initiatives and, in some cases, supported by Bushfire Recovery Grants, were established to promote healing and recovery in the most severely affected areas. Examples of local initiatives and individual efforts included nature-based art therapy incorporating natural bushfire artifacts, wildlife and vegetation restoration, citizen science to monitor wildlife habits, and the establishment of Community Recovery Committees (CRCs) to plan, implement, and evaluate longer-term recovery projects.¹²⁻¹⁴

Nature-led recovery remains a relatively new term when exploring recovery post-disaster, with limited literature available on how nature-based recovery efforts may increase health and well-being outcomes for individuals and communities post a bushfire disaster. This research project highlights how nature has impacted the recovery of remote and rural communities affected by the 2019/2020 Black Summer bushfires in East Gippsland. This study aimed to develop an understanding of how individuals living in rural and remote communities feel about being involved in nature-based community projects and events, and to better understand the lived experience of individuals in rural and remote communities through nature-based recovery projects.

Methods

A mixed methods approach was used to measure the impact of engaging in nature-based activities for individuals as part of community bushfire recovery in East Gippsland. Data were collected from June 2023 to September 2023 via a nature-based community recovery project survey and individual semi-structured community interviews. A paper-based survey was administered during the 4 local community events in East Gippsland. A total of 88 completed surveys were included in the analysis.

The modified¹⁵ survey tool (CN-12) and Evaluating Nature Activities for Connection Tool (ENACT)¹⁶ were utilized to explore

participants' feelings of safety, calm, connectiveness, hope, and involvement with nature-based recovery projects. The ENACT tool is used to predict the likelihood of behavioral outcomes from nature connection and to evaluate the effectiveness of nature-based activities.¹⁶ Similarly, the CN-12 is a multi-dimensional instrument applied to explore human connections with nature, time spent in nature, and an array of pro-environmental behaviors.¹⁵ These tools have not been utilized in a post-natural disaster context prior to this study, which provides additional value for this research.

The survey had a combination of multiple choice, Likert scale, and open-ended questions. Descriptive statistical analysis was performed using Statistical Package for Social Sciences¹⁷ to better understand how individuals living in rural and remote communities feel about being involved in nature-based community projects and events. In addition, Principal Component Analysis was undertaken using Jamovi software¹⁸ to identify underlying dimensions for questions about the participants' feelings about being in nature after participation in nature-based community projects and events. Kaiser-Meyer-Olkin (KMO) Test and Bartlett's Test of sphericity assessed the suitability of the data for Factor Analysis.^{19,20}

Qualitative data were collected through individual semi-structured interviews to explore the lived experience of people connecting with nature and their experiences of being involved in nature-based community projects and/or events. Interview questions were trauma-informed and designed to guide the researcher to capture all desired information, while providing flexibility for the participants to elaborate on their experiences. A thematic analysis was undertaken utilizing Braun and Clarke's 6-step process,²¹ which includes familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining, and naming themes, and producing the report. Findings were presented under theme headings together with participant quotes.

Results

Nature-Based Community Recovery Project Survey

Demographic profile

The majority of survey respondents were female ($n = 57$, 64.8%), and 31.8% ($n = 28$) were male. A large proportion of respondents belonged to the age group 41-50 years ($n = 20$, 22.7%), followed by people from 71-80 years ($n = 15$, 17%), 51-60 years ($n = 15$, 17%), and 31-40 years ($n = 13$, 15.7%). Out of 88 survey participants, 72 respondents (81.7%) attended recovery event/s, 9 (10.2%) were community members involved with the nature-based community recovery grant, and 7 (8.0%) engaged with the project when it was implemented ($n = 7$, 8.0%). Some participants selected more than 1 statement that represented them. The additional responses included "Presenter/facilitator of event" and "Landcare member."

Participants' relationship with nature

To the question about the importance of nature, 75 participants responded. Responses were coded according to themes. One-fifth of responses were related to "it helps me feel relaxed, calm, and comfortable" ($n = 19$, 25.5%), followed by "it supports our lives" ($n = 18$, 24.0%), and "it connects us with ourselves" ($n = 12$, 16.0%) (Figure 1).

Participants were given a series of statements related to their connections with nature and asked to rate each one. The original responses were on a 5-point Likert scale that ranged from "Strongly disagree" (1) to "Strongly agree" (5). The "Strongly agree" and "Agree" responses were combined to "Agree," and "Strongly

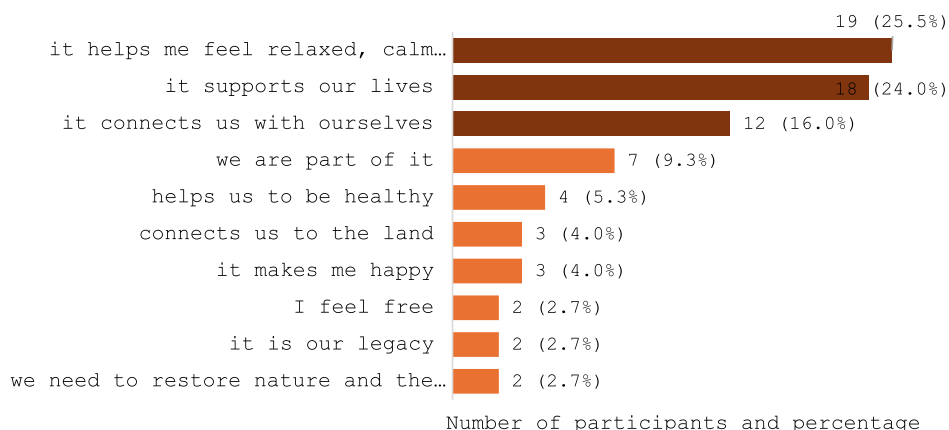


Figure 1. Codes for the question about the importance of nature.

disagree” and “Disagree” responses were combined to “Disagree” for simplification in the presentation of results. As can be seen in Figure 2, the majority of respondents agreed with all of the statements. However, the highest proportion of “Agree” answers was for the statements “I enjoy spending time in nature” ($n = 85, 96.6\%$), “I like to get outdoors whenever I get the chance” ($n = 82, 93.2\%$) and “Everything in nature is connected” ($n = 82, 93.2\%$).

Feelings when in nature after participating in a nature-based community project/event

After participating in a nature-based community project or event, participants were asked about their feelings when in nature. Similar to the previous question, the original responses on a 5-point Likert scale from “Strongly agree” to “Strongly disagree” were modified to a 3-Likert scale. Some of the statements were expressed in the negative to validate whether participants were responding to statements appropriately. Statements that got the highest number of

“Agree” were “I feel calm when I spend time in nature” ($n = 83, 94.3\%$), followed by “Nature has a calming effect on me” ($n = 81, 92.0\%$) and “Being in nature has a positive effect on my emotions” ($n = 81, 92.0\%$) (Figure 3).

Participants’ feedback about nature-based community project/event

Participants were asked to express how they felt about their involvement in the nature-based community recovery projects or events by rating the proposed statements from “Not at all” to “A great deal.” As presented in Figure 4, for around half of the participants, it was “A great deal” to “use different senses to experience nature” ($n = 44, 50.0\%$), “to be able to experience nature without disturbing” ($n = 37, 42.0\%$), and they felt that “the nature-based project made them feel calm and relaxed” ($n = 37, 42.0\%$).

The participants were asked to highlight the best parts of the nature-based community project/event. Responses were coded into

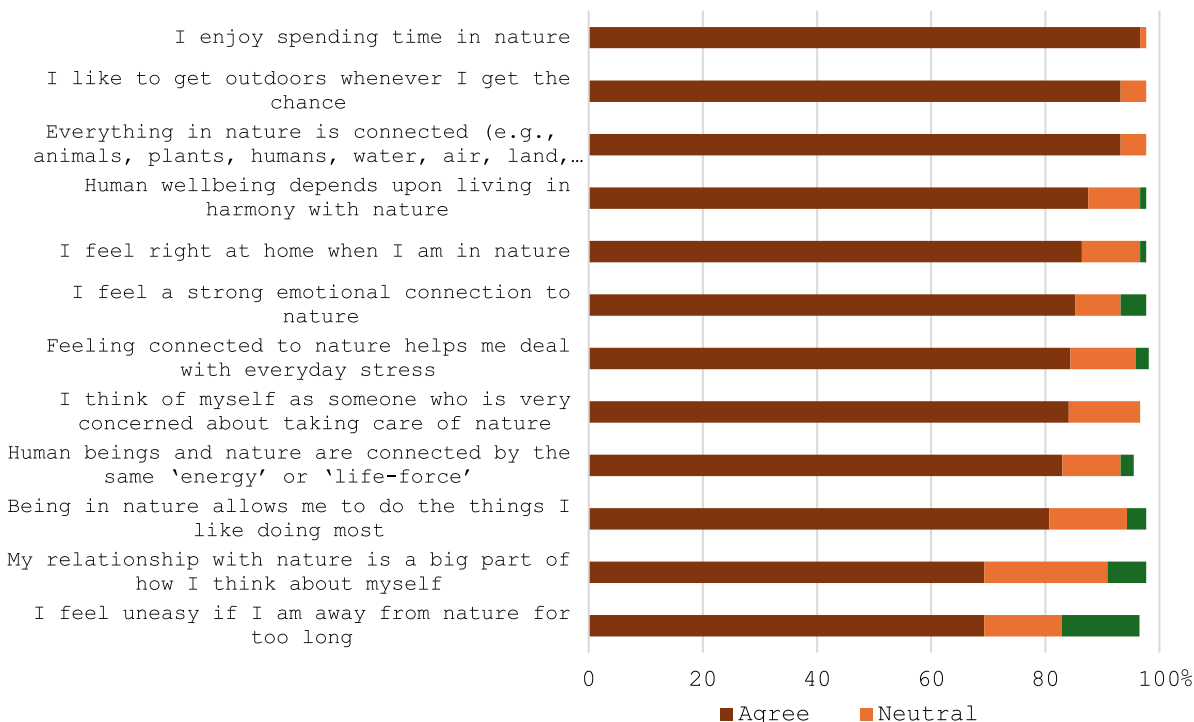


Figure 2. Participants’ connections with nature.

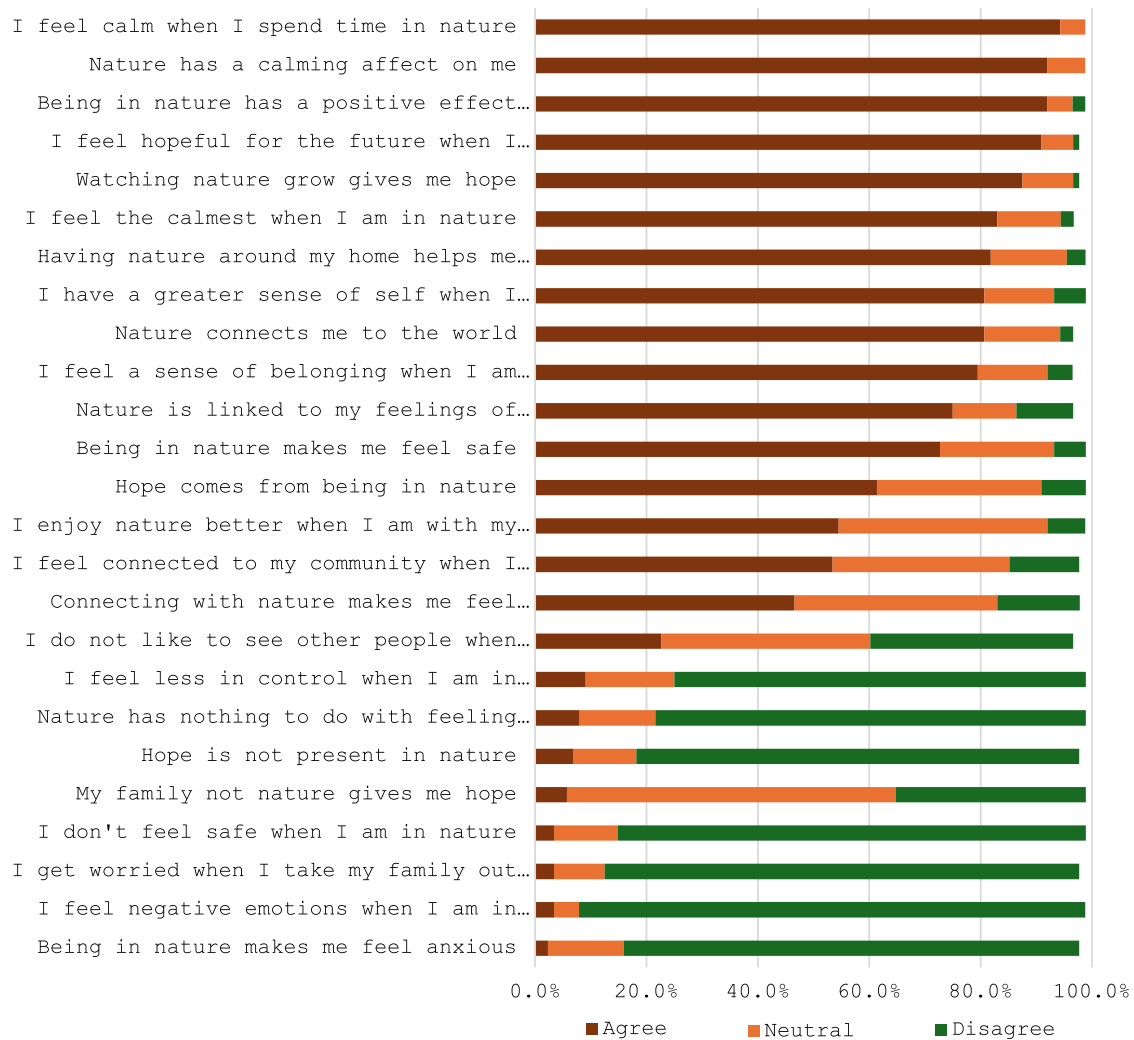


Figure 3. The participants' feelings when in nature (after participating in a nature-based community project/event).

similar concepts or themes. A large proportion of responses fell into "Connecting with people, community and nature" ($n = 34$, 38.6%), followed by "Experiencing and interacting with nature" ($n = 22$, 25.0%) (Figure 5).

According to participants, involvement in nature-based community projects would be very beneficial to "Everyone/Whole Community" ($n = 43$, 48.9%), "Children/Young people" ($n = 7$, 8.0%), "Local community" ($n = 3$, 3.4%), and "Local businesses" ($n = 3$, 3.4%), because such projects and events provide opportunities for "Getting back and connecting to nature" ($n = 9$, 10.2%), for "Giving back and taking care of nature" ($n = 8$, 9.1%), and "Connecting people with a shared purpose" ($n = 8$, 9.1%).

In terms of the general results of the nature-based community project/event, most respondents ($n = 66$, 75.0%) were satisfied with the outcome of the nature-based community project/event. Three-fourths of participants ($n = 69$, 78.4%) would recommend a nature-based recovery project in the future, because it is "connecting people and getting them involved" ($n = 15$, 17.0%) in activities related to nature, and it "provides education" ($n = 7$, 8.0%). In addition, the activities were considered "fun and enjoyable" ($n = 7$, 8.0%) (Figure 6).

Principal component analysis

Principal Component Analysis (PCA) was performed on Likert-scale questions using Jamovi Statistical Software.¹⁸ PCA is used as a method for dimension reduction or finding groupings of similar factors or variables. For the question about participants' feelings when in nature after participating in a nature-based community project or event, negative statements were reversed to the positive including the responses. (Texts that are written in the capital are reversed statements).

As shown in Table 1, 6 underlying components were extracted from the factor analysis: (1) calmness; (2) hope; (3) safety; (4) connections; (5) company; and (6) source of hope. The value of KMO was 0.837, which is regarded as "good," according to Field,²⁰ and verifies a satisfactory sample size. Bartlett's test of sphericity value χ^2 of 1287, with a significance level (P value) < 0.001 , indicated that the dataset overall was adequate for the applied data reduction technique.

Extracted factors with eigenvalues exceeding 1 explained 72.9% of data variance. All factor loadings were greater than 0.3 and the majority of them were larger than 0.7, which implied a good correlation between the individual variables and the group of factors to which they belong.²²

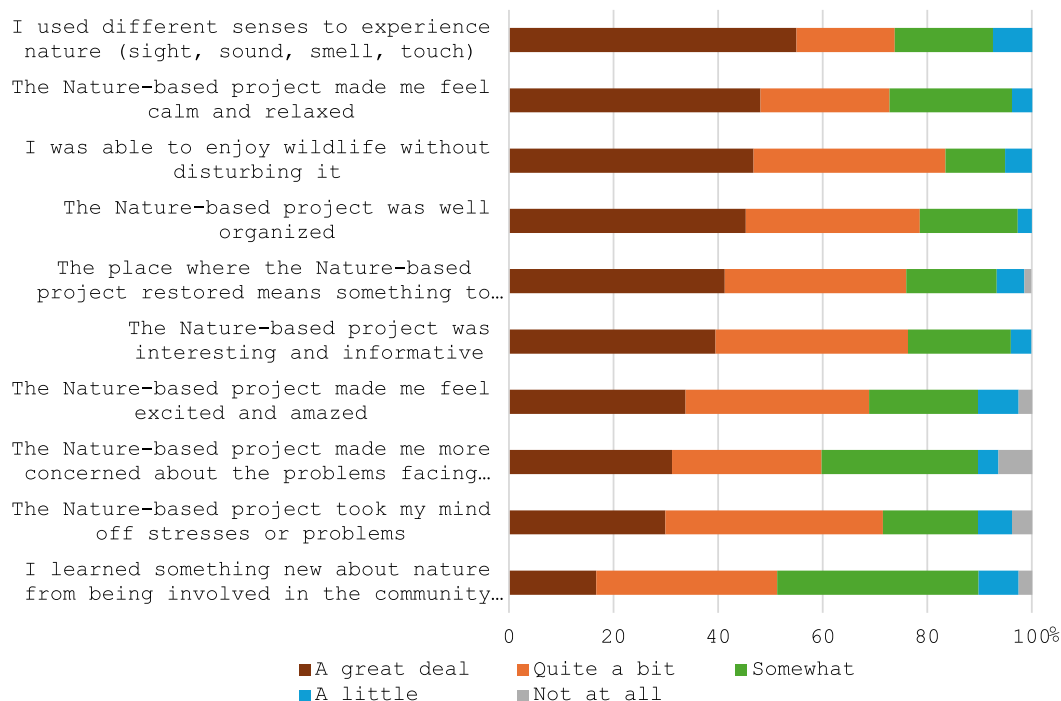


Figure 4. Participants' feelings about being involved in the nature-based community recovery project.

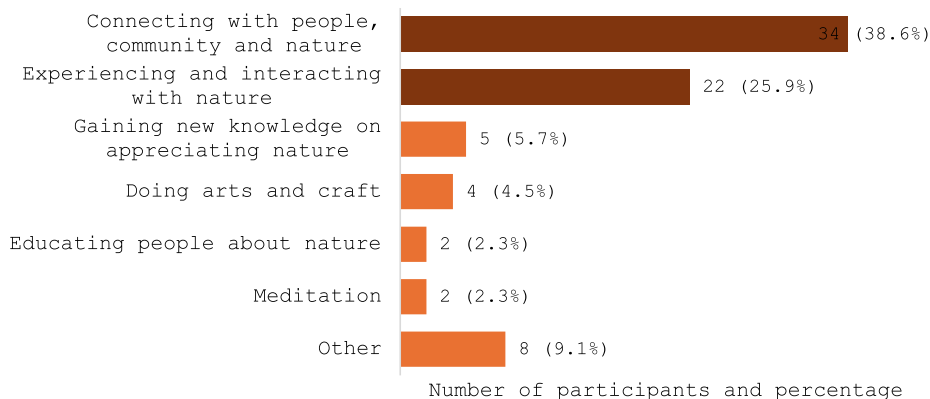


Figure 5. Codes for the best part of nature-based community project/event.

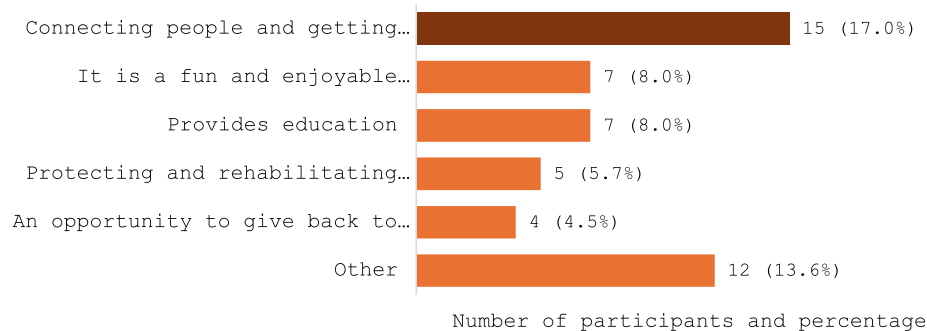


Figure 6. Reasons for recommending nature-based community recovery project/event.

Table 1. Feelings when in nature (after participating in the nature-based community project/event) (principal component factor analysis - varimax rotation)

	Factor loading	Eigenvalue	Variance explained (%)	Cumulative variance explained (%)
Component 1: calmness		9.418	37.671	37.671
I DO feel safe when I am in nature	0.654			
Being in nature DOES NOT make me feel anxious	0.813			
I feel the calmest when I am in nature	0.561			
I DO NOT get worried when I take my family out in nature	0.747			
I feel calm when I spend time in nature	0.713			
Nature has a calming effect on me	0.704			
I feel MORE in control when I am in nature	0.621			
I feel POSITIVE emotions when I am in nature	0.541			
Component 2: hope		2.467	9.868	47.539
Being in nature has a positive effect on my emotions	0.738			
I have a greater sense of self when I am in nature	0.542			
I feel a sense of belonging when I am in nature	0.683			
Nature connects me to the world	0.698			
Watching nature grow gives me hope	0.756			
I feel hopeful for the future when I see nature grow	0.770			
Component 3: safety		2.285	9.140	56.679
Having nature around my home helps me to feel safe	0.776			
Nature has SOMETHING to do with feeling safe	0.799			
Nature is linked to my feelings of safety	0.829			
Being in nature makes me feel safe	0.722			
Component 4: connections		1.707	6.828	63.507
Connecting with nature makes me feel connected to my community	0.762			
Hope comes from being in nature	0.682			
I feel connected to my community when I am in nature	0.832			
Component 5: company		1.212	4.849	68.356
I enjoy nature better when I am with my family	0.674			
I do not like to see other people when I am out in nature (-)	-0.677			
Component 6: source of hope		1.039	4.157	72.513
Hope IS present in nature	0.727			
My family not nature gives me hope (-)	-0.743			

KMO = 0.837, Bartlett = 1287, $P < 0.01$. The criteria were based on a 5-point scale, ranging from 1 = "Strongly disagree" to 5 = "Strongly agree"

PCA on the statements included in this question resulted in 6 components (Table 1). The first and third components ("calmness" and "safety") combine different statements on feeling safe and calm when in nature. The second component "hope" is related to the positive feelings, emotions, and hope that participants experience when they spend time in nature, while the last component "source of hope" includes statements about nature and family as possible sources of hope. The component "connections" represents the connection with nature as well as the community. Finally, the component "company" shows that participants either prefer to be with family or alone when they are in nature.

Interviews With Nature-Based Activity Participants

Nine individual semi-structured interviews were conducted via online software (Microsoft Teams) with participants who attended nature-based events in East Gippsland. Through the process of thematic analysis,²¹ the 4 major themes were produced: "In the reflective pond," "Learning in nature," "Walking hand in hand," and "The path forward." For the first theme, reflecting on the impacts of the Black Summer bushfires, 1 participant commented that "everybody in East Gippsland was affected by that fire, whether or not you actually lost anything" (P1). By attending the nature-based events, participants were able to share their

stories and experiences and “having like-minded people to talk to” (P6) provided a safe place for learning and healing. The participants found the “celebration of nature” (P1) through immersion in the outdoor activities provided an all-encompassing sensory experience they took with them. The events were “minimally impacting” on nature whilst providing “maximum benefit” (P1) to the participants.

The second theme described the Importance of “Learning in nature.” The nature-based events not only provided an opportunity for participants to practice mindfulness, reflect on their surroundings, and listen to nature, but also served as a platform for education. The session, led by experienced nature practitioners, involved “breathing and relaxing... the way they made us slow down and just rest and listen quietly to what was happening around us as far as the nature aspect” (P3). In addition, the practitioners passed on knowledge about species identification, replanting, and protection. By developing a deeper understanding of the workings of the forest, participants were able to develop empathy for the biological balance and stewardship, leaving them feeling enlightened and informed. Through the shared experiences, participants learnt more about building connections with self and surroundings and described being in nature as “very consoling” (P6), “therapeutic and relaxing” (P4).

Another beneficial outcome of the nature-based events was the collegiality created with “like-minded people” (P1, P2, P4) who were passionate about the environment, which was reflected in the third theme, “Walking hand in hand.” Having an “Indigenous presenter” (P1) who taught “respect for the land” (P1) brought a culturally sensitive and appropriate understanding to the events. Breaking down some of the barriers previously evident in some of the towns occurred as people worked together for the benefit of the entire region. By making the events open to all, the region not only benefited socially and environmentally, but also economically. The influx of tourists brought in additional revenue, stimulating the local economy, and fostering a sense of optimism about the region’s future. “[Tourists] come and spend money, they visit a lot of the local historical places... It’s nice to have the visitors come and visit our little part of the world” (P7).

The final theme developed from the participant’s experiences of attending the nature-based events in East Gippsland was around creating “The path forward.” They wanted “something consistent” and “something a bit more regular” (P4) with a longer time frame for activities. For those organizing such big events, a way of simplifying and streamlining the grant application process and managing the meetings and groups was needed. At the same time, there was discussion about wanting to move on from talking about the Black Summer bushfires, “so I don’t know if I’d like to see the event seen as a way of opening up those wounds again” (P3). Nevertheless, the participants shared their passion for the healing power of nature and commented that they “live out here because we love the land that we live on” (P1).

Discussion

This study explored how communities in East Gippsland interacted with nature whilst healing personally and as a community from the Black Summer bushfires. According to the literature, engagement with natural environments promotes positive psychological, mental, and general well-being.^{23–25} Similarly, in this research, it was found that the main reasons for spending time in nature are feeling calm, relaxed, safe, peaceful, and hopeful. Nature has a positive

effect on emotions. In addition, it was acknowledged by participants that nature plays an important role in human lives connecting them with themselves, family, people, community, and nature itself. In terms of the connection with nature, quantitative analysis revealed that almost all survey participants “enjoyed spending time in nature” and “liked to get outdoors whenever they get the chance.” The majority of participants felt “a strong emotional connection to nature” and they felt “very concerned about taking care of nature.” Feeling connected with nature helped them to deal with everyday stress. Participants recognized the importance of being in harmony with nature and how human well-being depends upon living in this harmony.

Data from the survey demonstrated the success of the delivered nature-based community projects and events with a high level of participants’ satisfaction (75.0%), and the willingness to recommend them in the future (78.4%). Their feedback was very positive, emphasizing the wonderful opportunity to enjoy wildlife without disturbing it, experience and interact with nature, connect with people, gain new knowledge on appreciating nature, do arts and crafts, and meditate. It was evident that these events helped them to heal from the consequences of the devastating Black Summer bushfires. Moreover, the participants found the nature-based projects interesting, informative, and well-organized.

The findings of this research supported other studies in terms of the importance of nature in the healing process.^{23–25} Nature-based recovery has the potential to positively impact individual and community health following a natural disaster.⁵ Being in nature is healing and helps to cope with stress and life difficulties. It was found that the combination of art activities and being in nature provided a therapeutic and consoling effect for participants. According to the findings, nature gave participants a sense of hope and was considered a significant source of hope along with family.

Nature-based activities create positive community and social connections in the aftermath of natural disasters.⁵ For example, after the Christchurch earthquake, people were tending community gardens because of the socialization opportunity and enjoyment of gardening amongst community members.²⁶ Similarly, in this research, it was revealed that nature-based recovery events provided opportunities for community empowerment, building new connections, and bringing people together. Being in a group of “like-minded people” with a passion for nature, sharing experiences, learning from each other, and engaging in activities together provided “a kind of therapy” and was very beneficial for people and the community as well.

In addition, the environmental education and awareness focus of the nature-based events was recognized by participants as they were involved in different activities, including nature protection and rehabilitation. Participants noticed that they learnt more about building connections with self and surroundings, as well as building empathy toward nature.

The expressed participants’ willingness to have more nature-based events in the future demonstrated the success of the delivered nature-based projects and events. Nature-based events with different focuses (e.g., educational, mediation, relaxation, nature protection, and rehabilitation) can attract people with different interests and needs.

Moreover, participants recognized the importance of nature-based events for tourism and economic development in the region. They believed that promoting local nature-based events more widely and making them open for people from surrounding areas and international visitors will benefit their local economy and the sharing of local knowledge.

There are several limitations associated with this study. The COVID-19 pandemic caused delays and difficulties in collecting and analyzing data. The Nature-Based Community Recovery Project was undertaken in East Gippsland with remote and rural communities affected by bushfires. As such, the study is geographically narrowed to this region. Exploration of effects from similar events and projects in other regions may provide further insight into the understanding of the lived experience of people connecting with nature post a bushfire event. The analysis and comparison of different post-natural disaster projects would add value to this field of study. A larger sample size of survey respondents would be ideal to gain a deeper understanding of how individuals living in rural and remote communities feel about being involved in nature-based community projects and events.

Despite these limitations, the findings demonstrate strong support for the positive effect of the nature-based community recovery project on the recovery of remote and rural communities post the Black Summer bushfire. A high level of satisfaction and positive feedback from participants indicate the success of the nature-based events. The demand for nature-based events and their importance for the community, people, and nature were emphasized. The findings on how communities in East Gippsland interact with nature provided insights for future recovery projects and ensured that sustainable nature-based recovery solutions for bushfire-impacted communities can be established.

Conclusion

This research project explored how communities in East Gippsland interacted with nature whilst healing personally and as a community from the 2019/2020 Black Summer bushfires. This study developed an understanding of how individuals living in rural and remote communities feel about being involved in nature-based community recovery projects and events. The findings revealed that nature has an important role in healing from trauma, and that nature-based activities and events can be helpful in spiritual, emotional, and psychological recovery.

Having experienced considerable grief as a result of devastating fires, the event participants had a strong attachment to the environment and drew solace from seeing it regenerate over the following months and years. The connection of people with nature and the observation of its regeneration after a disaster can foster the recovery of disaster-affected regions and increase community connectedness, resilience, post-traumatic growth, and life satisfaction.

The nature-based recovery is a relatively new approach and not well-studied yet in the context of individual and community recovery post-natural disasters. Further research on the nature-led recovery initiatives post-disaster would provide a better understanding of nature's impacts on people's recovery and the positive psychological and mental benefits of nature-based activities. The nature-based recovery approach has therapeutic potential and can serve as a protective factor against post-traumatic stress disorder, depression, and stress, thus promoting resilience and recovery of disaster-affected communities.

Given the magnitude of bushfire problems and the severity of fire-related mental health issues in Australia, as well as other regions prone to wildfires around the world, nature-based community recovery activities should be actively promoted and employed. As shown in this study, the proposed nature-based community recovery projects and events had great success, and there is a strong interest in having more events on a regular basis, as such activities

connect people and their communities to nature and improve the social, economic, and environmental recovery of the affected regions.

Data availability statement. Data are not publicly available.

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Author contribution. All authors have read and approved the final version of the manuscript. The corresponding author (Dr Daria Soldatenko) and the lead author (Professor Joanne E. Porter) had full access to all of the data in this study and take complete responsibility for the integrity of the data and the accuracy of the data analysis.

The lead author, Professor Joanne E. Porter, affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.

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Competing interest. The authors declare that they have no conflict of interest.

Ethical standard. Ethical approval for this project was granted by the Federation University Human Ethics Committee. Approval number A21-108. The research was undertaken with the appropriate informed consent of participants.

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