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RESEARCH ARTICLE

Forest therapy as a trauma-informed approach to disaster recovery: Insights from a wildfire-affected community

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Data Availability Statement: We have created and published a project on the National Science Foundation-funded DesignSafe-CI's Data Depot Repository, and have uploaded the data to the repository. In alignment with DesignSafe's Protected Data Best Practices, we have published the metadata and descriptive information about the dataset with the project. However, the data set is restricted because it contains sensitive or potentially identifiable information. This is because, although the transcripts have been reviewed to remove direct and indirect identifiers, our small

Abstract

A trauma-informed approach to disaster recovery recognizes the potential impacts of trauma, promotes resilience to protect against retraumatization, and can support catering the needs of disaster survivors in affected communities. A growing body of evidence demonstrates that interaction with nature is associated with a number of physical and mental health benefits, though literature surrounding nature-based therapy and disaster survivors is limited. Through key informant interviews with forest therapy guides from a program in wildfire affected Butte County, CA, this exploratory study investigates if and how "Forest Therapy " can serve as a trauma-informed approach to promote wellbeing in the face of climate change and associated disasters. We find that community-based forest therapy programs offer a promising, flexible approach to community-based trauma-informed mental health servicest in disaster-affected communities. Findings also identify opportunities to tailor implementation of future programs to better reach populations most impacted by disasters, including through targeted outreach and diverse guide recruitment. Future research should investigate the impacts of forest therapy on the mental health and wellbeing of participants, as well as the scalability of forest therapy programs in disaster-affected communities.

Introduction

Climate change is contributing to increasing frequency and severity of wildfires [1–3]. In the United States, the western state of California is among the nation's most affected. Between 2017 and 2021, California has experienced 7,930 wildfires, resulting in 2,132,516 acres burned and costing an estimated 4.5 billion dollars in fire suppression expenses alone [4–6]. In November 2018, Butte County, CA was devastated by the Camp Fire, which stands as California's deadliest wildfire in recorded history. The Camp Fire killed at least 85 civilians, displaced

sampling frame precludes complete de-identification. Specifically, we interviewed 11 of 14 individuals who served as forest therapy guides for the "Forest Therapy Pilot Program" established by Chico State University following the Camp Fire in Butte County, CA. Given that the guides' identities are public, contextual information provided during the interview may enable identification. As noted in our DesignSafe publication, interview transcripts have not been made public because complete de-identification is not possible, due to the small study population sample and the personal nature of the conversations. The data that is available for public access on DesignSafe includes the analytic matrix, which contains summarized, de-identified data from the individual interviews that was used for analysis. We have referenced the published data in our manuscript (DesignSafe project PRJ-3883, DOI: https://doi.org/10.17603/ds2-sffr-0489).

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53,000 people, destroyed 18,804 structures, and burned 153,335 acres of land [7, 8]. The Camp Fire is one of many fires that continue to ravage the area; we estimate that subsequent wildfires in 2020 and 2021, in combination with the Camp Fire, resulted in over 20% of Butte County being burned [9–11].

Wildfires and associated smoke events have been shown to have mental health consequences, including anxiety, depression, environmental grief and other sub-clinical impacts [12–15]. The loss of or damage to a person's home, property and community, compounded by the threat to their safety or to that of loved ones can negatively impact survivors' mental health for years after the disastrous event [13]. However, many rural communities hard hit by wildfires lack sufficient mental health services [16]. These baseline service limitations are only exacerbated by disasters; wildfires and other climate disasters may damage, destroy, or otherwise minimize access to existing mental health resources and services within a community [17, 18]. Indeed, Butte County is designated as a Mental Health Shortage area by the Health Resources & Services Administration [19]. Compounding pre-existing mental health shortages, the Camp Fire resulted in disruptions to the healthcare and education sectors where formal and informal mental health and social support services may have been previously accessed [20].

At the same time, the multitude of psychological impacts that commonly occur in the wake of a disastrous event are likely to yield increased demands for both acute and long-term mental health services in disaster-affected communities [18]. Community-based mental health services offered in a variety of settings can provide a broader range of functions compared to hospital-based mental health care [21], and may stop-gap the dearth in services amid rising demand following disasters. In particular, programs that use a "trauma-informed approach" may facilitate community healing and prevent retraumatization of community members [22].

"Trauma-informed care" as defined by the Substance Abuse and Mental Health Services Administration (SAMHSA) is a program, system or organization that understands the extensive impact of trauma and identifies potential paths for recovery; recognizes the symptoms and signs of trauma in clients, staff, families and others involved in the system; and responds by fully incorporating knowledge of trauma into practices, procedures and policies while actively seeking to resist retraumatization [23]. SAMHSA has identified the following six key principles as integral to trauma-informed care: Safety; Trustworthiness and Transparency; Peer Support, Collaboration and Mutuality; Empowerment, Voice and Choice; and Cultural, Historical and Gender Issues (Table 1) [23]. While a trauma-informed approach to disaster recovery has been proposed to acknowledge and address community trauma throughout the redevelopment process [22], little research has explored the trauma-informed methods to increase well-being and decrease ill-being in the face of climate-related disasters.

Forest therapy is inspired by the Japanese practice of "Shinrin-Yoku," also known as "forest bathing," a traditional technique designed to mindfully stimulate the five senses while connecting with nature [24]. According to the Association of Nature and Forest Therapy (ANFT), forest therapy is an evidence-based approach that supports well-being and healing through immersion in the natural world. Sessions are directed by certified forest therapy guides who lead participants on a clearly defined sequence of invitations and optional activities [Fig 1], providing structure to support engagement while creating space for unique personal experiences [25, 26]. Described as an "open-ended approach," forest therapy transfers autonomy and efficacy to the individual, a central pillar of trauma-informed practice [23, 25].

Forest therapy may be considered a misnomer, as no psychotherapy services—at least as traditionally understood by Western mental healthcare–are provided. Forest therapy is a wellness practice that has been implemented in over 60 countries, based on a secular, research-based framework [25, 27]. Forest therapy guides trained in the ANFT program complete a 6-month remote training program, followed by a 4-day immersive training in-person before

Table 1. Key points related to each trauma-informed principle. Table 1 provides SAMHSA definitions for each of the six principles of a trauma informed approach along with examples from interviews with forest therapy guides of how these principles appear during forest therapy walks. *SAMHSA, 2014.*

TRAUMA-INFORMED PRINCIPLE	SAMHSA DEFINITION	KEY POINTS FROM THE PERSPECTIVE OF FOREST THERAPY GUIDES
Safety	"Throughout the organization, staff and the people they serve, whether children or adults, feel physically and psychologically safe; the physical setting is safe and interpersonal interactions promote a sense of safety. Understanding safety as defined by those served is a high priority." [23]	**Physical safety**—conveyed through wilderness first aid certification, first aid kits on site, careful site planning, and informing walk participants on exit routes and potential hazards. **Psychological safety**—expressed via open-ended invitations for activities that walk participants can accept or refuse, non-judgment, non-coerciveness, trust-building, choice, and the neutral presence of the guides.
Trustworthiness & Transparency	"Organizational operations and decisions are conducted with transparency with the goal of building and maintaining trust with clients and family members, among staff, and others involved in the organization" [23]	**Trustworthiness**—established through non-coerciveness, non-judgment, listening, demeanor and voice tone, and is tied to transparency and safety. **Transparency**—conveyed during the hospitality phase at the beginning of walks when the guide explains what will happen and answers questions.
Peer Support	"Peer support and mutual self-help are key vehicles for establishing safety and hope, building trust, enhancing collaboration, and utilizing their stories and lived experience to promote recovery and healing. The term "Peers" refers to individuals with lived experiences of trauma, or in the case of children this may be family members of children who have experienced traumatic events and are key caregivers in their recovery." [23]	Conveyed through body language, deep listening, sharing, and the opportunity to connect at the end and after the walk. However, the walks are designed to be an individual experience.
Collaboration & Mutuality	"Importance is placed on partnering and the leveling of power differences between staff and clients and among organizational staff from clerical and housekeeping personnel, to professional staff to administrators, demonstrating that healing happens in relationships and in the meaningful sharing of power and decision-making. The organization recognizes that everyone has a role to play in a trauma-informed approach." [23]	Expressed through activity invitations and reducing hierarchy, for example through guide engagement in the walk alongside participants. Shared experience of Camp Fire by some participants may contribute to an unspoken understanding and sense of mutuality.
Empowerment, Voice & Choice	"Throughout the organization and among the clients served, individuals' strengths and experiences are recognized and built upon. The organization fosters a belief in the primacy of the people served, in resilience, and in the ability of individuals, organizations, and communities to heal and promote recovery from trauma. The organization understands that the experience of trauma may be a unifying aspect in the lives of those who run the organization, who provide the services, and/ or who come to the organization for assistance and support. As such, operations, workforce development and services are organized to foster empowerment for staff and clients alike." [23]	Established through invitations which provide walk participants with choice and empowerment. There is no end goal or prescribed objective. Guides are unsure if individuals follow through on intentions to heal after the walks.
Cultural, Historical & Gender Issues	"The organization actively moves past cultural stereotypes and biases (e.g. based on race, ethnicity, sexual orientation, age, religion, gender identity, geography, etc.); offers, access to gender responsive services; leverages the healing value of traditional cultural connections; incorporates policies, protocols, and processes that are responsive to the racial, ethnic and cultural needs of individuals served; and recognizes and addresses historical trauma." [23]	Expressed through land acknowledgments and invitations to Tribal leaders to provide historical context to land during some walks, and sharing of pronouns during introductions.

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they are eligible to receive certification to be an ANFT Certified Forest Therapy Guide [28]. The curriculum for training includes an introduction to the ANFT Standard Sequence [Fig 1], fundamental concepts and pedagogy for connecting to nature, lessons on safety and trail awareness, facilitation techniques for promoting open environments to encourage group sharing, and modes of learning about the history and other characteristics of one's bioregion, among other relevant topics of instruction [Fig 2] [28]. Open to clients of any background, forest bathing and similar nature therapy experiences have been conducted in a variety of

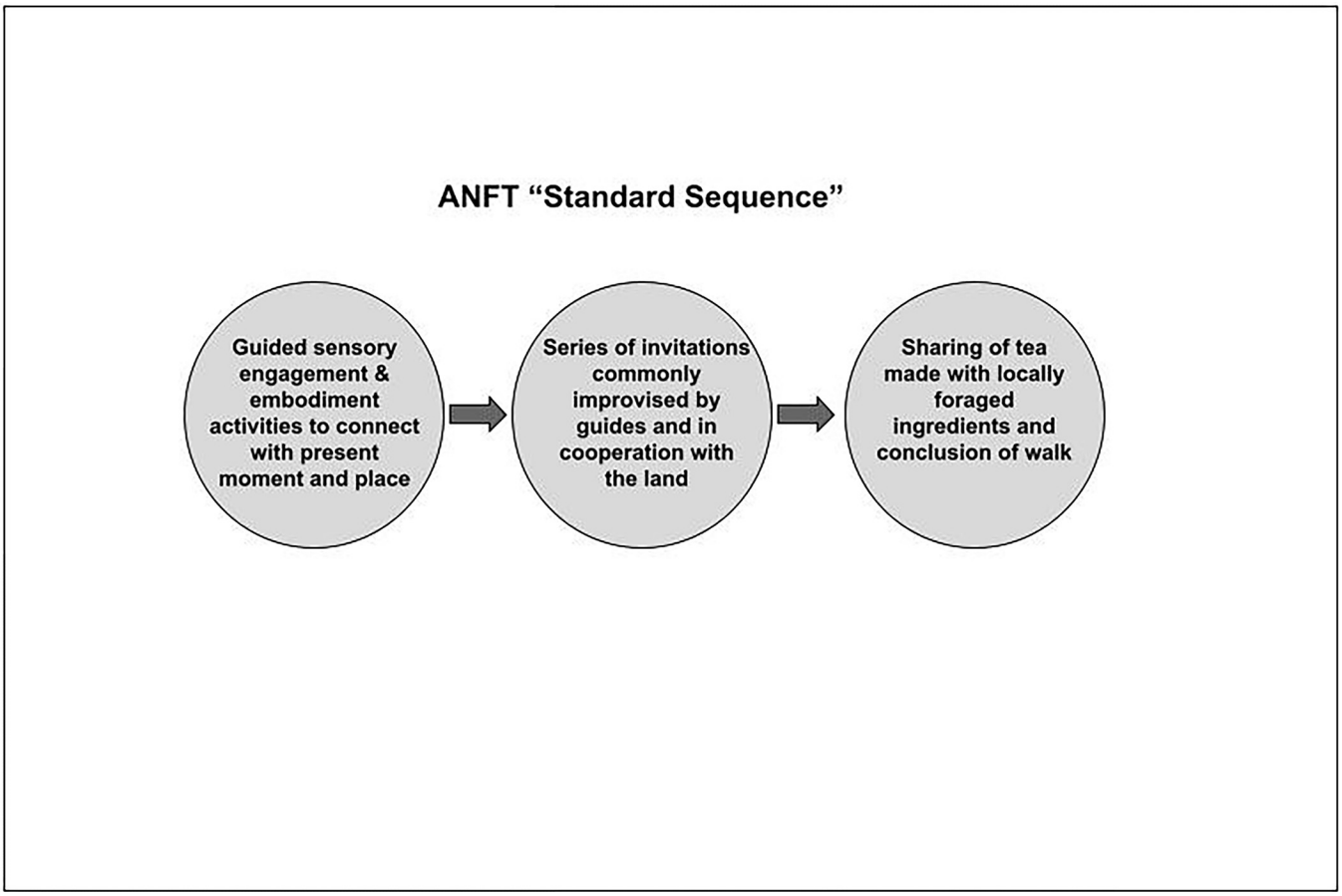

Fig 1. ANFT standard sequence. Fig 1 illustrates the Association of Nature and Forest Therapy standard sequence of events used to guide a forest therapy experience. *Clifford and Page, 2020.*

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environments, including recreational forested areas, campsites, controlled laboratory settings simulating the natural world with live plants, and fruit orchards [24, 29–33]. Forest therapy programs are being adapted and offered in some locations to be more accessible for people with limited mobility and physical and intellectual disabilities [34–36]. Throughout this paper, we will describe forest therapy sessions as "walks," however they can be guided at accessible locations and walking is not actually required for the experience.

Exposure to and interactions with nature demonstrate diverse health benefits, including improved sleep, relief from anxiety and stress, and opportunities to engage in physical activities that aid in the prevention of many chronic diseases and conditions such as diabetes and cardiovascular disease [37, 38]. Relatedly, research reports the therapeutic effects of the practice of forest therapy, including improved immune function, reduction in pain and symptoms associated with hypertension, coronary artery disease, mood disorders and stress, among other beneficial health outcomes [24, 39, 40]. For example, an experimental study of "Shinrin-Yoku" conducted in 24 forests across Japan between 2005 and 2006 identified lower cortisol levels, pulse rates, and blood pressure among the study participants exposed to the forest environment compared to those exposed to an urban setting [39]. These findings were echoed in a broader literature review of 64 publications dated between 2007 and 2017, which found forest bathing and nature therapy to be associated with lower blood pressure and heart rates, reduced symptoms of depression in certain populations, and a heightened sense of calm and wellbeing

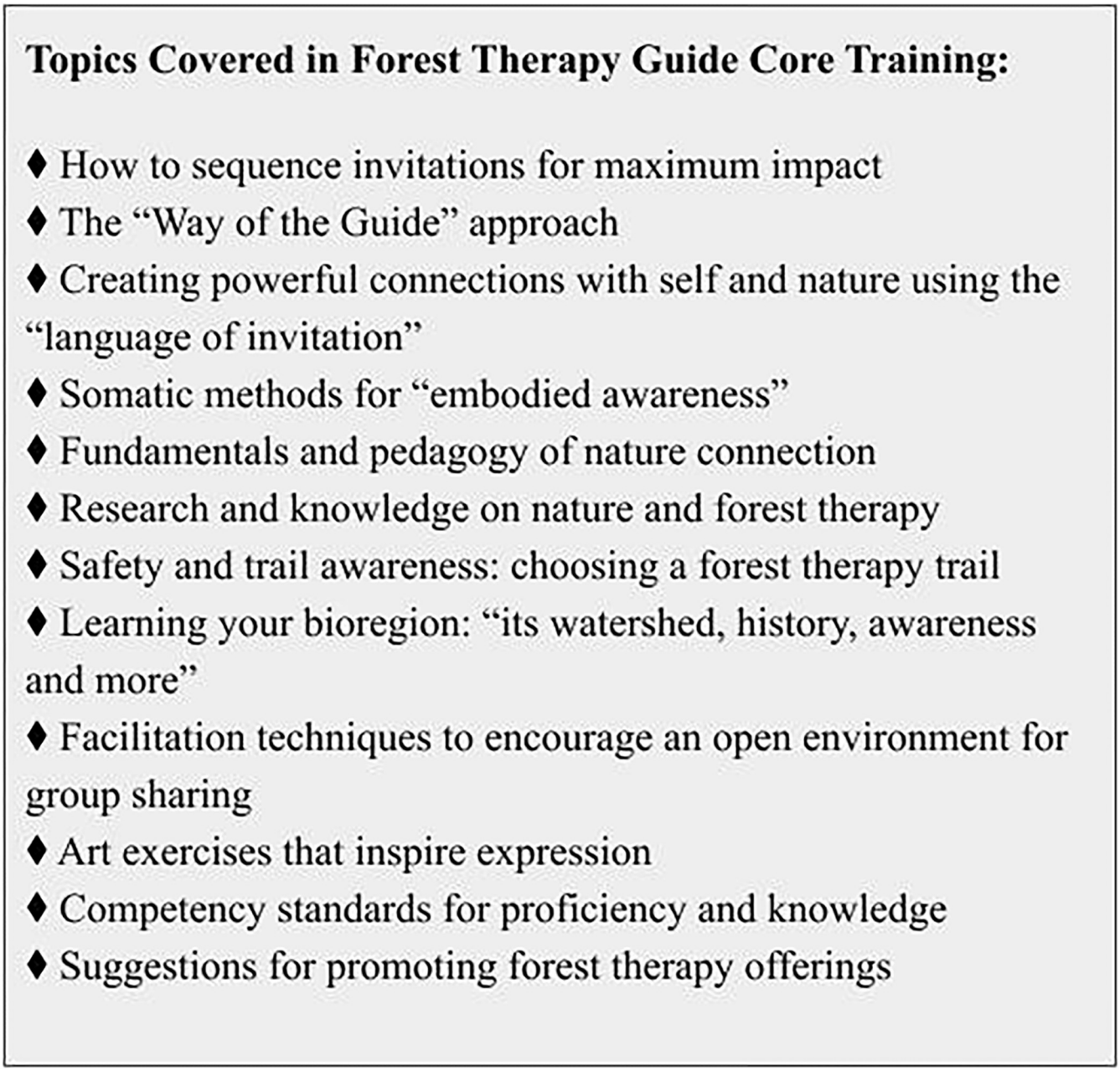

Fig 2. Forest therapy core training topics. Fig 2 summarizes the topics explored in the Association of Nature and Forest Therapy training program. *ANFT, 2021*.

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[24]. A second 2017 systematic review focusing exclusively on randomized control trials (RCTs) involving forest therapy found that in addition to an association with lower blood pressure, there was a positive effect of forest therapy on oxidative stress, hypertension, and cardiac and pulmonary function, although the effects of forest therapy on inflammation, anxiety and depression had mixed results [40]. Specific to public health emergencies, a recent study of healthcare workers with distinctly higher job stress during the COVID-19 pandemic found reductions in insomnia and daytime sleepiness, as well as reduced anxiety, depression and somatic symptoms following engagement in forest therapy [41].

Chico State University's Forest Therapy for Community Recovery program

In October 2019, the Chico State University's Chico Ecological Reserves received funding from the North Valley Community Foundation's (NVCF) Butte Strong Fund for the "Forest Therapy for Community Recovery" pilot project in response to the Camp Fire. The pilot project funded the certification of 15 interested members of the community, including mental health professionals, teachers and academics, outdoor educators, and those working in other fields to become forest therapy guides. Potential guides were recruited through local community organizations and partner agencies via news outlets and social networks, and once selected, they completed the ANFT certification program. During the training period, guides were Wilderness First Aid certified and learned about the ethos, techniques and tools of forest therapy, including the ANFT Standard Sequence [Fig 1].

The goal of the "Forest Therapy for Community Recovery" pilot was to develop and implement a scalable program to provide professionally guided forest therapy experiences to at least 450 individuals impacted by the 2018 Camp Fire and to evaluate the effectiveness of participation in forest therapy experiences on mental health and wellbeing. Forest therapy experiences were advertised and offered to the general public, with priority given to individuals impacted by the Camp Fire. The publicly announced "Forest Therapy for Community Recovery" walks occurred during July and August of 2021 and served 378 individuals. The pilot program faced implementation limitations due to the ongoing COVID-19 pandemic and because of some cancellations due to poor air quality from the 2021 Dixie Fire.

Study goals

While research into the practice of forest therapy has been growing since the 1980s, a gap exists related to forest therapy's application towards recovery from trauma, including from disasters [42]. In response, our exploratory study uses the Chico State University (CSU) "Forest Therapy Pilot Program" to describe if and how forest therapy can serve as a trauma-informed approach to promote wellbeing in the face of climate change and associated disasters. We examine forest therapy guides' perceptions of the integration of each of the principles of trauma-informed care into the practice of forest therapy in a community that has experienced repeated devastating wildfires. We also examine their views on operational considerations for implementing forest therapy programs as a community-based, trauma-informed approach to wellbeing enhancement in communities recovering from disaster.

Materials and methods

Ethics statement

The University of Washington (UW) Human Subjects Divisions determined this to be human subjects research that qualified for exempt status (Category 2 STUDY00013876). Verbal informed consent was obtained for all participants.

This qualitative research study gathered data through key informant interviews with a cohort of forest therapy guides leading walks in Butte County, an area of Northern California, USA that is being increasingly impacted by severe wildfires, including the historically devastating 2018 Camp Fire.

Study design and data access

This study was a collaboration among practitioners based at the CSU, and researchers at the University of California Los Angeles (UCLA) and UW, all of whom contributed to study design and conceptualization. CSU partners were solely responsible for the design and

administration of the forest therapy program. UW investigators conducted and analyzed the key informant interviews. Access to the interview data was restricted to UW researchers exclusively. This intentional separation of roles was designed to promote qualitative confirmability (i.e., impartiality of qualitative research process) [43], reduce social desirability bias among key informants, and adhere to ethical human subjects research practices.

Data collection

Leveraging SAMHSA's six key principles of a trauma-informed approach (Table 1), we developed an interview guide that broadly explored forest therapy as a trauma-informed approach to disaster recovery. Forest therapy guides were provided with SAMHSA's definition of trauma-informed care ("a program that is trauma-informed realizes the widespread impact of trauma, recognizes the signs and symptoms of trauma in clients, families, staff, and others involved with the program; and responds by fully integrating knowledge about trauma into policies, procedures, and practices, and seeks to actively resist re-traumatization") [23], and then were asked questions exploring if and how the forest therapy program addressed each of the six principles of trauma-informed care. Subsequent questions assessed the operational considerations for forest therapy implementation, including queries about motivation to become a forest therapy guide, the guide's perceived self-efficacy, and perspectives on the potential application of forest therapy in future disasters. The interview guide was reviewed by all members of the study team, and piloted with one member of the study team from CSU (BE), who was also a forest therapy guide.

Targeted recruitment for key informant interviews with forest therapy guides was facilitated with the assistance of research partners from CSU who were involved in the pilot project. CSU researchers circulated information about the study along with UW contact information to guides interested in participation. Criteria for inclusion required participants to be a certified forest therapy guide or enrolled in the forest therapy training program as part of the larger pilot, and to have guided at least one forest therapy walk as a guide. Individuals in the program who had not led any walks were excluded.

Key informant interviews were scheduled on an individual basis according to participating forest therapy guide's availability. In advance of each interview, background information on the goals and purpose of the study was provided, and forest therapy guides were read an informed consent statement and provided the opportunity to ask questions. Researchers obtained verbal consent before starting the interview, including permission to record for the purpose of transcription. Interviews lasted between 46 to 81 minutes.

Data analysis

Interview recordings were professionally transcribed. Themes were deductively identified by two members of the study team (CH and JR) using rapid qualitative analysis methods [44]. First, individual interview summaries were created by synthesizing and summarizing transcripts into key themes, using the interview guide as a structural template. These summaries were shared with forest therapy guides to confirm accuracy of the researchers' synthesis and interpretation, a process known as "member checking" to enhance credibility in qualitative research [45]. Forest therapy guides had two weeks time to provide written feedback on the summary. Where relevant, feedback on these summaries provided by guides was integrated into the final analysis.

Information was extracted from the individual interview summaries into a matrix, which was reviewed and distilled into an analytic memo summarizing key themes and counterpoints across interviews [44]. The first interview was summarized jointly by two researchers, and the

remaining transcripts were divided across the two researchers for development of individual interview summaries. Throughout each stage of analysis, researchers reviewed each other's work to affirm quality, comprehensiveness, and consistency before moving on to the next step of the process. The data analysis matrix and metadata have been published in the National Science Foundation-funded DesignSafe-CI's Data Depot Repository as project PRJ-3883 [46].

Results

Eleven interviews (including a pilot) were conducted with forest therapy guides who met inclusion criteria from October 14, 2021 to January 4, 2022.

Observed benefits of forest therapy

Forest therapy guides identified changes in walk participant's physical and emotional well-being, for example having a sense of calm and tuning into one's body. Two interviewees with a background in physiology described observing participants becoming more relaxed; they explained they perceived this to be related to engagement of the parasympathetic nervous system. Disconnecting from technology and having the chance to "unplug" was also mentioned by several interviewees. Reconnecting with nature was identified as a benefit of forest therapy, especially for individuals that one guide described as having a "broken" or "damaged" relationship with the environment after living through the Camp Fire. Additionally, participants raised the idea of forest therapy as a pathway to promote environmental stewardship; however, they noted that increased appreciation for the environment could exacerbate solastalgia the mourning of environmental changes or feeling homesick even while at home because of changes to the surrounding natural environment [13] and ecological grief the emotional response and mourning caused by the loss of nature [13] following future disasters. As shared by one guide, "*it's actually kind of preventative. We live in these spaces that we don't actually look at, or think about, or care for. And Forest Therapy is about prompting people to slowly, and carefully, and lovingly look at the place where they are. And until we can do that, then we won't care about any of these places, and we won't do anything to protect them. So if we do that, then I think people will grieve more deeply when these natural disasters take place, because they—now they've lost something that they do really love.*"

Forest therapy as a trauma-informed approach

Interviewees regarded forest therapy to be well aligned with a trauma-informed approach to disaster recovery, with many pointing to the incorporation of trauma-informed care principles into the ANFT training. Forest therapy guides considered the principles of safety, trustworthiness and transparency to be clearly integrated into the forest therapy program. Perspectives on how the principles of peer support; collaboration and mutuality; empowerment, choice and voice and cultural, historical and gender issues were integrated were more complex.

Safety

Forest therapy guides frequently discussed non-coerciveness, having choices, trust, and the idea of creating a "safe container" for walk participants to promote psychological safety during walks. About half of the interviewees considered the open-ended nature of the walks, with specific activity invitations extended to walk participants that they can accept or forgo, to be associated with psychological safety. One guide stated, "*Everything is invitational, so whatever feels safe and right for you is the right way to do it, right, there is no right or wrong way. . ..*" Guides described a lack of judgment, expectations, or sense of hierarchy, and the intentional neutrality

conveyed by guides during walks as mechanisms for ensuring psychological safety. Several guides expressed the desire to lead cohorts on forest therapy walks consistently over a duration of time to maximize benefits, deepen trust and to strengthen a sense of psychological safety among cohort members.

Several interviewees referred to wilderness first aid training and carrying supplies such as first aid kits, cell phones, water, bug spray, and sunscreen to encourage physical safety during walks. Choice of site selection and raising awareness of regional threats such as bears, rattlesnakes, ticks and poison oak were other components of physical safety that the guides considered when planning forest therapy walks. One interviewee shared, *"Safety-wise, we take all the measurements that we can in terms of preparing and being very aware of the environment that we are going to expose the participants,. . .sharing this information with the people before we start is also key to keep everybody safe."*

Trustworthiness and transparency

Most interviewees saw trust-building as a critical component of the forest therapy experience, and several described the walks as transparent; in other words, that they set clear logistical expectations for the walk (Table 1). "Hospitality" was described as an introductory period of the forest therapy experience in which the guide explains what will happen during the walk. Three guides tied the idea of hospitality to transparency, and described the hospitality portion of the walk to be part of their trust-building process. One interviewee elaborated on this concept, *"[transparency] would be, because you explained exactly what you're going to be doing that day, and part of my personal script is there are no goals to be obtained, there are no gold stars, there are no a-pluses or f-minuses."* About half of the guides emphasized the importance of setting the tone, listening attentively, and acting as a neutral party in order to remove judgment from the experience as mechanisms for building trust. Transparency, trustworthiness and safety were overlapping concepts, and our analyses pointed to redundancy in activities associated with these specific principles of trauma-informed care.

Peer support

Interviewees employed similar strategies for peer support that were described in trust-building, including using invitations to help with bonding, staying neutral, and having an equal reaction to everyone. Some guides noted that not all walk participants wish to open up to a group and share, which guides accommodate by engaging with individuals at the level they feel most comfortable. One expressed, *"Even if you're a fire survivor maybe you don't want to share or process, and so being really mindful of not everyone wants to rehash their trauma all the time."* All of the guides mentioned opportunities during or after sessions for walk participants to provide support to others.

Collaboration and mutuality

The majority of the guides described promoting opportunities for collaboration and mutuality through specific invitations extended to the walk participants, though one said that they "read the room" before sharing these invitations. Several guides mentioned the equal and full attention that they provide to all walk participants, thus leveling any power differences between the group members to facilitate mutuality. One guide suggested that reducing hierarchies was built into the forest therapy model and that the guides participate in the walks right alongside the walk participants by design. Another guide responded to this question by pointing to the understated mutuality established between Camp Fire survivors, saying, *"On any of these. . .*

chances are very good that the Camp Fire and subsequent fires since then have had a profound impact on them. And so there is sort of that connection."

Empowerment, voice and choice

Many of the interviewees affirmed that the concept of choice is an important element of forest therapy walks. The majority noted that since forest therapy lacks a prescribed end goal, the level and purpose of engagement is up to the individual. As one guide put it, "*People choose to do things that turn out to be healing for them, but it's not a planned deal. It's spontaneous. And I think that in itself is healing in a way that's great."* However, guides are often unaware of walk participants' long term intentions or if they follow through with any personal goals set during walks. One guide considered empowerment to not explicitly be part of the program, but did not think this omission was a flaw.

Cultural, historical & gender issues

While there were opportunities to address cultural, historical, or gender issues through sharing pronouns, land acknowledgments and inviting members of a local Tribe to provide deeper context on the land on some walks, interviewees disagreed on the extent to which the forest therapy program addressed these principles. Several forest therapy guides highlighted the importance of land acknowledgements as a way to incorporate this trauma-informed principle. One guide marked this as an area for improvement to be considered when planning future walks," *I'm already thinking of spending more time thinking about, not the ecological standing and history of the place that we do the walks, but the historical, and to some extent, political history of the places where we do the walks."* Participants also highlighted gaps in the program's ability to address this trauma-informed care principle related to lack of diversity in the program participant base and cultural barriers that may prevent participation by some individuals. This guide expanded on this comment, sharing, "*one thing that pops to mind is perhaps opportunity is lacking, and . . . if the program, the participants, the ideas were available to people of other economic backgrounds, ethnicities, and so forth, I think they would respond to it."*

Operational considerations for implementing forest therapy programs following a disaster

In addition to understanding whether forest therapy can be utilized as a trauma-informed approach to disaster recovery, forest therapy guides described operational issues to consider when implementing a forest therapy program in a community following a disaster. Interviewees described their own motivations to become a guide, as well as key aspects of the ANFT training program that individuals found to be most beneficial. Some interviewees also noted the stigma surrounding "therapy" as a potential obstacle for participation. Detailed summaries of these operational considerations are reported below and can be found in Table 2.

Guide recruitment

All interviewees in this study had been recruited to become guides as part of the "Forest Therapy for Community Recovery" pilot, and almost half of those interviewed were Camp Fire survivors themselves, saying this inspired them to join the program. Over three-quarters of the forest therapy guides referenced their occupation as a motivating factor, with common professions including social work, mental health, or disaster work in the community. Some guides working in mental health considered forest therapy to be a useful alternative to talk therapy, while others saw it as another tool to better serve their community.

Table 2. Key implementation considerations. Table 2 provides themes that appeared during interviews with forest therapy guides related to key implementation considerations for the CSU forest therapy pilot program (recruitment of guides, training, inclusivity and accessibility of walks, and marketing and messaging).

Implementation Consideration	Key Points
Recruitment	**Personal connection**—being a survivor of a disaster and/or living in an affected community can inspire people to become a guide. **Occupation**—working in specific fields such as social work, mental health, or disaster recovery or being part of existing community organizations and infrastructure can be a motivating factor.
Training	Support for guide cohorts can be provided through educational materials, customizable training, immersive experiences, relationships built within the cohort, and connection through WhatsApp groups and other forms of social media.
Inclusivity and Accessibility of walks	Guides recommended recruiting more guides of color to be more representative of the populations served and increasing accessibility of walks for people with limited mobility or transportation options, and other considerations to reach a broader spectrum of the population.
Marketing and Messaging	Guides expressed a need for culturally tailored messaging for people of different ethnicities and socioeconomic backgrounds to increase engagement in the program. Messaging may also need to avoid the stigma around the word "therapy."

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Training

All interviewees identified the educational materials and training support provided by ANFT as an important aspect of enhancing the forest therapy guides' confidence. A four-day immersive, in-person training experience allowed guides to practice and be with their cohort. Several described this immersive training as a critical component of their self-efficacy development and empowerment.

Over three-quarters of forest therapy guides emphasized the importance of the relationships and camaraderie between the cohort members, with some noting that this cohort was the most important aspect of their training. All members of the cohort were local to the affected area, allowing them to provide mutual support through in-person meet-ups, perceived to be especially valuable as their training took place remotely during the COVID-19 pandemic. The cohort also connected through a WhatsApp group and other forms of social media that allowed for support from trainers and other cohort members during the training and afterwards. One guide highlighted the cohort itself by saying, *". . .I don't think that I would have that same experience if I had just done it. . .Doing it with this group of people where we're all in Butte County, and we're all very committed to the health and wellness of our Butte County residents really makes us, I think, a fairly unique group."*

At the same time, the guides also described the importance of individualistic aspects of the training, both in terms of customizing training to meet the individual needs of walk participants, as well as providing encouragement to customize and tailor their approach to forest therapy.

Inclusivity & accessibility

Several forest therapy guides stated that the demographic makeup of the area made it challenging for walks to be inclusive of different racial, ethnic, and socioeconomic groups. The guides themselves were largely white, reflecting an area of California that two interviewees noted was not as racially or ethnically diverse as other parts of the state. Interviewees listed several areas for improvement in this regard, including training more guides of color, better educating

themselves to create relationships with communities where power differentials may present a barrier to program engagement, and to making the program more accessible for people who may not be able to get outside (e.g., seniors, individuals with limited mobility).

Marketing and messaging

There was also a call for more culturally and locally tailored marketing and delivery of the forest therapy program to better engage community members. One example is different messaging to overcome the hesitation that may be attached to language surrounding therapy at large, especially in some socio-demographic groups that may be apprehensive of therapy and mental health care. Several guides acknowledged that this could be explored further. As one put it, *"We believe that this is appropriate for everybody, but everybody might not be attracted to the same keywords . . .and also as we're developing other ecotherapy practices, if there's something that is more attractive to certain racial/ethnic groups, we may pursue that."*

Discussion

This exploratory study of forest therapy guides' perspectives provides insights on the alignment of forest therapy programs with each of the pillars of trauma-informed care in the context of disaster recovery. Forest therapy guides in this study broadly described the physiological and emotional benefits they observed during walks and their experience of how each of the SAMHSA principles of trauma-informed programming (Table 1) relates to forest therapy walks that were part of a community-focused wellness program developed in the aftermath of wildfire. They also discussed how their training to become a guide was trauma-informed. Guides in this study also identified operational factors to be considered and improved upon in order to strengthen the delivery of forest therapy programming in the post-disaster context.

As climate change increases the frequency and intensity of wildfires and other climate-sensitive hazards, communities must adapt and prepare for mental health impacts. Our findings indicate that forest therapy may serve as a feasible approach to providing trauma-informed community-mental health services in the wake of disaster. Its integration of trustworthiness and transparency as core to its delivery, including through its invitation to participants to experience it at their own pace and to achieve their own goals, may provide added value to a community reeling from disaster, particularly among populations with limited access to or acceptance of traditional mental health services. Further, its commitment to both physical and psychological safety may mitigate retraumatization of disaster-affected individuals, while reintroducing them to nature and its associated health and wellbeing benefits. Prior research has found that exposure to the return of flora and fauna in a wildfire-affected environment helped disaster-affected individuals re-establish a sense of place and reorient to a dramatically transformed landscape [47].

Our findings indicated that the forest therapy program fostered the trauma-informed principle of peer support among the guides, and potentially among the participants of walks as well. The lack of capacity of the program to provide coordinated and overt peer support to participants is unsurprising since it is intended to be experienced individually. However, the guides, recruited from locally affected communities, shared the common experience of the Camp Fire with one another and their walk participants, and established what was reported to be an unspoken sense of mutuality and collaboration. Participants in our study emphasized the importance of the camaraderie they experienced with their guide cohort, all of whom shared lived experiences around the Camp Fire. Moreover, the physical proximity afforded by all cohort members living within the same community allowed them to continue to support

one another throughout their tenure as guides. Communities considering establishing forest therapy programs following a disaster should consider opportunities for cohort building among guides throughout the lifecycle of the program.

Mental health impacts of climate change affect people from all backgrounds, but the repercussions are often magnified in marginalized populations [48]. Communities that have endured environmental racism, social injustice and poverty disproportionately experience higher risks for negative mental health risks and climate change impact, including wildfires [14, 49]. At the same time, outdoor recreation has historically excluded people of color [50]. In order for post-disaster forest therapy programs to reach diverse populations, including those most likely to experience the adverse mental health consequences of disasters, participants suggested training more diverse guides, targeted engagement with affected communities, and identifying opportunities to adapt the program to those who may be unable to access it due to physical restrictions. Further, additional attention to the trauma-informed care principles of "empowerment, voice and choice" and "cultural, historic and gender issues" offer opportunities to improve inclusivity and comfort for diverse populations, for example by proactively including information about the individual nature of the experience in marketing materials, and integrating discussion of the history of the lands the walks take place on and acknowledging their traditional stewards.

Limitations and opportunities for future research

Our study was a single case with a small sample size, geographical restriction, and study population with similar professional backgrounds and demographics that may impact the generalizability of results. Notably, many of the participants in our study had prior mental health or wellbeing-related training prior to becoming a forest therapy guide. As such, their perspectives may be influenced by their prior experiences. While this unique worldview may have enabled them to more thoughtfully reflect on the potential for forest therapy to serve as a trauma-informed practice, future research should integrate the perspective of guides from diverse backgrounds and in multiple contexts. Additionally, results are based on responses from a cohort of guides that knew each other and whose responses may have been influenced by peers through communication outside of the interviews. Moreover, recall and/or social desirability bias may have affected interviewees' responses.

Future research should investigate the effectiveness of forest therapy on improvements to mental health and wellbeing of participants who recently experienced disaster, including how it may mitigate the onset or exacerbation of post-disaster mental health sequelae. In addition, CSU's "Forest Therapy Pilot Program" serviced over 10% of its student population in only 8 months, pointing to its potential scalability. However, additional research is necessary to assess the feasibility and ability of post-disaster forest therapy programs to reach individuals living in communities where conventional therapy may not be available or may be stigmatized. Additional research is necessary to assess implementation outcomes (e.g., acceptability, appropriateness, feasibility, cost, penetration, sustainability) of forest therapy programs implemented in disaster settings [51], as well as their impact on mental health service access and availability.

As the impacts of climate change are increasingly experienced, forest therapy programs may offer opportunities to dampen the experience of ecoanxiety, climate grief, and solastalgia while concurrently promoting environmental appreciation and stewardship. Reconnecting with nature was identified by study participants as a benefit of forest therapy, especially for individuals that one guide described as having a "broken" or "damaged" relationship with the environment after living through the Camp Fire. However, additional research is necessary to understand and protect against potential retraumatization that could occur by reintroducing

disaster survivors into natural environments that remind them of their disaster experience. Moreover, while our study purposefully set out to assess a forest therapy program initiated in response to a disaster, future research should explore forest therapy programs as approaches to mitigate wellbeing impacts associated with more nuanced environmental changes, as well as examine impacts of forest therapy on motivation for, valuation of, and engagement in environmental conservation and climate adaptation and mitigation efforts.

Conclusion

Climate change is amplifying the intensity and frequency of climate-related disasters and the increasing adverse mental health outcomes resulting from these events. Lack of adequate mental health resources in at-risk communities calls for alternative and complementary methods of community-based mental health care that can be tailored towards specific disaster-affected populations, as exemplified in Butte County following the devastating 2018 Camp Fire. Findings from this exploratory study based on interviews with forest therapy guides in Butte County, CA, USA, indicate that community-based forest therapy programs offer a promising flexible and scalable approach to trauma-informed mental health care in disaster-affected communities. Findings also identify opportunities to tailor implementation of future programs to better reach populations most impacted by disasters, including through targeted outreach and diverse guide recruitment. Additionally, programming established surrounding a particular traumatic disaster event may introduce mutuality between participants based on shared experiences. Future research should investigate the impacts of forest therapy in disaster-affected communities on the mental health and wellbeing of participants, and the acceptability, appropriateness, feasibility, cost, penetration, sustainability of the approach.

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