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Key Characteristics of Forest Therapy Trails: A Guided, Integrative Approach

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Abstract: Forest therapy is an emerging holistic health practice that uses multisensory immersive engagements in forest settings to achieve health and wellbeing outcomes. Many forest therapy engagements take place via slow walks along a trail to optimally experience the array of sensory phenomena afforded along the route, yet surprisingly few forest therapy studies to date have investigated the characteristics of forest sites and trails that give rise to healthful experiences. In this research, we employ a hybrid approach to understand the conditions and features that contribute to a good forest therapy trail, using interviews with forest therapy guides to identify and highlight concepts for further refinement and structuring via a broad, integrative review of the relevant research and planning literature. Through this iterative approach, we identify and describe three site-related criteria (landscape character and quality, tranquility, and accessibility) and two trail-related criteria (design and construction and key features and qualities), each with a number of sub-criteria detailing specific conditions and considerations. This effort helps build a conceptual foundation and evidence base for assessment procedures that can be used to identify existing trails and design new ones that meet the needs of forest planners, managers, guides, and participants for the growing international practice of forest therapy.

Keywords: forest therapy; forest bathing; forest trails; forest therapy guides and practitioners; integrative review; key characteristics

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1. Introduction

Forest therapy as discussed in this paper refers to the practice of mindfully engaging in multisensory, immersive experiences in forests and other natural environments to realize health and wellness benefits [1,2]. From its initial formalization as a health-based activity in Japan in the early 1980s, forest therapy encompasses forest bathing (shinrin yoku), nature therapy, forest walks, and similar activities that have collectively become part of a growing international field of practice [3,4]. Similar to other professionally guided or self-guided mindfulness practices such as yoga and meditation, an important part of forest therapy takes place within an individual, quieting the mind and directing embodied awareness to the present moment [5–7]. What distinguishes forest therapy from these other practices is that the present moment exists not within the beige walls of a yoga studio or candle-lit meditation room but surrounded by a rich array of living, changing, multisensory natural phenomena. The interaction between an individual and the forest environment invites exploration, often via a slow, purposeful walk along a forest trail [8], and where other practices teach participants to consider each thought and experience with equal value, in forest therapy, it is within this interaction that key features and qualities of the forest environment are perceived and experienced in relation to an individual in ways that afford function, meaning, and attraction and call forth actions [1,9]. As a critical manifestation of

the person–environment interaction process, these "environmental affordances" [10–12] help connect individuals with the natural world and can lead to a range of health and wellbeing outcomes [13,14], from the simple pleasures of enjoying a view and playing with nature [15,16] to short- and sometimes long-term improvements in mental and physical health [17–20].

Identifying the key characteristics of forest settings and trails and translating them into guidelines for design, planning, and management are the central goals of the Forest Therapy Trails project, a U.S.-based effort initiated by social science researchers in the USDA Forest Service working in cooperation with public health and park professionals of the non-profit group Park Rx America, whose mission is to provide nature-based solutions for improving human and planetary health [21]. In an initial effort to address these goals, we conducted a comprehensive scoping review of empirical studies on forest therapy to examine how researchers conceptualized and measured important aspects of people–forest interactions and outcomes [22]. As expected, we found that most studies focused their efforts on assessing the health and wellbeing outcomes of forest therapy engagements. However, what surprised us relative to our project goals was how few studies attempted to look at how particular features and qualities of forest settings influenced these outcomes. Of the 266 studies we reviewed, less than 1 in 5 examined the outcome effects of specific forest characteristics in any detail. Instead, most studies treated the forest as a generic setting against which pre-post outcomes were evaluated or compared it against an equally generic urban or control (e.g., indoor) setting.

While only about half of the 50 studies that compared different forest setting characteristics found significant positive effects on the outcomes, the types of characteristics studied highlight promising directions pursuant to our project goals. These characteristics include forest stand and landscape types such as deciduous versus coniferous forests [23,24] and various combinations of water, forest, and landform types [25,26]; forest structural and spatial characteristics such as percent forest cover [27] and different viewscape characteristics [28,29]; and forest gradient effects such as the level of forest management [30,31] and degree of naturalness [32,33]. For additional clues about key forest features and qualities, we also conducted text analyses of passages within each article of the 266 article set where authors described the forest settings they selected for study. Here, the most frequently noted features and qualities included water [34,35], vegetation diversity [36,37], designated or protected status [38,39], naturalness [40,41], and large trees [42,43]. While together this information provides important clues for the development of guidelines for forest therapy trails, a major conclusion from our review was that, to more fully address our project goals, we would need to look beyond the forest therapy research literature.

A "Guided" Approach to Synthesis

In this paper, we take a hybrid approach to better understand the key characteristics of forest settings and trails that contribute to satisfying, health-promoting forest therapy engagements. The first part of this methodological framework involved concept generation using interviews with forest therapy experts. One of the foremost promoters of the forest therapy movement in the United States is the Association of Nature and Forest Therapy (ANFT), which, since 2014, has offered training and certification programs for forest therapy guides [44]. The guides organize and conduct forest therapy walks for individuals and groups, leading them through a sequence of mindfulness and embodied awareness activities or "invitations" that facilitate connections with nature to promote health and wellbeing. Although this sequence can be used virtually anywhere, in practice, most guides select locations and trails that will help maximize opportunities for multisensory immersion in nature [1]. Through their training and experience, guides possess substantial knowledge in identifying forest settings, features, and qualities conducive to satisfying engagements for their participants, and for this reason, we sought their input in this next phase in our investigation.

To supplement the conceptual foundation of our investigation and strengthen its evidence base, we then used the concepts generated from the interviews to guide an integrative review of the relevant research and planning literature. Consistent with the goals of our Forest Therapy Trails project, integrative reviews are broad-based syntheses of the literature on an emerging topic that bring together knowledge from different communities of practice to reveal new insights and perspectives [45,46]. They can be used to answer specific questions about a topic (e.g., identifying key characteristics) and to help organize and structure concepts to create useful frameworks for future applications (e.g., design and management guidelines). Using this hybrid approach iteratively, the concepts identified by the interviews helped direct the review, while the information uncovered from the review helped to expand the understanding of concepts and identify gaps not covered by the interviews. In the following sections, we more fully describe this novel approach to study and present the findings of our work and its implications for the development of guidelines for forest therapy trails.

2. Materials and Methods

2.1. Interviews

We initially contacted forest therapy guides at the 1st Annual International Forest Therapy Conference and Congress held in Sonoma, California, USA in July 2019. An in-conference announcement and flyer described our research project and invited those with guide experience to participate in an interview to discuss "your experiences with and in the places where you choose to guide. We are interested in what site and trail characteristics best complement your guiding experience." Participation was described as voluntary and their input treated as confidential. Interested individuals contacted a member of the research team and scheduled a time for a phone interview during the month following the conference.

The interview protocol consisted of seven open-ended questions covering: (1) guides' backgrounds and experiences related to forest therapy, (2) important characteristics or features of sites and trails in providing an optimal experience for forest therapy walks, (3) natural and built elements to include when designing an ideal forest therapy trail, (4) the importance of multisensory characteristics that contribute to forest therapy experiences, (5) the optimal sequence of experiences or invitations along a trail or walk, (6) the extent to which facility features and the natural environment matter in delivering a satisfying forest therapy experience, and (7) their opinions on incorporating environmental learning and stewardship activities into forest therapy walks. The open-ended questions provided opportunities for follow-up probes for the guides to think beyond their training an into broader issues of forest therapy experiences. The interviews averaged 1/2 h in length and were audio-recorded with the consent of the participant.

The 13 individuals who volunteered to participate resided, based their forest therapy practice, in rural areas (n = 3), small cities (n = 3), and major metropolitan areas (n = 7) across the Western (n = 3), Eastern (n = 5), Midwestern (n = 3), and Southern (n = 1) U.S., with one participant from Western Canada. At the time of their interviews, all participants had led forest therapy walks for one or more years, all but one was an ANFT-certified guide, and three served as instructors in guide training programs. Most of the participants became forest therapy guides as an extension of their personal and professional interests in the healing powers of nature, including backgrounds in horticulture and recreation therapy, outdoor and conservation education, landscape architecture and environmental studies, yoga meditation, massage therapy, integrative medicine, and spiritual education and practice. This diversity of backgrounds and experiences resulted in a rich set of responses, reflecting a range of perspectives and often providing unique insights on individual questions. Upon completion of the 13 interviews, the interviewer felt that data saturation had been reached and that input from additional participants was unnecessary [47]. This was evidenced by the repetition of major themes across participants in response to the interview questions, allowing the investigators to develop the initial codes for analysis.

2.2. Literature Review

The initial themes derived from the interviews (see next section) were interrogated through a broad review of the literature. The review was also informed by the expertise of the research team, one of whom is a certified forest therapy guide, two with professional careers in facilitating nature-based health and wellness programs for public and private sector organizations, and all with extensive research or on-the-ground experience in park and recreation planning and the human dimensions of greenspace and forest landscape management. From these perspectives, we drew upon our knowledge and searches of the literature across a wide range of topic areas and communities of practice, including forest therapy and restorative environments, landscape perception and preference assessment, outdoor recreation site preference and use modeling, outdoor recreation privacy and conflict, greenspace access and equity, nature and experiential education, trail planning and design, and recreation site and trail accessibility. Using the initial themes from the interviews within these various contexts, we searched for research articles using Scopus and for planning reports and other grey literature using Google and Google Scholar. In line with the purpose of integrative reviews [45,46], the aim of our search was not to produce an exhaustive review of the literature but to locate key documents and representative studies to clarify interview themes, identify gaps, and understand the thematic and topical relationships that will help to integrate and structure our findings.

2.3. Methodological Framework for Analysis

Our methodological framework employed a three-stage, inductive–deductive approach to theme development [48] that integrates findings from our interviews and the literature in an iterative fashion (Figure 1). In stage one, the verbatim text transcriptions of the interviews were read several times by one member of the research team, and 42 initial themes were identified from text segments using an inductive coding procedure [49]. This "theme generation" stage of analysis was focused on enumerating the characteristics of forest settings and trails that the guides sought or would ideally prefer in selecting a place for guiding forest therapy walks. These initial emergent themes were presented to the full research team and, based on our combined knowledge and expertise, used deductively to guide the literature review. In this second "theme refinement" stage of analysis, keywords and phrases from the interviews were linked to topical areas from the different communities of practice. For example, "big trees" as an emergent theme was used in combination with a search of the literature on "landscape preferences" [49]. As the literature review progressed and topical concepts were explored, the initial interview themes were refined and clarified, and frameworks described in the literature often suggested ways to group the themes into broader concepts [46]. To continue the example, "big trees" was a key vegetation feature that, along with other key water and wildlife features, helped define an important class of biophysical features related to forest landscape preferences and that guides sought out in the immediate trailside environment. To build upon this improved understanding, in the third "theme structuring" stage of analysis, the transcripts were re-coded by the same person to maintain consistency [47], and with further discussion among the research team, the revised themes were organized into 2 broad areas that included 3 criteria and 9 sub-criteria relating to site-level considerations and 2 criteria and 8 sub-criteria relating to trail-specific considerations.

In the findings that follow, we present these criteria with supporting information from the interviews and literature review that convey the depth and range of the issues they comprise.

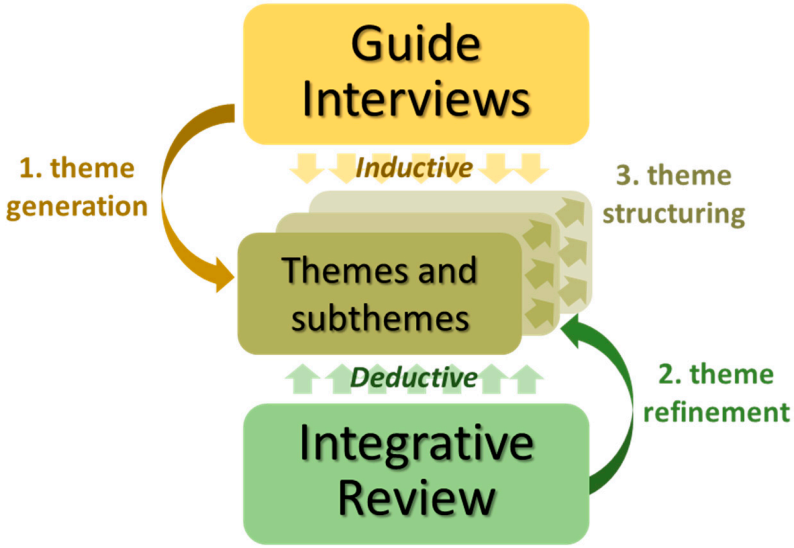

Figure 1. Methodological framework describing the three-stage, inductive–deductive approach to theme development involving theme generation, refinement, and structuring.

3. Results

Figure 2 illustrates the conceptual structure of the themes (criteria and sub-criteria) resulting from our hybrid, inductive–deductive approach to theme development. Reading from the center circle outward, the top (yellow) half of the figure encompasses the site-level considerations, with the inner (darker) and outer (lighter) rings showing criteria and sub-criteria relating to the landscape character and quality (sense of place, diversity, and integrity); tranquility (sensory, social, and environmental); and accessibility (proximity, facilities, diversity–equity–inclusion). The bottom (green) half of the figure encompasses the trail-level considerations for criteria and sub-criteria relating to design and construction (length and layout; trail bed surface, width, and slope; and route and accessibility "ROS" options) and key features (vegetation, water, and wildlife; views, spaces, and changes; usable nature; seating, gateways, and shelter; and signage, education, and stewardship). Encircling the diagram are phrases intended to capture the essence of each of the criteria and corresponding sub-criteria.

Table 1 summarizes the findings related to broad-level considerations for the location and selection of sites for forest therapy trails and engagements (top half of Figure 2). In each row, a given sub-criterion is briefly described, and representative quotations from the guide interviews are provided, along with the principal literature areas and representative citations.

These types of criteria and sub-criteria are similar to the site-level analyses employed in a few studies discovered in our earlier review of forest therapy research [22], where investigators conducted regional landscape suitability assessments to identify potential areas for forest therapy bases and trails, usually in a tourism development context [50–54]. For example, Capecchi et al. [50] developed a GIS-based decision support system based on information from a focus group and literature review to define 4 major criteria (usability, risk, psychological, and physiological) and 14 sub-criteria to map the suitability of forest areas in the Tuscany region of Italy for visitor stress recovery. Similarly, Dodev et al. [52] built on the previous literature to define 7 thematic sets of 22 criteria relating to the quality and favorability of landscape characteristics, location convenience, and healing potential to map the suitability of forest areas in the Smolyan Municipality of Bulgaria to provide forest therapy services. While this phase of our Forest Therapy Trails project is focused on concept development rather than field applications, our approach and the three criteria and nine sub-criteria we identify share some similarities with this previous work but also extend it in some important ways.

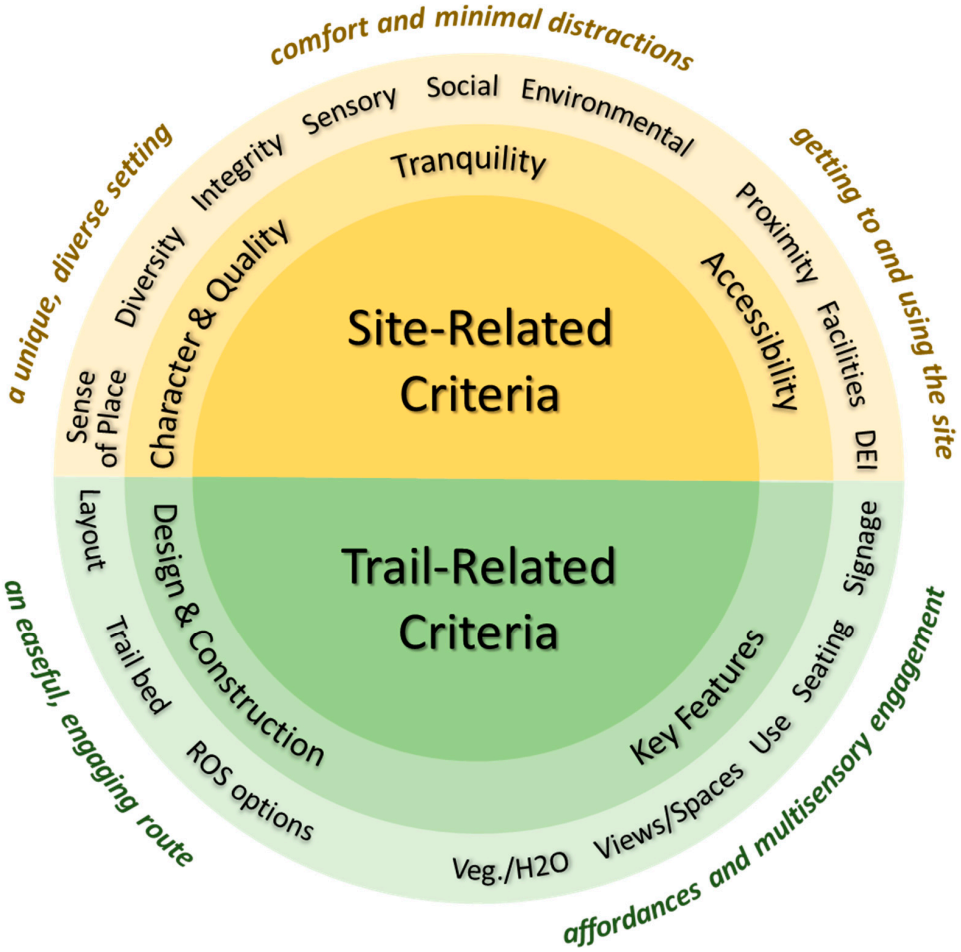

Figure 2. Conceptual structure of the key characteristics of forest therapy trails presented in this paper.

Table 1. Site-related criteria.

Criteria and Sub-Criteria	Description	Guide Interviews and Example Quotations [1]	Literature Topics and Example Citations
Landscape character and quality—a unique and diverse setting			
Sense of place	The characteristic biological, physical, and/or cultural patterns and features that define a site and its surrounding landscape and contribute to people's emotional bonding.	"Each place is unique. It is up to us guides to work with the land as opposed to making the land work with us" (2). " . . . the designer should drill down and listen to the people who live in that place and know . . . what is important about the place" (4).	Sense of place/place attachment [55,56], landscape character assessment [57,58], place-based planning [59,60]
Diversity	Aesthetic variety and vividness a site's landscape character patterns and features	"I think it is nice to have a diversity of elements" (12). "A trail with twists and turns and vistas into a variety of landscapes is nice" (9). "A variety of experiences and open spaces are lovely" (7).	Scenic quality assessments [58,61], landscape preference research [62,63]
Integrity	The condition or intactness of a site's landscape character patterns and features	"The greater amount of ecological diversity, the greater the palate of psychological reflection can become" (12). " . . . you need places that are diverse and complete ecosystems" (4). "More pristine conditions would be better" (5).	Scenic integrity [58,64], biodiversity and landscape preference [65,66], condition-care and recreation ecology [67,68], heritage and cultural landscape assessments [69,70]

Table 1. *Cont.*

Criteria and Sub-Criteria	Description	Guide Interviews and Example Quotations [1]	Literature Topics and Example Citations
Tranquility—comfort and minimal distractions			
Sensory	Isolation or buffering from visual, noise, and other sensory distractions	"For me most important is the quietude, that is my biggest one. That's most important" (10). " . . . Airplane noise can be very distracting. Highway noise can also bother people" (8). "Avoiding powerlines would be nice, sometimes you can't avoid them" (6).	Tranquility mapping [71,72], visual and noise impact assessments [73,74]
Social	Number and compatibility of other on-site users	"The sense of privacy is important" (3). " . . . there won't be a lot of other people on the trail that make the person feel intimidated, so that this person can have a one-on-one experience with nature" (11). "I would try to create the path in its own space away from bike trails, equestrians, and other uses where you have to negotiate around other outside stimuli" (8).	Outdoor recreation privacy and solitude [75,76], use conflicts and coping strategies [77,78]
Environmental	Physical and biotic factors that influence comfort and physical safety	"We want to minimize hazards along the trail. I identify types of snakes, watching for rocks and logs, poison oak and poison ivy, potential for ticks. I'm hoping to minimize encounters with hazards as much as possible" (3). " . . . everyone should feel comfortable . . . If there are bugs bothering them, they are going to clam up" (11).	Human thermal comfort and recreation climatology [79,80], "biophobia"—fear of nature and insects [81,82]
Accessibility—getting to and using the site			
Proximity	Distance/travel time from "home" or population centers	"Develop trails close to where people live for easier access" (5). "For a lot of people it is an edge to come out on one of these walks and . . . if they are with a group of people they don't know, proximity is important" (3).	Park and open space standards [83,84], nearby nature and urban-proximate forests [85,86], park proximity and visitor use [87,88]
Trailhead facilities	Parking, restrooms, and other support facilities	"Parking and a bathroom are the two major things. A visitor center with a bathroom is also nice" (1). " . . . features of comfort like bathrooms and close parking areas . . . " (13).	Level of facility development [89,90], setting preferences and experience outcomes [91,92]
Diversity, equity and inclusion	User diversity, forest and greenspace equity, inclusiveness in program location and language offerings	"We need to have trails for all people, especially underserved groups and groups with differing abilities" (8). "I charge $30/person [and] donate 30% back when I lead groups on their lands. I also ask groups what their budgets are" (1).	User diversity and equity [93,94], disparities and constraints to use [95,96], user fees and inclusion [97,98]

[1] Numbers in parentheses indicate the individual who is quoted.

3.1. Landscape Character and Quality

The first three sub-criteria we present all deal with the broader characteristics and qualities of the landscape related to people's perceptions and preferences. While the core concepts presented in this section emerged from our interviews, we interpreted and grouped them based on our knowledge and review of the literature in landscape assessments, particularly landscape character and scenic quality assessments that are used in the U.S., U.K., and other countries for regional and national landscape planning efforts. Together, the concepts of sense of place, diversity, and integrity contribute to a unique and diverse setting for forest therapy engagements.

3.1.1. Sense of Place

In describing the locations they seek and use for forest therapy walks, several of the guides we interviewed stressed the importance of understanding the qualities of a place that make it unique. This includes knowledge about the type of landscape and how it functions ecologically and socially; from city gardens and rural meadows to wildland forests, deserts, and blue spaces, each landscape embodies different archetypes that distinguish it from other landscapes. This knowledge also includes the stories associated with the landscape, including traditional knowledge of Indigenous peoples and local naturalists who forged deep connections to a place, along with one's own lived experiences of what makes a place special, even magical. The challenge to the guide or trail designer, therefore, is to learn about and interpret these distinctions and meanings for those who come to walk the trails and to be sensitive to cultural differences that might exist so that people can better connect emotionally with the place.

The ideas about places that arose from our interviews related strongly to the literature on the sense of places and their application in landscape assessments and recreation resource management issues [55,56,60]. On one level, the sense of a place is identified objectively through the characteristic biological, physical, and/or cultural patterns and features that define a site and its surrounding landscape [99]. This is the basis of landscape character assessments used in landscape planning efforts in the U.K. and elsewhere [57,100] and in scenic quality evaluations for federal land management in the U.S. [58]. On another level, however, these characteristics become more relevant to people when they are associated with meanings and values that create an emotional bond or place attachment [99]. Works at this level have been important in identifying and mapping aesthetic, spiritual, therapeutic, and other values in landscapes [59], anticipating people's responses to landscape changes [101], and communicating place information to culturally diverse groups to foster collaborations [102]. In relation to forest therapy, cultivating an attachment to places through positive, memorable experiences can lead to repeat visitations, enhanced health and wellbeing outcomes, and increased support for natural areas' protection programs [103–106].

3.1.2. Diversity

Landscape diversity or variety was mentioned by nearly all guides as an overarching characteristic they looked for in choosing a site for a forest therapy walk. As discussed by the participants, diversity manifested itself in a number of different ways that contribute to the beauty of a site: a variety of landscape or land cover types such as closed canopy forests and open meadows that provide different views and experiences; a diversity of landscape elements and features that include water, rocks, big trees, and flowering plants; and a variety of landforms and microclimates. Each of these characteristics were seen as adding to the aesthetic experience of forest therapy participants.

The guides' emphasis on landscape diversity and variety corresponds closely to concepts employed in scenic quality assessments, including expert-based systems and empirical studies of landscape preference. For example, the U.S. Forest Service's Scenery Management System asserts that high levels of variety and related concepts such as vividness, harmony, and uniqueness as found in vegetation, water, landforms, and cultural patterns and features contribute to a distinctive landscape high in scenic quality [58]. Assessed directly by experts or operationalized through the use of various landscape metrics, these overarching concepts have been used to identify and map the scenic quality in regional landscape assessments and to set scenic quality objectives for landscape management [61,107–109]. Similar concepts such as complexity, mystery, and coherence have also been tied to theories and assessments of landscape preferences, as they are thought to help explain people's attractions to a landscape in a more general sense than to specific landscape features [63,110–112]. However, some landscape assessment researchers assert that biophysical features and their measures can be assessed more reliably and correspond more closely to what people actually see at the landscape that affects their preferences [62,113].

This may particularly be the case within forest stands and along trails, and we discuss these below in our trail-related criteria.

3.1.3. Integrity

The topic of diversity was also discussed by some guides in the context of ecological quality and naturalness, particularly how sites that were higher in biodiversity and in pristine condition provided better opportunities for psychological reflection, stress reduction, and a multisensory experience. In contrast, guides who had done walks in forests that were monocultural plantations, sites with homogeneous over- and understory layers, and along trails that were in a degraded condition or low in naturalness found that such settings could be boring, detract from people's experiences, and would require more programming on the guide's part to provide a satisfying experience.

Ideas about site quality and condition voiced by the guides relate to the broader concept of integrity, as seen in the literature on landscape perception and assessment, recreation ecology, and cultural and heritage landscape assessments. As used in the Scenery Management System, scenic integrity refers to the degree of intactness or lack of disruption in the patterns and features that contribute to the scenic quality [58]. Many landscape preference studies have shown naturalness to be a primary indicator of people's preferences [64,114], while other works have linked measures of species richness and biodiversity to preference and psychological restoration [65,66,115]. Beyond visual perception, forest landscape diversity has been linked to natural soundscape diversity, which also contributes to preference and restoration [116,117]. Landscape condition and care also figure importantly in people's preferences for landscapes and green spaces [67,118], and a number of studies in recreation ecology [64] have shown that trail bed erosion and trailside vegetative conditions can be important determinants of trail preference and choice [119–122], and while the guides in our interviews did not discuss them in this context, integrity and the related concept of authenticity are central to cultural and heritage landscape assessments [69,70,123]. This aspect could be particularly important in selecting sites for forest therapy walks in landscapes such as botanic gardens or historic sites where the built environment plays a prominent role in people's experience.

3.2. Tranquility

The next three sub-criteria identified by our analysis group together concepts that deal broadly with tranquility as a multidimensional phenomenon. While early conceptualizations of tranquil landscapes in the research and planning literature focused primarily on the identification of quiet areas and the absence of anthropogenic sounds [124,125], more recent explorations of people's experiences of and desires for tranquility in the landscape have expanded the concept to include sensory, social, and environmental dimensions [71,72,126]. Together, these dimensions point to the identification of landscape areas and setting characteristics that promote psychological and physiological comfort and minimize distractions [127].

3.2.1. Sensory

In the context of our interviews, the sensory dimension of tranquility was dominated by references to noise intrusions, mainly from nearby highways and aircraft overflights but also adjacent land uses and activities. Visual intrusions such as powerlines and other built environment elements were also mentioned, but nearly every guide felt noise was the major sensory distraction experienced by their clients, and some guides avoided noisy sites that might otherwise have high beauty or other desirable attributes. Guides recognized that the location of forest therapy sites was a deciding factor in minimizing noise distractions, and remote rural locations and larger sites offered better opportunities to find quiet. In busier or more urban locations, one guide dealt with noise distractions by calling the group's attention to the character of the surrounding landscape to help place the sounds in a more accepting context, e.g., mentioning that "we all use cars to get around".

The literature on landscape preference and assessment has long been dominated by concerns about visual resource quality, and while visual impact assessment methods and tools are well-developed [73,128,129], most noise mapping and soundscape perception studies are more recent [130,131]. In wildland recreational context, visual impact assessment work has focused on major landscape development activities such as timber harvests, high-voltage transmission towers and corridors, wind turbines, and in identifying optimal locations and design strategies that reduce their visibility from key observation points and corridors [129,132,133]. Light and air pollution can also impact the visual quality, and studies of these distractions aim at the protection of dark skies and visibility [71,134]. Noise is unwanted, and sometimes, a harmful sound that is mainly anthropogenic in nature and its presence, intensity, and/or frequency can be a major distraction and stressor in both urban and natural settings [121,135,136]. Quiet is not simply the absence of noise but the perception of calmness, which may include acceptable levels of anthropogenic sound, as well as pleasant natural sounds [137–140]. Research on noise and quiet area mapping has accelerated under policies such as the 2002 EU Environmental Noise Directive [141,142], and approaches include noise mapping of objective sound pressure levels [74,143] and subjective assessments of quietness from public and expert groups based on soundwalks and other perceptual approaches [144,145]. The general trend in research has been away from noise assessments and toward integrated soundscape studies that assess the totality of the sonic environment and its interactions with other sensory perceptions in promoting healthful, restorative built and natural settings [146,147]. Although the guides did not mention olfactory impacts, unpleasant odors have long been at the forefront of land use nuisance regulations, and research on measuring and mapping odors has grown in recent years [148,149]. As with research on sound, the trend has been toward integrated smellscape studies that examine the spectrum of pleasant and unpleasant smells and their effects on human health and wellbeing [150–152]. The pleasing effects of sensory phenomena are critical to forest therapy experiences and are discussed in detail in Section 3.5 below.

3.2.2. Social

Social issues related to other site users were mentioned by more than half of the guides as factors that disrupted the tranquility of forest walks for their clients. These issues included both the number of other users and different trail user types, including boisterous groups of hikers and fast-moving mountain bikers and runners. While a part of the disruption related to physical space constraints, with others trying to pass the forest therapy group on the trail, it was chiefly a psychological feeling resulting in a loss of privacy and solitude. To engage intimately with nature, forest therapy participants needed to feel comfortable and uninhibited in their actions, and having others on the trail watching their activity could be intimidating. Guides avoided high-use and multi-use trails, and if they were designing their ideal trail, it would be a "quiet trail" well separated from other users and dedicated to forest therapy. One guide mentioned that large forest therapy groups can sometimes be their own distraction to individual participants and that it was important to limit group sizes or split the group in two if large groups were expected for a forest walk.

Privacy and solitude have been identified in the wilderness and outdoor recreation literature as key reasons for engaging in forest- and nature-based activities such as hiking, canoeing, and cross-country skiing [75,104]. The forest environment offers a place of escape from people's busy lives and an escape to a place that helps achieve a state of solitude or small-group intimacy [153,154]. Outdoor recreation settings that afford privacy serve as refuges for creative and reflective thought, emotional release, and intimate communication, all of which are consistent with the goals of forest therapy [76,155]. Conflicts can occur when the presence, intensity, or actions of others interfere with people's ability to achieve privacy, solitude, or other goals of their recreational engagement and can result in stress, dissatisfaction, and visitor displacement [77,156–158]. Recreational use conflicts are often asymmetrical, and because of the importance placed on privacy, solitude, and reliance on quality forest settings, forest therapy participants are likely to be vulnerable to experiencing

conflicts from other trail users who come in large numbers or whose goals are more social-, speed-, or equipment-oriented [159–161]. Managers can help reduce potential use conflicts by segregating uses in different areas, creating different trail types, designating one-way trails to reduce group encounters, and regulating use numbers, though the latter can be difficult in public settings [78,162,163]. Forest therapy guides and participants can choose less popular places and times for engagements to minimize conflicts [164,165], and guides can also use their training and experience to help participants cope with constrained nature experiences when and where they occur [166].

3.2.3. Environmental

Some aspect of physical comfort was mentioned by nearly every guide as an important prerequisite for an enjoyable, health-promoting nature experience, though they often mentioned different types of environmental conditions that helped or hindered successful engagements. One was ambient air temperature, and when the summer days got too hot, people were not interested in going out. In such cases, some guides would schedule walks early or late in the day or make sure the trail had plenty of shade and, ideally, proximity to a water body where participants could sit and soak their feet. Cold, windy winter days were also challenging, particularly when trying to engage participants in slow or standing sensory immersion activities. Another environmental factor related to biting insects, poisonous plants and venomous animals, and other biotic threats, real or imagined, posed significant challenges to guides in providing a safe and comfortable experience for their participants. For example, dressing in highly protective clothing and wearing potent bug spray interfered with the sensory experience, and fear of ticks and poison ivy kept people to the center of the trail. Guides could minimize these distractions in choosing more open sites and trails, at least during the times of the year when they were most problematic. Finally, the physical environment itself could pose challenges to safety and comfort, and guides talked about the importance of scouting trails in advance to identify safe sites for engagements or at least being aware of locations along the trail where there were tree roots, steep ledges, or rocky or slippery stretches that could be safety hazards.

Recreation use and choice modeling studies have shown that site and trail use levels and preferences for many activities such as hiking, bicycling, and picnicking are highly correlated with temperature and precipitation [127,167,168]. Recreation climatology is a growing area of research that deals with understanding climatic and microclimatic factors relating to human thermal comfort and site suitability for recreation and tourism [79,169,170]. In our previous review of the forest therapy literature [22], the few studies examining microclimatic factors generally found that measures such as high air temperatures and relative humidity can negatively impact physiological and psychological health outcomes [171–173]. Notably, Lin et al. [80] developed a thermal comfort model to identify the optimal structural conditions and times of day for forest walks. A growing focus of recreation climatology has examined the impact of climate change on nature-based activities [174–176], including those dependent on a narrow range of environmental conditions such as snow for skiing [177,178], as well as how increased pollinosis [179,180], the spread of disease-transmitting insects [181–183], and other concerns can pose challenges for people seeking a comfortable experience in nature. Beyond these environmental drivers, in the U.S. and other countries, there is a growing concern about increasing cultural alienation from nature, especially for urban children who may grow up with little familiarity of wild places and the creatures that inhabit them [184,185]. This can lead to irrational fears of encounters with wild things, especially insects, snakes, and some mammals [81,82]. Forest therapy and other forms of experiential environmental education can play an important role in reducing such fears and strengthening people's connections to nature [186–188].

3.3. Accessibility

Access was a key issue that ran throughout our interviews, from broad considerations on site selection to specific concerns about trail design and construction. At the broader,

site selection level, this section discusses three sub-criteria relating to how people get to and are able to use sites for forest therapy: proximity; facility development; and diversity, equity, and inclusion.

3.3.1. Proximity

Issues relating to proximity were mentioned by four of the guides we interviewed, two of whom stressed that, in order for forest therapy experiences to be broadly accessible, sites and trails needed to be located close to where people lived. Relating to the idea of escape as discussed above, another said that it was ideal to have a site where they could get away from the sounds of the city, but if not, it was still possible to host successful walks in closer urban sites, and while more remote sites may offer a more diverse environment for forest therapy, another cautioned that participants who made longer drives to reach a site often required a winddown period to relax before a walk. By the same token, long or busy return drives home could diminish the stress reduction benefits gained by the experience.

Proximity has long been a major criterion in developing recreation and open space standards for different park types, with small neighborhood parks located close or within walking distance to where people live and larger regional facilities such as metropolitan forest preserves located further away and accessible by car and, in some locations, public transportation [83,84,189,190]. Fixed proximity and area standards are often unrealistic when applied across diverse communities and geographies, and in the U.S. and elsewhere, many communities have adopted performance benchmarks to provide an optimal mix of opportunities for their residents [191]. While forest therapy bases have been developed as part of national-level tourism efforts in rural and urban-proximate forests of Japan [38] and South Korea [192], in most other places, forest therapy has not yet been incorporated in the mix of open space opportunities, and therefore, proximity guidelines are lacking. On the other hand, planners and scholars in many countries have embraced the broader idea of nearby nature and providing natural areas, alone or within larger parks or along environmental corridors close to where people live, many of which are conducive to use for forest therapy [85,86]. While much of the work on park use and choice is oriented around more active recreational pursuits, the general finding that proximity is positively related to frequency of use would seem to hold for forest therapy visitation as well [87,88,193], and insofar as people tend to use parks more frequently when they live closer to them, related evidence shows that park proximity can play an important role in stress reduction and other health and wellbeing outcomes [194–196].

3.3.2. Trailhead Facilities

Most of the guides we interviewed felt that, at a minimum, forest therapy sites should have adequate parking and toilet facilities for their clients, with the majority stressing that these were important or critical. These should ideally be located close to the trailhead where the walk begins so that individuals can join the group and use the facilities while waiting for others to arrive. In most cases, guides' mention of bathrooms and drinking water indicated preferences for fairly developed facilities, which would be consistent with other facility preferences they mentioned, including visitor and nature centers for participants to visit before or after the walk or to use for shelter in case of inclement weather.

Visitors at developed recreation sites in the U.S. and other countries increasingly desire a high level of facilities that are well-maintained, particularly with respect to restrooms [89,90,121]. Recreation researchers in the U.S. and other countries have also identified demographic and cultural differences in facility development preferences, with some groups such as older adults and African American visitors preferring higher levels of development and maintenance than other groups [197,198]. However, higher levels of facility development also tend to equate with higher use levels [199,200], which could lead to crowding and privacy conflicts, as described earlier. The U.S. Forest Service's Recreation Opportunity Spectrum (ROS) provides a social–ecological framework for guiding facility development across a wilderness-to-urban spectrum [201–203]. By understanding

how site and trail improvements relate to visitor experiences, forest therapy planners and guides can identify the level of facility development that best matches user preferences and expectations [91,92,204].

3.3.3. Diversity, Equity, and Inclusion

Issues related to promoting user diversity, equity, and inclusion (DEI) were not explicitly mentioned in our interview protocol but, rather, emerged in various ways throughout our conversations with the guides, often in the context of other site- and trail-related criteria discussed in Results. Foremost was in the selection of sites and trails that provided access to a wide range of individuals; this includes the proximity considerations mentioned above, as well as in trail design and construction specifications discussed in the next section. DEI considerations were also expressed in the types of groups guides catered their practice to, which, for one guide, emphasized youths with learning and emotional challenges, and, for another, included programs offered in Spanish, as well as English. Many of the guides mentioned that their walks often attracted older adults and that they selected sites and conducted activities that were sensitive to individuals with mobility and hearing difficulties. Program and site use fees was another topic with DEI implications, as many guides are in forest therapy as a private practice and rely on compensation for their services. Here, one guide mentioned her willingness to negotiate fees to accommodate the budget of participating groups, while another often worked with municipal park districts that sponsored the forest walks so they could be offered free or at a reduced cost to a broad range of community residents.

DEI has long been an important issue in the provision of park and recreation opportunities in the U.S. and other countries and has become increasingly important in recent years [93,94,205]. Individuals and groups can experience a range of barriers and disparities that constrain their participation in leisure and recreation [95,96,206]. In the context of forest therapy, fees and inequalities in the distribution and/or quality of facilities and programs can disproportionately impact older adults and others who may be on low or fixed incomes, racial and ethnic minority individuals, and others who experience significant constraints to participation [97,207–210]. Different groups may think about and use natural areas in different ways, but there is increasing evidence that nature is important to everyone in both urban and rural settings, and thus, it is important for forest managers and forest therapy providers to understand the best ways to deliver nature opportunities and experiences to all of their constituents [98,210,211].

3.4. Design and Construction

With this section, we now turn the focus of discussion to the trail level. Table 2 summarizes our findings with respect to two sets of criteria dealing with trail design and construction and with the identification of key trailside features and qualities (bottom half of Figure 2). For the first set of criteria, from our guide interviews and literature review, we identified three sub-criteria relating to trail design and construction that together work to create an easeful, engaging route for forest therapy participants.

Table 2. Trail-related criteria.

Criteria and Sub-Criteria	Description	Guide Interviews and Example Quotations [1]	Literature Topics and Example Citations
Design and construction—an easeful, engaging route			
Length and layout	Length, route type, and alignment	"We don't cover a lot of territory. In the beginning I felt I really had to . . . cover lots of space, but as time has passed, I don't feel that way" (6). "Loops are nice. . . . The loop works well" (3). "If I was designing the ideal forest therapy path, I would want to incorporate mystery, bends where you can't see around the corner . . . " (4).	Nature trail design [212,213], recreation and nature trail preferences [214,215]

Table 2. *Cont.*

Criteria and Sub-Criteria	Description	Guide Interviews and Example Quotations [1]	Literature Topics and Example Citations
Surface, width, and slope	Trail bed composition, width, and running/cross-slopes	"Condition of the trail is important, not overgrown . . . Roots can be problematic if people are unstable on their feet" (1). "The trail should be wide enough for people to pass along the length of the trail" (5). " . . . slightly hilly but not too difficult for people with accessibility issues. Hilly enough to provide interest . . . flat and boring is not great" (6).	Trail design and accessibility guidelines [216,217], trail bed preferences [120,218]
Route and accessibility options	A variety of routes, environments, and degrees of difficulty	"We should think about the Recreation Opportunity Spectrum (ROS) and how forest bathing fits within ROS and how we can apply what we know from ROS" (5). "I can imagine the same way there are nature trails with different accessibility levels, there might be some forest therapy trails that are more accessible and some that are more wild" (7).	ROS [203,219], trail setting and recreation experience preferences [91,92]
Key trailside features and qualities—environmental affordances and multisensory engagement opportunities			
Vegetation, water, and wildlife	Plants from flowers to big trees, visual and physical access to various water features, animals from insects to megafauna	"Trees, hopefully big, older trees . . . Shade is important. People want to sit in the shade . . . " (1). "Water features are important. . . . if they can get close to water that is a huge thing. The tactile sense brings people in very quickly" (6). "Having a place where there are butterflies to watch . . . The addition of flowering plants in the understory can be magical and mind-blowing" (3).	Forest landscape preferences [220–222], restorative environments [65,223,224]
Views, spaces, and changes	Distant, panoramic, and detail views; private nooks, group, and ceremonial spaces	"An overlook or scenic view somewhere is nice, adding to the sensory experience" (2). "A clearing in the woods where people can sit on the ground for a tea ceremony is nice . . . A fire circle would be nice" (4). " . . . habitat transitions are very helpful as well . . . It can be going from woods to meadow to wetland . . . differences in elevation work, too . . . On a half-mile [1 km] trail three or four habitat transitions is enough" (11).	Forest landscape spatial description, preferences, and restoration [225–227]; experience of change [228,229]
Usable nature	Edible species, collecting, and opportunities for active engagement	"Having plants or bushes or trees that are edible is nice. That is a beautiful perk. Having those things widens the web of interbeing" (2). "Sensory interaction comes back to having a trail that invites interaction . . . we can introduce wild tending and encourage people, so people feel invited to interact with the surroundings" (7). "Hopefully, in the future there will be forest therapy parks where guides can harvest natural herbs" (10).	Leave No Trace and museumification of nature [230–232], active engagement in nature and wild foraging [233,234]
Seating, gateways, and shelter	Natural and built elements that facilitate activities	"We can have benches made out of split logs that look as close to a fallen log as possible but that are still comfortable for people. The more we can do that, the better" (11). "Should have shelter of some sort, in case of thunderstorms or rain. A gazebo is wonderful" (1). "The bigger view is that there would be a variety of infrastructure including huts and rocks and benches and maybe even platforms. . . . " (7).	Built environment image [235,236], biophilic design [237,238]

Table 2. *Cont.*

Criteria and Sub-Criteria	Description	Guide Interviews and Example Quotations [1]	Literature Topics and Example Citations
Signage, education, and stewardship	Interpretive opportunities and constraints	I think there is great value in a brochure . . . [or] self-guided trail app [where people could] walk to spot one and it would pop up and guide with an invitation . . . If an app is used it should be available in multiple languages" (13). " . . . reading is such a cognitive process. . . . so, that poses an interesting challenge about how to create signage to help people get into a state of embodiment" (12). "I wouldn't bombard them with information. Let the love percolate. Stay in inspiration" (10).	Trail design guidelines [239,240], nature interpretation and experiential education [241,242]

[1] Numbers in parentheses indicate the individual who is quoted.

3.4.1. Length and Layout

In terms of trail design, most of the guides felt a long trail was unnecessary and that a fulfilling 1.5–3 h experience could be attained in walks of 1 km or less. For most participants, but particularly for older adults, younger children, and those with mobility challenges, the distance to reach the trailhead should also be short so that fatigue did not set in before the guided walk commenced. An exception to this guideline was mentioned by one guide who worked with teenaged groups, where a vigorous hike to get to the trailhead often helped to expel excess energy so participants could then be more focused and appreciative during the slow walk. As for route type, loop trails were preferred so that participants could experience an unfolding array of new environments throughout the walk. However, with the guide introducing new activities or invitations, walks that returned along the same route also worked along linear corridors and longer trails. Whichever type of route was available, but especially in the latter cases, curvilinear alignments were highly preferred, as they reduced long sight lines that might otherwise reveal past and future destinations, as well as the visibility of others along the trail. Trails with bends and dips that conformed to the patterns of nature introduced a sense of mystery and flow of experience through the landscape.

Expert-based design guidelines for nature trails are consistent with the preferences expressed by our guides and call for shorter loop trails with a naturalistic alignment that have both aesthetic appeal and are accessible to a broad range of participants [212,213,240]. Our previous review of forest therapy research found that, of the 56 articles that reported the lengths of trails used by researchers to evaluate the health effects of forest therapy engagements, the median length was 2.5 km [22]. Other research on trail use and choice preferences address a range of trail activities, but a work focused on walking showed walkers prefer short distances to a trailhead [243] and prefer or cover shorter lengths of trail compared to other user types [244,245]. While one study involving bicyclists showed trail sinuosity was not related to use levels [214], other research shows that mystery can be a desirable predictor of preferences in forested park and trail settings, though if visibility is severely constrained by vegetation, such settings can be seen as fearful [215,246–248].

3.4.2. Surface, Width, and Slope

With respect to trail construction, many of the guides stressed that the trails they selected to host forest therapy walks should be accessible to individuals with a wide range of mobilities. This translated to a relatively flat, even, and stable surface of packed gravel or wood chips that could accommodate individuals in wheelchairs and that was wide enough (1–2 m minimum) so that others could pass by the group if necessary. Rocks, exposed roots, and cross-slopes should be minimal for those with balance issues and for everyone's safety when engaging in experiential activities that rely on closing one's eyes or moving in unfamiliar ways.

Trail construction standards and specifications have been developed by many public agencies and private organizations, including comprehensive frameworks covering a spectrum of trail activity types for land, snow, and water-based recreation and a range of trail classes from minimally to fully developed [216,249–251] to more focused guidelines directed at specific types such as nature trails [213,252,253]. Surface, width, slope (grade and cross-slope), and other parameters such as height–width clearance and turning radius are based on safety/risk levels for different trail classes and engineering considerations that take into account sustainability for expected use levels. Accessibility is an important consideration for public trails, and in the U.S., universal access requirements call for new or altered pedestrian and hiking trails to incorporate accessibility standards where it is practicable and consistent with the cultural or environmental setting and intended user experience [217]. Given the relatively short distances traversed in typical forest therapy walks, it is often possible to incorporate universal design standards into a shorter beginning section of a longer trail to provide access to interesting features and experiences that might otherwise present barriers to use [217]. Aesthetic considerations also play a role in trail construction. Trail use studies have shown variations in preferences in relation to setting and activity types, with asphalt and gravel trails and flatter surfaces preferred by urban trail walkers [194,218] and dirt trails by day hikers [244]. Study findings are not always consistent with each other, however, and preferences for trail construction criteria can depend on the issue being addressed by the investigator. For example, dirt trails that were muddy or rocky due to erosion negatively impacted hikers' experiences [120,122], while gravel trails were found to be the loudest and least attractive surface compared to wood, grass, or stone pavement in terms of noise annoyance [254].

3.4.3. Route and Accessibility Options

While most of the guides we interviewed shared similar views with regard to the trail design and construction sub-criteria just discussed, several guides also stressed the need for diversity and choice in route and accessibility options. This included having multiple trails at a site to fit the needs and interests of particular groups with respect to length and degree of difficulty, different surface types along a trail that provide different experiential qualities, including stretches with grass or a soft surface for walking barefoot, and trails with different widths, including stretches that are narrow where individuals can brush against aromatic vegetation and wider stretches where an entire group can congregate for an activity. Others mentioned activity diversity and the option of having forest therapy trails and opportunities for kayaking, mountain biking, or for people with dogs. While guides stressed the need for and importance of accessibility standards for their clients, they also recognized that all trails need not be fully accessible and that different lengths and development levels provided different types of experiences. In this respect, one guide mentioned the potential for applying the Recreation Opportunity Spectrum or ROS to forest therapy trails, which could help providers and land managers think about how to best match forest settings with desired experiences.

In our previous review of the forest therapy literature [22], we identified a few studies that compared guided versus self-guided forest therapy engagements, showing that the two types can provide equally beneficial yet different experiences for individuals [255,256]. Another study found that forest therapy trail users preferred a range of trail types, consistent with the ROS framework [106]. Originally developed in the context of national forest planning and management, ROS recognizes that different types of forest settings from primitive to developed provide different experiences to people in terms of challenge, risk, isolation, and other factors [201,203]. The framework has been expanded by others to encompass land and water activities in a range of federal and non-federal lands [90,219,257,258] incorporated into accessibility guidelines [217] and applied to urban settings [204,219]. In this latter context, ROS can be particularly important in understanding how to identify and manage urban forests and other nearby settings to enhance people's connection to nature, tranquility, and other factors important to forest therapy engagements [91,92,204].

3.5. Key Trailside Features and Qualities

The final set of sub-criteria relate to the key features and qualities present in proximity to or experienced from the trail. While earlier criteria tap into various sensory dimensions and environmental affordances, they tend to do so indirectly by the broader motivating qualities of landscapes and trails that create a context and ambience for the walk, such as diversity, tranquility, and accessibility. In contrast, the sections that follow group together features and qualities that, by virtue of their trailside presence, engage participants directly as environmental affordances and multisensory experiences. These can also be broadly perceived and experienced but are often specific to an individual based on their needs and desires, past experience, and social-situational context [11,12,259].

It should be noted that the guides and the literature we reviewed discussed perceptual processes both abstractly in relation to how sight, sound, smell, motion, and other single- and multi-sensory modalities and affordances are engaged in the experience of forest environments, as well as concretely via the identification of key features and qualities of forest environments that give rise to various sensory experiences and affordances. While each is an important and valid perspective, our emphasis is on the latter, as identifying the key features and qualities translate more directly to guidelines for design and management.

3.5.1. Vegetation, Water, and Wildlife

Trees were among the top-mentioned key features that guides desired to have in their walks. Deciduous tree canopies afforded cooling shade over the trail and coniferous trees produced aromatic phytoncides that afforded pleasant smells and had healing properties. While these forest type characteristics were important, in terms of trailside features many guides also talked about the importance of individual trees, particularly big or old trees. Sitting under, leaning against, touching, and even talking with a big tree provided participants with a powerful and intimate way to connect with nature. Guides also spoke of the importance of a lush and diverse understory layer of vegetation, with shrubs, forbs, grasses, moss, and fungi of unique shapes and textures, still and in motion, and flowers and fruit that attracted insects and birds and produced mind-blowing displays of colors and smells in the woods at springtime and in meadows and prairies in the summer. Water was another top-mentioned trailside feature that guides desired to have on their walks, though many trails lacked close or direct access to it. Clear, moving streams with riffles and waterfalls were ideal for their interactive possibilities, affording coolness, sounds, reflections, healthful negative ions, and opportunities to see fish and other aquatic life that could be both stimulating and restorative. Full or partial immersion in water can be a magical, powerful experience, but if direct access was not possible, visual access from a bridge or along the trail was still a major plus. Wildlife was often mentioned indirectly and in the context of habitat conditions that afforded opportunities to see birds, insects, and mammals. Seeing wildlife on a walk was always welcome but not always guaranteed, and their motion and sound were primary sensory appeals.

In our review of the forest therapy literature, an analysis of notable features mentioned by authors in their forest setting descriptions showed that large trees, vegetation diversity, and water were among the most frequently mentioned features [22]. The broader literature on forest and greenspace preference/restoration corroborates the importance of vegetation, water, and wildlife mentioned in our interviews. Studies of within-stand forest landscapes generally show that mature, closed-canopy forests with large diameter trees of moderate densities and lush but relatively open understories are preferred and seen as more psychologically restorative compared to young, dense stands across various forest types and countries of study. Tree species and height diversity can also add to preference, particularly if there is a mix of coniferous and deciduous species and a dominant mature tree component [113,220,259–262]. Groundcover and overall vegetative diversity of forests and greenspace are positively linked to preference and restoration, with plants of different colors and textures and associated bird and insect life adding to the appeal [65,115,263]. Standing and downed dead wood often detracts from preference and restoration, although

information, old growth context, and on-site experience can contribute to positive appraisals [264–268]. The focus of most these studies is on the visual landscape, but in a few instances, natural forest sounds were identified as an important factor in preference and restoration [136,269]. Beyond the sensory–aesthetic dimension, large trees, either single trees or in groves and old growth forests, are revered in many cultures around the world for a diversity of values, including symbolic, spiritual, heritage, educational, scientific, and environmental [270–274]. Water has long been an important predictor of landscape preferences [221,275,276], and "blue spaces" have received increased attention in recent years for their positive impact on people's health and wellbeing [224,277,278]. The presence of water, whether as natural bodies of fresh or saltwater or as artificial features such as fountains and ponds, can be a source of preference and restoration for their visual contrast and motion, relaxing sound qualities, and interactivity [279–281]. In terms of visual access, the quality of a natural water body is important but not always critical, particularly in urban settings, although color, odor, and bank erosion can detract from the preference [282,283]. Good water quality is, however, important for physical access, and direct contact, interaction with, and immersion in water can be a highly therapeutic experience [284–286]. Wildlife can have a positive effect on forest and landscape preference and restoration, and studies have looked directly at their presence in the landscape [220] and as an indirect component in the overall biodiversity of a site [66,223,287]. Of the former studies, the visual presence of animals and insects can be an important part of a nature experience, while, for birds, it is often their song that adds to the experience [288]. Of the latter studies, the perception of biodiversity may be a more important predictor of preference than the actual biodiversity [287].

3.5.2. Views, Spaces, and Changes

The guides described different types of views they would prefer to have along the route of their forest walks. Foremost were distant views and overlooks that not only provided an enjoyable contrast in an otherwise enclosed forest landscape but also afforded participants a sense of safety in being able to see what lies ahead on the trail and the larger landscape. One guide asserted that these extended views can also operate on a metaphoric level to expand participants' mental horizons and strengthen the mind–body connection. At the opposite end of the view spectrum were detailed views of standing dead "snag" trees, tree bark, roots, fallen logs, and other nooks and crannies that provided habitats for moss, fungi, insects, small mammals, and birds, which, in turn, created interest and drew participants into close-up exploration of the sights, sounds, smells, and textures. Along with views, different spaces created by vegetation and topography also afforded different perceptual experiences and behavioral opportunities along the trail, from small, enclosed spaces off the trail for solitary reflection and refuge to larger clearings for light breezes and group activities, such as a tea ceremony. To facilitate different experiences and activities, the guides felt it was important to have a number of different views or spatial transitions along the walk, with natural transitions or changes in topography and vegetation every 15–20 min or three to four transitions on a 1 km trail. While these types of changes tend to be fixed in the landscape, the guides also spoke about taking advantage of ephemeral opportunities provided by microclimate, weather, and the season. Windy days, light rain or snow, temperature shifts, and spring wildflowers were some of the many potential ephemeral changes that can contribute to a multisensory, immersive experience.

Expert-based foundational work in scenic landscape assessment by Litton [225] (see also [289]) describes a typology of compositional view types created by landform, vegetation, and other landscape elements. While subsequent applications focus on more distant and panoramic features and focal landscape views [58,290], Litton's typology also describes enclosed, detail, and ephemeral views. With a few important exceptions [291–293], landscape preference research also tends to focus on view types and spaces that conform to the dominant paradigm of scenic landscape aesthetics [294–296], where scenic vistas, focal or feature views with moderate levels of enclosure, and within-forest views that allow one to see ahead are preferred over wide-open or highly enclosed and obstructed

views [63,226,297–300]. By contrast, detailed views and small, enclosed spaces have been the subject of several on-site studies in the forest therapy literature we identified in our review paper [22], where small-scale elements such as flowers and mossy stones and intimate spaces that provide privacy and refuge are viewed by participants as valued and restorative parts of their forest visits [37,227,301–305]. In terms of changes along the trail, studies on landscape and trail use preferences support our guides' assertions that changes and transitions in vegetation, topography, enclosure, and the other static and ephemeral elements can have a positive effect on user preferences [228,229,244,292,293,306–309].

3.5.3. Usable Nature

While healthful forest therapy outcomes can be realized by stationary viewing of forests onsite, through a window, or even virtually, most guides stressed the importance of actively engaging participants in intimate, multisensory experiences along a forest walk. Where it was permitted, guides invited participants to individually wander off-trail to hug a tree, take a flower or feather to wear in one's hair, pick edible berries to taste, or gather branches to make a forest fairy shelter or artistic display. As part of a group activity, guides themselves often preferred to build a fire and/or pick native herbs for use in an end-of-walk tea ceremony. Each of these activities rely on the ability to use the forest beyond the trail bed, something that, in many parks, gardens, and restored natural areas, is forbidden or discouraged. However, in other, more remote forests or resilient urban locations, some guides mentioned the need to temper the dominant "leave no trace" outdoor use ethic with one of "wild tending" that allows for gentle, sustainable use and builds reciprocal relationships between people and nature.

Leave No Trace (LNT) principles evolved from research in recreation ecology and aim at minimizing visitor use impacts in park and forest settings via education rather than regulation [230,231,310,311]. While LNT principles as originally crafted are intended to promote responsible use, they can lead to a hands-off approach to use and land management that limits the kinds of active interactions with nature that are important in forest therapy and experiential outdoor education [1,312]. This is especially the case in some parks and natural areas, where collecting of any kind is forbidden and off-trail exploration is restricted by fences or other barriers that separate visitors from nature, as if people were in a museum [232]. While there are certainly places where this is necessary, such as in a botanic garden, in many park and forest areas, a broader use ethic can allow for intimate, multisensory experiences that strengthen people's connections to nature [233,313]. The recent growth of research in urban foraging provides a good example of how the sustainable harvesting of common plants can be a powerful way to build nature connections and place-protective behaviors without harming the biodiversity [234,314–316]. Simple nature restoration activities such as collecting and broadcasting wildflower seeds can be another way to engage individuals in pleasant sensory experiences that nurture both people and the environment [232,242,317,318].

3.5.4. Seating, Gateways, and Shelter

In discussing the role of support features in the trail environment, many of the guides we interviewed stressed the importance of keeping things natural by using objects from the forest when possible and introducing other features as needed in ways that blur the distinction between the built and natural world. For example, a fallen log can be moved into place along a trail for seating in a way that looks entirely natural, and log sections can be cut and set upright singly for a private sit spot or arranged in a circle for a group space. These more primitive objects can afford seating for many individuals, but some individuals, because of their needs or experience, may not consider them sit-able. In these cases, a split and finished log raised to standard seating height with stone or log supports and a rough-hewn seat back affords additional comfort and accessibility but still possesses the essential qualities of the fallen log. Further improvements upon nature, and features and materials that abstract or deviate from nature, should be introduced cautiously so

that they do not detract from the essential natural qualities of the forest. Gateways or thresholds provide symbolic entry and exit points to the forest walk, and while a few guides mentioned bridges over water, as an example, others used habitat transitions or natural features such as a large rock or tree to signify a gateway. Built shelters such as picnic shelters, gazebos, teepees, or yurts were useful in times of inclement weather, but at other times, a large canopy tree or simple tarp or awning could suffice for shade or a light rain. Beyond these basic support features, the guides mentioned numerous potential additions, including yoga platforms, hammocks, fire pits, child play areas, storage boxes for guide supplies, and labyrinths of plants and natural materials, for participants to wind down prior to a walk. In most of these cases, the guides stressed the same principle of borrowing from the essential qualities of the surrounding forest so that the feature becomes a part of and enhances the overall trail experience.

Nature has long been the main inspiration for the design and construction of park and trail support features as seen in the early writings of Andrew Jackson Downing, park designs of Joseph Paxton and Frederick Law Olmsted, and facility design guides of the U.S. National Park Service [235,319]. Modifications should use local natural materials and be rustically designed with natural colors, forms, and textures while maintaining safety, comfort, and durability [235]. Contemporary extensions of these basic ideas can be seen in expert-based design guidelines such as the U.S. Forest Service's *Built Environment Image Guide* [236,320] and perceptually and theoretically grounded principles of biophilic design [237,321,322]. Accessibility considerations need not conflict with these basic guidelines and principles, though, in some cases, more extensive work may be required to ensure support facilities meet universal access standards [217]. By enhancing the fit between support features and the natural environment, designers and managers can strengthen connections between forest therapy participants and nature [313,323,324].

3.5.5. Signage, Education and Stewardship

While most of our interview questions relating to site and trail criteria were framed and answered from a guide's perspective, we also asked directly about how trails could be programmed for self-guided forest walks. Most guides here felt that signage could be an effective way to introduce basic activities to heighten participants' sensory experiences, with small signs or numbered posts and accompanying brochures synced to major natural features and locations along the trail. Identifying these points of engagement depended upon the skills and sensitivity of the trail designer, and if the trail was actively managed, signs could be moved and invitations changed to make walks more interesting for repeat visitors and/or to take advantage of seasonal changes. Invitations and any introductory messages needed to be brief and simply stated to maintain participants' focus on embodied awareness and avoid heavy cognitive processing. In that respect, a few guides mentioned the potential of using audio messages, either with equipment embedded within posts that could be accessed with a push button or retrieved with a smartphone activated by a QR code, though here, too, there was some hesitancy in introducing technology into the experience. While guides recognized the importance and value of increasing participants' environmental awareness about a site, its ecology, and history, most felt that during the forest walk this should happen indirectly through sensory experience, with basic site information imparted before the walk began and questions and discussion left for the end of the walk. Nature centers near trails were also seen as a good way for participants seeking further information to obtain it before or after a walk. As a form of experiential learning, a few guides have incorporated simple stewardship activities into walks or as part of a longer day of activities, but even here, the focus should be mainly on the sensory experience, with environmental information imparted in a way that is not prescriptive. The general consensus about environmental learning and stewardship activities is that they should flow naturally as an outgrowth of the forest therapy experience rather than attempting to program information and advocacy efforts into it.

Recreation site and trail design guides describe a typology of sign types for location, wayfinding, regulation, accessibility, interpretation, and other purposes [239,250,325]. Signage of the type that would be used on a forest therapy trail include location post markers (e.g., keyed to brochures) and interpretive signs, and design guides illustrate a variety of styles from simple and rustic to elaborate and modern [240,320,326]. Some park, trail, and forest providers have adopted digital applications for interpretation and other purposes due to their flexibility, cost, and multilingual capabilities [327,328]. Research on visitor perception of interpretive signage and digital technology tends to show low awareness and use but also that attractiveness and simplicity can increase the chances that they will be used [329–331]. While some landscape preference studies have shown that signage or other types of information can lead to increased familiarity and preferences for ecological management [241,264,332], other studies show limited or no effect on preferences [333]. Suksri et al. [303] found that, while signage can play a role in nature trail learning experiences, the primary vehicle for environmental knowledge and appreciation came through direct perception of the environment. Other studies reinforce the idea that promoting opportunities and experiences for nature connection can be an important pathway to environmental learning and pro-conservation behavior [334,335]. Insofar as stewardship activities enhance sensory experience and emotional connections to nature, these can also provide opportunities for environmental learning in ways that are compatible with forest therapy goals [242,336].

4. Discussion

Although many forest therapy engagements take place on trails through forest landscapes so that participants can experience the sequence of multisensory phenomena that unfolds before them, surprisingly few studies of forest therapy to date have sought to examine the characteristics of forest settings and trails that give rise to enjoyable, health-giving outcomes. As part of our Forest Therapy Trails research project, we used a hybrid, iterative approach to identify the key characteristics of forest therapy trails, drawing upon the expert knowledge of forest therapy guides to generate concepts for further explication and structuring through a broad-based integrative review of research and planning literature across relevant communities of practice. Through this approach, we developed a two-level structure of key characteristics, with one set of three criteria and nine sub-criteria relating to the location and selection of forest therapy sites and a second set of two criteria and eight sub-criteria dealing with trail-related features and considerations. In this discussion, we reflect on our findings and the limitations of our approach and suggest avenues for future research and application.

4.1. Reflections

A primary contribution of our work is that it provides a useful conceptual identification and structuring of key characteristics of forest therapy trails at both the site- and trail-specific levels. In our previous review of the forest therapy literature [22], we identified a few studies where investigators had developed regional suitability assessments [50–54] and several others where specific trail features were examined for their effects of health and wellbeing outcomes [23–43] but no studies that have looked comprehensively at both levels. In developing an assessment procedure that is useful for planning and design and for forest therapy practice, both types of information are necessary. While this phase of our Forest Therapy Trails project remains at the conceptual level, we feel that it provides a solid base of evidence to operationalize the criteria for potential field application.

Another contribution of our work is that it brings to the forefront key characteristics that have been underrepresented in the forest therapy literature to date. One example of these is tranquility, particularly the sub-criterion dealing with sensory distractions such as noise. Noise was a major factor in the selection of sites among several of the guides that we interviewed, and while a few forest therapy studies have measured noise and its effects on health outcomes [39,173,337], the prominence to which it was talked about in

our interviews and in the focused studies on tranquility that we reviewed indicate further attention to it is warranted, especially for forest therapy sites near urban areas. Another example relates to the sub-criterion of usable nature, and while our previous forest therapy review paper [22] identified a number of studies where participants engaged in purposeful hands-on stewardship activities [38,338,339] or nature-based arts and crafts activities that made use of forest materials [340–342], no studies mentioned the kinds of constraints to active interactions with nature that our guides discussed and our related search of the urban foraging and museumification literature revealed.

The hybrid inductive–deductive approach to investigation is also a novel contribution of our work. Concepts emerging through the inductive coding of our conversations with forest therapy guides seeded a broad-based search of the literature in ways that a standalone literature review could not, and deductive frameworks and theories across varied communities of practice identified from the literature helped to structure and fill in conceptual gaps not revealed by the interviews. On a broader level, our effort also helps to better connect the various communities of practice as they relate to research in forest therapy, which, with its dominant emphasis on health and wellbeing outcomes, has paid limited attention to how outcomes relate to the wider scope of human–forest interactions [22]. For example, research on landscape preferences, particularly relating to restorative environments [136,343,344], has much to offer in understanding the key characteristics of successful forest therapy sites and trails. The need for cross-pollination among communities of practice works in both directions, and research in forest therapy, with its focus on multisensory experience, active engagement, and the importance of the "detail landscape" has important implications for work in landscape preference, which has tended to focus on visual perception and rely on virtual representations of static landscape scenes [345].

4.2. Limitations

This research has a number of limitations. With respect to our interviews, while the 13 forest therapy experts we talked with represented a broad spectrum of professional backgrounds and regional and urban-rural diversity within the U.S., their common trailing by the Association of Nature and Forest Therapy and lack of a broader, international representation potentially limited the types of activity-based and cultural expressions of the practice that could help to identify key site- and trail-related characteristics. By the same token, while the guides possessed unique skills and backgrounds for providing successful forest therapy experiences for their participants, the participants themselves may hold different feelings about what site and trail characteristics are important. In some ways, the literature review component of our hybrid approach helps compensate for these limitations, as most of the studies we reviewed were participant-based and the studies themselves were based in a wide range of locations around the world. The centrality of these findings to forest therapy varies, however (see more below), and while a few forest therapy studies have examined site and trail characteristics from a visitor perspective [29,42,226,304], further research, including qualitative, in-depth approaches and quantitative surveys, economic valuation, and choice modeling approaches, could be productive [301,337].

Another potential research limitation concerns the range of literatures tapped for our integrative review. While we attempted to search across diverse communities of practice, our work was constrained by our own expertise and knowledge of related fields we felt were pertinent to forest therapy. Future work could productively tap into additional communities of practice, particularly in the humanities, where work on topics such as the aesthetics of nature and landscape have been addressed from diverse philosophical, historic, spiritual, phenomenological, and other perspectives that could hold important implications to the theory and practice of forest therapy [346–355]. In a similar vein, in our choice to focus on identifying key features and qualities of forest settings and trails that give rise to multisensory experiences and affordances, our presentation tended to em-

phasize practical matters over theoretical ones. Here, further exploration of relevant work, particularly with respect to social science research and theory on embodiment [356,357], affordances [11,358,359], and aesthetic experience [360–363] could be fruitful.

Within the range of literature we did investigate, we are aware of the limitations in extrapolating characteristics found important for some recreational activities such as trail hiking and bicycling to forest therapy. In many ways, forest therapy is a unique activity that resists easy comparisons, and for this reason, it is important to encourage research and planning that aims toward optimizing people's experiences and the healthful outcomes that can occur.

5. Conclusions

Forest therapy as a recognized practice began in the early 1980s, and in our previous review of the forest therapy research literature, we found that more than 70% of all empirical articles were published within the previous 5 years [22]. Given this recency and tendency to focus on health outcomes, in this paper, we looked beyond the forest therapy research literature to identify the key characteristics of forest sites and trails that contribute to successful forest therapy experiences. Using a hybrid, iterative approach to investigation that drew upon the expertise of forest therapy guides and an integrative review of research and planning literature across diverse, related communities of practice, we described 17 characteristics of forest sites and trails. While we feel the identification and structuring of these characteristics is a significant contribution to the field of forest therapy, they remain on the conceptual level, and further work is needed to operationalize and evaluate the criteria for field application. This is the next step in our Forest Therapy Trails project, and we invite interested researchers and practitioners to join us in this effort and share their own experiences to help advance the growing international practice of forest therapy.

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