

Brown, T.L. (2023). Forest bathing. In S. Priest, S. Ritchie & D. Scott (Eds.). *Outdoor Learning in Canada*. Open Resource Textbook. Retrieved from <http://olic.ca>

# Forest Bathing

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Tara L. Brown is a Ph.D. candidate in Forestry at UBC. After experiencing the stress-reducing benefits of shinrin-yoku, she pivoted from running STEM education and environmental monitoring programs to studying health and forest bathing in Vancouver. As a Public Scholar and Institute of Asian Research fellow, Tara leads the Silent Trails project, explores the role of forest therapy in Canadian healthcare, and has led diverse groups of youth, UN GEF members and medical professionals.

Shinrin-yoku, translated as “forest bathing,” is a self-directed practice that engages the five senses for immersive experiences in forested areas or other natural environments (Hansen et al., 2017). This practice embodies various activities, including leisurely walks, breathing in the air, akin to natural aromatherapy, and appreciating the forest scenery. On the other hand, shinrin-ryoho, or “forest therapy,” evolved from forest bathing by integrating evidence-based research and employing guided therapeutic activities (Kotte et al., 2019). Both practices serve as non-invasive, preventative, complementary, and non-pharmacological approaches to wellness.

Forest bathing emerged in Japan in the 1980s in response to increasing urbanization and the consequential detachment from natural environments (Akiyama, 1982). The simple practice has gained popularity globally due to the easily accessible activity and positive impact on health and well-being. Forest bathing has been extensively studied for its health benefits. It is even considered the most widespread activity associ-

ated with forest and human health (see also “Nature Prescription in Canada: Why and How?”). In Canada, with its extensive and diverse forest ecosystems, these practices offer an enriched dimension to outdoor learning experiences, both from wellness and pedagogical perspectives.

The kanji characters depicting shinrin yoku, 森林浴, are 森 (mori), translating to “forest” or “woods,” and 林 (hayashi), translating to “grove” or “woodland” and are typically used in forestry to convey a landscape dominated by trees. The kanji 浴 (yoku), translating to water and valley, is more commonly used in words like 日光浴 (nikkōyoku), meaning sunbathing, which captures the essence of immersion or bathing. Therefore, shinrin-yoku can be understood as “forest bathing,” representing immersing oneself in a forested environment for therapeutic and holistic well-being.

### Historical and Cultural Roots

During the 1980s, Japan emerged as the world's second-largest economy, primarily fueled by high-technology industries. This period was marked by migration to urban centres, a decline in the birth rate and an aging population, affecting the labour force and leading to a shortage of young workers (Statistics Bureau of Japan, 2023). Simultaneously, the increased use of computers in the workplace resulted in various health problems among office workers. This phenomenon was termed "technostress," a form of adverse psychological effects stemming from the rapid technological changes and the "always-on" culture (Brod, 1982; Song et al., 2016).

Shinrin-yoku was introduced in 1982 by Japan's Forestry Agency as part of a broader public health strategy. The article titled, "bathing in the scents of the forest to train body and soul" (Akiyama, 1982), initially served as a marketing tactic to attract urban dwellers to rural areas, to boost local economies and improve their health (Imai, 2013; Miyazaki, 2018, p. 10).

The Forestry Agency's initiative was rooted in the hypothesis that engaging all five senses in a forest environment and inhaling natural organic compounds known as phytoncides could have therapeutic impacts (Tokin & Keizou, 1980). This premise, initially based on the work of Soviet chemist Dr. Tokin and Japanese professor Dr. Keizou, garnered significant governmental attention, establishing a research grant in 1988. This grant facilitated the formation of the Forest Therapy Research Group (Segami, 2022), with Dr. Yoshifumi Miyazaki conducting the first empirical study on Yakushima Island in 1990 to validate the therapeutic effects of forest atmospheres (Li et al., 2013; Miyazaki, 2018).

Shinrin-yoku is inspired by Japan's cultural and spiritual traditions, notably Buddhism and Shinto, which advocate for a harmonious relationship with nature (Asquith & Kalland, 1996; Rots, 2017; Statistics Bureau of Japan, 2023). These traditions have been incorporated into the spiritual dimensions of shinrin-yoku (Hansen & Jones, 2020).

Shinto is an indigenous religion that originated in Japan, embodying a reverence for Kami, spiritual entities encompassing natural objects and elements such as trees, mountains, lakes, and rivers (Asquith & Kalland, 1996). This belief system is entwined with the cultural fabric of Japan, finding expressions in various traditional Japanese arts and rituals. Shinto manifests in tea ceremony, calligraphy, and flower arrangement.

The practice of shinrin-yoku, which emphasizes sensory immersion in forest environments, reflects the Shinto ethos of nurturing a relationship with the natural world. The therapeutic and spiritual dimensions of forest bathing reflect the Shinto appreciation for the restorative and transcendent qualities inherent in nature. Moreover, Japan's Forestry Agency initiative to introduce shinrin-yoku can be perceived as a modern-day endeavour to revitalize and uphold the age-old Shinto tradition of harmonious co-existence with nature amidst the burgeoning technostress and urban-centric lifestyle.

Internationally, shinrin-yoku has gained considerable recognition, inspiring research, and public health initiatives worldwide. The concept is gradually gaining traction in Canada, especially among outdoor educators (Mathias et al., 2020) and healthcare professionals (Gallagher, 2020).

Although existing research supports the benefits of shinrin-yoku, the spiritual dimensions of the practice complicate its scientific quantification. Dr. Miyazaki asserts that our comprehension of the practice is still in a developmental phase and calls for further investigation to elucidate its full range of effects. Miyazaki emphasizes that the practice yields the greatest benefits in untouched natural settings, characterized by lush moss and towering ancient trees. These unspoiled environments evoke a sacredness and connection to nature, akin to the atmosphere in Shinto shrines (Miyazaki, 2018).

### Scientific Evidence in Forest Therapy

Forest therapy, as conceptualized by Miyazaki (2003), represents a scientifically validated form

of forest bathing designed and validated by certified experts to achieve therapeutic outcomes (Kotte et al., 2019; Segami, 2022). This conception significantly drew upon the notion of evidence-based medicine conceived by Canadian researcher Gordon Guyatt, emphasizing clinical expertise with the best available external clinical evidence from systematic research to make conscientious, explicit, and judicious decisions for individual patient care (Guyatt, 1991).

Distinct from green exercise, forest therapy does not aim for aerobic activity or track physical performance (Barton, 2016). Unlike mindful meditation, which often involves interoception - awareness of internal bodily sensations, forest therapy fosters exteroception - outward engagement with nature. This intentional, multisensory approach to engaging with the natural environment has been scientifically shown to protect against mental illness and enhance overall well-being (Clarke et al., 2021).

Certified forest therapy guides offer a range of activities tailored to foster a deep connection with the natural environment. Participants may engage in mindful walking, gentle stretching or yoga, and reflective journaling. The formalization of this approach came through Japan's Forest Agency, which mandated the backing of scientific evidence to substantiate the health benefits of forest therapy, leading to the establishment of Forest Therapy bases and roads across Japan (Imai, 2013).

Approximately 65 Forest Therapy Bases and Roads have been institutionalized in Japan to promote public health and foster environmental sustainability. Strategically situated in recreational forests proximate to major urban areas, these wellness centers aim to provide accessible wellness solutions while encouraging ecological stewardship (H. Li et al., 2022).

### **Regional Variations in Canada**

The diverse landscapes of Canada, analogous to the environmental variety found in Japan's Forest Therapy Bases from Hokkaido to Okinawa,

provide a broad spectrum of settings for forest therapy. Each distinct landscape, from the rainforests of British Columbia to the boreal expanses in Quebec and the Maritimes, offers a unique assortment of flora, fauna, and sensory experiences, which could enrich the practice of forest therapy.

Across Canada, several cities and parks are embracing the concept of forest therapy trails (Siddiqi, 2023). These self-guided paths are designed to immerse users in nature, engaging all their senses. Despite the growing interest, it is noteworthy that, unlike in Japan, forest therapy in Canada is not regulated, and certifications provided by forest therapy organizations are not grounded in rigorous scientific validation.

Under the Healthy Parks Healthy People initiative, visitors to the Gros Morne National Park in Newfoundland are encouraged to immerse themselves in the park's natural settings. In collaboration with local healthcare professionals, the park staff have devised a list of health-promoting activities that visitors and residents can engage in within the park. These activities span a broad spectrum of outdoor experiences, including forest bathing, where visitors are encouraged to immerse themselves among the trees in designated trails (Parks Canada, 2019).

Ontario Parks has established a self-guided forest therapy trail at MacGregor Point Provincial Park, marking the first of its kind in Ontario. This initiative, also stemming from the Healthy Parks Healthy People directive, aims to promote the restorative health benefits of nature immersion. Collaborating with the Global Institute of Forest Therapy and Nature Connection (GIFT), this project encompasses a designated trail with mindfulness prompts to foster a deeper connection with nature (Porchuk & LeGros, 2022).

Markham, Ontario, has integrated forest bathing by establishing self-guided trails across several locations (City of Markham, n.d.). These trails in Pomona Mills Park, Rouge Valley Trail, Springdale Park and Valley, and Toogood Pond Park facilitate gentle sensory-based interactions with the for-

est environment. The aim is to foster a deeper connection between individuals and the natural forested surroundings.

Recently in Western Canada, Metro Vancouver Regional Parks and Vancouver Parks Board have been offering forest bathing activities to the public (Metro Vancouver, 2022; Vancouver Board of Parks and Recreation, 2022).

### **Therapeutic Benefits**

Forest bathing, or *shinrin-yoku*, provides many health benefits, primarily categorized into psychological and physiological domains. These encompass stress alleviation, enhanced cognitive functions, improved cardiovascular health, and fortified immune system.

The psychological benefits of forest therapy and forest bathing have been substantiated through various studies, demonstrating their positive impact on healthy individuals and those diagnosed with certain medical conditions. The benefits are alleviating anxiety, depressive symptoms, and negative moods, enhanced relaxation, and cognitive restoration (Antonelli et al., 2021; Park et al., 2022). The theoretical foundations of these benefits can be traced back to two key theories, namely the Stress Recovery Theory (Ulrich, 1981; Ulrich et al., 1991) and Attention Restoration Theory (Kaplan & Kaplan, 1989; Kaplan, 1995).

Stress Recovery Theory and Wilson's (1984) biophilia hypothesis are rooted in the evolutionary theory of natural selection, suggesting that humans, having evolved in natural are more attuned to nature than urban environments. Ulrich posited that exposure to natural environments facilitates recovery from stress and fatigue, serving as a survival mechanism to replenish cognitive resources (Kellert & Wilson, 1995; Ulrich, 1981; Ulrich et al., 1991). On the other hand, Attention Restoration Theory, emanating from psycho-functionalist theory, posits that humans are predisposed to attend to and respond favourably to natural settings that were beneficial to survival throughout evolution. Such engagement with natural settings is linked to reduced men-

tal fatigue and enhanced concentration (Kaplan & Kaplan, 1989; Kaplan, 1995). Alongside these theories, anticipatory effects also play a significant role in the psychological benefits of forest bathing.

The physiological benefits of forest bathing have also garnered significant attention. Research indicates a notable placebo effect associated with cortisol levels when individuals anticipate forest bathing. It has been observed that merely planning and visualizing a forest bathing session can lower cortisol levels compared to anticipating a visit to an urban area (Antonelli et al., 2021). This phenomenon underscores the intrinsic psychological affinity individuals may have towards forest environments, further bolstering the therapeutic assertions of forest therapy and forest bathing.

An investigation to determine the physiological benefits of forest bathing was spearheaded by Yoshifumi Miyazaki in 1990, whose preliminary findings measured a reduction in blood pressure and cortisol levels during a forest walk (Miyazaki, 1993). Subsequent research has extended the understanding of health benefits to include enhanced cardiovascular and respiratory health due to cleaner air intake, strengthened immune system marked by an increase in natural killer cells and anti-cancer proteins, a significant reduction in inflammatory responses, and diminished cortisol levels signifying stress reduction (Li et al., 2008). As global health dynamics shifted with the onset of the COVID-19 pandemic, a renewed focus emerged regarding forest bathing's potential to bolster immune system defense against the virus (Charnock et al., 2021).

Given that a significant portion of Canadians over 65 have been diagnosed with hypertension, the mechanism by which forest bathing mitigates stress and promotes cardiovascular health is of particular interest (Canada, 2016). Stress, characterized by physiological arousal in response to various stimuli, triggers the release of cortisol. This hormonal response activates the sympathetic branch of the autonomic nervous system, elevating heart rate and blood pressure: both indicators of cardiovascular function. En-

gaging with serene natural environments during forest bathing can induce a relaxation response. This response is marked by a shift in autonomic nervous system activity by decreasing sympathetic and increasing parasympathetic activity, which, in turn, lowers heart rate and blood pressure. The relaxation response is further evidenced by reductions in salivary cortisol levels and heart rate variability (Song et al., 2016). The impact of these physiological responses extends to the broader spectrum of benefits offered by forest bathing, which vary in duration.

Forest bathing has been shown to offer a wide array of benefits, affecting mental well-being, cognitive function, and physical health (Han, 2017; Keniger et al., 2013; Sandifer et al., 2015). However, the ideal duration for these positive effects remains inconclusive, ranging from 5 minutes to 30 days (Kobayashi et al., 2021; Liu et al., 2021; Shanahan et al., 2016; White et al., 2019; Yeon et al., 2021). Notably, even short exposures to nature can yield measurable positive impacts, making forest bathing a flexible and accessible form of therapy (Barton & Pretty, 2010; Meredith et al., 2020). Moreover, the comparative efficacy of forest bathing in alleviating depression underscores its therapeutic potential. A review of randomized controlled trials found forest therapy to be a more effective short-term intervention for alleviating depression in adults than conventional treatments (Rosa et al., 2021). These findings seem to be broadly applicable across various demographics, although the role of cultural and geographical factors can influence outcomes (Joye & van den Berg, 2011; Yeon et al., 2021).

### **Environmental Measurements**

The migration trend towards larger urban centers in Canada is accompanied by notable environmental degradation (Government of Canada, 2022). The therapeutic practice of forest bathing serves as one nexus between urban dwellers and forest environments, known for mitigating urban heat, filtering pollutants, and augmenting overall urban ecosystem services crucial for counteracting the adverse health impacts of urban living (Rajoo et al., 2020).

Forest bathing offers an immersive experience that engages primarily the senses of sight and sound (Wilson, 1984). This sensory interaction with the natural environment, including water streams, wind rustling through leaves, and bird songs (Li et al., 2013), has been scientifically associated with enhanced physiological relaxation and emotional well-being (Buxton et al., 2021).

Forest bathing also facilitates a beneficial interaction with phytoncides, or biogenic volatile organic compounds (BVOCs), which are released by plants to deter pests and pathogens (Tokin & Keizou, 1980). These chemicals, emanating from various plant parts including leaves, flowers, and roots, have been identified in over 1000 different types, with coniferous trees like pines, cedars, and spruces being the primary producers in temperate forests (Antonelli et al., 2020; Ohira & Matsui, 2013). While BVOC production can be influenced by both biotic and abiotic stressors (Ohira & Matsui, 2013), and the health benefits may vary with different tree species (Morita et al., 2007; Oishi et al., 2003). Research underscores their potential to boost immunity, reduce mental fatigue, and enhance mood via antioxidant and anti-inflammatory effects (Antonelli et al., 2020). However, the mechanisms and optimal BVOC concentrations for these benefits warrant further exploration, given the environmental changes, emission variations, and different plant species (Antonelli et al., 2020).

### **A Canadian Context**

The worldwide popularity of forest bathing for public health initiatives has significantly grown marked by a surge in research since the first English-language article was published in 2007 (Li et al., 2007), media coverage such as a New York Times article (O'Connor, 2010), and the release of seminal English-language books (Li, 2018; Miyazaki, 2018). Despite this global recognition, the majority of research studies continue to be conducted in Japan and other Asian countries (Payne & Delphinus, 2018) with awareness and interest in the practice only recently emerging in Canada for the public (Hennig, 2019).



While forest bathing is a practice centred on individual health and well-being, achieved through sensory immersion in natural settings (Hansen et al., 2017), it should not be conflated with Indigenous land-based practices. The latter is deeply rooted in specific cultural traditions and philosophies, often extending far beyond the individual to address broader social, cultural, and political dimensions, such as settler colonialism and Indigenous self-determination (DeLancey & Broadhead, 2023). Forest bathing also sets itself apart from green exercise and mindful meditation. The practice isn't about elevating the heart rate or achieving a meditative mind; it's an intentional engagement with the natural world. Participants immerse all their senses - sight, sound, taste, smell, and touch - in an environment perceived as safe and restorative (Hansen et al., 2017).

Certified guides often lead what are known as forest therapy sessions. These sessions involve guided activities such as mindful walking, meditation, gentle stretching or yoga, and reflective journaling, all aimed at fostering a deeper connection with the natural environment (Kotte et al., 2019). Across Canada, 10,000 health practitioners, registered for nature prescriptions, may recommend forest bathing as a therapeutic intervention to their patients and offer free access to parks and botanical gardens (B.C. Parks Foundation, n.d.).

### **How to Practice Forest Bathing**

During a forest bathing session, individuals are encouraged to immerse themselves fully within the natural surroundings, tapping into human's intricate multisensory perception capacities. Choosing a suitable forested area is crucial for effective forest bathing. Ideal settings should be rich in diverse vegetation, have calming natural sounds, and be relatively free from human disturbances (H. Li et al., 2022). Perceived and physical safety is paramount. Participants should be educated about potential risks and precautions, and effective group management is crucial for a safe and fulfilling experience (Imai, 2013, p. 20). Health risks, such as exposure to harmful particulate matter from wildfires, highlight the possi-

ble dangers of forest environments (Aguilera et al., 2021; Government of Canada, 2021).

Visually absorbing nature's diverse colours, shapes, and movements can provide a calming effect and maintain arousal, as illustrated by Ulrich (1981) and Horiuchi et al. (2014). Tuning into the natural sounds of the forest, like rustling leaves, flowing water, and bird songs, as suggested by Song et al. (2021), can offer physiological relaxation and reduce stress. The olfactory dimension can be explored by breathing in the forest's unique scents, such as the aroma of pine or other essential oils from trees, which Ikei et al. (2015) found to induce physiological relaxation. Touching the bark of trees, walking barefoot on the forest floor, or feeling the texture of leaves and stones can further deepen the multisensory experience and induce a state of relaxation (Ikei et al., 2017; Ikei & Miyazaki, 2020). Activities such as guided breathing exercises and body awareness exercises, as illustrated by Balban et al. (2023), can assist in grounding the individual, lowering physiological arousal, and enhancing mood. Moreover, tasting, where safe and guided, could be a part of the experience, perhaps in the form of a tea ceremony using local herbs. This holistic engagement using multiple senses facilitates a deeper connection between the individual and the forest environment, thereby amplifying the therapeutic benefits of forest bathing.

### **Limitations**

Forest bathing's therapeutic potential has spurred research and interest, albeit with criticisms rooted in methodological limitations such as small sample sizes, a focus on healthy volunteers, and a geographic concentration in Asian countries (Kobayashi et al., 2018; Payne & Delphinus, 2018; Yu et al., 2017). Methodological concerns due to inconsistent forest bathing protocols, lack of standardized measures, and frequent use of convenience sampling, undermine the reliability of health outcomes (Kamioka et al., 2012). An umbrella review emphasizes the need for robust evidence before integrating forest therapy into mainstream medical practices (Antonelli et al., 2021).

Most phytoncide (BVOC) research focuses on Japanese cedar and cypress trees, which constitute 42% of Japan's forested land due to artificial plantations, leading to a public health issue of cedar pollen hay fever affecting 40% of the population (Otake, 2023). This narrow research focus could mislead individuals about the universal benefits of forest bathing. Furthermore, the literature often omits environmental factors like vegetation type and BVOC data (Antonelli et al., 2021; Barnes et al., 2019). Lastly, the scarcity of long-term, cross-disciplinary research indicates a gap in comprehending forest bathing's lasting impacts and the interplay between forest environments and health.

### Future Outlook

Expanding evidence supporting the benefits of forest bathing necessitates extended geographical research, interdisciplinary collaboration, and methodological standardization to improve this practice's global understanding and application. Given the concentration of forest bathing research in Japan and other Asian countries, it's imperative to diversify geographical settings to enrich the understanding of forest bathing effects across different cultural and environmental contexts (Wen et al., 2019). Engaging interdisciplinary teams comprising medical, environmental, psychological, and social science experts can strengthen research methodologies, reduce biases, and provide a more holistic understanding of forest bathing's impact. An up and coming Canadian study of forest bathing in Metro Vancouver, BC, aims to address some of the identified gaps in the literature and will contribute insights for the global understanding of forest bathing's therapeutic potential as well as its application in different geographical and cultural settings (Innes & Brown, 2022).

Standardizing forest bathing protocols and measurement metrics is crucial for enhancing the comparability and validity of findings across different studies. Establishing a consensus among the research community on the definitions, methodologies, and measurement instruments will foster a more cohesive body of evidence.

Increasing public awareness and education on the potential benefits and limitations of forest bathing is essential for fostering informed public engagement. This includes understanding the safety considerations, especially for individuals with specific health conditions, and the importance of guided forest bathing sessions for maximizing therapeutic benefits.

Integrating the findings from forest bathing research into public health policies and urban planning can contribute to creating healthier and more sustainable living environments. Collaborations between researchers, policymakers, and practitioners will be crucial for translating scientific evidence into practical solutions that promote public health and well-being.

### Conclusion

Shinrin-yoku, or forest bathing, presents an accessible and non-pharmacological approach to enhance health and well-being. Its evolution into a scientifically substantiated practice, known as forest therapy, showcases the bridging of traditional knowledge with empirical validation. The practice's emergence in Canada reflects a global recognition of nature's role in health promotion, albeit within a different cultural and environmental context.

Methodological and geographical limitations in current research highlight the necessity for standardized protocols and diversified study locales to integrate forest therapy into mainstream medical practices. A pending Canadian dissertation will address some of these gaps and contribute to a more holistic understanding of forest bathing. The initiative to integrate forest bathing into public health strategies, underscored by policy considerations and public education, exemplifies a multidimensional approach to health promotion. Through a standardized research framework, forest bathing could transition from a complementary practice to a recognized therapeutic intervention, fostering a harmonious interplay between nature and human health.

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