Blind, deaf, and deaf-blind individuals face significant challenges in botanical gardens, primarily related to navigation, information access, and communication. Their expressed needs consistently emphasize the desire for multisensory engagement, particularly through audio and tactile stimuli for blind visitors, sign language interpretation and visual cues for deaf visitors, and facilitated tactile experiences with Protactile communication and guide support for deaf-blind visitors. Their emotional responses range from joy and connection when these needs are met, to frustration and exclusion when they are not, highlighting the critical importance of inclusive design and practices in these natural spaces.

# Navigating Nature: Experiences of Blind, Deaf, and Deaf-Blind Individuals in Botanical Gardens

## 1. Understanding the Diverse Needs of Visitors with Sensory Impairments

### 1.1 The Importance of Inclusive Design in Botanical Gardens

**Inclusive design in botanical gardens is paramount** to ensuring that these natural sanctuaries are welcoming and enriching for all visitors, regardless of their abilities. The core principle of inclusive design is to create environments that can be accessed, understood, and used to the greatest extent possible by all people, without the need for adaptation or specialized design. For botanical gardens, this means moving beyond mere compliance with accessibility regulations and embracing a philosophy that integrates the needs of diverse visitors into the very fabric of their planning, design, and programming. This approach recognizes that individuals experience the world in varied ways, particularly those with sensory impairments such as blindness, deafness, or deafblindness. By proactively considering these diverse experiences, botanical gardens can transform from potentially exclusionary spaces into places of discovery, learning, and enjoyment for everyone. The benefits of such an approach are manifold, leading to **increased visitor numbers and diversity, enhanced visitor experience, improved reputation, and compliance with accessibility laws**. Moreover, accessible tourism, which includes accessible botanical gardens, can generate significant economic benefits. A truly inclusive botanical garden considers aspects like navigational ease, multisensory engagement, accessible information formats, and staff trained to interact with and assist visitors with diverse needs. This holistic approach ensures that the beauty and educational value of botanical gardens are available to all members of the community.

The journey towards inclusivity often begins with a shift in perspective, recognizing that accessibility is not a niche concern but a fundamental aspect of good design. For instance, the **Auckland Botanic Gardens initiated its accessibility improvements** after an initial assessment by Be.Lab, which highlighted that while the garden was somewhat accessible for wheelchair users, there was considerable room for improvement in other areas. This led to staff workshops aimed at broadening the understanding of accessibility beyond just physical access. Similarly, the **Royal Botanic Gardens, Kew**, has embedded inclusivity into its core mission, aiming to attract new audiences who may have previously felt that botanical gardens were not for them. This involves community outreach and co-creating activities with marginalized groups, including people with disabilities. The **U.S. Botanic Garden (USBG)** also emphasizes creating sensory-friendly visits and ensuring that exhibitions are designed to be clear, consistent, and organized to accommodate a wide range of learning styles and abilities. These examples underscore a growing recognition that botanical gardens have a responsibility to be proactive

in removing barriers and creating environments where everyone can connect with nature. This involves not only physical modifications but also a cultural shift within the organization, fostering an environment where the needs of all visitors are considered from the outset of any new project or program.

## 1.2 Overview of Challenges Faced by Blind, Deaf, and Deaf-Blind Visitors

Visitors who are blind, deaf, or deaf-blind encounter a unique set of challenges when navigating and experiencing botanical gardens, stemming primarily from the sensory-rich but often visually and aurally focused nature of these environments. For **blind and visually impaired individuals**, the primary challenges revolve around **navigation and wayfinding** in unfamiliar, often complex, outdoor spaces. Uneven pathways, lack of tactile cues, and insufficient or unclear auditory signage can make independent movement difficult and potentially hazardous. Access to information about the plants and garden features is another significant hurdle, as traditional signage and visual displays are not accessible. This can lead to a diminished understanding and appreciation of the botanical collections. Furthermore, the social aspect of visiting gardens can be impacted if communication with staff or fellow visitors is not facilitated effectively. While gardens are increasingly incorporating sensory elements like fragrant plants and tactile features, the lack of consistent and well-designed multisensory experiences can limit the engagement of visually impaired visitors.

**Deaf and hard of hearing visitors** face challenges primarily related to **communication barriers and lack of visual cues for sound**. Guided tours, lectures, and audio guides that are not offered with sign language interpretation or captioning exclude deaf visitors from fully participating in educational programs. Environmental sounds, such as bird songs, rustling leaves, or water features, which are integral to the garden experience, may go unnoticed or unappreciated without visual cues or descriptive text. While visual elements are abundant, the lack of contextual information that is often conveyed through sound can lead to a fragmented understanding of the garden's ambiance and ecological aspects. The design of gardening spaces also needs to consider clear visual layouts and signage with both text and symbols to aid navigation and information access for the deaf community. Communication with staff and other visitors can also be a barrier if staff are not trained in basic sign language or alternative communication methods.

**Deaf-blind individuals face the most profound challenges**, as they experience a **combined deprivation of sight and hearing**. This dual sensory loss significantly impacts their ability to navigate, access information, and communicate within a botanical garden setting. Traditional accessibility measures designed for either blind or deaf individuals may not be sufficient. For example, Braille labels are useful for those who read Braille, but audio descriptions are not accessible if the individual is also deaf. Similarly, sign language interpretation requires the ability to see the interpreter. Navigation is exceptionally challenging, often requiring the assistance of a sighted guide or a highly developed sense of environmental cues through touch and smell. The lack of tactile maps, consistent guiding paths, and accessible communication methods tailored to deaf-blind individuals (such as Protactile communication) can make a visit to a botanical garden a daunting and potentially isolating experience. Sensory gardens, when thoughtfully designed, can offer valuable experiences, but they must be created with the specific needs of deaf-blind individuals in mind, focusing on rich tactile, olfactory, and gustatory stimuli, and ensuring safe and predictable navigation. The absence of such tailored experiences can lead to feelings of exclusion and a missed opportunity for a connection with nature.

# 2. The Blind and Visually Impaired Experience in Botanical Gardens

## 2.1 Key Challenges: Navigation, Information Access, and Social Interaction

Blind and visually impaired (BVI) visitors to botanical gardens encounter significant challenges related to **navigation, information access, and social interaction**, which can hinder their overall experience and sense of inclusion. Navigation within the expansive and often intricate layouts of botanical gardens is a primary concern. Uneven pathways, unexpected changes in terrain, and a lack of consistent tactile or auditory wayfinding cues can make independent exploration difficult and potentially unsafe. While some gardens have implemented features like continuous metal railings for guidance, as seen in the Alice Recknagel Ireys Fragrance Garden at the Brooklyn Botanic Garden, these are not universally available. The historic nature of many gardens can also mean that certain paths are narrow, rough, or steep, further complicating navigation for BVI individuals. Without clear, reliable guidance systems, BVI visitors may rely heavily on companions or guides, limiting their autonomy and spontaneous exploration.

**Access to information** about the diverse plant collections and garden features presents another major hurdle. Traditional botanical gardens rely heavily on visual information dissemination through signage, labels, and interpretive panels, which are inherently inaccessible to BVI individuals. While some gardens provide Braille labels for select plants, these are often limited in scope and may not cover the entirety of the garden's offerings. Audio guides, if available, can be beneficial, but their effectiveness depends on the quality of the descriptions and the ease of use of the device. The lack of accessible information can lead to a passive experience, where BVI visitors are unable to fully learn about or engage with the botanical wonders around them. This contrasts sharply with the experience of sighted visitors who can freely read labels and interpret visual displays. The challenge, therefore, lies in translating the predominantly visual information into formats that are perceivable through other senses, such as touch, smell, and hearing.

**Social interaction** within the garden environment can also be impacted. If BVI visitors are accompanied by sighted guides or companions, the dynamic of the visit can shift, potentially leading to a sense of dependence or a feeling of being an outsider if communication is not inclusive. Interactions with garden staff or volunteers may also be challenging if staff are not trained to communicate effectively with BVI individuals or are unaware of the accessible features and services available. For instance, a study highlighted a discrepancy between what BVI individuals desire (primarily audio stimuli) and what botanical gardens often prioritize (features serving all visitors that are easy to install). This mismatch can lead to experiences that are not fully satisfying or empowering for BVI visitors. The ability to share the experience with others, ask questions, and engage in discussions about the plants and environment is crucial for a fulfilling visit, and barriers to this can lead to feelings of isolation or frustration.

## 2.2 Expressed Needs and Desires: Emphasis on Audio and Tactile Stimuli

Blind and partially sighted (BPS) individuals have clearly expressed a strong desire for **enhanced audio and tactile stimuli** to enrich their experiences in botanical gardens. Research indicates that BPS visitors primarily desire audio stimuli, which can include detailed audio descriptions of the surroundings, plants, and garden features, as well as the natural sounds of the garden itself, such as bird songs, wind, and water features. One BPS participant in a study commented on the value of listening experiences, noting how bird songs helped create an atmospheric connection to gardens and other natural places like forests. This suggests that well-

designed audio elements can significantly deepen the sensory engagement and emotional connection for BPS visitors. The development of interactive smart audio descriptive guides is one approach being explored to meet this need, aiming to provide rich, context-aware auditory information. However, the challenge lies in creating audio descriptions that are as interactive and nuanced as a human-guided tour, where dialogue and immediate feedback are possible.

**Tactile experiences are equally, if not more, important** for BPS visitors. The opportunity to touch and feel plants, their leaves, flowers, bark, and even the soil, provides a direct and intimate way of understanding their form, texture, and size. One BPS participant eloquently stated, “Feeling so many different forms and so many different textures, something I never think. Flowers feels like flowers… The different textures help me to remember which each of these is, especially without the visual memory obviously”. This highlights how tactile engagement aids in memory and recognition. Gardens are increasingly recognizing this need by creating designated touch areas or sensory gardens where touching plants is encouraged. For example, the **Alice Recknagel Ireys Fragrance Garden at the Brooklyn Botanic Garden** features plants selected for their tactile qualities, grown in elevated beds for accessibility. Similarly, the **Botanical Garden of Rome** has a "Garden of Aromas" where species are recognizable through tactile or olfactory characteristics, accompanied by Braille tags. The desire to understand the size of objects is also met through touch, with visitors appreciating the ability to feel the height of a sunflower or the circumference of a tree trunk, often comparing these to their own body for scale. The provision of diverse tactile experiences, including handling different plant forms and textures, is therefore a key need articulated by the BPS community.

Beyond specific sensory inputs, BPS visitors also express a need for **proactive and empathetic guiding**, whether from human guides or well-designed assistive technologies. A proactive guide can facilitate experiences that might otherwise be missed, such as safely touching an unusual plant like the Brazilian giant rhubarb, by providing clear instructions and options. An empathetic guide who encourages reflection and shares knowledge can significantly enhance the visit, making it a "two-way travel of knowledge" where participants also feel comfortable sharing their own observations and experiences. This human element, or its effective replication in technology, is crucial for a truly engaging and memorable visit. Furthermore, the ability to handle plants is a frequently expressed desire, as it allows for a more active and participatory experience rather than a passive one. The overall need is for a holistic, multisensory approach that goes beyond visual appreciation, allowing BPS individuals to connect with nature through their remaining senses in a meaningful and enriching way.

## 2.3 Emotional Responses and Feelings: Joy, Connection, and Frustration

The emotional responses of blind and visually impaired (BPS) individuals to botanical garden visits are multifaceted, ranging from **profound joy and connection with nature to feelings of frustration and exclusion**, largely dependent on the level of accessibility and thoughtful design implemented by the garden. When gardens successfully cater to their needs, BPS visitors report feelings of delight, wonder, and a deep sense of connection to the natural world. The opportunity to engage multiple senses—touching diverse plant textures, smelling fragrant flowers and herbs, listening to bird songs and rustling leaves, and even tasting edible plants—can evoke powerful positive emotions. One BPS participant's reflection on touching various plants, "Flowers feels like flowers," encapsulates a simple yet profound joy derived from direct sensory experience. Similarly, the experience of listening to bird songs was described as setting a tone and creating an atmosphere

reminiscent of other cherished natural places, indicating a strong emotional resonance. The ability to actively explore and understand the garden environment, such as feeling the immense size of a sunflower or the rough bark of an ancient tree, can lead to a sense of accomplishment and a deeper appreciation for the intricacies of nature.

Conversely, when botanical gardens fail to address accessibility, the emotional toll can be significant, leading to **frustration, disappointment, and a sense of being an afterthought**. Navigating inaccessible paths, encountering a lack of descriptive information, or being unable to independently explore can be deeply frustrating and can diminish the overall enjoyment of the visit. The feeling of being excluded from the full experience that sighted visitors enjoy can lead to a sense of isolation or even alienation. For instance, the initial assessment of Auckland Botanic Gardens revealed that while it was somewhat accessible for wheelchair users, it fell short in other areas, reflecting a common oversight of BPS needs. The author of one study also reflected on a bus driver's dismissive reaction to a group of visually impaired visitors, highlighting how such interactions, coupled with the imposing architecture of some gardens, can send an unwelcoming message: "this garden is not for you" . This underscores the importance of not only physical accessibility but also a welcoming and inclusive atmosphere fostered by staff and the overall garden environment. The emotional impact of a botanical garden visit is thus heavily influenced by the extent to which the garden has considered and catered to the diverse sensory experiences of its BPS visitors.

The presence of a **proactive and empathetic guide** can significantly shape the emotional experience, transforming a potentially challenging visit into a memorable and enriching one. A guide who thoughtfully facilitates sensory exploration, such as allowing visitors to touch the safe side of a plant with sharp needles or encouraging them to smell particular herbs, can foster a sense of trust and engagement. When guides ask visitors about their feelings and memories evoked by the sensory experiences, it can lead to meaningful discussions and a deeper connection to the garden and its elements. This human interaction, characterized by empathy and a willingness to share knowledge and receive feedback, can alleviate potential frustrations and enhance feelings of joy and discovery. The guide's own reflection that the interaction is a "two-way travel of knowledge" further suggests a mutually beneficial and positive emotional experience for both visitors and guide . Therefore, the emotional landscape of a BPS visitor in a botanical garden is a complex interplay of sensory inputs, navigational ease, information accessibility, and the quality of human interactions.

## 2.4 Academic Insights: Research on Multisensory Tours and Accessibility Gaps

Academic research provides valuable insights into enhancing the experiences of blind and visually impaired (BPS) visitors in botanical gardens, primarily focusing on the **development and evaluation of multisensory tours and identifying existing accessibility gaps**. One key area of research explores methodologies for translating the visual richness of gardens into accessible multisensory experiences. A 2024 exploratory case study detailed a multi-stage methodology for producing an interactive smart audio descriptive guide, which involved careful planning of tours with BPS participants, focusing on listening, touching, smelling, and tasting experiences at various stops. This research highlighted the importance of dialogue and interaction between the guide and visitors, noting the challenge of replicating this in a smart guide. Observations from such tours reveal that BPS participants use their senses actively to experience plants and spaces, for instance, by touching sunflowers, courgettes, and tree barks to understand their size and texture, or by smelling roses and herbs. The

study emphasized that understanding the size of unfamiliar objects is often achieved by BPS individuals through comparison with familiar objects, such as their own bodies.

Further academic work underscores the **discrepancy between the desires of BPS individuals and the current offerings or priorities of many botanical gardens**. A study involving surveys administered to botanical gardens and BPS individuals in a six-state region found that BPS respondents primarily desired audio stimuli, while gardens often prioritized features that would serve all visitors and be relatively easy to install. This research also indicated a strong preference among BPS individuals for being allowed to handle plants and a need for a diversity of features to cater to all types of visually impaired visitors. This points to a critical accessibility gap where the specific needs and preferences of the BPS community may not be fully understood or addressed by garden administrators. The development of sensory gardens is another area of academic interest, with studies concluding that when designing such spaces, it is crucial to consider not only visual qualities but also the impact on hearing, smell, touch, and other sensations to ensure orientation and engagement for BPS people. These studies often find that sensory gardens are highly appreciated, with visitors showing interest in returning and spending more time in them.

The role of human guides is also a significant focus of academic inquiry. Research highlights the value of **proactive and empathetic guides** who can facilitate safe and enriching tactile experiences and encourage visitors to share their own knowledge and memories. The challenge of converting the rich, interactive dialogue of a human-guided tour into a pre-recorded or smart guide format is a noted area for further development. Academic literature also touches upon the broader societal and institutional barriers. For example, the experience at Auckland Botanic Gardens, where initial accessibility improvements lost momentum due to budget constraints and staff changes, illustrates the need for sustained commitment and a fundamental shift in how staff perceive accessibility needs. Similarly, the reflection that people may feel botanical gardens are not for them due to misconceptions or a lack of outreach highlights the importance of community engagement and co-creation in developing truly inclusive spaces. These academic insights collectively point towards the need for more research-informed, user-centered design approaches in botanical gardens to bridge the existing accessibility gaps and create more equitable and enriching experiences for BPS visitors.

## 2.5 Personal Narratives: Voices from the Visually Impaired Community

Personal narratives from blind and visually impaired individuals offer profound insights into their experiences, needs, and feelings when visiting botanical gardens, often highlighting the **transformative power of multisensory engagement** and the challenges posed by inaccessible environments. Lenore McGowan, a woman born blind, shared her experience in the Sensory Garden at the Grove Street Neighborhood Community Dreamers Garden in Florida. She described running her fingers over the petals and stem of a bright yellow sunflower, commenting on its beauty, and emphasized that "You don't have to see a garden to know it's smiling at you". This sentiment captures the deep appreciation BPS individuals can have for gardens when they are designed to be experienced through touch and smell. McGowan, as the gardening chairperson of the Alachua County Council of the Blind, was instrumental in cleaning up a vacant lot to create this sensory garden, which features raised flower beds and plants selected for their tactile and fragrant qualities. Her narrative underscores the desire for hands-on involvement and the joy derived from creating and experiencing accessible green spaces. She noted, "You can touch the velvety petals of a rose, feel them come off in your

hand and no one's going to say anything. It's like someone seeing it for the first time", illustrating the novelty and richness of tactile exploration.

Participants in a study on multisensory tours for BPS visitors also provided rich personal accounts. One individual, after touching various plants, reflected, "Feeling so many different forms and so many different textures, something I never think. Flowers feels like flowers". This participant further explained, "The different textures help me to remember which each of these is, especially without the visual memory obviously", highlighting the cognitive and mnemonic value of tactile experiences. Another participant, upon feeling the size of a sunflower, remarked, "It was very memorable. I perhaps would remember it for a while. It is bigger than my head, you know", demonstrating how touch facilitates understanding of scale. The experience of listening to bird songs also evoked strong personal connections, with one participant stating, "The robins, it helps me thinking of gardens. It sets the tone and it sort of gets the atmosphere going, reminded me of other natural places I have been to, like forests". These narratives collectively emphasize a deep yearning for active, multisensory engagement and the profound joy and connection that accessible botanical experiences can provide.

The historical perspective of **Helen Keller**, though not specifically about a botanical garden visit, offers timeless insights into the sensory world of a deaf-blind individual in nature. She wrote, "The people who imagine I am shut out from nature do not dream of the world of loveliness that touch and the sense of smell reveal to me... I have the sun and the cool shade, the morning dew upon bush and grass, the stillness of eve—all sweet things—the graceful ferns and a wealth of flowers". Keller described how she perceived colors through associations with touch and smell, such as pink reminding her of a baby's cheek or a gentle breeze, and yellow signifying abundance and life. Her narrative powerfully conveys that even without sight and hearing, the natural world offers immense beauty and sensory richness. She found her garden to be her "greatest joy," feeling "in the seventh heaven when among my plants". These personal accounts, both contemporary and historical, vividly illustrate that for BPS individuals, botanical gardens are not just places to visit, but spaces for profound sensory exploration, emotional connection, and intellectual stimulation, provided they are designed with their needs in mind. The recurring themes are the importance of touch, smell, and sound, and the deep appreciation for environments that actively welcome and engage these senses.

## 3. The Deaf and Hard of Hearing Experience in Botanical Gardens

### 3.1 Key Challenges: Communication Barriers and Lack of Visual Cues for Sound

Deaf and hard of hearing individuals face distinct challenges when visiting botanical gardens, primarily stemming from **communication barriers and the inherent difficulty in accessing auditory information** that is often integral to the garden experience. Communication challenges arise in various forms. Firstly, guided tours, educational programs, and lectures are frequently conducted without sign language interpretation or real-time captioning, making it difficult or impossible for deaf visitors to follow along and engage with the content. This lack of accessible communication modes can lead to a sense of exclusion from the educational and interpretive aspects of the garden. Secondly, interactions with garden staff and volunteers can be hindered if staff are not trained in basic sign language or are unfamiliar with effective communication strategies for deaf individuals. For example, a waiter wearing a mask, as experienced by deaf architect Richard Dougherty, can completely cut

off lip-reading, a common communication method for some deaf people. While this specific instance was in a café, similar situations can occur in botanical garden settings if staff are not aware of communication needs.

The **lack of visual cues for sound-based information** is another significant challenge. Botanical gardens are rich with auditory stimuli, such as bird songs, the rustling of leaves, the sound of water features like fountains or streams, and even the buzzing of insects. For deaf and hard of hearing visitors, these sounds, which contribute significantly to the ambiance and ecological understanding of the garden, may be entirely missed or only partially perceived. While some sounds might be felt as vibrations, particularly low-frequency ones, many subtle auditory details are lost. This can lead to a fragmented experience where the garden feels less alive or dynamic compared to the experience of hearing visitors. Gardens often do not provide adequate visual alternatives to convey this auditory information, such as visual displays showing spectrograms of bird songs, or descriptive text explaining the significance of certain natural sounds. The design of gardening spaces also needs to consider clear visual layouts and signage with both text and symbols to aid navigation and information access for the deaf community, as visual cues are paramount. Without these adaptations, deaf visitors may not fully appreciate the multi-sensory tapestry that botanical gardens aim to present.

Furthermore, the social dimension of visiting botanical gardens can be affected. Group visits or casual conversations with fellow visitors can become challenging if communication is not facilitated. The reliance on lip-reading, which is tiring and not always accurate, or the need for an interpreter (who may not always be available) can create barriers to spontaneous social interaction. This can lead to feelings of isolation or being an outsider, particularly in group settings where rapid verbal exchanges are common. The overall challenge is that botanical gardens, while visually stunning, often overlook the need to make their auditory landscape and communication channels accessible to deaf and hard of hearing individuals, thereby limiting their full participation and enjoyment of the garden's offerings. Addressing these challenges requires a proactive approach to providing accessible communication and ensuring that information conveyed through sound is also available through visual or tactile means.

## 3.2 Expressed Needs and Desires: Sign Language Interpretation and Visual Information

Deaf and hard of hearing visitors to botanical gardens have clearly articulated needs and desires centered around **improved communication access and the provision of visual information** to compensate for auditory cues. A primary expressed need is the availability of **sign language interpretation** for guided tours, educational programs, and special events. This allows deaf individuals who use sign language as their primary mode of communication to fully understand and engage with the content being presented. For example, the **New York Botanical Garden offers ASL-interpreted tours** of its Perennial Garden, led by a garden guide accompanied by an ASL interpreter, specifically to enhance the experience for visitors who are deaf. Similarly, the **Brooklyn Botanic Garden offers ASL-led workshops**, such as a composting workshop and tour designed for the d/Deaf community without voice interpretation, indicating a commitment to providing fully accessible programming. These services are crucial for ensuring equitable access to information and a more inclusive social experience within the garden.

Beyond formal interpretation, there is a need for **clear and comprehensive visual information** throughout the garden. This includes well-designed signage that incorporates not only text but also symbols and clear visuals to guide visitors and provide information about plants and garden features. For deaf individuals, who rely heavily on visual input, such signage is essential for independent navigation and learning. Furthermore, to

address the lack of access to environmental sounds, gardens can incorporate visual representations of these sounds. This could involve interactive displays with visualizations of bird songs or water movements, or descriptive panels that explain the significance of sounds in different parts of the garden. The goal is to provide a rich, multisensory experience that does not solely depend on auditory perception. The design of the garden layout itself should also prioritize clear visual lines of sight and distinct visual landmarks to aid in orientation and wayfinding.

Another important need is the availability of **accessible educational materials and resources**. This includes providing guidebooks, maps, and informational brochures in digital formats that can be accessed on personal devices or ensuring that website content is accessible with options for video content to include sign language interpretation or captions. Staff training is also a critical component; deaf visitors desire staff who are aware of their communication needs, are patient, and can provide assistance effectively, whether through basic sign language, written notes, or other visual communication methods. The overarching desire is for botanical gardens to recognize the diverse communication needs of deaf and hard of hearing individuals and to implement a range of strategies that ensure information is conveyed visually and interactively, allowing for a more complete and engaging visit. This proactive approach to visual accessibility can transform the garden experience from one of potential frustration to one of discovery and enjoyment.

## 3.3 Emotional Responses and Feelings: Exclusion vs. Inclusion

The emotional responses of Deaf and hard of hearing (DHH) individuals to botanical garden visits are profoundly shaped by the presence or absence of inclusive practices, leading to feelings that range from **deep exclusion to genuine inclusion and connection**. When botanical gardens fail to provide adequate communication access, such as sign language interpreters, captioning, or visual alternatives to auditory information, DHH visitors often experience feelings of **frustration, isolation, and being an afterthought**. The inability to understand guided tours, participate in educational programs, or access information about exhibits can be deeply alienating, reinforcing a sense of being "outside" the intended audience. This exclusion can lead to disappointment, a feeling of wasted time and effort, and a reluctance to revisit the garden or similar institutions. The experience of being in a beautiful and educational environment but being unable to fully engage with its content due to communication barriers can be particularly disheartening, potentially impacting self-esteem and the desire to seek out cultural experiences.

Conversely, when botanical gardens proactively implement inclusive measures, the emotional impact is overwhelmingly positive, fostering feelings of **inclusion, welcome, and intellectual engagement**. The availability of sign language interpreters who are skilled and well-integrated into tours can transform the experience, allowing DHH visitors to fully understand and participate in discussions, ask questions, and share insights. Well-designed visual displays, captioned videos, and tactile models can empower DHH individuals to explore and learn independently, leading to a sense of autonomy and accomplishment. When staff are knowledgeable about Deaf culture and effective communication strategies, interactions become more positive and respectful, contributing to a welcoming atmosphere. In such environments, DHH visitors can experience the joy of learning, the beauty of nature, and the pleasure of social interaction on an equal footing with hearing visitors. This sense of belonging and full participation can lead to increased confidence, greater appreciation for botanical gardens, and a desire to return and explore further. The contrast between these two

scenarios highlights the critical role of accessibility in shaping not just the practical experience but also the emotional well-being of DHH visitors.

## 3.4 Academic Insights: Studies on Effective Communication Strategies

Academic research and institutional guidelines offer valuable insights into **effective communication strategies for Deaf and hard of hearing (DHH) individuals** in public spaces like botanical gardens. The "COME IN! - BOTANICAL GARDEN" methodology, for example, provides practical advice for interacting with DHH visitors, emphasizing that they are not a homogeneous group and may have varying communication preferences. It suggests using simple phrasing in printed texts and, for verbal communication, always facing the person, making eye contact, speaking loudly (but not shouting), and using a natural or slower pace with clear pronunciation and lip movement. The use of gestures, facial expressions, or pantomime is encouraged when appropriate. A key recommendation is that only one person should speak at a time, and speakers should not walk while talking. When sign language interpreters are used, the guidance is to talk directly to the visitors, not the interpreter, and to make pauses to accommodate the delay inherent in interpretation. This document also notes that audio guides can be enriching for visitors with special needs, implying that if properly designed with visual or tactile interfaces, they could benefit some DHH individuals, though this is not explicitly detailed for this group in the provided snippet.

Further academic research, such as that highlighted by MDPI on the challenges of hearing loss, points to **architectural and environmental barriers that impact communication**. Poor acoustic conditions, excessive background noise, and inadequate amplification devices (like hearing loops) can severely hinder comprehension for those using hearing aids or cochlear implants. Ticket offices with partitions can create communication difficulties, and poor lighting can make lip-reading challenging, especially during guided tours in enclosed spaces. A significant obstacle is the lack of alternative communication methods, such as the full conversion of verbal information into written text or sign language, which increases the risk of disorientation or missing critical information, particularly in emergency situations. The Botanic Gardens Conservation International (BGCI) publication "Roots" mentions that the **United States Botanic Garden (USBG)** has been actively involved in accessibility work, including programs for specific audiences and accessible exhibitions, which would implicitly include considerations for DHH visitors, although specific strategies for this group are not detailed in the snippet. These academic and institutional perspectives underscore the need for botanical gardens to adopt a multi-pronged approach to communication, encompassing staff training, environmental modifications, and the provision of various assistive technologies and services to cater to the diverse needs of DHH visitors.

## 3.5 Personal Narratives: Perspectives from Deaf Visitors (Currently Limited)

While detailed personal narratives specifically from deaf individuals recounting their experiences and feelings while visiting botanical gardens are somewhat limited in the provided search results, some accounts offer glimpses into their perspectives, particularly concerning communication and accessibility. The story of **Richard Dougherty, a deaf architect**, though primarily focused on his career and an interview setting in a café near the Botanic Gardens in Belfast, touches upon communication challenges that are relevant to any public space, including botanical gardens. His difficulty lip-reading a waiter wearing a mask and the need for his interviewer to act as an interpreter in that moment highlights the everyday communication barriers deaf individuals can face. While this occurred in a café, such scenarios can easily translate to interactions at a botanical garden's

ticket counter, information desk, or during a chance encounter with staff. Dougherty's reflection on a doctor telling his mother "I'm very sorry but your son can't hear" and his feeling of being a "failure" in that moment, though from his childhood, speaks to a broader societal context of how deafness is sometimes perceived, which can influence an individual's confidence and expectations when navigating public spaces. His subsequent positive experiences in a school for deaf children, however, also point to the transformative power of accessible and supportive environments.

The initiatives by botanical gardens to provide **ASL-interpreted tours and programs**, such as those at the New York Botanical Garden and the ASL-led composting workshop at the Brooklyn Botanic Garden, implicitly suggest a recognition of the needs of the d/Deaf community. While these are institutional responses rather than personal narratives, they indicate an effort to create more inclusive experiences. The Brooklyn Botanic Garden's program, specifically designed for the d/Deaf community *without* voice interpretation, is a particularly strong example of catering directly to the linguistic and cultural preferences of this group. It would be valuable to hear directly from participants of such programs to understand their feelings – whether they feel a greater sense of inclusion, engagement, and connection to the garden as a result of these tailored offerings. The lack of extensive personal narratives in the search results underscores a potential gap in documented firsthand accounts from deaf visitors about their specific joys, challenges, and unmet needs within botanical garden settings. More research and outreach focusing on collecting these personal stories would be beneficial for gardens aiming to enhance accessibility and create truly welcoming environments for deaf and hard of hearing individuals.

The article "Accessible Gardening for the Deaf: Inclusive Tips & Ideas" provides general advice rather than personal stories, but it reflects an understanding of the deaf community's needs, such as the importance of clear visual layouts and signage with text and symbols. It also mentions the challenge of communication in community gardening spaces and the need for more accessible gardening resources. These points, while not narratives, hint at the types of issues deaf individuals might encounter and the improvements they would likely appreciate. For instance, the recommendation to encourage visual communication methods in community gardening spaces suggests that standard verbal communication can be a barrier. The desire for more gardening resources designed with the deaf community in mind, such as books and online content, also points to a broader need for information to be presented in accessible formats. Collecting and amplifying personal narratives from deaf visitors could provide richer, more nuanced insights into how these general needs manifest in the specific context of botanical garden visits and how such visits impact their feelings of connection to nature and the garden community.

## 4. The Deaf-Blind Experience in Botanical Gardens

### 4.1 Key Challenges: Combined Sensory Deprivation, Navigation, and Communication

Individuals who are deaf-blind face a unique and profound set of challenges when visiting botanical gardens, stemming from the **combined loss of sight and hearing**. This dual sensory deprivation significantly impacts their ability to navigate, access information, and communicate, making independent exploration of these often large and complex environments exceptionally difficult. **Navigation is a primary hurdle**. Without sight, visual cues for wayfinding are unavailable, and without hearing, auditory signals or instructions cannot be perceived. This makes it extremely challenging to move through the garden safely and confidently. While tactile paths or

guide ropes can be helpful, they are rarely implemented comprehensively in botanical gardens. The presence of uneven surfaces, steps, water features, or dense plantings can pose significant risks without clear, consistent tactile guidance or the assistance of a sighted guide. The layout of botanical gardens, often designed with aesthetic appeal for sighted visitors as the primary focus, may not consider the navigational needs of deaf-blind individuals, leading to a confusing and potentially disorienting experience.

**Communication presents another major barrier**. Standard methods of information dissemination in botanical gardens, such as visual signage, Braille labels (if the individual does not read Braille or is also deaf), audio guides, or spoken explanations from staff, are largely inaccessible. For those who use sign language, an interpreter is needed, but the interpreter must be able to communicate tactilely if the individual has limited or no vision. **Protactile communication**, a language based on touch, is crucial for many deaf-blind individuals, but awareness and availability of interpreters proficient in this method are limited. Interactions with garden staff or volunteers can be fraught with difficulty if staff are not trained in effective communication strategies for deaf-blind individuals. This can lead to feelings of isolation and frustration, as the visitor may be unable to ask questions, seek assistance, or share their experience with others. The lack of accessible communication extends to emergency situations as well, where auditory or visual alarms are ineffective.

Accessing the richness of the botanical garden experience is also a significant challenge. While gardens are multisensory environments, the primary modes of engagement are often visual and auditory. Deaf-blind individuals rely heavily on touch, smell, taste, and vestibular/proprioceptive senses. However, **opportunities for safe and meaningful tactile exploration are often limited**. Concerns about damaging plants or encountering hazardous plants (e.g., thorns, irritants) can restrict touch. While some gardens have sensory areas or allow touching of specific plants, these may not be well-integrated or adequately promoted for deaf-blind visitors. Information about plants, their names, origins, and uses, which is typically conveyed through visual or auditory means, needs to be translated into tactile formats, such as Braille labels (if the individual reads Braille) or through direct, tactile communication from a guide. The absence of such adaptations means that the educational and aesthetic value of the garden may be largely lost on a deaf-blind visitor. The Deafblind Community Services in Canada notes that places like parks and art galleries can feel inaccessible, and even getting outdoors for exercise can be a challenge, highlighting the broader environmental barriers faced by this community.

## 4.2 Expressed Needs and Desires: Tactile Experiences, Protactile Communication, and Guide Support

Deaf-blind individuals express a strong need for **rich, accessible tactile experiences, effective communication methods such as Protactile communication, and reliable guide support** to fully engage with and enjoy botanical gardens. The sense of touch becomes a primary mode of exploring and understanding the world when sight and hearing are limited or absent. Therefore, gardens that wish to be inclusive must provide ample opportunities for safe and varied tactile engagement. This includes plants with diverse textures (soft, rough, smooth, fuzzy, prickly), varying temperatures, and distinct shapes and sizes. Raised garden beds can make plants more accessible for touching, and designated tactile exploration areas, perhaps with guidance on which plants are safe to touch, are highly desirable. The desire is not just to touch, but to feel the essence of the plant – its structure, its life. For example, feeling the veins of a leaf, the moisture of the soil, or the intricate pattern of bark can provide a profound connection to nature. The "yarning" or tactile art installations

mentioned by Deafblind Community Services, where knitted or crocheted yarn squares are attached to objects in public places, also point to a desire for tactile engagement with the environment, even beyond natural elements.

**Effective communication is paramount**. For many deaf-blind individuals, especially those with congenital or early-onset deafblindness, **Protactile communication** is a vital language that relies on touch. This method allows for direct, nuanced communication and connection. Botanical gardens need to ensure that staff, particularly guides or interpreters, are trained in Protactile communication or that visitors can be accompanied by their own Protactile interpreters. The availability of Braille signage is important for those who read Braille, but it must be placed at an accessible height and location. For others, tactile maps or models of the garden layout can aid in orientation. The Deafblind World workshops conducted by Deafblind Victoria, where deaf-blind presenters share information about communication, technology, and personal life stories, underscore the importance of direct, accessible communication and the sharing of lived experiences. A participant in one such workshop noted learning "how much thought and planning goes into navigating the world when you're deafblind" and how information gathering is limited, highlighting the critical need for proactive communication support.

**Guide support**, whether from trained garden staff, volunteers, or personal care attendants, is often essential for deaf-blind individuals to navigate the garden safely and to access information about the plants and environment. A guide who is sensitive to the visitor's communication preferences and pace can make a significant difference. This includes providing clear, tactile cues for navigation, describing the surroundings in a way that can be understood through touch or residual senses, and facilitating interactions with the garden's elements. The desire is for guides who are not just navigational aids but also facilitators of a rich, multisensory experience. The Recreation program run by Deafblind Victoria, which organizes monthly community outings to places like the Royal Botanical Gardens, relies on support from DBV and Able Australia, indicating the necessity of organized support for community access. Ultimately, deaf-blind visitors need botanical gardens to be proactive in creating environments where touch is encouraged, communication is accessible through various tactile means, and support is readily available to ensure a safe, enriching, and empowering visit.

## 4.3 Emotional Responses and Feelings: The Significance of Touch and Smell

For deaf-blind individuals, the emotional responses to botanical gardens are deeply intertwined with the sensory experiences available to them, particularly **touch and smell**, as these senses often become the primary channels for connecting with the environment. When botanical gardens are designed or adapted to be tactilely and olfactorily rich, they can evoke profound feelings of joy, wonder, curiosity, and a strong sense of connection to nature. The ability to explore diverse textures, from the velvety softness of a petal to the rough, intricate patterns of tree bark, can be incredibly stimulating and emotionally uplifting. Smelling fragrant flowers, herbs, and the earthy scent of soil can trigger memories, evoke calmness, and create a rich, immersive experience. A teacher who built a sensory garden with students, including those with multiple impairments and deafblindness, described such gardens as "awesome with inspiring creativity, understanding, calmness, recreation and concept development". This suggests that well-designed sensory experiences can lead to very positive emotional outcomes.

Conversely, when botanical gardens are not accessible or do not cater to the needs of deaf-blind individuals, the emotional impact can be one of **frustration, isolation, and disappointment**. The inability to navigate

independently, the lack of accessible information, and the absence of opportunities for tactile or olfactory exploration can make a visit stressful and unfulfilling. The participant in the Deafblind World workshop feedback session described the world as potentially "overwhelming" for someone who is deaf-blind, as "everything is going on around you at a quick pace" and information gathering is limited. This feeling of being overwhelmed or excluded can easily translate to a botanical garden setting if it is not designed with their needs in mind. The effort required to plan and navigate a visit, coupled with the potential for communication barriers, can lead to anxiety and a reluctance to visit such spaces.

The historical perspective of **Helen Keller**, who was deaf-blind, powerfully illustrates the profound emotional connection that can be forged with nature through touch and smell. She wrote, "The people who imagine I am shut out from nature do not dream of the world of loveliness that touch and the sense of smell reveal to me". Her descriptions of delighting in the whip-poor-will's song (perceived through vibrations) and the "gorgeous colors of a sunset" (associated through touch and smell) reveal a rich inner world and a deep appreciation for nature's beauty, accessed through her remaining senses. She described her garden as her "greatest joy" and felt "in the seventh heaven when among my plants". These accounts highlight that for deaf-blind individuals, the emotional resonance of a botanical garden visit is not diminished by the lack of sight and hearing; rather, it is channeled through other sensory pathways. When these pathways are engaged thoughtfully, the emotional rewards can be immense, fostering a sense of peace, belonging, and profound connection to the natural world. The key is for botanical gardens to recognize and actively cultivate these non-visual and non-auditory sensory experiences.

## 4.4 Academic Insights: Research on Nature Engagement and Sensory Substitution

Academic insights into the experiences of deaf-blind individuals in nature, including botanical gardens, often focus on the concepts of **nature engagement and sensory substitution**, highlighting how remaining senses are utilized to perceive and interact with the environment. While direct research specifically on deaf-blind visitors in botanical gardens is limited in the provided snippets, related studies and resources offer valuable perspectives. The Deafblind UK article, for instance, emphasizes that gardening and being in nature provide a multi-sensory experience that is particularly rewarding for those with dual sensory loss, as "our other senses come into play". This points to the natural human tendency towards sensory substitution, where the acuity of remaining senses like touch, smell, and taste may be heightened or more keenly focused upon. The article also mentions Helen Keller's appreciation for the tactile and olfactory qualities of flowers, reinforcing the idea that these senses are crucial for nature appreciation.

The concept of **sensory substitution** is further implicitly supported by the types of accessibility features suggested for deaf-blind individuals. For example, the Deafblind UK article suggests using devices like the Optacon to convert text on seed packets into Braille, and notes that flowers in bloom may have distinctive scents or textures, implying that these non-visual, non-auditory cues become primary sources of information and enjoyment. Recommendations for garden design, such as using small plant beds for easier access and placing "markers" to distinguish between plants, are practical applications of creating an environment where touch and spatial awareness can be effectively utilized. While not explicitly framed as "academic research" in the traditional sense, these practical guides are often informed by an understanding of deaf-blind sensory perception and the need to create environments that maximize the potential for engagement through alternative sensory channels. The broader field of disability studies and sensory ethnography likely contains

more in-depth academic explorations of how deaf-blind individuals experience and make meaning of natural environments, which would further illuminate the principles of sensory engagement and substitution in this context.

## 4.5 Personal Narratives: Accounts from Deaf-Blind Individuals and Advocates

Personal narratives from deaf-blind individuals and their advocates provide invaluable insights into their experiences, needs, and the profound impact that accessible environments can have. While direct, detailed accounts of botanical garden visits from a deaf-blind perspective are not extensively present in the provided search results, the available information offers significant glimpses. The "Deafblind World" workshops facilitated by Deafblind Victoria, for instance, feature deaf-blind presenters like Alison Rawson, Jackie Sciberras, and Heather Lawson, who share their personal life stories and experiences. Although these workshops are not specifically about botanical gardens, the act of sharing personal narratives about "deafblind communication, technology, [and] personal life stories" in an organizational setting demonstrates the importance of firsthand accounts in raising awareness and understanding. The feedback from a participant in one such workshop, who learned about the extensive thought and planning required for deaf-blind individuals to navigate the world, underscores the unique challenges they face daily, which would certainly extend to a visit to a botanical garden. This participant's reflection that "everything is going on around you at a quick pace, and it's overwhelming" provides a powerful, albeit indirect, personal insight into the potential sensory and cognitive load in unfamiliar environments.

The writings of **Helen Keller**, a renowned deaf-blind author and activist, though historical, remain profoundly relevant. Her descriptions of experiencing nature through touch, smell, and vibration offer a deeply personal narrative of engagement with the natural world. She eloquently stated, "The people who imagine I am shut out from nature do not dream of the world of loveliness that touch and the sense of smell reveal to me". Keller's ability to find immense joy and sensory richness in her garden, feeling "in the seventh heaven when among my plants," illustrates the potential for profound connection when environments are experienced through non-visual and non-auditory senses. Her narrative is a testament to the resilience of the human spirit and the capacity to find beauty and meaning through alternative sensory pathways. While not a critique of specific botanical garden accessibility, her writings serve as a powerful reminder of what is possible when the senses of touch and smell are engaged.

The work of educators and advocates, such as the teacher who built a sensory garden for students with vision impairments including deafblindness, also provides a form of narrative, reflecting on observed positive outcomes. This teacher noted that the sensory garden became a basis for science units and allowed for "great concept development," and that students "preferred to linger in the sensory region longer" and showed "interest in returning to the garden again". While these are observations of children, they point to the positive emotional and educational impact of well-designed sensory environments for individuals with significant sensory impairments. The efforts of organizations like Deafblind Community Services, which promote activities like "yarning" (tactile art installations) and visits to sensory gardens during Deafblind Awareness Month, also highlight a commitment to creating and promoting accessible experiences, driven by an understanding of the needs and desires of the deaf-blind community. These initiatives, often shared through photo galleries or event listings, provide a collective narrative of a community striving for inclusion and access to public spaces like

botanical gardens. More direct, contemporary personal narratives from deaf-blind individuals specifically about their botanical garden visits would further enrich the understanding of their unique perspectives and needs.

# 5. Global Perspectives and Initiatives in Accessible Botanical Gardens

## 5.1 Examples of Inclusive Practices from Around the World

Botanical gardens around the world are increasingly recognizing the importance of inclusivity and are implementing a variety of practices to enhance accessibility for visitors with sensory impairments. These initiatives range from specialized garden designs to tailored programs and staff training. For instance, the **Brooklyn Botanic Garden in the USA** features the **Alice Recknagel Ireys Fragrance Garden**, established in 1955 as the first garden in the country designed for individuals who are blind or visually impaired, . This garden encourages touching and smelling plants selected for their fragrant or tactile qualities, with plants grown in elevated beds for wheelchair accessibility and Braille labels for many plants. Similarly, the **New York Botanical Garden** offers ASL-interpreted tours of its Perennial Garden and ASL-led workshops, specifically catering to the d/Deaf community. These examples from the United States demonstrate a long-standing and evolving commitment to accessibility.

In Europe, the **Botanical Garden of Rome (Orto Botanico di Roma) in Italy** has a "Garden of Aromas" where plants are chosen for their tactile or olfactory characteristics, and all plants are accompanied by Braille tags. This garden also features other collections like a Japanese Garden and a Rose Garden, aiming to provide diverse sensory experiences. The **Royal Botanic Gardens, Kew, in the UK**, has embedded inclusivity into its core strategy, with initiatives like discounted tickets for low-income individuals and community outreach programs. The **Real Jardín Botánico in Madrid, Spain**, under its "El Jardín Accesible" initiative, offers sensory guided tours and workshops focusing on touch and smell for visually impaired visitors, and has developed a video tour with Spanish Sign Language (LSE) interpretation for deaf visitors. The **sensory garden in Kunštát, Czech Republic**, established in 2009, features Braille descriptions and offers guided tours by visually impaired workers or guides who know sign language. These examples highlight a global trend towards integrating accessibility into the core offerings of botanical institutions.

## 5.2 The Role of International Organizations in Promoting Accessibility

International organizations play a crucial role in promoting accessibility and sharing best practices among botanical gardens globally. **Botanic Gardens Conservation International (BGCI)** is a key player in this field. BGCI supports and disseminates information about national or local projects that advance accessibility, such as the "El Jardín Accesible" project at the Real Jardín Botánico in Madrid, which aligns with UN Sustainable Development Goals emphasizing education, knowledge access, and the right to enjoy green spaces. By sharing case studies and frameworks, BGCI helps other gardens learn and implement similar strategies, facilitating a global exchange of knowledge and encouraging a more standardized approach to accessibility. **Deafblind International (DbI)** is another organization that advocates for the rights and inclusion of deaf-blind people worldwide. While not specific to botanical gardens, DbI's work in sharing inspirational stories and fostering networks contributes to a broader understanding of the deaf-blind community's engagement with the world, including nature and horticulture. Such organizations often provide resources and host conferences that can influence how public spaces approach accessibility for deaf-blind visitors.

National or regional organizations also play a vital role in directly facilitating access and creating supportive community experiences. For example, **Deafblind Victoria in Australia** organizes recreation programs that include visits to the Royal Botanic Gardens in Melbourne and Cranbourne Botanical Gardens, demonstrating how local organizations can collaborate with gardens to develop tailored programs and raise awareness. Similarly, **Deafblind Community Services (DBCS) in Canada** organizes events during Deafblind Awareness Month, including visits to sensory gardens, further promoting access and community engagement. The **Association of Nature and Forest Therapy (ANFT)** also discusses the importance of protactile experiences for deaf-blind individuals in natural settings, emphasizing a shift towards allowing deaf-blind people to lead in experiencing nature through touch, which has implications for how botanical gardens design and offer programs. These organizations, both international and local, act as catalysts for change, helping to ensure that accessibility is actively implemented to enhance the experiences of visitors with sensory impairments.

## 5.3 Cultural Variations in Understanding and Addressing Sensory Disabilities

The understanding and addressing of sensory disabilities, including how botanical gardens approach accessibility, can **vary significantly across different cultural contexts**. While there is a growing global awareness of the need for inclusivity, the specific societal perceptions of disability, the resources allocated, the types of accommodation prioritized, and even the willingness of individuals to identify as having a disability or request assistance are deeply influenced by cultural norms and values. For example, in some cultures, there might be a stronger emphasis on community support and familial responsibility, which could impact how individuals with sensory impairments experience public spaces like botanical gardens, perhaps relying more on personal networks for assistance rather than institutional accommodations. Conversely, other cultures might place a higher value on individual independence and institutional accountability for providing accessible services. The interpretation of what constitutes an "accessible" or "enjoyable" experience can also be culturally shaped. For instance, the design of sensory gardens might incorporate plants and elements that hold particular cultural significance in one region but not in another.

The "COME IN! - BOTANICAL GARDEN" methodology, which includes considerations for communication with hearing impaired visitors (e.g., facing the person, clear lip movement) and the use of sign language interpreters, reflects a European perspective, likely Czech, given its mention of Prague Botanical Garden. This suggests that certain regions may have established more formalized guidelines or frameworks for accessibility in public spaces. However, the implementation and effectiveness of such guidelines can still be influenced by local cultural understandings of disability. Therefore, while the fundamental needs for information access, navigation, and sensory engagement are universal for blind, deaf, and deaf-blind individuals, the strategies for meeting these needs and the societal context in which these efforts occur will likely reflect local cultural norms, values, and levels of disability awareness. A truly global approach to accessibility in botanical gardens must be sensitive to these variations and promote solutions that are culturally appropriate and effective, ensuring that inclusivity is not a one-size-fits-all concept but one that respects and responds to diverse cultural landscapes.

# 6. Recommendations for Enhancing Accessibility and Visitor Experience

## 6.1 Designing for Multisensory Engagement

**Designing for multisensory engagement is paramount** for creating inclusive and enriching experiences in botanical gardens, particularly for visitors with sensory impairments. This approach involves intentionally incorporating elements that stimulate all senses—sight, sound, touch, smell, and even taste (where safe and appropriate)—to ensure that everyone, regardless of their sensory abilities, can connect with and appreciate the garden's offerings. For **blind and visually impaired visitors**, this means moving beyond purely visual displays to include a rich tapestry of auditory, tactile, and olfactory experiences. Gardens can achieve this by planting a diverse array of species known for their fragrant flowers and foliage, interesting textures (smooth, rough, fuzzy, prickly), and distinctive sounds (e.g., bamboo rustling in the wind, seed pods rattling) . Creating dedicated "touch and smell" gardens with raised beds and clearly labeled plants that are safe to touch allows for direct, hands-on interaction. The installation of water features not only adds visual appeal but also provides soothing auditory input. Audio guides with detailed descriptions of the surroundings, including plant characteristics and garden layouts, are essential, and these should be complemented by tactile maps and models for orientation.

For **deaf and hard of hearing visitors**, multisensory engagement involves providing **visual and tactile alternatives to auditory information**. This includes well-designed interpretive signage with clear text and visuals, captioned videos, and interactive exhibits that use visual displays or vibrations to represent sounds like bird calls or insect activity. The use of sign language interpreters for tours and events is crucial. For **deaf-blind visitors**, the emphasis on tactile and olfactory engagement is even more critical. Gardens should provide a wealth of opportunities for tactile exploration of plants and garden features, supported by Braille labels and trained staff or Support Service Providers (SSPs) who can facilitate communication and guide exploration using ProTactile or tactile sign language. The "COME IN! - BOTANICAL GARDEN" methodology also suggests that expositions should be made interesting in terms of touch, smell, and hearing, and that it should be possible to touch selected plants and objects. By thoughtfully designing gardens that appeal to all senses, botanical institutions can create more equitable, memorable, and meaningful experiences for every visitor, fostering a deeper connection to the natural world.

## 6.2 Implementing Effective Communication Strategies

**Implementing effective communication strategies is fundamental** to ensuring that botanical gardens are accessible and welcoming to all visitors, particularly those who are deaf, hard of hearing, or deaf-blind. For **deaf and hard of hearing individuals**, this involves providing information in visual and tactile formats. Key strategies include the availability of qualified sign language interpreters for guided tours, lectures, and special events, ensuring that interpreters are visible and well-lit. Real-time captioning (CART) services for spoken content offer another vital access route. All audiovisual presentations, such as videos or interactive displays, must be captioned. Interpretive signage should be clear, concise, and use high-contrast text and visuals. Staff should be trained in basic communication etiquette, such as facing the person when speaking, maintaining eye contact, speaking clearly without shouting, and being prepared to use written notes or other visual aids if needed. The "COME IN! - BOTANICAL GARDEN" guide also emphasizes allowing only one person to speak at a time and pausing for interpreters.

For **deaf-blind individuals**, communication strategies must be tailored to their specific needs, which can vary widely. This often requires the availability of **Support Service Providers (SSPs) or interveners** trained in tactile communication methods like ProTactile or tactile sign language. Information should be available in Braille and large print. Staff should be aware of how to interact respectfully and effectively, which may involve learning basic tactile signals or understanding how to work with an SSP. For all visitors, providing clear, accessible information before the visit, such as on the garden's website about available accessibility services and features, can help in planning and managing expectations. This could include details about accessible entrances, sensory-friendly hours, availability of assistive devices, and specific programs for visitors with disabilities. By adopting a comprehensive and visitor-centered approach to communication, botanical gardens can break down significant barriers and ensure that all visitors, regardless of their sensory abilities, can fully participate in and enjoy the educational and recreational opportunities offered.

## 6.3 Training Staff and Volunteers for Inclusive Interactions

**Comprehensive training for staff and volunteers is a cornerstone of creating an inclusive environment** in botanical gardens. It is not enough to simply install accessible features; the human element of interaction is crucial for a positive visitor experience. Training programs should cover a range of topics, including an overview of different types of sensory impairments (blindness, low vision, deafness, hard of hearing, deaf-blindness) and the diverse ways individuals communicate and navigate. Staff should learn about the specific accessibility features and services offered by the garden and how to direct visitors to them. Crucially, training must focus on **effective communication strategies**. This includes guidance on how to interact respectfully and assistively with visitors who have sensory impairments, such as always speaking directly to the person (not their companion or interpreter), using clear and concise language, offering assistance without being overbearing, and being patient and attentive. For deaf and hard of hearing visitors, staff should learn basic sign language phrases or be aware of how to use alternative communication methods like written notes or text-to-speech apps. For blind or visually impaired visitors, staff should be trained in sighted guide techniques and how to provide clear verbal descriptions of the surroundings.

Furthermore, training should address **disability, etiquette and awareness**, helping staff and volunteers to understand the social and emotional aspects of disability and to avoid making assumptions or using patronizing language. Role-playing scenarios can be an effective way to practice inclusive interactions and build confidence. Staff should also be informed about the garden's policies regarding service animals and how to appropriately interact with visitors who use them. The "COME IN! - BOTANICAL GARDEN" methodology emphasizes that staff should be able to provide information about the garden in an accessible way and be prepared to assist visitors with special needs. This includes being aware of potential sensory triggers in the garden environment and knowing how to respond to visitors who may become overwhelmed. Ongoing training and refresher courses are important to ensure that staff knowledge and skills remain current and that a culture of inclusivity is continuously fostered within the botanical garden. Ultimately, well-trained staff and volunteers are essential ambassadors for the garden, helping to create a welcoming and supportive atmosphere for all visitors.

## 6.4 Fostering Co-creation with Disabled Communities

**Fostering co-creation with disabled communities is essential for developing truly inclusive and effective accessibility initiatives** in botanical gardens. Rather than viewing accessibility as a task to be completed by

experts alone, gardens should actively involve individuals with sensory impairments and disability advocacy organizations in the planning, design, implementation, and evaluation of accessibility features and programs. This collaborative approach ensures that the solutions developed are not based on assumptions but on the real needs, preferences, and lived experiences of the people they are intended to serve. Co-creation can take many forms, from establishing advisory panels of individuals with diverse sensory impairments to conducting focus groups and user testing for new exhibits or services. For example, the Real Jardín Botánico in Madrid involved people with intellectual disabilities in validating their accessible sensory route and interactive panels, and the U.S. Botanic Garden engages in community outreach and co-creates activities with marginalized groups, including people with disabilities .

By partnering with disabled communities, botanical gardens can gain invaluable insights that might otherwise be overlooked. This can lead to more innovative, user-friendly, and sustainable accessibility solutions. For instance, blind and visually impaired individuals can provide direct feedback on the usability of tactile maps or audio guides, while deaf individuals can advise on the most effective ways to present sign language interpretation or visual information. Deaf-blind individuals and their support organizations can offer guidance on Protactile communication and the design of tactile experiences. This collaborative process not only improves the quality and relevance of accessibility measures but also helps to build trust and a sense of ownership within the disabled community. It sends a powerful message that their perspectives are valued and that the botanical garden is genuinely committed to inclusion. Furthermore, co-creation can extend beyond physical and programmatic access to include the development of interpretive content that reflects diverse perspectives on nature and the environment. By embracing co-creation, botanical gardens can move beyond mere compliance and become leaders in fostering equitable and meaningful engagement with nature for everyone.

## 7. Conclusion: Towards Truly Inclusive Botanical Gardens

The journey towards **truly inclusive botanical gardens** is an ongoing process that requires commitment, creativity, and a deep understanding of the diverse needs of all visitors, particularly those with sensory impairments. As explored throughout this research, blind, deaf, and deaf-blind individuals face unique challenges in navigating, accessing information, and fully experiencing the sensory richness of botanical gardens. Their expressed needs consistently highlight a desire for **multisensory engagement**, **effective communication**, and **thoughtful support** that allows them to connect with nature on their own terms. The emotional impact of a visit is profound, ranging from joy and connection when accessibility is prioritized, to frustration and exclusion when barriers persist.

Achieving true inclusivity means moving beyond minimum compliance and embracing a philosophy of **universal design and co-creation**. It involves designing gardens that are inherently accessible, providing information in multiple formats, training staff to be knowledgeable and empathetic, and actively partnering with disabled communities to ensure that their voices are heard and their experiences valued. Global initiatives and examples from botanical gardens around the world demonstrate that progress is being made, but there is still much work to be done. By implementing the recommendations outlined—designing for multisensory engagement, implementing effective communication strategies, training staff, and fostering co-creation—botanical gardens can transform into spaces where everyone, regardless of their sensory abilities, can discover the wonders of the plant world, find solace in nature, and feel a genuine sense of belonging. The

ultimate goal is to create botanical gardens that are not just physically accessible, but also emotionally welcoming and intellectually stimulating for all members of our diverse human family.

# 8. References

## 8.1 Primary Academic & Peer-Reviewed Sources


- **Matamala, A., Orero, P., & Neves, J.** (2024). Translating gardens into accessible multisensory tours for blind and partially-sighted visitors: An exploratory case study. *Universal Access in the Information Society*. https://doi.org/10.1007/s10209-024-01107-0
- **Hussein, H., Nik Zainal Abidin, N. M., & Omar, Z.** (2016). Sensory gardens: A multidisciplinary effort. *Asian Journal of Behavioural Studies*, 1(1), 32–43. https://doi.org/10.21834/ajbes.v1i1.18
- **Krzeptowska-Moszkowicz, I., Moszkowicz, Ł., & Porada, K.** (2021). Evolution of the concept of sensory gardens in the generally accessible space of a large city: Analysis of multiple cases from Kraków (Poland) using the Therapeutic Space Attribute Rating Method. *Sustainability*, 13(11), 5904. https://doi.org/10.3390/su13115904
- **Salisbury, K. V.** (2000). *Enhancing the experiences of blind and visually impaired visitors in botanical gardens* [Master's thesis, University of Delaware]. UDSpace. http://udspace.udel.edu/server/spi/core/bitstream/8e079f9d-5bd9-4dfa-ab1c-93918aa03f73/content


## 8.2 Botanic-Garden & Institutional Sources


- **Brooklyn Botanic Garden.** (n.d.). *Accessibility*. https://www.bbg.org/visit/accessibility
- **Real Jardín Botánico (Madrid).** (n.d.). *El Jardín Accesible*. https://www.rjb.csic.es/jardinaccesible
- **Royal Botanic Gardens, Kew.** (n.d.). *Inclusion and access*. https://www.kew.org/
- **United States Botanic Garden.** (n.d.). *Accessibility services*. https://www.usbg.gov/visit/accessibility
- **New York Botanical Garden.** (n.d.). *Accessibility services*. https://www.nybg.org/visit/accessibility
- **Botanic Gardens Conservation International (BGCI).** (2023). *Roots*, 20(2) – Special issue on inclusion and wellbeing. https://www.bgci.org/resources/roots


## 8.3 Community & NGO Reports


- **Deafblind Victoria.** (2022). *Deafblind World workshops and recreation programs*. https://deafblindvic.org.au/
- **Deafblind Community Services (Canada).** (2023). *Deafblind Awareness Month events*. https://deafblindcommunityservices.ca/


## 8.4 Historical & Public-Domain Narratives


- **Keller, H.** (1908). *The world I live in*. Doubleday.
- **Keller, H.** (1929). *My religion*. Garden City Publishing.