All visitors welcomed:
how universal access supports inclusive activities in protected natural areas

by

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A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture and Regional and Community Planning
College of Architecture, Planning, and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2024

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Abstract

Protected natural areas often have a dual mission to conserve both cultural and natural resources while offering recreational and educational opportunities (Alexander 2007). However, individuals with disabilities often face unequal access within natural areas due to various physical, informational, and programmatic barriers (Groulx, Freeman, and Lemieux 2022). While some guidelines for implementing universal design and access in urban spaces exist, there is a lack of knowledge and guidance for applying universal access in protected natural areas alongside additional priorities like conservation and visitor management (Groulx et al. 2021).

To fill this knowledge gap, a proposed universal access Guidebook for land managers was developed for use in protected natural areas. Methods used to inform the Guidebook included an analysis of prominent universal design and visitor use guidelines and eight semi-structured interviews with land managers, visitor program directors, and accessibility specialists. The Guidebook incorporates the specific challenges and opportunities identified by the interviewees and provides actionable strategies, considerations, and an integrated planning process to create high quality, inclusive experiences. To demonstrate the application of the Guidebook, a projective design was proposed for Konza Prairie Biological Station, located in the Flint Hills Region of Kansas. The recommendations and design show how the site can provide equitable visitor experiences for all.

The findings confirmed that visitor access and management planning in natural areas does not typically consider universal access. Additionally, the findings revealed that opportunities and challenges go beyond the need for adapted universal access guidelines. Fostering collaboration, knowledge sharing, and improving access to resources and funding are also critical to successfully implementing universal access. Research limitations include a limited number of

interviewees and a lack of feedback on the proposed Guidebook. Future research should include more interviewees and the guidebook should be reviewed by experts and those with lived experience with disabilities. Overall, the Guidebook encourages land managers to implement universal access in protected natural areas which would allow all people, regardless of ability, to enjoy the beauty of nature.

ALL VISITORS WELCOMED:

How Universal Access Supports Inclusive Activities in Protected Natural Areas

Maly Sears



Master of Landscape Architecture | 2024
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Committee: Kirby Barrett; Ryan Sharp

Abstract

Protected natural areas often have a dual mission to conserve both cultural and natural resources while offering recreational and educational opportunities (Alexander 2007). However, individuals with disabilities often face unequal access within natural areas due to various physical, informational, and programmatic barriers (Groulx, Freeman, and Lemieux 2022). While some guidelines for implementing universal design and access in urban spaces exist, there is a lack of knowledge and guidance for applying universal access in protected natural areas alongside additional priorities like conservation and visitor management (Groulx et al. 2021).

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The findings confirmed that visitor access and management planning in natural areas does not typically consider universal access. Additionally, the findings revealed that opportunities and challenges go beyond the need for adapted universal access guidelines. Fostering collaboration, knowledge sharing, and improving access to resources and funding are also critical to successfully implementing universal access. Research limitations include a limited number of interviewees and a lack of feedback on the proposed Guidebook. Future research should include more interviewees and the guidebook should be reviewed by experts and those with lived experience with disabilities. Overall, the Guidebook encourages land managers to implement universal access in protected natural areas which would allow all people, regardless of ability, to enjoy the beauty of nature.

Acknowledgments

This research project and my academic journey would have been impossible without the kindness, strength, and wisdom of my professors, committee, studio friends, fiance, and parents. My gratitude for you is endless.

Thank you to all my professors at Kansas State University. How did you get to be so smart and kind? Thank you to my committee, Lee Skabelund, Kirby Barrett, and Ryan Sharp. You were patient when I was upset. You guided me when I was confused. You poured so much time into me and my project.

Thank you to my studio friends. You made it worth it to come into studio everyday. I cannot imagine a more caring, smart, funny, and supportive group of people. I will miss each of you dearly, and wish you nothing but the best.

Thank you to my fiance, Thomas Putnam. You have literally been there since day one. I can't believe we met the first day of college and have been best friends since. Your support, wisdom, and endless kindness inspires me every day.

Finally, thank you to my dad and mom, Matt and MaryEllen Sears. You have seen me fail and succeed innumerable times, and have been there through it all. You answered so many late night calls, helped me gain perspective on challenging situations, and encouraged me to pursue what I'm passionate about. I hope I can use my landscape architecture degree to do as much good in the world as the two of you have done.

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1.

INTRODUCTION

1a. Project Introduction & Dilemma
1b. Research Question
1c. Project Outline

ONE

1a. Project Introduction & Dilemma

Protected natural areas offer great opportunities for education, recreation, and improving physical and mental wellbeing (Alexander 2007; Wolf and Wohlfart 2014). Despite this, physical, information, and program barriers disproportionately exclude people with disabilities from participating in nature-based activities (Groulx et al. 2021; Vaughn n.d.). Universal access is an emerging design and decision-making lens that aims to eliminate barriers and make public spaces inclusive and equitable for all people. Unfortunately, universal access and design are rarely provided in natural settings. Landscape architects have a responsibility to change this narrative so all people, regardless of ability, can enjoy natural areas.

The characteristics of protected natural areas create inherent challenges to providing universal access. Providing and maintaining universal access requires funding, which is often challenging for natural areas. Natural area staff also have many responsibilities and may lack the time or knowledge to provide universal access. (Jill Haukos 2023). Finally, improving accessibility without compromising the site's natural and cultural resources will often create a significant challenge (Alexander 2007; Driskell and Steve Wohlford 1993; Goldstein and Knutson 2014). Furthermore, the standard design approach is to meet the minimum legal requirements outlined by the Americans with Disability Act (ADA) and the Architectural Barriers Act (ABA). These policies are highly focused on addressing physical barriers related to mobility disabilities. Because of this narrow focus, complying with the ADA and ABA often does not guarantee accessibility or support the inherent range of visitor needs and abilities. It often results in exclusive and unwelcoming visitor experiences, highlighting the need for universal access (Goldstein and Knutson 2014).

Presently, landscape architects and land managers lack comprehensive, universal access guidelines for inclusive planning and design in protected natural areas (Groulx, Freeman, and Lemieux 2022; Larson et al. 2016). More research and knowledge are necessary to develop inclusive planning and design practices appropriate to natural areas' unique context. Further, addressing this issue requires the collaborative effort of land managers, resource specialists, landscape architects, accessibility specialists, stakeholders representing a range of disabilities, and others (Kirkindall 1999; Schrader 2023).

This report is significant since it seeks to fill this gap and develop a universal access guidebook. Advancing universal access is essential to ensuring that all people, regardless of ability, have equitable opportunities to experience natural areas (Groulx et al. 2021; Knutson et al. 2021; Vaughn n.d.).

1b. Research Question

Research Question

How can universal design strategies be adapted for use in protected natural areas to create inclusive and quality experiences for visitors with mobility, vision, and hearing disabilities?

Research Subquestions

1. What are the big picture and site-specific challenges that influence the provision of universal access in protected natural areas and how can those challenges be overcome?

2. What are the key factors and design strategies to address barriers and create high quality, inclusive nature-based activities for individuals with mobility, vision, and hearing disabilities?

3. How can collaboration between natural area staff, the public, accessibility specialists, and landscape architects improve decision-making and universal access strategies in alignment with each of their responsibilities and priorities?

4. How can existing standards and guidelines be adapted to better accomplish universal access alongside conservation and visitor use objectives within protected natural areas?

1c. Project Outline

Goals

1. Develop strategies to support **quality experiences and full participation** in protected natural areas for people with mobility, vision, and hearing related disabilities.

2. Broaden land managers, visitor program directors, accessibility specialists, and landscape architects' understanding of the **importance, opportunities, and challenges of providing universal access** to and within protected natural areas.

3. **Adapt universal design strategies** to be appropriate for use in protected natural areas through partnerships with natural areas' staff and accessibility specialists.

Methods

1. Conduct a comparative analysis of existing documents covering universal design and accessibility and visitor use.

2. Conduct semi-structured interviews with subject matter experts.

3. Conduct a site inventory and analysis to support the projective design.

Outcomes

1. Create a guidebook for implementing universal design in the context of protected natural areas.

2. Develop a projective design of the Konza Prairie Biological Station (KPBS).

2.

BACKGROUND

2a. Chapter Overview
2b. Literature Review
2c. Project Site Introduction

TWO

2a. Chapter Overview

The existing literature provides context for this project and was used to develop the project's research methods including the semi-structured interviews and document analysis (Found in Chapter 5). The project and methods aim to address the knowledge gaps and challenges identified in this literature review.

Literature Review Contents

1. Visitors of Protected Natural Areas

1a. Benefits of Nature–Based Activities
1b. Visitor Impact
1c. Conservation Management Plans

2. Disabilities

2a. Exclusion From Protected Natural Areas
2b. Overview of Disabilities
2c. Perspectives on Disability

3. Legislation and Universal Design

3a. Accessibility Legislation
3b. Universal Design
3c. Applying Universal Design to the Physical, Information, and Programming Environments

4. Integrating Universal Design in Protected Natural Areas

4a. Compatible Goals
4b. Incompatible Goals

Project Site Introduction

Konza Prairie Biological Station

2b. Literature Review

1. Visitors of Protected Natural Areas

1a. Benefits of Nature–Based Activities

Recreating in natural environments supports overall wellbeing, while the absence has made heart disease, diabetes, exhaustion, and mental, behavioral, and social health challenges more prevalent (Cordell 2008; Maller et al. 2006; Wolf and Wohlfart 2014). Active recreation like walking and hiking improves the cardio-respiratory system and mental cognition (Wolf and Wohlfart 2014; Zhang et al. 2017). Activities can also improve awareness, self-confidence, attitude, and social relationships (Zhang et al. 2017). Passive activities like viewing nature support emotional and spiritual needs like feeling restored, psychological health, stress reduction, social interaction, solitude, and joy (Aguilar-Carrasco et al. 2023; Bandukda et al. 2020; Groulx et al. 2021; Groulx, Freeman, and Lemieux 2022; Millennium Ecosystem Assessment 2004; Wolf and Wohlfart 2014; Zhang et al. 2017).

1b. Visitor Impact

Protected Natural Areas: The International Union for Conservation of Nature (IUCN) recognizes protected natural areas as areas of land dedicated to protecting biological diversity and natural and cultural resources and providing visitor activities, including recreation and education. These areas are managed through visitor use and access plans, master plans, legal requirements, and other means (Thomas and Middleton 2003).

Positive Visitor Impacts: Visitor activities in protected areas can have positive environmental, social, and personal impacts. Providing opportunities for visitors to experience and learn about nature can increase understanding of conservation issues. It can also foster awareness, appreciation, and desire to protect natural resources, local culture, and cultural resources. Visitation also supports physical, mental, spiritual, and social well-being (Leung et al. 2018; Spencely et al. 2015).

Negative Visitor Impacts: Negative impacts include introducing invasive species, declining wildlife populations, and habitat destruction (Alexander 2007; Larson et al. 2016). Visitor infrastructure can also degrade air and water quality, permanently alter landforms, and impact visual aesthetics and natural soundscapes. The level of impact depends on the amount and type of recreation, timing, spatial distribution, and carrying capacity, which is a measure of a resource's resilience to human activity (Alexander 2007; Larson et al. 2016; Leung et al. 2018).

1c. Conservation Management Plans

Conservation Management Plans: This is an essential and practical tool for achieving and maintaining the desired conditions for the site's features (Alexander 2007; Thomas and Middleton 2003; Leung et al. 2018). A natural area management plan identifies important natural, geographic, physiological, and cultural features and sets out site-specific objectives and actions to reach desired conservation outcomes (Alexander 2007; Knutson et al. 2021; Thomas and Middleton 2003).

Visitor Access Planning: This planning is integral to the conservation management plan. Visitor access plans aim to create sustainable, safe, and quality visitor experiences while mitigating negative visitor impacts to the site. (Alexander 2007; Knutson et al. 2021; Thomas and Middleton 2003)

2. Disabilities

2a. Exclusion from Protected Natural Areas

Exclusion: Barriers disproportionately exclude people living with disabilities from recreating in protected natural areas. A barrier is any condition, environment, infrastructure, practice, or attitude that prevents participation (Aguilar-Carrasco et al. 2023; Groulx et al. 2021; Groulx, Freeman, and Lemieux 2022; Voight et al. 2008; Zhang et al. 2017). Many view the ability to participate in and access nature as a civil right and is essential to a person's overall wellbeing (Groulx et al. 2021; Schahfer and Robi-son, n.d.; Vaughn n.d.).

2b. Overview of Disabilities

Medical Perspective: The Centers for Disease Control and Prevention (CDC) classifies disabilities into six categories: mobility, hearing, vision, cognition, independent living, and self-care (2020). While designers and land managers should consider all types of disabilities when designing visitor experiences, this research will focus on mobility, hearing, and vision. The CDC reported in 2021 that 27% (599,918) of adults living in Kansas have one or more types of disabilities. Mobility related disabilities are the second most experienced, with hearing and vision being the fourth and fifth (CDC 2023).

Mobility: Lower body functional limitations can reduce mobility activities like walking, climbing stairs, standing, sitting, and crouching. The most common limitation is walking a quarter mile. One study found that 13.4% (32.3 million) of adults had difficulties walking this far, and 7.6% (18.3 million) could not at all (Taylor 2018). 42.7% of adults with reduced mobility use aids like canes, crutches, and walkers, which are more common than wheelchairs (CDC 2023; Taylor 2018).

Vision: Activity limitations include "blind or serious difficulty seeing, even when wearing glasses" (CDC 2023). One study found that 5.1 % (12.3 million) of adults have serious difficulty seeing. Of this number, 1.6 million are fully blind (Taylor 2018). Without proper accommodations or universal access, blind or partially sighted people (BPSP) may have limited mobility independence (Bandukda et al. 2020; Taylor 2018).

Hearing: Activity limitations include "deafness or serious difficulty hearing" (CDC 2023). One study found that 7.1 % (17.1 million) of adults experience serious hearing difficulty. Of this number, 3.4 million are fully deaf (Taylor 2018). These include a lack of visual signage and minimal or inadequate space for sign language communication along walking paths (Taylor 2018; Vaughn, n.d.).

Spectrum of Experiences: People experience disabilities in different ways and intensities. For example, low vision, blind, and deaf-blind are a spectrum with different experiences and needs. Disabilities may also not be evident. A person with a mobility disability may use a wheelchair, prosthetics, or no assistive device (Taylor 2018; Vaughn, n.d.).

2c. Perspectives on Disabilities

Medical Model: This model is the most common worldview that places the burden of accessing public spaces on the person with a disability. In this context, it is not the responsibility of designers and land managers to create universally accessible spaces. This results in the oversight and misunderstanding of the needs of individuals with disabilities in the design processes (Vaughn 2018; Groulx, Freeman, and Lemieux 2022).

Social Model: This model recognizes the relationship between the demands of the environment and the normal spectrum of human abilities. When the two are misaligned, this creates barriers. Vaughn (2018) emphasizes the need to adopt the social model when designing public spaces to eliminate barriers. This shift in attitude and design approach will minimize the burden on disabled people to adapt or use separate accommodations.

3. Legislation and Universal Design

3a. Accessibility Legislation

Overview: The legislation and policies that govern the accessibility design of public spaces are based on the Medical Model. Some legislation was passed as recently as 34 years ago (as of 2024). The following is a short list of accessibility acts and policies relevant to outdoor design.

1968 Architectural Barriers Act (ABA): This act is "the first significant measure to ensure access to the built environment for people with disabilities. It included enforceable standards for accessible design applicable to various facilities. However, the ABA only applied to facilities built with federal dollars and facilities receiving federal funding" (Braley et al. 2023).

3a. Accessibility Legislation

1990 The Americans with Disabilities Act (ADA): This act is one of the United States's most comprehensive civil rights legislation prohibiting discrimination. The law applies to state and local governments and is binding for private organizations that provide a place of public accommodation like recreational trails (Braley et al. 2023). It prohibits discrimination but focuses on interior spaces rather than outdoor environments (Vaughn 2018).

2004 Outdoor Developed Areas Accessibility Guidelines (ODAAG): The United States Access Board published guidelines outlining binding legal requirements for land managed by federal agencies. ODAAG contains technical requirements for developing and altering infrastructure covered by ADA of 1990 and the Architectural Barriers Act (ABA) of 1968 (United States Access Board 2014).

2010 ADA Standards for Accessible Design: The Department of Justice (DOJ) interpreted the ADA legislation and provides standards for some recreation facilities but not trails. The standards focus on the needs of wheelchair users and people who are blind or have low vision (Goldstein and Knutson 2014; U.S. Department of Justice 2010).

2011 Other Power-Driven Mobility Devices (OPDMD) Regulations: The DOJ interpretsed the ADA legislation to create these regulations. Mobility devices for individuals with mobility-related disabilities are now categorized as either wheelchairs or OPDMDs (Wolf and Loza 2020).

2014 Amend Outdoor Developed Areas Accessibility Guidelines: ODAAG was amended to address trails, picnic and camping facilities, viewing areas, and beach access routes. ODAAG is binding for federal agencies but not private entities (United States Access Board 2014).

3c. Universal Design

Definition: Universal design is not the same as 'accessible,' a legal term focused on meeting minimum requirements (University at Buffalo 2023; Steinfeld and Maisel 2012). Designing to meet accessibility requirements does not ensure accessibility or usability by all people (Driskell and Steve Wohlford 1993). In contrast, universal design accommodates the widest spectrum of physical and cognitive abilities through a single, all-encompassing design (instead of a separate design). This design approach enables all people, regardless of ability, to have quality experiences and participate in their desired activities. (Groulx, Freeman, and Lemieux 2022; Steinfeld and Maisel 2012).

History: Ronald Mace, a disabled architect, developed the seven principles of universal design (UD) with the Center for Universal Design. The center defines UD as follows: "The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (NC State University 1997; Vaughn (b.) n.d.).

Critiques: While designers widely reference these principles, they are broad goals without definitive steps or standards to achieve a measurable outcome. The principles were also developed for product design and need adaptation to fit other situations (University at Buffalo 2023). It is essential to understand that applying universal design in a natural environment poses different challenges than in urban settings.

Adaptations and Future Outlook: Since then, organizations have adapted the concept and principles. Steinfeld and Maisel describe universal design as a process and design approach instead of vague and idealistic goals (2012). The American Society of Landscape Architects (ASLA) also published universal design guidelines. The guidelines provide inclusive design recommendations for people with neuro-cognitive disabilities, blindness and low vision, and deafness and hardness of hearing. (Dillon and Jared Green 2019). However, these guidelines still exclude recommendations for applying universal design in protected natural areas.

Despite the critiques, universal design is a promising framework and tool for eliminating barriers and creating equal opportunities for nature-based activities (Vaughn n.d.). However, the framework is still in its early stages and requires further development, application in real projects, and evaluation to become a reliable design tool (Steinfeld and Maisel 2012).

3d. Applying Universal Design to the Physical, Information, and Programming Environments

Universal Access: This is the characteristic of a place or amenity to be usable by all people to the greatest extent possible without separate accommodations (Goldstein and Knutson 2014). Universal design improvements can be categorized into three 'environments' in order to achieve universal access: Physical, Information, and Program (Groulx et al. 2021):

1. **The physical environment:** involves providing appropriately designed, implemented, and managed infrastructure (altered or new).

2. **The information environment:** deals with the format, accessibility, and clarity of information on site and online.

3. **The program environment:** deals with the delivery and format of visitor programs. Programs should be equitable and support independent participation, opportunities to experience with family and friends, and multisensory experiences.

Comparison of Design Frameworks

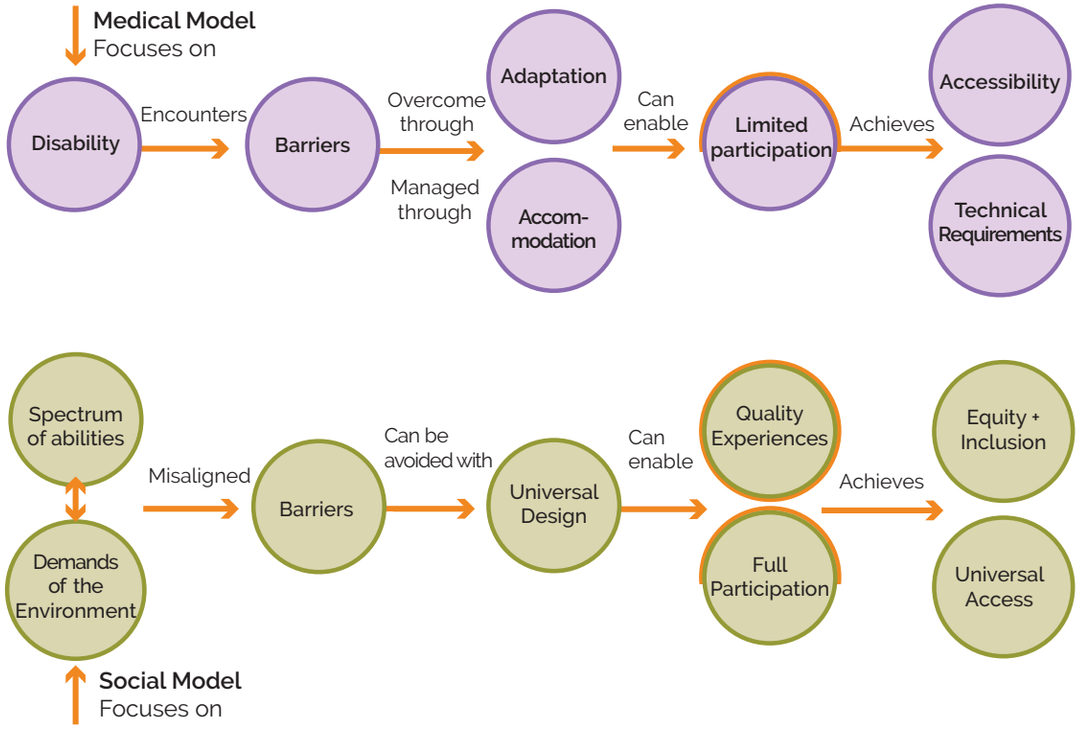


Fig 2.1 Comparison of Design Frameworks.

Compatible Goals and Actions

Universal Access	Compatible Actions	Visitor Use Management
Equitable access to all desired experiences (4, 7)	Provide full access to desired user experiences (3, 7). Enjoy natural and cultural features through universally accessible boardwalks, overviews, variety of terrain, etc. (2, 5, 6)	Provide varying challenge levels while aligning environmental demands and ability level (1, 2)
Address information and program barriers (4, 5, 8)	Provide sense of freedom, self accomplishment, and self reliance (3, 5)	Clear wayfinding signage (2, 3)
Multi - sensory experiences (2, 5, 6)	Provision of information in alternate formats to determine ability to use trail, improve interpretation, wayfinding, and safety (2, 3, 6)	Sustainability (1, 2, 3)
Visitor safety (2, 6)	Minimize negative impacts to the land and maximize positive ones (2, 3, 9)	Trail planning considers safety and trail obstacles (2, 3)
Slope, tread, & rest and passing spaces (technical requirement) (2, 5)	Provide ongoing facility staff training (2, 4, 8)	Slope and tread (2, 3)
	Ensure economic sustainability by budgeting for universal design and trail upkeep (2, 8)	Promote stewardship through education (3, 9)

1. (Bureau of Land Management 2017)
2. (Knutson et al. 2021)
3. (Department of Conservation and Recreation 2019)
4. (Groulx et al. 2021)
5. (Zhang et al. 2017)
6. (Bandukda et al. 2020)
7. (Schahfer and Robison 2023)
8. NPS (Washburn et al., 2014.)
9. IUCN (Leung et al. 2018)

Fig 2.2 Compatible Goals and Actions.

4. Integrating Universal Design in Protected Natural Areas

4a. Compatible Goals

Overview: Universal design strategies need to be integrated with existing conservation and visitor access goals and strategies. When implemented harmoniously, the result should be quality, sustainable, and inclusive visitor experiences. However, there are situations where providing universal access is not compatible with the primary objectives of the site.

Compatible goals: Universal access and visitor use management have several compatible goals. (Reference Figure 2.2 on the following page for an overview of how their respective goals overlap). Despite overlaps, there are few guidelines or studies that directly discuss how these goals can be implemented harmoniously. More research is necessary to advance universal design in protected natural areas.

4b. Incompatible Goals

Overview: Providing inclusive and quality visitor experiences is essential to many nature reserves (Larson et al. 2016; Leung et al. 2018). At the same time, conservation objectives have to be maintained. Tension can arise when balancing conservation goals with universal access and design. This tension is exacerbated since universal design strategies have yet to be comprehensively adapted for use in natural settings or considered in the context of conservation management (Groulx, Freeman, and Lemieux 2022; Larson et al. 2016).

Incompatible Situations: Designing sustainable infrastructure means maximizing accessibility without altering the integrity and character of the land. Universal design may be impracticable due to steep slopes, dense vegetation, vulnerable wildlife and vegetation populations, and vulnerable natural resources. Appropriate decision-making, design, and visitor use and conservation management can ensure visitor activities do not compromise the protection of the site's features (Alexander 2007; Driskell and Steve Wohlford 1993; Goldstein and Knutson 2014; Groulx et al. 2021; Zhang et al. 2017).

2c. Project Site Introduction

Konza Prairie Biological Station

Overview: The project focuses on the visitor experience at the Konza Prairie Biological Station (KPBS) located south of Manhattan, Kansas. This 8,616 acre field station is located in the Flint Hills Ecoregion within the largest area of remnant tallgrass prairie shown in Figure 3.3. It is one of the few places where people can enjoy and learn about the tallgrass prairie.

Visitor Use: Common visitor types include: 1) Researchers; 2) Local Students (K-12 and college-age from Manhattan, Kansas); 3) Other Local Residents and Visitants (individuals, families, etc.); 4) National and International Researchers and Visitants. These visitors come to enjoy the tallgrass prairie and engage in research, educational experiences, guided tours, and self-guided hikes.

Universal Access: Minimal attempts have been made to improve universal access in the physical, information, or program environments. The staff's approach to universal access or accessibility has been more reactive and on a case-by-case basis to accommodate visitors in contrast to a more proactive and planned approach.

Project Intent: First, to conduct site inventory and analysis of the visitor infrastructure and provisions. Second, to develop a projective design with strategies that will improve universal access. These findings are located in Chapter 6.

Location of the Konza Prairie in the Flint Hills

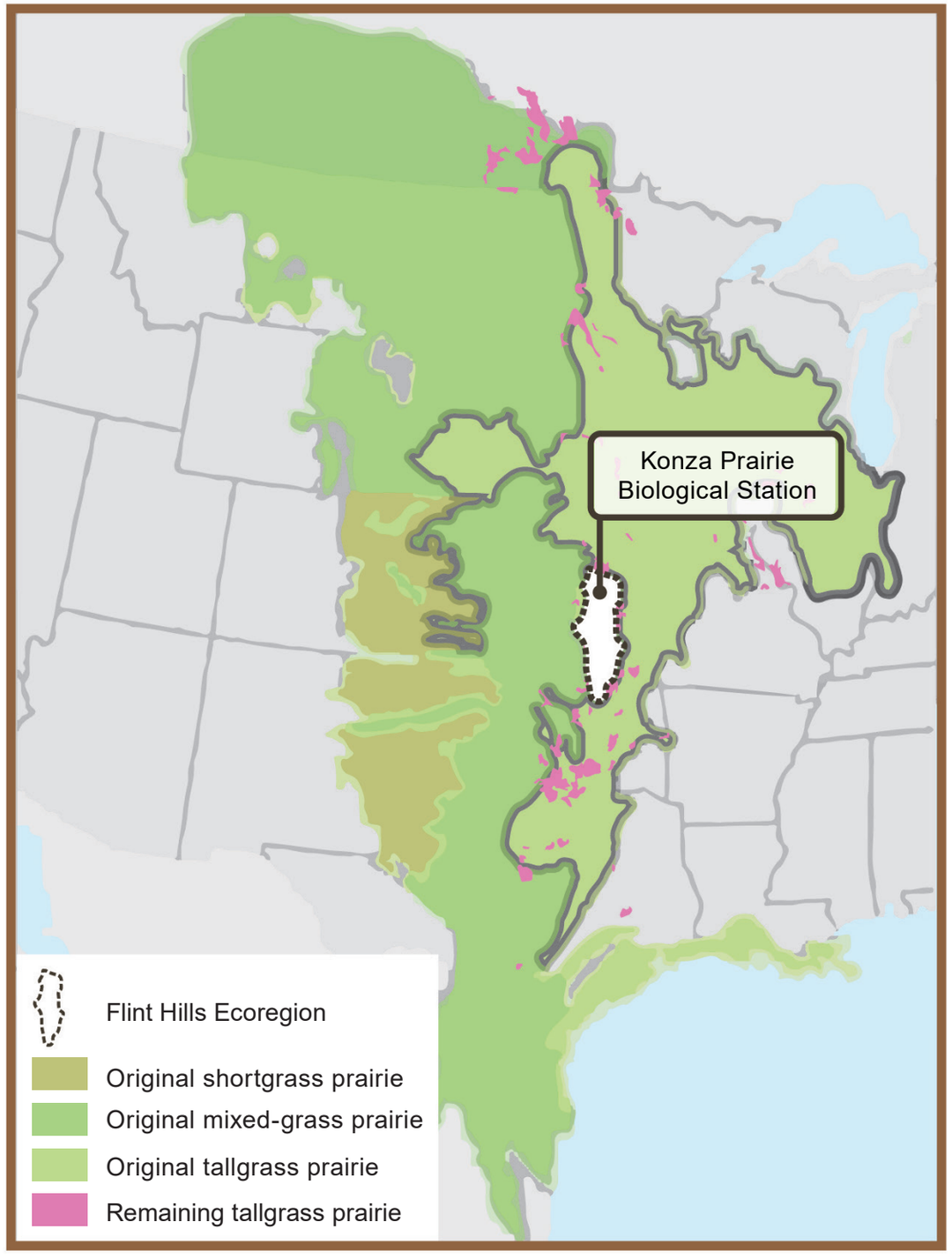


Fig 2.3 Location of the Konza Prairie Biological Station in the Flint Hills.

3. METHODS

3a. Semi-Structured Interviews
3b. Document Analysis
3c. Site Analysis

THREE

3a. Semi-Structured Interviews

What

Semi-structured Interviews were conducted in December 2023 with individuals representing three key stakeholders: land managers, visitor program directors, and accessibility specialists. The interview analysis process and findings are located in Chapter 4.

Background

Landscape architects often work with land managers, visitor program directors, and accessibility specialists when doing designing natural areas to support visitor activities. Collaboration between each of these groups is essential to successfully provide universal access in natural areas. It is expected that compiling their expertise will allow for the development of more comprehensive planning and design processes for implementing universal design and access.

To Gain a Better Understanding of:

1. The common barriers people face when visiting and participating in programs and activities (ie. social, physical, information, program, other).

2. The challenges, opportunities, and strategies within each profession, to remove barriers and create an inclusive environment.

3. Strategies and considerations to provide quality and inclusive visitor experiences.

4. The collective expertise and perspectives of each interviewee group (to develop the proposed Guidebook).

Interviewee Selection Process

Participant Groups: Participants hold the generalized titles of land managers, visitor program directors, and accessibility specialists. These groups were chosen since they represent key stakeholders that influence visitor experiences in natural areas. Conservationists are not included since they do not have a formal decision-making responsibility regarding visitor experiences, which is the focus of the research.

Participant Identification: Potential interviewees were selected starting with the researcher's contacts and then using the snowball method. The potential interviewees were primarily identified from the Midwest to provide insight that is applicable to the selected project site, the Konza Prairie.

Recruitment and Approvals: Recruitment was confirmed by email and phone call. Prior to the initiation of formal interviews, each interviewee preferenced whether to be identified in this report and IRB approval was granted through Kansas State University.

Land Managers

John Blair: John is a terrestrial ecosystem ecologist and director of the Konza Prairie Biological Station. He is deeply involved in the conservation efforts, research, and visitor management of the preserve. As the director, he is a primary stakeholder that would be pertinent to include if a formal conservation management and visitor access plan was created for the KPBS. His experience and familiarity with the KPBS provided insight of conservation objectives and how to create sustainable and high quality visitor experiences while protecting the site.

Anne Lowe: Anne works for the town of Breckenridge as their Open Space & Trails Manager. She is responsible for coordinating open space and trail activities, long range planning for open space goals, securing funding, and preparing management plans. Her experience in long range planning provided insight into the conservation management decision making process. Further, she has experience with community engagement and stakeholder management, and recreation use management. She provided valuable input into designing quality visitor experiences in alignment with visitor use management and universal access objectives.

Land Manger One: They are a land manager of a publicly owned preserve. This manager is passionate about the protection and interpretation of the natural and cultural resources on the preserve. Their professional experience provided valuable insight on creating sustainable and engaging visitor experiences.

Visitor Program Director

Jill Haukos: Jill is the director of education for the Konza Environmental Education Program and works extensively with public outreach. She prepares online information, maps, and educational materials about the Konza Prairie for K-12 students and leads a variety of tours and hands-on science workshops. Because of her expertise of the Konza in relationship to visitors and education, she provided valuable insight on creating quality experiences and the challenges of integrating universal design concepts in at a field station.

Heather Brown: Heather is the chief of interpretation and visitor services at the Tallgrass Prairie National Preserve. Her role deals with visitors and education including supervising staff and conducting tours and education programs. She was also a contributor to the preserve's Accessibility Self-Evaluation and Transition Plan (SETP). The SETP documented existing barriers and provided strategies for upgrading facilities, services, and programs. Heather provided insight in identifying barriers and advocating for and improving universal access in natural areas.

Emily Schrader: Emily works for the Missouri Department of Conservation (MDC). She currently is a partnership engagement coordinator and emphasizes diversity and inclusion. In the past she held positions as a recreation use specialist, conservation educator, and conservation education consultant. Her experience provided insight on how the MDC protects sensitive natural areas while providing quality experiences and universal access when appropriate.

Accessibility Specialist

Accessibility Specialist One: They are a landscape architect with the National Parks Service and have experience with identifying accessibility improvements for various national parks. Their team often encounters challenging situations on how to improve access while protecting natural and cultural resources. Their professional experience provided insight in providing quality experiences and evaluating natural areas to improve universal access.

Alexa Vaughn: Alexa is the author of "Deafscape" and advocates for the inclusion of disabled people in all public space. She developed 'toolkits' that explore how to include disabled people in the design process and design beyond ADA. As a deaf landscape architect, she proposes using universal design as a process and tool to eliminate barriers and allow all people to participate in activities. Alexa provides consultation services, holds workshops, and facilitates inclusive community engagement meetings. Her experience and research provided insight into the challenges and importance of integrating universal design in public spaces.

Interview Procedures

Interviewees were provided with an IRB-approved project participation information sheet and questions prior to the interview. Since the interviews were semi-structured, follow-up questions were asked as needed. The interviews were completed over zoom and closed captions were turned on for accessibility and to aid in note taking. A preface was read before starting the interview questions.

Preface

Protected natural areas often have a dual mission of protecting the site's assets while providing opportunities for visitor activities. Protected [natural] areas are defined by the International Union for Conservation of Nature (IUCN) as "an area of land (…) dedicated to the protection of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means" (Thomas and Middleton 2003). Additionally, protected areas are widely recognized for social roles including supporting visitors' learning and recreation. Conservation, visitor use management, and universal access play roles in supporting these functions of protected areas.

Some questions will reference land managers, visitor program directors, and accessibility specialists. These are generalized titles with the following possible responsibilities:

Land Manager: Also referred as superintendents and directors. They may make decisions over natural areas concerning land management, restoration, and programmatic planning for visitor use. They may also secure funding, coordinate projects, and foster partnerships with local organizations.

Visitor Program Directors: Also referred as recreational use specialist, or visitor program directors. They may make decisions over anything dealing with visitors such as programs, tours, and educational workshops. They may also oversee the creation of maps, guides, social media and website upkeep, and visitor information requests.

Accessibility Specialist: Also referred as accessibility and universal access specialists or consultants. They may conduct accessibility auditing for a site, provide design recommendations, and serve as consultants to facility staff. They may also conduct accessibility training and workshops and facilitate stakeholder meetings.

You may decline to answer any question for any reason without repercussions. Please try to speak clearly into your microphone since the interview will be recorded via zoom. Please confirm that you received and read the project participation information sheet I sent you. Do you have any questions? May I please get your verbal consent to proceed?

Interview Questions

Each interviewee group were asked a set of similiar questions that aimed to answer the overarching research subquestions. Some of the questions are tailored to the specific expertise of each participant group.

Research Subquestions:

1. What are the big picture and site-specific challenges that influence the provision of universal access in protected natural areas and how can those challenges be overcome?

2. What are the key factors and design strategies to address barriers and create high quality, inclusive nature-based activities for individuals with mobility, vision, and hearing disabilities?

3. How can collaboration between natural area staff, the public, accessibility specialists, and landscape architects improve decision-making and universal access strategies in alignment with each of their responsibilities and priorities?

4. How can existing standards and guidelines be adapted to better accomplish universal access alongside conservation and visitor use objectives within protected natural areas?

Land Manager Questions

A widely agreed definition of universal access is that a place or amenity be usable by all people, regardless of ability, to the greatest extent possible, without separate accommodations. The aim of universal access is to provide equitable opportunities for all people to enjoy an area by addressing physical, information, program, and social barriers.

1) When making visitor use and access decisions are there situations where providing universal access and respecting conservation work is in conflict? If so, how do you prioritize one over the other?

1b) How could providing universal access to the natural area you work with improve or negatively impact any conservation, visitor use, and program goals you would have?

2) Are there barriers you are aware of that may prevent people with mobility, vision, or hearing disabilities from visiting, recreating, or participating in programs in protected natural areas? When responding, consider the types of barriers discussed in the literature: Physical; Information; Program; Social; or other types.

3) What ways has your facility tried to improve universal access, and what challenges have arisen?

4) What support, resources, knowledge, and/or expertise do you and your staff need to eliminate barriers and create inclusive activities for all visitors? How could you obtain the support, resources, or knowledge you mentioned?

5) If given the support, resources, and knowledge you needed, what opportunities exist to remove barriers and create inclusive experiences for all people?

6) What are the essential considerations and strategies to provide high-quality visitor experiences in natural areas?

6b) How could visitor experiences be further improved within natural area(s) you work with?

7) When making visitor use and access decisions what issues, if any, would benefit from public input? Does your facility engage the public for input prior to making visitor use and access decisions?

7b) [if their facility doesn't seek input or find it beneficial]: Can you elaborate why public input is not [a part of / beneficial to] your decision-making process and how, if at all, public engagement could be done in a more beneficial way?

7b) [If their facility finds input beneficial] Who do you involve and how? How do you use their input?

8) When considering improvements to universal access, what conservation factors would you want visitor program directors and accessibility specialists to consider?

9) What standards, guidelines, or examples do you use in your professional work to make conservation, visitor use, visitor program, and/or access decisions? Are you aware of additional standards or guidelines?

10) Do you have any additional thoughts to add before we wrap up the interview?

Visitor Program Director Questions

A widely agreed definition of universal access is that a place or amenity be usable by all people, regardless of ability, to the greatest extent possible, without separate accommodations. The aim of universal access is to provide equitable opportunities for all people to enjoy an area by addressing physical, information, program, and social barriers.

1) When creating and facilitating visitor programs (such as tours, workshops, and learning experiences) are there situations where providing universal access and respecting conservation work is in conflict? If so, how do you prioritize one over the other?

1b) How could providing universal access to the natural area you work with improve or negatively impact any conservation, visitor use, and program goals you would have?

2) Are there barriers you are aware of that may prevent people with mobility, vision, or hearing disabilities from visiting, recreating, or participating in programs in protected natural areas? When responding, consider the types of barriers discussed in the literature: Physical; Information; Program; Social; or other types.

3) What ways has your facility tried to improve universal access for visitor programming and activities, and what challenges have arisen?

4) What support, resources, knowledge, and/or expertise do you and your staff need to eliminate barriers and create inclusive activities for all visitors? How could you obtain the support, resources, or knowledge you mentioned?

5) If given the support, resources, and knowledge you needed, what opportunities exist to remove barriers and create inclusive experiences for all people?

6) What are the essential considerations and strategies to provide high-quality visitor experiences in natural areas?

6b) How could visitor experiences be further improved within natural area(s) you work with?

7) When planning visitor programs and recreation opportunities, what issues if any, would benefit from public input? Do you and your staff engage the public for input prior to implementing programming?

7b) [if they don't seek input or find it beneficial]: Can you elaborate why public input is not [a part of / beneficial to] your planning process and how, if at all, public engagement could be done in a more beneficial way?

7b) [If they find input beneficial] When gathering public input, who do you involve and how do you use their input?

8) When considering improvements to universal access, what visitor program goals would you want land managers and accessibility specialists to consider?

9) What standards, guidelines, or examples do you use in your professional work to make conservation, visitor use, visitor program, and/or access decisions? Are you aware of additional standards or guidelines?

10) Do you have any additional thoughts to add before we wrap up the interview?

Accessibility Specialist Questions

1) To what extent is universal access standard design practice in public spaces? Compared to urban public spaces, is it equally common practice to provide universal access in protected natural areas?

1b) What are the challenges that influence the widespread adoption of universal access in protected natural areas? How could such challenges be addressed?

2) Universal design is often implemented in the context of indoor spaces and product design. In what ways, if at all, could universal design be adapted and improved for use in natural settings?

3) When making decisions about visitor experience, are there situations where providing universal access and respecting conservation work is in conflict? If so, how do you prioritize one over the other?
3b) How could protecting the integrity of the land and natural features positively or negatively impact your goals as an accessibility specialist?

4) Are there barriers you are aware of that may prevent people with mobility, vision, or hearing disabilities from visiting, recreating, or participating in programs in protected natural areas? When responding, consider the types of barriers discussed in the literature: Physical; Information; Program; Social; or other types.

5) In your experience, what opportunities exist when aiming to remove barriers and provide inclusive visitor experiences at the site scale?

6) In your experience, how have you resolved any challenging situations that arise when removing barriers and making visitor experiences more inclusive? For example, implementing universal access is in opposition to other functions, uses, priorities of the site.

7) What are the essential strategies and considerations when designing high-quality experiences for individuals with mobility, vision, and hearing disabilities, whether in general or in natural areas?

8) When making visitor use and universal access decisions, in what situations, if any, do you think it's beneficial for you and/or the natural area's staff to seek public input?

8b) [if they don't seek input or find it beneficial]: Can you elaborate why public input is not [a part of / beneficial to] your decision-making process and how, if at all, public engagement could be done in a more beneficial way?
8b) [If they find input beneficial] When gathering public input, who do you involve and how do you use their input?

9) As an accessibility specialist, what initial suggestions would you give to land managers and visitor program directors of protected natural areas to make visitor experiences more inclusive?

10) What standards, guidelines, or examples do you use in your professional work to make conservation, visitor use, visitor program, and/or access decisions? Are you aware of additional standards or guidelines?

11) Do you have any additional thoughts to add before we wrap up the interview?

3b. Document Analysis

What

Universal design and visitor use guidelines were selected and analyzed to understand the key concepts and identify what themes are lacking from each set. The information found was used to support the proposed Guidebook found in Chapter 5 and create an integrated planning and design process. This integrated process considers both universal design and visitor use management objectives to achieve sustainable and inclusive visitor experiences.

Background

Based on the literature review and semi-structured interviews, a knowledge and resource gap was identified. Very few universal design and accessibility guidelines are written specific to protected natural areas. Similarly, existing visitor use and management guidelines do not consider universal access. Document analysis was selected as a method to help bridge this knowledge gap.

To Gain a Better Understanding of:

1. Which universal design and visitor use guidelines are commonly used by landscape architects and land managers both in the United States and internationally.

2. Guidelines that are not as prominent but contain relevant information to this research.

3. Existing universal access and design strategies and principles.

4. Existing visitor use and management strategies and principles.

5. How each of the strategies and principles can be integrated to create comprehensive guidelines specific for use in protected natural areas.

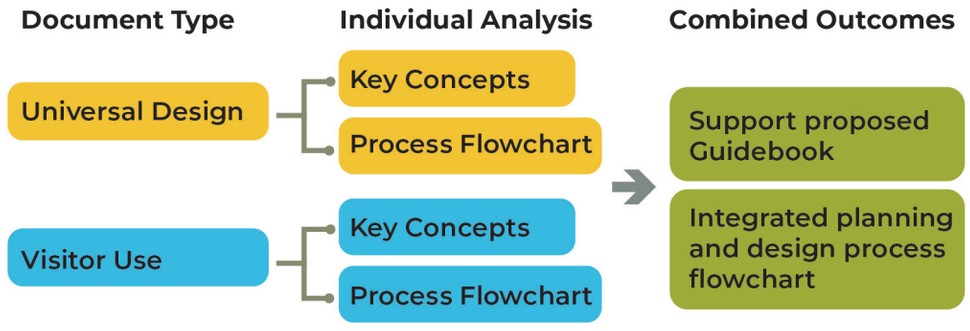


Fig 3.1 Overview of document analysis purpose.

Selection Criteria for Universal Design

The selection criteria were developed through the literature review. To be selected, a guideline must contain **at least two of the following criteria:**

1. Discussion of universal design/access or accessibility.

2. Specific access and participation considerations pertaining to mobility, sight, and hearing disabilities.

3. Discussion of technical standards.

4. Discussion of user experience.

5. Discussion about the compatibility of universal design and conservation strategies in protected natural areas.

Universal Design Documents

Guideline	Publisher	Selection Criteria 1	2	3	4	5
Professional Practice: Universal Design (Dillon and Jared Green 2019).	American Society of Landscape Architects (ASLA)	✓	✓		✓	
Principles of Accessibility Design for Landscape Architecture (Braley et al. 2023)	American Society of Landscape Architects (ASLA)	✓	✓	✓		
Outdoor Developed Areas: a summary of accessibility standards for federal outdoor developed areas (United States Access Board 2014)	United States Access Board	✓		✓		
Trails For All People: Guidance for Accessibility and Inclusive Design (Knutson et al. 2021)	Pennsylvania Land Trust	✓	✓	✓	✓	✓
Universal Access to Outdoor Recreation: A Design Guide (Driskell and Steve Wohlford 1993)	PLAE, Inc.	✓	✓	✓	✓	✓

Published by major national organization

Table 3.1 Universal design and accessibility documents.

Selection Criteria for Visitor Use management

The selection criteria were developed through the literature review. To be selected, a guideline must contain **at least two of the following criteria:**

1. Discussion of conservation management in protected natural area.

2. Access planning (how much access, type of activity, user experience).

3. Specific design strategies for visitor amenities to protect natural, geologic, or cultural features.

4. Discussion of universal access or accessibility alongside visitor use.

Visitor Use Management Documents

Guideline	Publisher	Selection Criteria 1	2	3	4
Tourism and Visitor Management in Protected Areas: Guidelines for Sustainability (Leung et al. 2018)	International Union of Conservation of Nature (IUCN)	✓	✓		
Visitor Use Management Framework A Guide to Providing Sustainable Outdoor Recreation (Interagency Visitor Use Management Council 2016)	Interagency Visitor Use Management Council (IVUM)	✓	✓		
Management Planning for Nature Conservation (Alexander 2007)	Springer Science	✓	✓		
Trails Guidelines and Best Practices Manual (MA Department of Conservation and Recreation 2019)	Massachusetts Department of Conservation and Recreation		✓	✓	✓
Environmentally Sustainable Trail Management (Marion and Leung 2004)	Centre for Agriculture and Biosciences International (CABI)		✓	✓	

Published by major national or international organization or publisher

Table 3.2 Visitor use documents.

Guideline Evaluation

Based on the literature review and semi-structured interviews, the following matrices were developed to evaluate each set of guidelines for relevant information.

Universal Design Guidelines

		Universal Design Guidelines				
		Professional Practice: Universal Design	Principles of Accessibility Design for Landscape Architecture	Trails For All People: Guidance for Accessibility and Inclusive Design	Outdoor Developed Areas: a summary of accessibility standards for federal outdoor developed areas	Universal Access to Outdoor Recreation: A Design Guide
Law and Policy	ODAAG; ADA; ABA					
Technical requirements	Trails (slope, width)					
	Signage					
	Other					
Specific to impairment type	Mobility					
	Hearing					
	Vision					
Specific to barrier type	Physical					
	Information					
	Service / Program					
User experience	Multi sensory					
	Signage (informational, interpretative)					
	Variety (destinations, loops, terrain, etc)					
Setting	Public Urban Space					
	Protected Natural Area					
Design process	Framework					
	Inventory and Analysis					
	Inclusive Participation					
Discussion of Compatibility with Conservation & visitor use						

Table 3.3 Universal design evaluation matrix.

Visitor Use Management Guidelines

Design Considerations		Visitor Use Management Guidelines				
		Tourism and Visitor Management in Protected Areas: Guidelines for Sustainability	Visitor Use Management Framework A Guide to Providing Sustainable Outdoor Recreation	Management Planning for Nature Conservation	Trails Guidelines and Best Practices Manual	Environmentally Sustainable Trail Management
Visitor Use and Access	Law and Policy	Wilderness Act; ADA; ABA; Other				
	Technical considerations for trail design	Challenge Level				
		Trails (slope, width, tread)				
		Other (signage, bridges, safety, etc)				
	Sustainability	Physical				
		Ecological				
		Economic				
		Social				
	Protection of resources - strategies	Natural				
		Geologic				
	Visitor Impact	Positive				
		Negative				
	User experience	Educational Programs				
		Signage (informational, interpretative)				
		Variety (destinations, Multi sensory, etc)				
	Accessibility	To the Site				
		Within the Site				
Planning Process	Planning process	Framework				
		Who Participates				
	Discussion of compatibility with universal access					

Table 3.4 Visitor use evaluation matrix.

3c. Site Analysis

To inform the Projective Site Design of the Konza Prairie Biological Station (KPBS), a site inventory and analysis was conducted. Methods to capture data included site visits, Google Earth, and Geographic Information System (GIS), and conversations with the KPBS Site Staff. The following information topics are covered in the Site Analysis located in Chapter 6:

Tallgrass Prairie Ecoregion Overview

Konza Prairie Biological Station Overview
History and Founding in 1971
Site Context
Site Overview
Mission
Site Character

Natural and Cultural Resources
Streams and watersheds
Common Vegetations and Wildlife
Cultural Resources

Research Initiatives

Visitor use
Site Zoning
Visitor Use and Programs
Existing Signage and Information
Existing Website

Trail Experience
Elevation Profiles
Existing Signage and Information

Discussion with Site Staff
Known Barriers
Implementation Constraints
Previous and Current Accessibility Efforts
Opportunities to Improve Universal Access
Potential Sites for Trail and Entrances

Typical Trail Experience



Fig 3.2 Steep trail with limestone steps.



Fig 3.3 Narrow trail with steep cross slope.



Fig 3.4 Wide, flat trail through wooded area.

4. FINDINGS

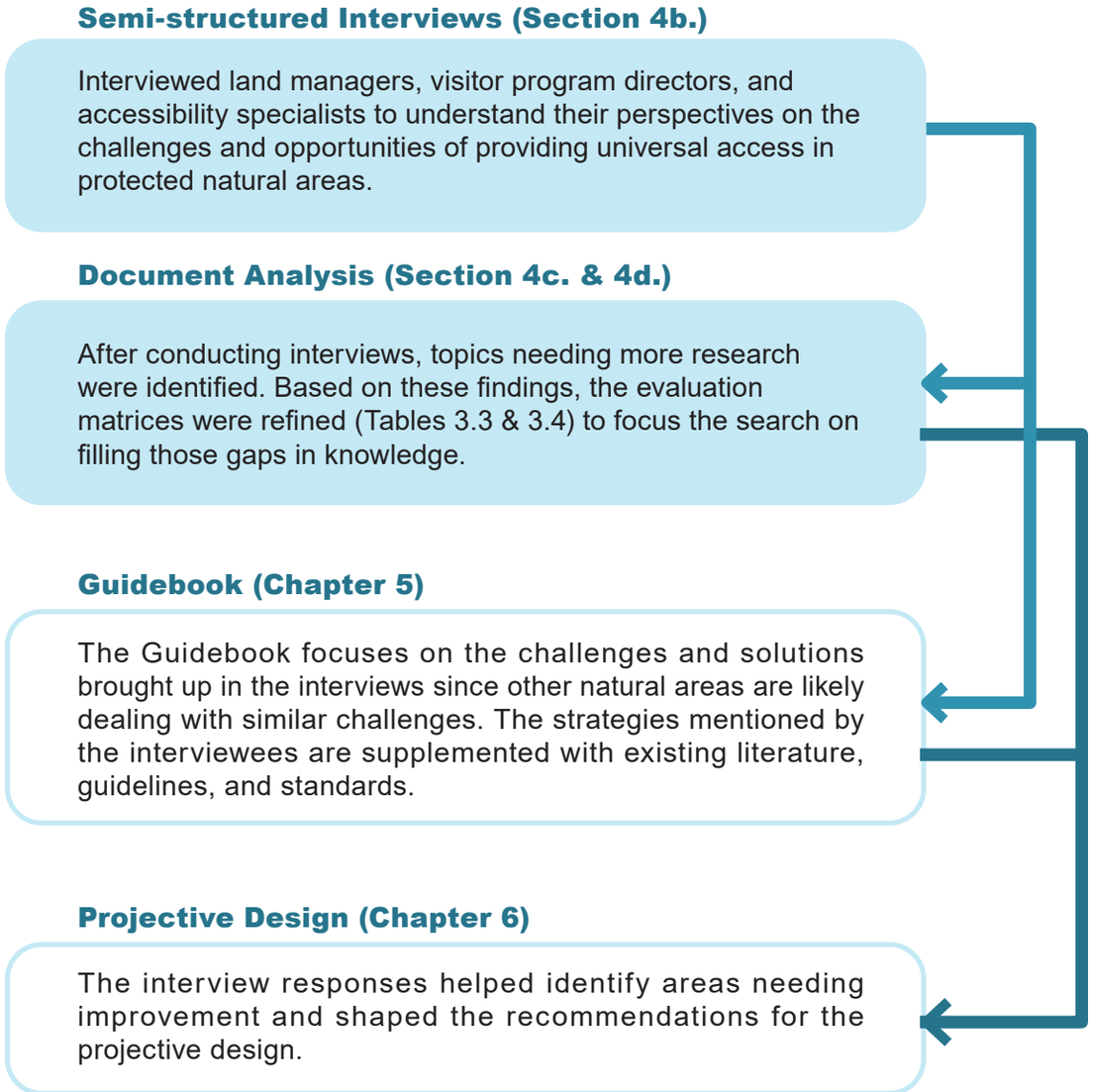
4a. Chapter Overview
4b. Semi-Structured Interviews
4c. Document Analysis: Universal Design
4d. Document Analysis: Visitor Use

FOUR

4a. Chapter Overview

The semi-structured interviews and document analysis were conducted to better understand the interrelated factors that influence universal access and visitor use decisions. The aim was to use the findings to identify opportunities and develop recommendations for providing universal access in the context of protected natural areas.

Relationship between methods



4b. Semi-Structured Interviews

Land Managers

John Blair
Field Station Director at Konza Prairie Biological Station

47 Minutes

Anne Lowe
Open Space and Trails Manager Town of Breckenridge

40 Minutes

Land Manager One
Land Manager

47 Minutes

Visitor Program Directors

Jill Haukos
Education Director at Konza Prairie Biological Station

32 Minutes

Emily Schrader
Prior Recreational Use Specialist with Missouri Department of Conservation

43 Minutes

Heather Brown
Chief of Interpretation Tallgrass Prairie National Preserve

43 Minutes

Accessibility Specialists

Alexa Vaughn
Accessibility and Deafscape Specialist

39 Minutes

Landscape Architect One
National Park Service

50 Minutes

Interview Analysis Process

Retrieve transcriptions from Zoom software. Revise the transcriptions for accuracy using Dovetail software.

Transfer the revised transcripts to Microsoft Word. Do an initial read through of the transcripts to begin identifying codes.

Develop the following codes using inductive coding methods. Highlight the transcripts based on the following codes:

1. Implementation challenges
2. Universal access barriers
3. Example of universal design
4. Opportunities to improve
5. Resources for staff
6. Other key ideas

After highlighting codes, further filter the responses using the criteria below:

1. If it directly answered the research question and subquestions.
2. If it is applicable to the Konza Prairie Biological Station (the project site).

Keep the relevant responses and omit the irrelevant information.

For each interview question, the relevant information was grouped into general categories such as challenges, considerations, and strategies. From there, the most important strategies and considerations were distilled into the interview findings.

Question 1

Land Managers (Q1)
When making visitor use and access decisions are there situations where providing universal access and respecting conservation work is in conflict? If so, how do you prioritize one over the other?

Visitor Program Directors (Q1)
When creating and facilitating visitor programs (such as tours, workshops, and learning experiences) are there situations where providing universal access and respecting conservation work is in conflict? If so, how do you prioritize one over the other?

Accessibility Specialists (Q3)
When making decisions about visitor experience, are there situations where providing universal access and respecting conservation work is in conflict? If so, how do you prioritize one over the other?

Key Takeaways

1. This topic of conflicts between universal access and conservation comes up often. However, the majority of interviewees stated that they balance goals instead of prioritize. Instead, the issue are resolved on a case-by-case basis.

2. Numerous factors influence decision making. Factors include visitor safety, preserving endangered / sensitive species and ecosystems, preserving the character of the land, and maintaining other facility functions like research.

3. Decisions and prioritization, when necessary, are often resolved by referencing guiding documents (like a master plan), identifying important natural resources, and making decisions in interdisciplinary teams.

"I will say that particular topic [where universal access and conservation work may conflict] comes up on pretty much every decision we make." (Lowe 2023)

"Access just needs to be another layer of conservation work." (Vaughn 2023)

"I wouldn't say we prioritize one over the other, it's a conversation how to balance." (Landscape Architect One 2023)

"You have to do your very, very best to make it accessible, yet also preserve the resource. So it can be a really challenging job to make these decisions." (Brown 2023)

Overview

Only 1 (one) interviewee stated that universal access is not possible at the natural area they work with. The other interviewees indicate that making their facilities accessible is important but tempered by additional factors.

Situations Universal Access is Not Appropriate

1. **To protect sensitive resources and ecosystems**

Some ecoystems are highly impacted, making accessibility challenging if it further changes the natural quality of the site (Haukos 2023).

Identify through natural resource studies the most important natural resource areas including threatened and endangered species, wildlife corridors, and wildlife habits (Lowe 2023; Schrader 2023; Land Manager One 2023).

“Those are areas that we definitely prioritize for conservation and very much try to avoid, say, putting a trail or a trailhead in those particular areas” (Lowe 2023).

“The sensitivity of an area would really prioritize where and what amount of public use that we would want to allow” (Schrader 2023).

2. **To maintain the character of a natural or cultural resource**

“There’s that fine line. You want to make sure that the resources are accessible, yet not totally changing the historic fabric so much that you have lost the specialness, the historic value of the thing you’re trying to save, so that everyone can experience it” (Brown 2023).

Decision Making

1. **Reference the facility’s guiding documents**

Utilize the facility’s guiding documents to ensure decisions regarding visitor use, programs, universal access, and conservation align with the facility’s mission and vision.

The Town of Breckenridge is guided by an overall open-space and trails master plan that helps them make decisions. “Any improvements, anything that we’re putting in really runs through this decision making framework, so that we can make sure that we’re really examining all of the factors in at play” (Lowe 2023).

2. **Work as an interdisciplinary team & consult experts**

Assess parks for universal access with an interdisciplinary team of park staff. This increases the team’s expertise and allows for problem solving that aligns with everyone’s goals.

“We can talk through what the issue is, what the barrier is for access and what are ways that we can come up with a solution to remove that, that aligns with kind of the goals of the natural resource manager, the cultural resource manager or facility” (Landscape Architect One 2023).

3. **Reduce potential conflicts**

Locate visitor trails and facilitated visitor programs in areas that with the best accessibility or least barriers. The goal is for visitor use to not conflict with important conservation areas or other land uses like research (Blair 2023; Schrader 2023).

4. **Problem solving & creative solutions**

If a conflict between accessibility and conservation arises, strive to find solutions that are equitable, allow the same experiences for everyone, and reduce alteration to the natural or cultural resource (Brown 2023).

5. **Equity based decisions**

Ensure visitor opportunities are equitable. If the priority is protecting a resource and limiting visitors impact, then access needs to be limited for All people; not just disabled people (Land Manger One 2023).

Question 1B

Land Managers & Visitor Program Directors (Q1B)
How could providing universal access to the natural area you work with improve or negatively impact any conservation, visitor use, and program goals you would have?

Accessibility Specialists (Q3B)
How could protecting the integrity of the land and natural features positively or negatively impact your goals as an accessibility specialist?

Key Takeaways

1. Reflect on how you think about access and its relationship to natural areas. Universal access is not automatically opposed to conservation objectives.

2. Universal access may have positive impacts on conservation, visitor use, and program goals including improving opportunities for education and empowering visitors to make informed decisions.

3. Do not automatically dismiss projects to improve universal access based on concerns for negative impacts to conservation or visitor use. Strive to identify work solutions that achieve access and minimize negative impacts.

4. Make all visitor use and access decisions with an ethical lens. For example, if an area needs to be restricted, then it should be restricted to all people.

Impact on conservation, visitor use, and program goals

"[Universal access] would help visitor use because that's just allowing that many more people the opportunity to see what we have and to learn the value of tallgrass prairie and the species that live here." (Land Manager One 2023)

"Being able to provide a prairie experience for additional people with disabilities or other challenges would enhance public appreciation of the prairie and it might actually increase financial support." (Blair 2023)

Impact on accessibility goals

"Creating more opportunities to be educated about the place is more important than not constructing a paved trail." (Vaughn 2023)

"We're achieving the park service mission of protecting these [resources] for future generations. At the same time, depending on what that means — protecting that land and natural feature — if that restricts access to only a certain population of visitors, I see that as a pretty big problem." (Landscape Architect One 2023)

Overview

The land manager and visitor program directors mostly indicate that providing universal access would have a beneficial impact on their other goals. The interviewees brought up some negative impacts, but often presented some solutions to overcome the issues. The accessibility specialists discussed how the facility staff's mindset toward universal access and conservation could impact their universal access work.

Universal access positive visitor impact

1. **Experience nature in solitude**

"Getting wheelchairs further into the backcountry so that people could actually hike — because hiking with a solitude feeling is [essential]" (Brown 2023).

2. **Increase visitor education**

Permitting accessible trails allows visitors to have educational experiences. Visitors who are older, are a family with kids or have a disability may not be able to do a strenuous hike but may still want to learn more about the area, the value of the prairie, and the species that live there (Land Manager One 2023; Vaughn 2023).

"A big part of conservation is educating people about what they can do to help their environment. So really, if the biggest sin is creating a more accessible trail, then that's kind of against the whole point of conservation" (Vaughn 2023).

3. **Foster appreciation and stewardship**

Universal access can provide and improve experiences, hopefully leading to a better sense of appreciation, stewardship, and ethics. This could also increase awareness and support including financial (Blair 2023; Lowe 2023).

"We have the philosophy that people will generally tend to care about the things they can experience. So, we do try to give them some of those experiences" (Lowe 2023).

6. **Provide additional options to experience the site**

Bus tours, adaptive wheelchairs, and braille trails (for blind and low vision visitors) can provide options for experiencing the site and participating in programs (Brown 2023; Lowe 2023).

5. **Overcome steep or difficult terrain**

Retrofitting and creating wheelchair friendly trails can help people overcome steep terrain. This is a bit easier than full ADA (Americans with Disability Act) compliance, (Blair 2023; Lowe 2023).

4. **Improve visitors' decision making**

Visitor experience can be improved by providing information at trailheads necessary to make informed decisions (Lowe 2023).

"Signage that we have at trailheads gives people the most information about the grades, the experience so that they can make really intelligent decisions before jumping on the trail and hopefully getting users empowered to make those decisions. Like, yeah, I think I can handle this trail. It's got a 5% grade, but it's smooth and there are good rest stops along the way" (Lowe 2023).

Potential negative impacts

1. **Construction**

Depending on the project, negative impacts to conservation are possible (Land Manager One 2023). However, modifications to provide greater accessibility like paving portions of a trail would not likely have major impacts to conservation (Blair 2023).

2. **Tour roads and buses**

While providing bus tours can allow a wider range of visitors to participate, roads can cause, "A lot of erosion and stuff washing off into the prairie. But that's not specific to just universal access. That's anybody who hops on the bus" (Land Manager One 2023).

Buses also may disturb wildlife. The size of the bus and number of visits per day will influence the level of disturbance. Smaller buses more like vans and 1-2 visits a day was found to lessen negative impact (Brown 2023).

Impact on accessibility goals

1. **Attitude toward access**

Providing access is often seen as the opposite to conservation such as putting a paved path in nature. However, all paths, no matter the material or use, is man-made. Making it clear that very little in natural parks is truly natural can be helpful (Vaughn 2023).

2. **Equitable protection**

Protecting resources is important. However, if decisions or strategies to protect cultural or natural resources restrict only certain visitors then that is a problem. Even though park managers must balance resource protection and visitor use, "How those strategies are implemented really should be with an equitable lens and not restricting access for one person over another" (Landscape Architect One 2023).

Question 2

Land Managers & Visitor Program Directors (Q2)
Accessibility Specialists (Q4)
Are there barriers you are aware of that may prevent people with mobility, vision, or hearing disabilities from visiting, recreating, or participating in programs in protected natural areas? When responding, consider the types of barriers discussed in the literature: Physical; Information; Program; Social; or other types.

Key Takeaways

1. The identified barriers are primarily focused on physical and mobility related barriers.

2. Hearing, information, and social barriers are far less frequently discussed. This may mean there are fewer of these types of barriers or a lower level of awareness and attention toward them.

3. General public visitations may be inherently less accessible, especially since guides, assistance, or amenities may not be available. Facilitated programming often can provide more assistance.

Natural Barriers

"I think the most significant barriers at our site are probably physical barriers and associated with the nature of the landscape in this region." (Blair 2023)

Design Barriers

"Having one accessible trail or one trail designated accessible isn't usually a good idea either because folks do want to have options and accessibility means different things to different people." (Vaughn 2023)

Maintenance Barriers

"The natural environment kind of creates barriers that again, maintenance staff have to keep maintaining." (Landscape Architect One 2023)

Overview

Most responses focused on physical and mobility related barriers. It seemed that interviewees were less familiar with information and social barriers. The two interviewees that mentioned hearing disabilities did not mention any associated barriers. The importance of providing options and alternative formats when delivering information and programs came up multiple times.

General Barriers

1. **Lack of options**

A lack of options is a barrier since it limits the extent of participation and ability to choose one's recreational experiences. This applies to trails and all other programming and offered experiences.

"With any type of disability, I think it is always about having options and variety" (Vaughn 2023).

"Right now, we have 40 miles of hiking trails, but only about a mile and a half is level enough for a wheelchair" (Brown 2023).

2. **Defaulting to mobility barriers**

While being aware of and addressing mobility barriers is essential to universal access, it can be limiting when staff are not aware of other types of barriers (information, programming, social) or the needs of other disabilities (vision and hearing).

3. **Not communicating what amenities are present**

Conservation areas may have varying levels of visitor infrastructure and amenities. For example, general conservation areas may have less infrastructure whereas education and nature centers with facilitated programs often will provide more (Schrader 2023). This is useful for conservation but can be a barrier if the presence or lack of amenities are not communicated clearly for visitors to make informed decisions.

4. **Incomplete accessibility**

Any inaccessible space or feature could end the experience for somebody with a disability. Consider the full experience of a visitor on the site to ensure complete accessibility.

"I don't know how we missed this, but we have a handicap parking area that is concrete and we have a sidewalk all the way from the restrooms all the way to the House. But along the way, there is an outhouse, a curing house, and the barn that there's no way for people to get to those areas on a level path and I thought, how can we have missed that?" (Brown 2023).

5. **Changing weather conditions and trail maintenance**

Weather conditions like rain can make paths impassable with water and mud. It may be necessary to harden the trail surfaces or pave (Brown 2023). If trails are not maintained as weather conditions and the natural environment impact trail conditions, then this can create barriers (Landscape Architect One 2023).

Physical Barriers

The majority of interviewees pointed out that the most common and challenging barriers are usually physical. This can impact people with mobility and health issues (Blair 2023).

Challenging terrain can also impact blind and low vision visitors who may need a guide to experience the site (Blair 2023; Haukos 2023).

Common Barriers: Strenuous trails; Steep hills & high slopes; Rugged and uneven terrain; Materials and ground surface; Tight turning and maneuvering in small spaces; Stream crossings; Wetlands; Sandy beaches.

Information + Program Barriers

"Blind, low vision and hearing disabilities are probably more related to interpretation and programs" (Landscape Architect One 2023).

Common Information Barriers: Lack of wayfinding for blind and low vision; Lack of visual signage trailhead information not presented in alternative formats.

Common Program Barriers: Ranger programs don't provide printed materials. Written materials have to be read so it may be more difficult to quickly ask and answer questions; Lack of alternative formats including large print, braille, and audio descriptions for outdoor programs; No staff present who use sign language.

Question 3

Land Managers & Visitor Program Directors (Q3)
What ways has your facility tried to improve universal access for visitor programming and activities, and what challenges have arisen?

Accessibility Specialists (Q6)
In your experience, how have you resolved any challenging situations that arise when removing barriers and making visitor experiences more inclusive? For example, implementing universal access is in opposition to other functions, uses, priorities of the site.

Key Takeaways

1. There are several complex factors that could impact a natural area staff's ability to improve universal access. Generating funding for projects is one of the most common challenges.

2. It is best practice to never assume universal access has been achieved without input from folks with lived experience (people with a disability).

3. When challenges arise, creative problem solving and collaborating with a diverse team of experts is best for developing solutions.

Challenges

"It's a lot of that tension of the demand for recreation while still conserving our best natural resources." (Anne Lowe)

"There's never enough time or money, of course." (Land Manager One 2023)

Resolving Challenging Situations

If someone says absolutely not, we do some creative problem solving and think what are alternatives that we can provide in the meantime until we can able to provide full access? (Landscape Architect One 2023)

Overview

The majority of interviewees discussed actions they have taken to improve universal access. Only one interviewee stated that they have not addressed universal access. Numerous challenges that the staff and facilities face were identified The most common challenge noted was not having enough funding.

Improvements toward Universal Access

1. **Conduct accessibility audit and plan**

The Tallgrass Prairie National Preserve conducted an Accessibility Self Evaluation Transition Plan (SETP) which identified specific programmatic and facility related items to improve their universal access (Brown 2023).

2. **Make steep hills easier to climb**

The Konza Prairie Biological Station (KPBS) installed limestone steps on the steepest hills and a bench for resting at the top. This was an effort to make climbing easier but doesn't improve accessibility for those with significant mobility or health issues (Blair 2023).

3. **Create new trails**

The KPBS also has discussed plans to create a new, flat trail that as an alternative to the steep trails. This would provide a short hike to see a portion of prairie which improves accessibility and is useful to those who just want a shorter walk (Blair 2023).

4. **Section 508 Compliance — website update**

The Tallgrass Prairie National Preserve updated their website to comply with Section 508. Section 508 passed in 1998 as an amendment to the Rehabilitation Act. This requires federal agencies to make their electronic and information technology accessible to all people with disabilities (Brown 2023).

5. **Update permitting system**

The Missouri Department of Conservation updated their special use permitting system to make the application process for use of motorized mobility devices more streamlined.

"This has lessened the barrier for folks to find that permit. To get that permit before it was something you had to call the office about. We had to fill out a paper document, it was scanned, it was very archaic. And so this online special use permitting system has provided a little more clarity about what's consistent for access and what's allowable" (Schrader 2023).

Challenges

1. Improving accessibility can cause other visitor use conflicts.

2. Balancing the provision of good user experience without destroying the natural resources.

3. Financial / funding.

4. The time it takes to go through design, raising funding, and sending designs out to bid.

5. Being in the remote locations is challenging to bring out construction equipment.

6. Not knowing everything that is available to improve universal access.

7. Receiving push back when people have varying priorities and background with providing universal access.

It is collaborating with an interdisciplinary team of park staff that I've found to be the most beneficial when there are challenges resolving varying priorities and push back. We talk through suggestions and solutions (Landscape Architect One 2023).

Question 4

Land Managers & Visitor Program Directors (Q4)
What support, resources, knowledge, and/or expertise do you and your staff need to eliminate barriers and create inclusive activities for all visitors? How could you obtain the support, resources, or knowledge you mentioned?

Key Takeaways

1. Universal access requires help from many different experts, the general public, and dedicated internal staff devoted to inclusion and access issues. This takes time to establish these resources and learning is an ongoing process.

2. Financial support is a common challenge that can limit the natural area's ability to provide universally accessible visitor infrastructure.

Knowledge and Guidance

We're still very much learning. And we have we have a lot of ground to gain there." (Lowe 2023)

"I think it's just trying to be aware of the needs that are out there by the visiting public." (Land Manager One 2023)

"We would welcome guidance and suggestions for how we could improve our accessibility to the site." (Haukos 2023)

Raising Funds

"Because we're a privately owned entity, we don't get any support from the city, the state, or from federal government for public accessibility. So all of those things that we do have to come out of our budget or from grants that we would write or from private donors. So raising funds to cover those improvements is always a bit of a challenge." (Blair 2023)

Overview

Many of the responses revolved around the need for support from experts and consultants to learn best practices. Further, establishing staff members and committees who are dedicated to diversity, equity, and inclusion can serve as a point of contact and resource for learning and implementing accessibility best practices. Cultivating staff knowledge seems essential to numerous interviewees.

Support and Resources Needed

1. **Input from experts**

Input, guidance, and suggestions from experts on accessibility best practices is necessary (Blair 2023; Haukos 2023). Additionally, architecture and engineering expertise may be necessary for physical improvements like making a parking lot the appropriate slope (Blair 2023).

Consultants show best practices for public engagement. Consultants can help develop the right questions about access and inclusion that can then be used to develop a master plan or guiding documents (Lowe 2023).

2. **Accessibility audit**

Experts walking through the site can be “an eye–opening experience” (Brown 2023). A report is often created to show what improvements are necessary (Brown 2023).

3. **Public input**

A citizen advisory group like the Social Equity Advisory Commission in Breckenridge can bring many issues to light and help the natural area’s staff understand what visitors need to thrive (Lowe 2023).

“Just being open to listening to folks that actually have some of these issues and not be afraid to invite them to the site and go through the buildings” (Brown 2023).

3. **Financial support**

Need funding to accomplish any improvements (Blair 2023; Brown 2023; Haukos 2023). This can be done by applying to grants, charitable foundations, and private donors.

Knowledge Needed

1. **Diverse staff knowledge and expertise**

Having a diverse range of expertise and skills is essential to providing quality and sustainable visitor experiences (Lowe 2023). Institutional knowledge sharing and learning from senior staff can help the team understand why policies and decisions are in place (Schrader 2023).

2. **Staff education**

Knowledge about the technology available to enhance universal access is necessary (Land Manager One 2023).

Weekly meetings, ‘deep dive’ series, and training on internal policies and procedures provides staff with foundational knowledge (Schrader 2023).

3. **Appoint staff dedicated to universal access issues**

A diversity, equity, and inclusion (DEI) committee can focus on issues and solutions of inclusive outdoor access (Lowe 2023).

The Missouri Department of Conservation appointed a relevancy branch with recreational use specialists. These specialists are the point of contact for all staff to ask questions such as: What does ADA compliance mean, where is it necessary to make changes in order to provide access to the outdoors (Schrader 2023).

The Tallgrass Prairie National Preserve is supported by an accessibility coordinator from the regional office (Brown 2023).

Question 5

Land Managers & Visitor Program Directors (Q5)
If given the support, resources, and knowledge you needed, what opportunities exist to remove barriers and create inclusive experiences for all people?

Accessibility Specialists (Q5)
In your experience, what opportunities exist when aiming to remove barriers and provide inclusive visitor experiences at the site scale?

Key Takeaways

1. Prioritize understanding and removing barriers faced by different user groups through continuous collaboration with the community. Directly seek and incorporate disabled stakeholder input in design and decision making.

2. Help natural area staff connect accessibility requirements with real scenarios to understand the impact and necessity of following these requirements for improving access.

"The biggest opportunity is training and understanding and helping connect the dots of why it's important to improve access, how to do it, and why some very specific details are really important." (Landscape Architect One 2023)

Overview

The land managers and visitor program directors identified few opportunities to remove barriers and create inclusive visitor experiences. I believe the reason for the limited responses may be due to the open-ended nature of the question and needing stakeholder input and site assessments to make informed decisions. Of the opportunities discussed, many focused on communication between the facility staff and the public or between accessibility specialists and facility staff.

Communication and Engagement Between Staff and the Public

1. **Stakeholder input**

"The best way to remove barriers it's really by talking with local stakeholders as much as possible, which really doesn't happen a lot in the design process" (Vaughn 2023).

Community engagement is not, "happening a lot with disabled group in particular. Usually we'll have general stakeholder meetings and oftentimes they're not accessible" (Vaughn 2023). Barriers to participating in engagement need to be eliminated and focus groups with disabled stakeholders is essential (Vaughn 2023).

2. **Collaboration with the public**

It is critical to understand the barriers certain user groups face so that the staff can remove them. Creating an inclusive visitor experience demands a good collaborative effort with the community. This means maintaining a constant feedback loop between the community and park staff (Lowe 2023).

3. **Information sharing with the public**

Improving formal information sharing with the public is important. Helping visitors understand the level of public use an area is managed for (a facilitated visitor center versus a primitive backcountry experience) since areas will offer different levels of visitor infrastructure, amenities, and staff assistance (Schrader 2023).

Staff Rraining with Accessibility Specialists

1. **Explain the ‘why’ behind accessibility requirements**

Connect the dots between what accessibility code and requirements are and how following the requirements improves access for many people (Landscape Architect One 2023).

Telling staff, “Make this parking space 2% slope in all directions” doesn’t make an impact. Connecting the requirements with real scenarios makes more of an impact. For example, Imagine you are visiting a park with someone that uses a wheelchair and needs to get out of their vehicle. It is a really sloped parking stall and while they’re getting out the wheels are moving down the slope (Landscape Architect One 2023).

Opportunities for Inclusive Experiences

1. Create an alternate route for individuals that face mobility barriers that prevent them from using the steep hill climbs that are a major part of the rest of the nature trail (Blair 2023).

2. Figure out how to get more people out on the prairie (Land Manger One 2023).

3. Provide an all terrain wheelchair to reach the fishing areas. This would increase visitor opportunity to experience catch and release fishing (Brown 2023).

4. Design alternate ways to engage with the buildings on site which are a key visitor experience. Until full physical access can be provided, the staff are interested in creating videos, write up, and translating materials into braille. training a staff member to do sign language (Land Manger One 2023).

5. Train a staff member to do sign language (Land Manger One 2023).

Questions 6 and 6B

Land Managers & Visitor Program Directors (Q6 & Q6b)
(Q6) What are the essential considerations and strategies to provide high-quality visitor experiences in natural areas? (Q6b) How could visitor experiences be further improved within natural area(s) you work with?

Accessibility Specialists (Q7)
What are the essential strategies and considerations when designing high-quality experiences for individuals with mobility, vision, and hearing disabilities, whether in general or in natural areas?

Key Takeaways

1. Decision making should be done with interdisciplinary teams and with the guidance of visitors with disabilities.

2. Signage that is simple, engaging, and universally understandable is key to providing high quality experiences.

3. Land managers should consider how to provide universal access deeper into the site so more people can experience solitude.

“I think that’s the most essential consideration is how do we provide access to an area of the prairie where you feel like you are in the midst of the prairie?” (Blair 2023)

“Being able to experience the site personally at their own speed and on their own terms, being able to find and be safe on the trail, and being able to follow the trail effectively. [are essential considerations].” (Haukos 2023)

Overview

The accessibility specialists' responses focused on how to build a strong foundation for decision making and the delivery of information and amenities in a variety of formats. In contrast, the land managers and visitor program directors' responses tended to consider how the visitors interacted and connected with the site. The most frequent responses to providing high quality experiences centered on signage and opportunities to experience solitude in nature. The interviewees did not provide any considerations or strategies for creating high quality visitor experiences for visitors with specific types of disabilities.

Strategies

1. **Input on Decision Making**

Adhering to codes and requirements doesn't equate to the most effective or convenient solution for visitors with disabilities to access or enjoy a site. The biggest strategy is including the public and visitors with disabilities on decisions (Landscape Architect One 2023).

2. **Interdisciplinary Team**

An interdisciplinary team is key to creating really successful experiences. One person does not have all the answers and collaboration (Landscape Architect One 2023).

Considerations for High Quality Experiences

1. **Provide Options**

Offer more than one accessible trail. Offering just one will not support the needs and interests of a diverse range of people (Vaughn 2023).

2. **Signage and Information**

Deliver information and programming in different formats for people to choose how to best engage (Vaughn 2023).

Convey information in a simple to understand, universal format (Lowe 2023; Vaughn 2023).

Ensure trails are easy to locate with sufficient wayfinding signage (Haukos 2023). Interpretative signage about ecosystems should be improved using the considerations above.

3. **Provide universal access in secluded areas**

Accessibility is often offered near visitor centers and not further into the site. Consider providing accessibility in areas further into the site that are relatively protected and secluded from obvious human influence (Blair 2023; Brown 2023; Land Manager One 2023).

4. **Emphasize the Sensory Experience**

Consider how to provide and enhance opportunities for visitors to hear the sounds of the landscape and touch plants as they walk. If vehicle tours are offered, find ways for visitors to still connect with sensory experiences (Blair 2023; Land Manager One 2023).

Further Possible Improvements

1. Streamlining the parking experience to get visitors out of their car and experiencing the landscape (Lowe 2023).

2. Improve the interpretative signage along the trails. Consider incorporating QR codes, auditory messages, and other languages in addition to English (Blair 2023; Haukos 2023).

Question 7 and 7B

Land Managers (Q7)
When making visitor use and access decisions what issues, if any, would benefit from public input? Does your facility engage the public for input prior to making visitor use and access decisions?

Visitor Program Directors (Q7)
When planning visitor programs and recreation opportunities, what issues if any, would benefit from public input? Do you and your staff engage the public for input prior to implementing programming?

Accessibility Specialists (Q8)
When making visitor use and universal access decisions, in what situations, if any, do you think it's beneficial for you and/or the natural area's staff to seek public input?

All (7b / Q8) Follow up Question
[if they / their facility doesn't seek input or find it beneficial]: Can you elaborate why public input is not [a part of / beneficial to] your decision-making process and how, if at all, public engagement could be done in a more beneficial way?

[If they / their facility finds input beneficial]: Who do you involve and how? How do you use their input?

Key Takeaways

1. The level and type of public engagement that is conducted is based on factors like the size of the project (small / large), the type of issue or project, site ownership (public / private), internal policies, legislation, the site's managed purpose (conservation / visitor use / research / etc.).

2. Public input is integral to some natural areas' planning and decision making while other natural areas do not actively seek public input. The natural areas that are not actively seeking input have an email and phone number for visitors to contact the natural area's staff with questions and complaints.

"We shouldn't be doing any projects on accessibility without including disabled stakeholders in the process." (Vaughn 2023)

"What better way to make it more accessible by asking the very people that need accessibility?" (Brown 2023)

"[We should] definitely [be] engaging the visitors because if you don't engage the public, how are you going to know what their expectations are? Some expectations may not be feasible, but that gives you an opportunity to explain why we're not doing that." (Brown 2023)

"If we're doing our job, right, we are engaging the public or at least asking them. Whether the public chooses to be engaged is up to them, but at least asking them to chime in on things." (Land Manger One 2023)

Overview

Most interviewees expressed strong support for community engagement. However, they lacked consensus regarding the specific types of projects needing public input. Furthermore, there was no standard methods for conducting the engagement. Finally, land managers tended to involve people with disabilities only on projects focused on accessibility improvements, while accessibility specialists advocated for seeking input from disabled stakeholders for all projects that affect visitor use.

When Public Engagement is Mandatory

1. Required by internal policies set by the individual natural area.

2. Required by federal laws such as National Environmental Policy Act (NEPA).

When Public Engagement is Voluntary

The Konza Prairie Biological Station (KPBS) does not typically seek public input on site development or management since it is privately owned, managed as a research entity, and doesn't have public funding (Blair 2023; Haukos 2023).

Situations that Benefit From Public Engagement

1. Every project pertaining to accessibility (Vaughn 2023).

2. Bigger projects pertaining to visitor use and access (Land Manger One 2023).

3. Developing an open space / site master plan (Lowe 2023).

4. To know what groups or individuals have felt excluded or been unable to access specific areas or resources at the site (Blair 2023).

5. To better understand what kinds of opportunities visitors want to see and do (Brown 2023).

6. Potential solutions or strategies that may be implemented (Landscape Architect One 2023).

7. Regulation or policy changes (Schrader 2023).

Who is Engaged?

1. "Friends of" groups comprised of a board of elected and appointed individuals. Mostly people interested in conservation and the prairie (Blair 2023).

2. An advisory council comprised of community members (Lowe 2023).

3. Anyone directly impacted by the decisions (Brown 2023).

4. Specific user groups, organizations, or entities who may be interested in or impacted by the project. For example:

- If the project is to improve programming for the deaf, inviting the local School for the Deaf is appropriate (Land Manager One 2023).
- If the project may have a significant impact on natural resources, seek input from fisheries and wildlife organizations like Audubon, Wildlife Society, or Fisheries Society (Land Manager One 2023).

5. Seek disabled stakeholders. Reach out to local organizations with disabled members and national associations for the deaf or blind (Vaughn 2023).

Methods of Engagement

1. **Informal methods**

Email and phone to ask questions and provide information (Blair 2023; Schrader 2023).

2. **Formal methods**

Open houses, focus groups, ad one-on-one interviews (Lowe 2023). Listening sessions with the public conducted online (Schrader 2023).

3. **Social media and website platforms**

Facebook posts (Haukos 2023; Land Manger One 2023). The National Park Service also runs the Planning, Environment and Public Comment (PEPC) for public comment.

4. **After facilitated programs**

Survey attendees of programs which help staff improve programs (Lowe 2023).

5. **Accessibility considerations**

Maximize public input by making engagement accessible. Not all people can or want to use certain programs. Provide different ways to collect interview data by offering physical locations, zoom calls, phone calls, and online surveys (Vaughn 2023).

Question 8

Land Managers (Q8)
When considering improvements to universal access, what conservation factors would you want visitor program directors and accessibility specialists to consider?

Visitor Program Directors (Q8)
When considering improvements to universal access, what visitor program goals would you want land managers and accessibility specialists to consider?

Accessibility Specialists (Q9)
As an accessibility specialist, what initial suggestions would you give to land managers and visitor program directors of protected natural areas to make visitor experiences more inclusive?

Key Takeaways

1. Prioritize sustainable trail design and thoughtful planning to minimize negative impacts to resources.

2. Consider the range of natural experiences people want from rugged to maintained. Strive to accommodate the range of experiences with necessary amenities and improvements to physical access.

3. Invite individuals with varying abilities and needs to go through the site and provide suggestions. Be proactive in taking the small steps that will make immediate improvements to universal access while also understanding some projects will take much longer.

The planning aspect of conservation involves understanding the locations of the best resources and wildlife movement corridors, and then making efforts to avoid providing access directly through these critical areas (Lowe 2023).

“We understand there are people who want to have that very rugged, primitive, back country experience. We also understand there are places where you want to to take your two-year-old or have group of individuals who want to go that need a little more assistance for where they can travel and what amenities they need. And we’re able to balance those needs and provide those resources.” (Schrader 2023)

“Be proactive about taking small steps that will improve access. For example, understand that making physically accessible trail will take even longer than making way finding and signage. [It is a] process, not everything is going to happen overnight.” (Vaughn 2023)

Overview

The land managers emphasized situations where universal access needs to be balanced with existing conservation, visitor use, and research goals. While the visitor program directors offered insights, they did not specify program goals that require consideration. This may stem from the absence of standard frameworks for planning facilitated visitor programs, leaving program directors without clear guidelines for identifying key factors for others to consider in their work.The Accessibility specialists identified a few key suggestions for site staff to improve univeral access.

Land Manager Responses

1. **Natural Resources**

Factors to consider when improving universal access are minimizing soil erosion, and minimizing impacts to stream water quality and biota (Blair 2023).

Designing sustainable trails to respect the integrity of natural resources is critical (Land Manager One; Lowe 2023). You don't want to change the natural areas. "Otherwise you've defeated the point; there's no point to go see it if you've now changed it" (Land Manager One 2023).

2. **Respect other natural area uses**

Any modifications need to be assessed to ensure they do not impact long term research on site (Blair 2023).

3. **Visitor experiences**

Maintain a natural feel to the experience as much as possible. That's one of the reasons why people come there and appreciate it is that they feel like they're in the midst of a prairie (Blair 2023).

Design visitor experiences near wildlife and natural resources to provide good interpretive experience, but don't destroy the resources (Lowe 2023).

4. **Planning and Construction**

Conservation requires planning and understanding where the best resources and wildlife movement corridors are and not provide access through the middle (Lowe 2023; Land Manager One 2023).

Limit visitors access through sensitive areas that are the focus of the experience like a prairie or woodland area. You don't want people there to detract or damage the resource (Land Manager One 2023).

During the construction process, avoid damaging the resources people want to see (Land Manger One 2023).

Visitor Program Director Responses

1. **Up to the Site Manager**

It would be nice to have access for as many people as possible, but I would leave it up to the individual land manager and the individual site to decide how to implement universal access (Haukos 2023).

2. **Planning**

Understand the site's resources and public use (Schrader 2023).

Don't overlook things. Have people come out with limited mobility or visual impairment and go through your site to give suggestions. Don't be afraid of what they might say (Brown 2023).

Consider alternative ways for mobility but making sure it does not impact the resources. You have to think about long term impacts and goals to make things accessible (Brown 2023).

3. **Visitor experiences**

Understand that visitors want different experiences. Some people want to have very rugged backcountry experiences while some families may want to take their toddler out, or a group may need more assistance and amenities where they go. Try to accommodate providing resources and access to these various experiences (Schrader 2023).

Accessibility Specialist Responses

1. **Incorporating Feedback**

Accept and be proactive about addressing feedback it's really important making sure that the visitors have been heard and taken care of (Vaughn 2023).

2. **Implementation**

Take small steps to improve access and be patient with larger projects that may take more time. Making improvements is a process (Vaughn 2023).

3. **Consider Disability Fatigue**

There is a lack of staff understanding what accessibility entails. Training staff in what accessibility means and what accommodations are available on site is important. People get disability fatigue from arriving at a park and having to ask what accommodations are available for certain disabilities like hard of hearing. Often the response is we have accessible parking stalls (Landscape Architect One 2023).

Question 9

Land Managers and Visitor Program Directors (Q9)
What standards, guidelines, or examples do you use in your professional work to make conservation, visitor use, visitor program, and/or access decisions? Are you aware of additional standards or guidelines?

Accessibility Specialists (Q10)
What standards, guidelines, or examples do you use in your professional work to make conservation, visitor use, visitor program, and/or access decisions? Are you aware of additional standards or guidelines?

Key Takeaways

1. Most parks use internal guidelines and partnerships to make informed decisions.

2. None of the interviewees were aware of or use guidelines that explicity have universal design and access guidance.

"The ABA standards are the bare minimum requirements that you have to comply to for outdoor public spaces, outdoor natural spaces." (Vaughn 2023)

Overview

As expected, the interviewees affiliated with larger organizations like the National Park Service and the Missouri Department of Conservation use manuals, frameworks and master plans to make various decisions. The majority of the interviewees referenced legal requirements such as the ADA, ABA, and NEPA. When asked if they use any universal design and access guidelines for decision making, **none of the respondents were aware of or used universal access specific guidelines to make conservation, visitor use, or visitor program decisions.** Additional methods for decision making include consulting partnerships and learning from other parks.

Summarized Responses

1. **Legal requirements**

Land Managers: ADA (Land Manager One 2023; Lowe 2023), ABA (Land Manager One 2023) and NEPA, an environmental screening form. The process makes sure the decisions made have minimal risks to the resources (Land Manager One 2023).

Visitor Program Directors: For site design decisions use ADA and ABA. For signage guidelines use Harpers Ferry Center through the National Park Service (Brown 2023).

Accessibility Specialists: For conservation of natural and cultural resources decisions use NEPA and NHPA (Landscape Architect One 2023). For visitor use decisions use the Interagency Council for Visitor Use Management framework (Landscape Architect One 2023).

2. **Internal guidelines**

Land Managers: Use master plans and guiding documents (Lowe 2023). Make decisions based on standards associated with field stations such as keeping public activities away from research, sampling locations and research equipment (Blair 2023). Collaborate with partners to make decisions (Blair 2023; Lowe 2023).

Visitor Program Directors: Make informed decisions based on an Accessibility report developed for the specific natural area (Brown 2023). The Missouri Department of Conservation uses a resource policy manual. The manual outlines criteria for how decisions are made and a guide for public use (Schrader 2023).

Accessibility Specialists: Many cities and parks have their own guidelines making it hard to figure out exactly what to follow (Vaughn 2023).

3. **Universal access guidelines**

Land Mangers: Unaware of standards or guidelines for universal access and design (Blair 2023; Land Manger One 2023; Lowe 2023). Mostly reference specification standards from ADA and ABA (Land Manager One 2023; Lowe 2023).

Visitor Program Directors: Universal access guidelines are not used to plan the facilitated programming and education programs (Brown 2023; Haukos 2023).

Accessibility Specialists: The process of developing guidelines isn't always done as thoroughly as needed since public projects are budgeted and on a tight schedule. Often the input and feedback process is cut short (Vaughn 2023).

Question 1

Specific to Accessibiity Specialists

Accessibility Specialists (Q1)
To what extent is universal access standard design practice in public spaces? Compared to urban public spaces, is it equally common practice to provide universal access in protected natural areas?

"People think universal design is a buzzword for good design. They don't actually think about accessibility as much as they should for the disabled community." (Vaughn 2023)

1. **Standard practice in urban spaces versus protected natural areas**

Universal access is not standard practice for either setting. It is probably more commonly considered in urban spaces since there are more landscape architects working in the public sector than for the national and state park sectors (Vaughn 2023).

2. **Universal access implementation in National Parks**

Implementation of universal access varies based on the size of the park, its associated resources, knowledge of the site staff, and the size of the project (Landscape Architect One 2023).

Larger national parks tend to have their own planning or project management team that typically have at least some expertise on universal access (Landscape Architect One 2023).

Staff at smaller national parks may not be aware of universal access resources or the design assistance the Denver Service Center can offer. For these projects, universal access may or may not be included depending on the expertise at that park (Landscape Architect One 2023).

Question 1B

Specific to Accessibiity Specialists

Accessibility Specialists (Q1b)
What are the challenges that influence the widespread adoption of universal access in protected natural areas? How could such challenges be addressed?

1. **Is universal access opposite of preserving a site?**

People often view universal access as opposite to preserving a site. However, the sites we claim as natural and pristine frequently are altered already by previous land uses, including indigenous agriculture. Therefore, land managers and designers are encouraged to reassess their perspective on what types of infrastructure are suitable for natural areas (i.e rugged trails) versus what is deemed inappropriate (i.e. paved trails for universal accessibility) (Vaughn 2023).

1a. **Recommendation**

Raising awareness that protected natural areas are already altered sites and helping land managers connect with the idea that an accessible trail is not much different than any other trail that alters a site (Vaughn 2023).

2. **Staff knowledge and capacity**

It is often difficult for staff to be experts in universal design and access since most are also responsible for resource management, visitor maintenance costs, deferred maintenance, etc. (Landscape Architect One 2023).

2a. **Recommendation**

Make sure information about accessibility and universal access is available. Increase training opportunities to teach staff the importance of universal access and implementation strategies. Introducing a new process can be overwhelming so find ways to integrate universal access into the parks current frameworks and management processes is key (Landscape Architect One 2023).

Question 2

Specific to Accessibiity Specialists

Accessibility Specialists (Q2)
Universal design is often implemented in the context of indoor spaces and product design. In what ways, if at all, could universal design be adapted and improved for use in natural settings?

"ADA standards and other laws are all applicable. There are different things that you can do with existing principles, you just have to think about them a little bit outside of the box." (Vaughn 2023)

1. **Context**

This is an issue with all landscapes and exterior spaces since the majority of universal design guidelines are for interior spaces (Vaughn 2023).

1a. **Recommendation**

The existing standards including the Architectural Barrier Act (ABA) and the Americans with Disabilities (ADA) Design Standards it is a matter of thinking about them within different setting and making them applicable (Vaughn 2023).

2. **Context**

Depending on the ownership of natural areas, different laws will be legally binding. Natural areas owned or on federal land have to abide with the Architectural Barriers Acts and other laws and standards (Landscape Architect One 2023).

2a. **Recommendation**

Even if a natural area isn't mandated to follow certain federal standards, those standards can still be implemented to go above and beyond what is required (Landscape Architect One 2023).

Question 10

Land Managers and Visitor Program Directors (Q10)
Do you have any additional thoughts to add before we wrap up the interview?

Accessibility Specialists (Q11)
Do you have any additional thoughts to add before we wrap up the interview?

Overview

Many of the interviewees reemphasized that each natural area has different opportunities, constraints, resources, and priorities. This is a good reminder that implementing universal access is nuanced and has to respond to the specific site. They also reinforced their position that natural areas have a responsibility to provide universal access.

Responsibility toward access

"We have a lot of conversations around Colorado about this. We don't think visitor use is gonna go away. It kind of peaked in the pandemic when our mantra here was to get outside. And I think we have these amazing new people who have discovered the outdoors since the pandemic. It's really on us to try and find ways to connect to them, provide access for them" (Lowe 2023).

"Always try to do your best. Make good decisions, choices, and compromises to protect the resource but also make it as accessible as possible. Before we had so many things that weren't actually accessible, I felt like I was constantly apologizing. And I hated that because it was not accessible. Try to see it from other people's perspective and the challenges that they're facing" (Brown 2023).

Different contexts

"Keeping in mind that we are not a traditional park that we're a biological research station and that we're privately owned. So some of the things that might be attributable to a public accessible, public land and park are really not gonna apply to us" (Haukos 2023). Providing public access at a research station raises, "I'm still working my way through how best to integrate the public accessibility or conservation mission and research mission" (Blair 2023).

Keep in mind that it is hard to relate apples to oranges sometimes. The Missouri Department of Conservation is a very large entity. That oversees a great range of public use, land, information and research, and management (Schrader 2023).

All interviewee groups are aware of the importance of universal access and balancing visitor management and conservation needs.

Providing universal access would support many natural areas goals like recreation, education, stewardship, and even funding.

There will always be challenges to providing universal access. Collaboration, diverse perspectives, an equity lens, and creative problem solving is essential to overcome most challenges.

OVERALL TAKEAWAYS

Major opportunities to improve universal access include addressing staff mindset, knowledge, and education.

Having compassion and directly asking people with lived experiences (with disabilities) is best practice to improve universal access.

Situations must be dealt on a case-by-case basis since the legal requirements, policies, project types, site context, status of resources, and intended use greatly differ between natural areas.

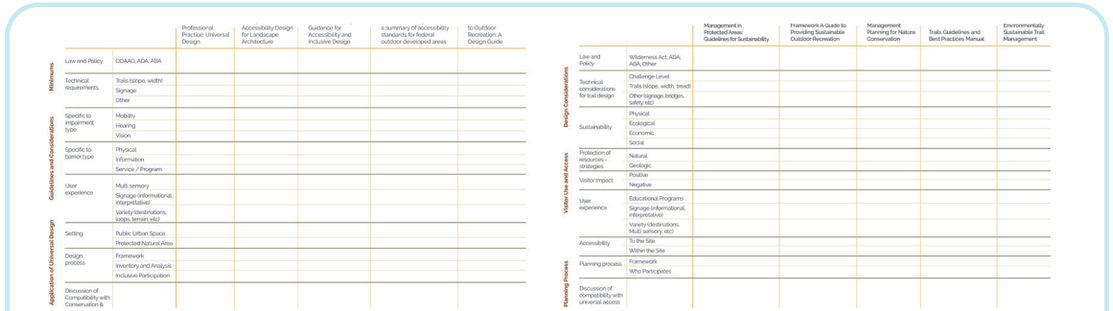
There is lack of guidance and standards for providing universal access to general visitor activities or facilitated programs. While accessibility has been historically an issue, addressing barriers through universal design and access is an emerging movement.

Document Analysis Introduction

Content Analysis Process

First, the contents of each document set (universal design and visitor use) were analyzed using the categories outlined in the matrices (Chapter 3 Tables 3.3 and 3.4). Individual tables were created to visually summarize the contents of each document.

Topic Category Matrices



Individual Tables

Universal Design

Law and Policy	Technical Requirements	Mobility	Physical
		Hearing	Information
		Vision	Program
User experience	Public Urban	Design Process	Compatibility
	Protected Natural		

Visitor Use

Law and Policy	Technical considerations for trail design	Sustainability	Resource Protection	
Visitor Impact	User experience	Accessibility	Planning process	Compatibility

✱ Discussed in Depth ✕ Discussed Briefly ☐ Not Discussed

The Icons indicate if the document covers the topic in depth, briefly, or not at all.

Fig 4.1 Overview of content analysis process.

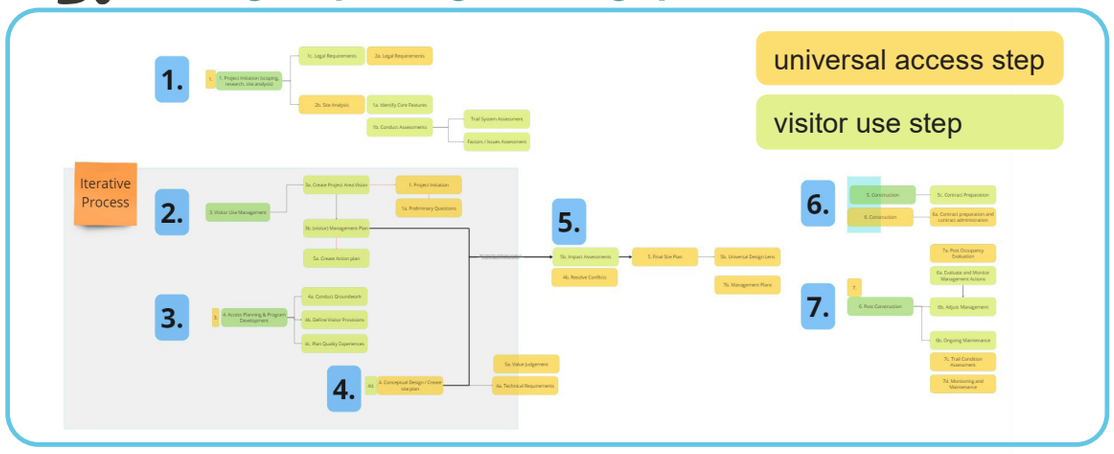
Planning and Design Flowcharts Process

Second, each set of documents were synthesized to create the separate planning and design process flowcharts. The strategies and frameworks from each separate process were meshed into one process to create an integrated process. The integrated planning and design process is located in the proposed Guidebook (Chapter 5).

1. Synthesis of the planning strategies and frameworks outlined in the universal design documents. → **2.** **Universal Design Planning and Design Process**

Synthesis of the planning strategies and frameworks outlined in the visitor use documents. → **Visitor Use Planning and Design Process**

3. **Meshing the planning and design processes**



4.

Outcome: Integrated Planning and Design Process

Fig 4.2 Development process of the planning and design flowcharts.

4c. Document Analysis: Universal Design

Documents

1. Professional Practice: Universal Design
2. Principles of Accessibility Design for Landscape Architecture
3. Outdoor Developed Areas: a summary of accessibility standards for Federal outdoor developed areas
4. Trails For All People: Guidance for Accessibility and Inclusive Design
5. Universal Access to Outdoor Recreation: A Design Guide

Glossary

ADA 1990 Americans with Disabilities Act
ABA 1968 Architectural Barriers Act
BMPs Best Management Practices | not legally binding

Contents Comparison

The contents of the documents range from focusing on universal design to accessibility (Y–Axis). Each document is also focused on different settings from Urban to Rural outdoor spaces (X–Axis).

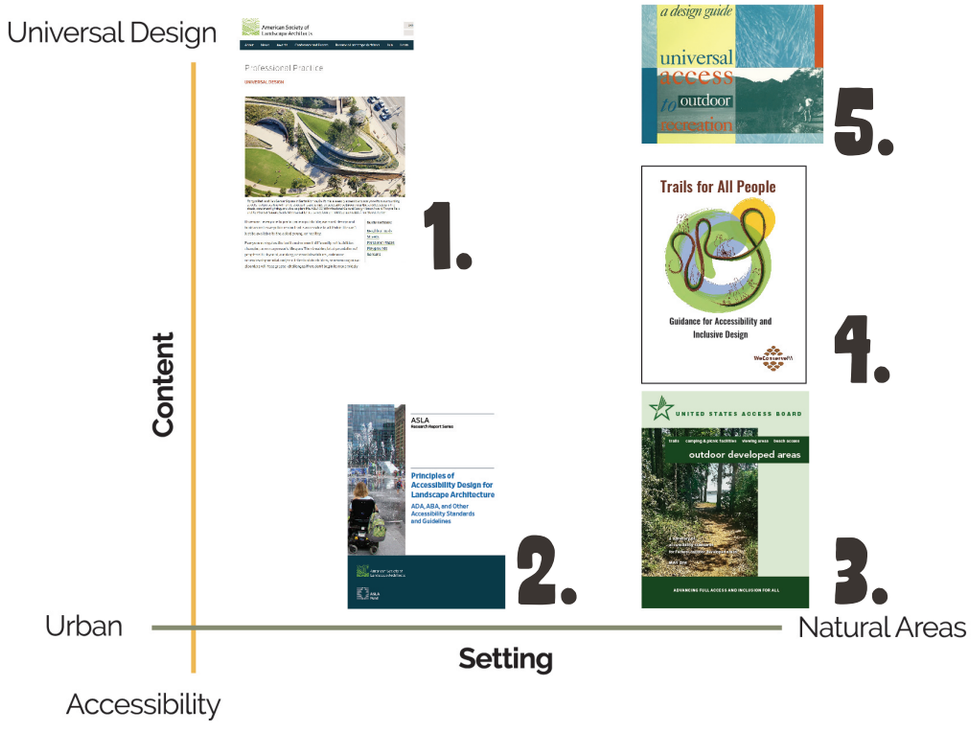


Fig 4.3 Content comparison of universal design documents.

Timeline of publishing date

Comparing the published date of the documents relative to one another and the passing of the ADA Standards is useful for judging the relevancy of the documents.

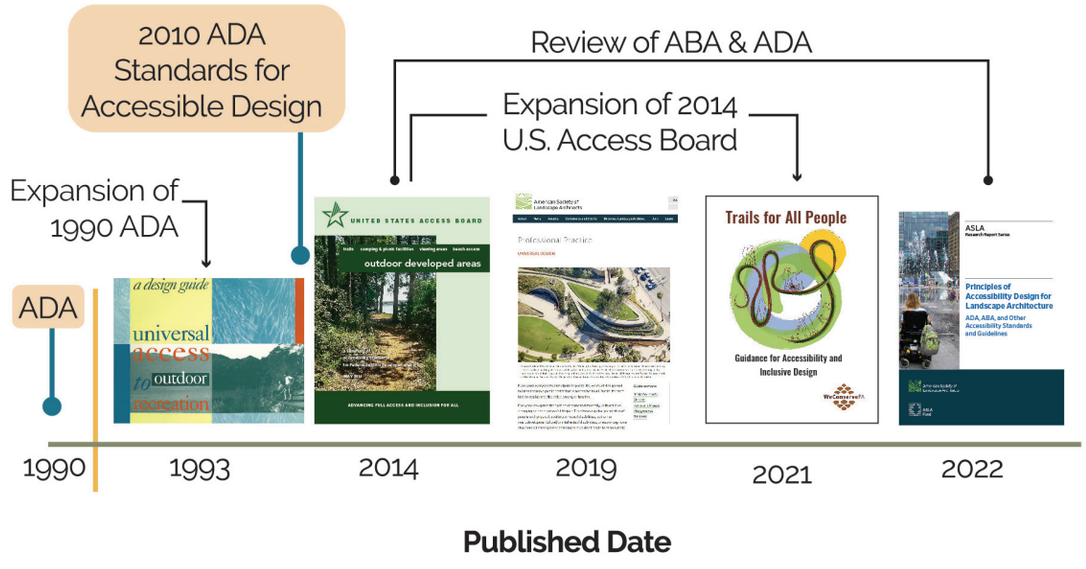


Fig 4.4 Relationship between universal design documents.

1. Professional Practice: Universal Design

Universal Design and Accessibility | (Dillon and Jared Green 2019)

This article introduces big-picture issues with specific strategies to improve universal access. Overall, the guide provides a robust section for improving visitor experiences and has several recommendations for mobility, vision, and hearing-related disabilities. It also includes recommendations for neuro-divergent individuals, which is not within the scope of this research. However, this guideline is tailored to settings primarily in urban locations and does not include recommendations for rural, natural areas.

Setting: Neighborhoods, Streets, Parks and Plazas, Playgrounds, Gardens

User Experience:

- Safety is key: Experience without fear of unexpected, unsafe environments.
- Range of Risk: When expected and informed, providing a range of risk allows visitors to engage in the level of challenge. Universal access means accessible options at different levels.
- Walkable: Should have clear / legible routes, and be easily navigable in alternate languages and formats.
- Provide Options: Design visitor experiences to support choices and opportunities.
- Multi-Sensory: Navigation in the built environment depends almost entirely on visual cues. Incorporate design elements that can be accessed through different senses For example, the use of auditory, haptic, and textural cues can aid in wayfinding and enrich experiences for all.
- Frequent and clear signage: should indicate walking distances to specific destinations.

Bathrooms and other amenities: Clearly mark where these are located with multi-sensory signage. Accessible restroom should be offered in every place restrooms are located, not just at the trailhead. This will allow visitors to go further into the site

Planning Process: always co-design with people with disabilities. Able-bodied landscape architects and designers won't know all of the difficulties that people with disabilities experience in environments designed without them in mind.

Discussion of Compatibility with Visitor Use Management: None

Table 4.1 Contents overview document 1.

Law and Policy ✕	Technical Requirements	Mobility ✕	Physical ✱
		Hearing ✕	Information ✕
		Vision ✕	Program
User experience ✱	Public Urban ✱	Design Process	Compatibility
	Protected Natural		

2. Principles of Accessibility Design for Landscape Architecture

Universal Design and Accessibility | (Braley et al. 2023)

The guide provides clarity on the settings and scenarios where ADA and ABA standards are applicable. It offers quick references to technical requirements crucial for landscape architects. The guide briefly discusses the distinction between accessibility and universal design. However, the section lacks depth and in describing the concept or importance of universal design. The guide concentrates on tackling physical barriers and provides guidelines for wheelchair accommodation. However, it does not address best practices for information and program barriers or strategies to support users with vision and hearing disabilities. The guide also does not discuss methods to provide rich visitor experiences.

"In order to lead the planning and design of inclusive, healthy, equitable, and safe environments, landscape architects have an obligation to be aware of and work in compliance with standards for accessibility." (Pg. 2)

Technical Requirements:

Barrier Removal: Removing barriers alongside designing areas and amenities to be universally accessible is important to making a natural area inclusive. Existing facilities are exempt from the ADA Standards but some barriers in existing facilities should still be removed on a case-by-case basis. Consider accessible routes, the primary function area, and equivalent facilitation.

Design Process: Accessibility guidelines and standards should be an integral part of the design process from the conceptual design to final construction documents. "Application of accessibility standards should not be simply one of the last "plan checks" in the design process." (Pg. 17)

Discussion of Compatibility with Visitor Use Management: Minimal

Joe Meade Forest Service stated, "The disabled community [is] sensitive to the need to preserve the "experience" of forests. The research showed that "blind adherence" to accessibility standards could be detrimental to both the environment and the experience." (Pg. 1)

Table 4.2 Contents overview document 2.

Law and Policy ✕	Technical Requirements ✱	Mobility ✱	Physical ✱
		Hearing	Information ✱
		Vision	Program
User experience ✕	Public Urban	Design Process ✱	Compatibility ✱
	Protected Natural ✱		

3. Outdoor Developed Areas: a summary of accessibility standards for federal outdoor developed areas

Universal Design and Accessibility | (United States Access Board 2014)

This guide outlines the technical requirements covered by the ADA and ABA for outdoor settings and amenities like trails and camping facilities. It offers diagrams depicting these requirements, clear but brief scoping requirements, and an explanation of exceptions to compliance. The guide is focused on addressing physical barriers and guidelines for wheelchair accommodation. Guidance to address information and program barriers or vision and hearing-related disabilities is limited.

Technical Requirements: Conditions for Exception: These conditions recognize that constraints and limitations in the outdoor environment may make compliance with the technical requirements inappropriate. Before conditions for exception can be applied, "all other design options are thoroughly explored. Where a condition for exception applies to only part of a trail or an outdoor recreation access route (ORAR), the rest of the trail or route must comply with all the technical requirements for the trail or route."

Accessibility:

Mobility: Trail surface, width, obstacles, passing spaces, slope, cross slope, resting intervals, passing spaces.

- Think about how obstacles, passing spaces, and resting intervals can be designed and utilized to improve accessibility for those with vision and hearing impairments. For example, a resting interval should be made large enough for multiple people to face each other and sign.

Vision: Protruding objects "Objects that protrude into the trail clear tread width, passing spaces, and resting intervals can pose hazards to people who are blind or have low vision." This only applies to constructed elements and Not natural features like branches.

- However, clearing these protrusions when necessary as a part of maintenance and/or routing trails safely around the protrusion is essential to universal access.

Hearing: No information

Discussion of Compatibility with Visitor Use Management: Minimal

- Limited to discussion of the Conditions for Exception

Table 4.3 Contents overview document 3.

Law and Policy ✱	Technical Requirements ✱	Mobility ✱	Physical ✱
		Hearing	Information ✕
		Vision ✕	Program
User experience	Public Urban ✱	Design Process ✕	Compatibility
	Protected Natural		

4. Trails For All People: Guidance for Accessibility and Inclusive Design

Universal Design and Accessibility | (Knutson et al. 2021)

This guide discusses when legal standards (ABA) must be met and explores where these standards intersect with conservation and visitor use goals. Unlike the other documents, this guide discusses inclusive planning, design, and decision-making strategies. It also discusses how universal design can be applied to signage and trail maintenance to support quality visitor experiences. The guide is focused on addressing physical barriers. Guidance to address information and program barriers or vision and hearing-related disabilities is limited.

User Experience

- Progressive Access: A trail rating system that acknowledges that hikers "vary significantly with respect to the kinds of physical, cognitive, and social difficulties they have." Therefore, a baseline 'easy' trail should be set that fully meets BMPs for accessibility. Through inclusive design processes, challenge level can be increased for all users, including those with disabilities
- Wayfinding Signage: Emphasizing inclusive design from the beginning ensures that all users feel welcome and accommodated on the trail. Signs identifying officially assessed trails should be placed at the trailhead and all access points." Display total distance and distance to the point of the first exception to accessibility standards.
- Management Plan: A written document that ensure continued positive user experience. "Ad hoc maintenance decisions can unintentionally and swiftly damage design elements of the trail intended to optimize accessibility and enjoyment of the trail."

Decision Making Process: Preliminary considerations for trail design and further insight into the "conditions of exception" outlined in the U.S. Access Board's guidelines are provided. Additionally, strategies for conducting inclusive planning are outlined.

Discussion of Compatibility with Visitor Use Management: Yes

- Universal Design, Accessibility, and Sustainability Go Hand-In-Hand: How sustainable trail design integrates aspects of universal design and promotes accessibility. This include: sustainable grades, erosion resistance, out-sloped tread, frequent linear grade reversals, positive user experiences, lower maintenance needs.
- Trail Signage: can help define rugged, experiences and provides an inclusive environment for all trail users, including those with a range of disabilities.

Table 4.4 Contents overview document 4.

Law and Policy ✱	Technical Requirements ✱	Mobility ✱	Physical ✱
		Hearing	Information ✕
		Vision ✕	Program
User experience	Public Urban	Design Process	Compatibility ✕
	Protected Natural ✱		

5. Universal Access to Outdoor Recreation: A Design Guide

Universal Design and Accessibility | (Driskell and Steve Wohlford 1993)

The book follows the framework of the Recreation Opportunity Spectrum (ROS), which categorizes natural areas along a spectrum from urban/rural to primitive. It suggests that the extent of universal design and accessibility should align with the characteristics of the land. Extensive recommendations are given for integrating universal design into the decision-making process and across natural settings like trails, fishing areas, and signage. A large section is also dedicated to technical specifications. The book is focused on addressing physical barriers and guidelines for wheelchair accommodation. Guidance to address information and program barriers or vision and hearing-related disabilities is limited.

User Experience Environmental design should provide a diversity of recreation opportunities. Providing a range of trails can help protect the integrity of the site and allow trails to blend into the landscape. A range of development and challenge level allows visitors to choose the experience type and level of difficulty they desire.
Design Process Four sections: 1) The design process (how universal design can be incorporated through all stages of planning, development, and maintenance), 2); Integrating universal design in the outdoor environment (dilemmas when incorporating universal design in natural settings; decision making process); 3) Applying the guidelines (Examples of applying technical specifications for various areas like paths, picnic areas, campgrounds, fishing areas, etc.); 4) Other issues and considerations (areas of special concern for the design and management of natural areas).
Discussion of Compatibility The level of universal access within an area should be determined in the context of the ROS (Recreation Opportunity Spectrum) classification (urban/rural to primitive). In natural areas, “scope requirements should be structured to ensure the accessibility is provided where and when it is expected.”

- This framework may be seen as outdated and harmful. To only provide the level of accessibility expected for the setting would mean that many people would never experience back-country areas. land and trail managers should incorporate universal design while balancing the protection of the environment and character of the land regardless of the ROS setting.

Table 4.5 Contents overview document 5.

Law and Policy	Technical Requirements *	Mobility *	Physical *
		Hearing	Information *
		Vision X	Program
User experience *	Public Urban	Design Process *	Compatibility *
	Protected Natural *		

Evaluation Tables Summary

The tables show which guides contain information oncertain topic areas and can be referenced in specific situations.

‘Universal Access to Outdoor Recreation’ (5) has the most relevant discussion of universal design in natural areas but was published in 1993. The information needs modernizing since the U.S Access Board’s 2014 Guidelines and ADA’s 2010 Standards for Accessible Design hadn’t been published yet.

1.

Law and Policy X	Technical Requirements	Mobility X	Physical *
		Hearing X	Information X
		Vision X	Program
User experience *	Public Urban *	Design Process	Compatibility
	Protected Natural		

2.

Law and Policy X	Technical Requirements *	Mobility *	Physical *
		Hearing	Information *
		Vision	Program
User experience X	Public Urban	Design Process *	Compatibility *
	Protected Natural *		

3.

Law and Policy *	Technical Requirements *	Mobility *	Physical *
		Hearing	Information X
		Vision X	Program
User experience	Public Urban *	Design Process X	Compatibility
	Protected Natural		

4.

Law and Policy *	Technical Requirements *	Mobility *	Physical *
		Hearing	Information X
		Vision X	Program
User experience	Public Urban	Design Process	Compatibility X
	Protected Natural *		

5.

Law and Policy	Technical Requirements *	Mobility *	Physical *
		Hearing	Information *
		Vision X	Program
User experience *	Public Urban	Design Process *	Compatibility *
	Protected Natural *		

Universal Design Document Findings

4/5 4 of 5 documents cover technical requirements in depth while only 2 covered user experience. This indicates a focus on meeting standards and not considering what the actual experience is.

1/5 1 of 5 documents discuss design strategies for hearing related disabilities. This indicates a knowledge and resource gap.

2/5 2 out of 5 documents discuss the compatibility between universal design and visitor use management objectives. This indicates a lack of universal design guidelines geared for use in nprotected natural areas.

0/5 0 of 5 documents discuss addressing program barriers. This indicates a knowledge and resource gap.

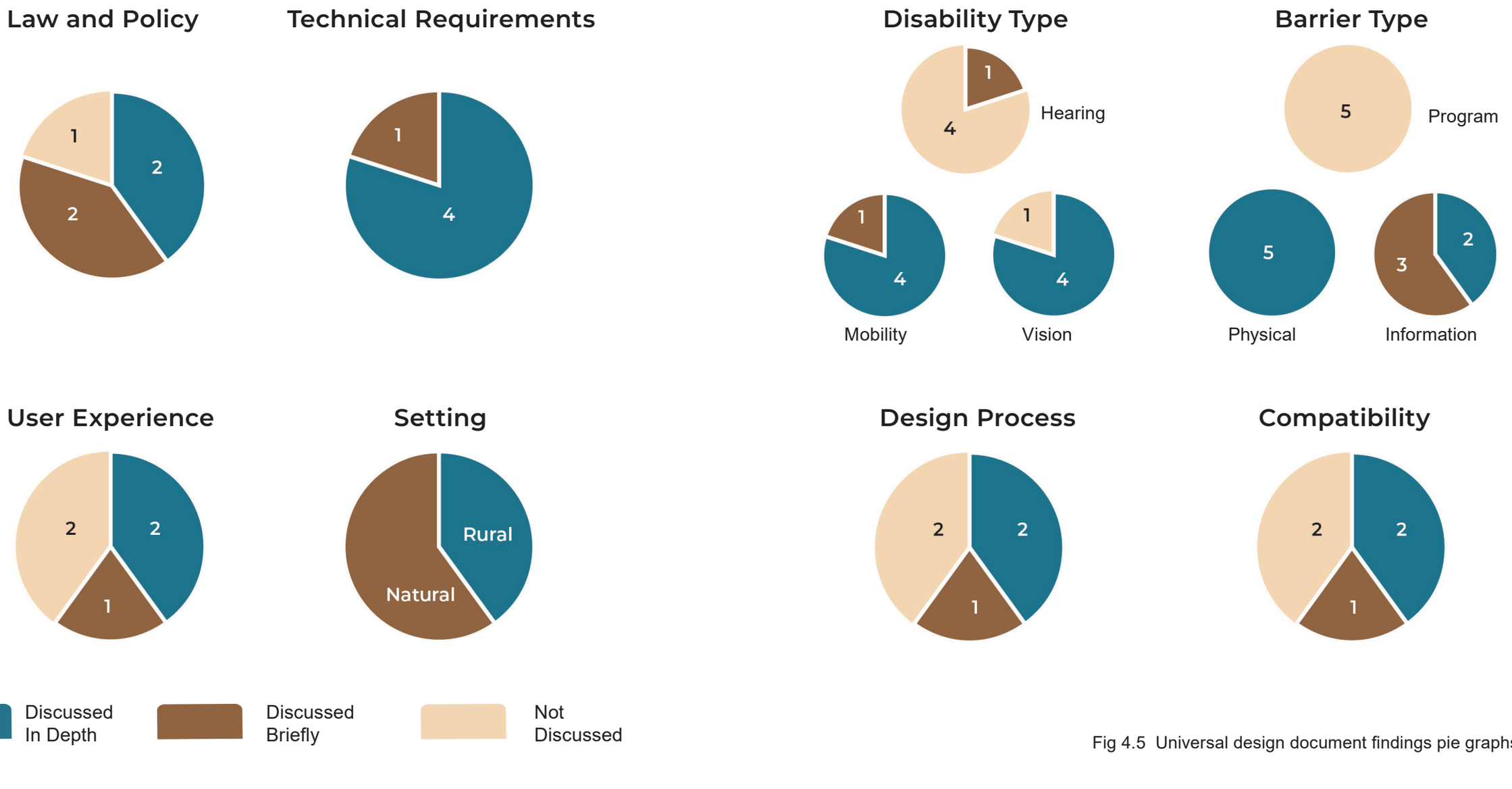


Fig 4.5 Universal design document findings pie graphs.

1. Project Initiation

1a. Preliminary Questions

1b. Participatory Design

2. Scoping and Research

2a. Legal Requirements

2b. Site Analysis

3. Program Development

4. Conceptual Design

4a. Technical Requirements

4b. Value Judgment

4c. Universal Design Lens

4d. Resolve Conflicts

5. Final Site Plan

6. Construction

6a. Contract Preparation & Contract Administration

7. Post Construction

7a. Post Occupancy Evaluation

7b. Management Plans

7c. Trail Condition Assessment

7d. Monitoring and Maintenance

Fig 4.6 Universal Design: Planning and Design Process Flowchart.

Universal Design

1. Build an interdisciplinary project team: With designers, land managers subject-matter specialists, and users representing "A diversity of skills, interests, disabilities, and have an appropriate technical knowledge" (Driskell and Steve Wohlford 1993).

1a. Conduct inclusive community engagement or 'participatory design' – which involves designing with and learning from people with a range of perspectives and experiences. Be open to integrating challenging and alternate ideas. Make the process truly accessible and safe to avoid alienating stakeholders (Dillon and Jared Green 2019; Knutson et al. 2021).

1b. Ask questions: Would making a trail more accessible to some make it less enjoyable to others? How much additional energy and money would it take to construct and maintain a trail that would be accessible to more people? Does the organization have the capacity to bear the additional expense? If the trail were made accessible, how much more accessible would it be? Are there other trail uses like biking that may cause conflict (Knutson et al. 2021)?

2. Conduct scoping and research: Review all existing sources of information and visitor needs, project purpose, and priority to make informed decisions. Identify and assess deficiencies in available accessible recreation areas and programs and consider budget priorities (Driskell and Steve Wohlford 1993).

Planning and Design Process

2a. Meet legal standards: Universal design builds on standards outlined by laws like ADA and ABA. Understand these legal standards, determine their applicability to the project site, and meet them as a baseline for providing universal access. Strive to improve universal design beyond the legal requirement and consider adopting federal standards as best practice if not legally binding to the project site (Braley et al. 2023; Knutson et al. 2021).

2b. Conduct Analysis: This process identifies constraints and opportunities. For universal access planning, analysis guides the selection and placement of required modifications. Following this process helps ensure visitor needs are balanced with environmental concerns (Driskell and Steve Wohlford 1993).

3. Program Development: Identify the desired recreation experience and expected level of accessibility in the primary recreation areas. Approach this step with a universal access mindset to mitigate unnecessary barriers to the proposed activities or participants(Driskell and Steve Wohlford 1993).

4. Conceptual Design: Engage in an iterative design process to ensure visitor infrastructure and amenities fit the site conditions and that the appropriate level of accessibility is established.

4a. Technical Requirements: Apply the technical requirements of the applicable standards (ADA & ABA). Refer to the "Outdoor Developed Areas" and "Trails for All People" Guidelines. This stage ensures the foundations of accessible infrastructure are established before finalizing plan (Driskell and Steve Wohlford 1993).

4b. Adhering to accessibility standards is essential for many visitors to participate in natural areas. However, a blind adherence to technical requirements can lead to negative impacts to the environment and the visitor experience (Braley et al. 2023).

4c. Value Judgments: help determine when and where to provide universal access and protect certain natural or cultural features. Values can include protecting certain wildlife species and providing an equitable visitor experience. Use best judgments and creative problem-solving on a case-by-case basis to balance site objectives and values (Leung et al. 2018).

4d. Many accessibility standards focus on addressing physical barriers for people with mobility challenges, especially those who use a wheelchair. The project team should strive to think more broadly about how design standards and best practices can be adapted to support a broader spectrum of needs. For example, a resting space is usually dimensioned for a person using a wheelchair but should be large enough for multiple people to face each other and sign.

4e. Identify and resolve situations where implementing universal design may significantly alter the site's character. Refer to the Conditions for Exceptions, which recognize that constraints and limitations in the outdoor environment may make compliance with the technical requirements inappropriate. The 'Outdoor Developed Areas' and 'Trails for All People' guidelines explain these conditions (Knutson et al. 2021; U.S. Access Board).

Universal Design

Planning and Design Process

1. Project Initiation

1a. Preliminary Questions

1b. Participatory Design

2. Scoping and Research

2a. Legal Requirements

2b. Site Analysis

3. Program Development

4. Conceptual Design

4a. Technical Requirements

4b. Value Judgment

4c. Universal Design Lens

4d. Resolve Conflicts

5. Final Site Plan

6. Construction

6a. Contract Preparation & Contract Administration

7. Post Construction

7a. Post Occupancy Evaluation

7b. Management Plans

7c. Trail Condition Assessment

7d. Monitoring and Maintenance

5. Finalize the conceptual designs into a final site plan. This step includes specifying the materials, surfaces, and design details, which are factors of universal design (Driskell and Steve Wohlford 1993).

5a. The construction documents must depict the level of work and detail required by the contractor to ensure the construction team retains the aspects of universal design during construction. Require the contractor to submit an "as-built" drawing (Driskell and Steve Wohlford 1993).

6a. Select the contract administration team who will ensure the contract is being met throughout construction, especially regarding universal design aspects. Ideally, the administration is the same as the design team and/or administrators who have experience and sensitivity for recreation construction (Driskell and Steve Wohlford 1993).

Once the contract is awarded, conduct a pre-work meeting to review the "purpose, objectives, and desired outcome of the project" concerning universal design and access (Driskell and Steve Wohlford 1993).

7. Following post-construction, several activities must happen to ensure universal access continues to be provided as intended.

7a. Review and critique if the universally designed infrastructure works as intended and how the team would do it differently. This assessment aims to minimize the recurrence of similar problems in the future and identify aspects that can be corrected through proper maintenance (Driskell and Steve Wohlford 1993).

7b. Create a maintenance plan to ensure a positive user experience after a trail is built. "Ad hoc maintenance decisions and actions can unintentionally and swiftly damage design elements of the trail intended to optimize accessibility and enjoyment of the trail" (Marion and Leung 2004). This plan should address maintenance issues and contain information about the original tread materials, grades, structures, natural features, and constructed amenities so future management actions do not unintentionally alter the original intent of the design (Knutson et al. 2021).

7c. Regularly schedule in-person inventory and observation assessments of trail features, including slope, cross slope, width, surface, and obstacles. These activities will provide objective and reliable data to create work tasks for maintenance and management (Knutson et al. 2021)

7d. Proper maintenance is critical for universal access, while improperly maintained trails can create barriers. Ensure the maintenance staff understand universal design to uphold the design intent and avoid creating new obstacles. Routine tasks such as clearing branches uphold universal access (Knutson et al. 2021; Driskell and Steve Wohlford 1993).

4d. Document Analysis: Visitor Use

Documents

1. Tourism and Visitor Management in Protected Areas: Guidelines for Sustainability
2. Visitor Use Management Framework A Guide to Providing Sustainable Outdoor Recreation
3. Management Planning for Nature Conservation
4. Visitor Use Management Framework A Guide to Providing Sustainable Outdoor Recreation
5. Environmentally Sustainable Trail Management

Glossary

IUCN International Union for Conservation of Nature (International)
IVUM Interagency Visitor Use Management Council (U.S. Federal)
DCR Department of Conservation and Recreation
NEPA National Environmental Policy Act
NHPA National Historic Preservation Act
BMPs Best Management Practices

Contents Comparison

The contents of the documents range from focusing on trail design to management planning (Y–Axis). The document are also geared toward different settings from International guides to U.S. Federal and State (X–Axis).



Fig 4.7 Content comparison of visitor use documents.

Timeline of publishing date

Comparing the published date of the documents is useful since the guidelines build-on and reference one another. The IUCN references the IVUM while the Management Planning for Nature Conservation discusses and critques existing management frameworks at the time but doesn't cover the documets published by the IUCN or IVUM.

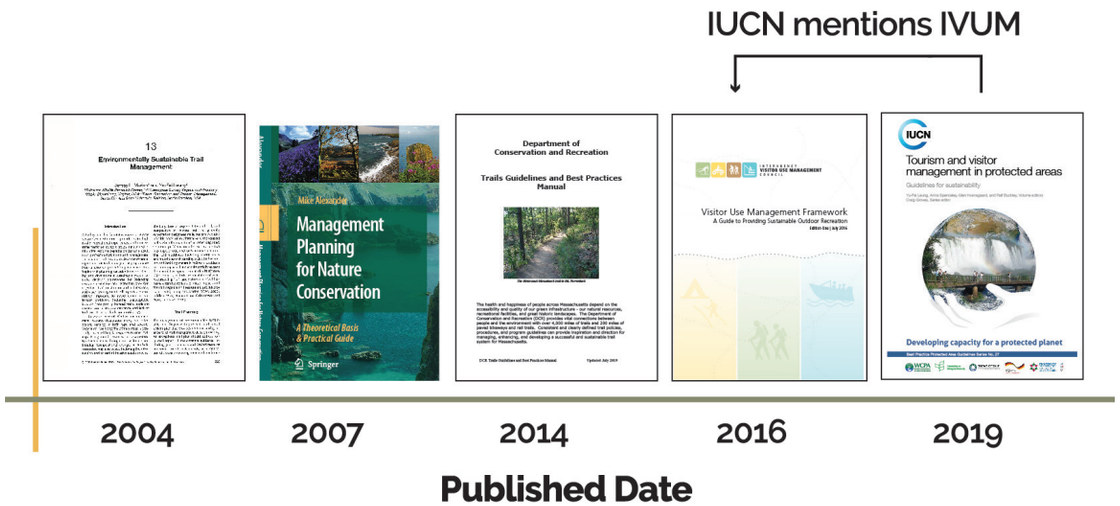


Fig 4.8 Relationship between visitor use documents.

1. Tourism and Visitor Management in Protected Areas: Guidelines for Sustainability

Visitor Use Management | (Leung et al. 2018)

The IUCN's guidebook focuses on sustainable tourism, visitor use management, and conservation principles for land managers. The guide explores frameworks and decision-making processes used worldwide, and strategies are given to achieve high-quality visitor experiences without negatively impacting the social and ecological environment. Note that this guide is for sustainable tourism on a global scale within larger protected areas. Therefore, some BMPs may not be fully applicable to smaller protected areas. In addition, the document fails to address accessibility or universal access as a factor for providing meaningful experiences and does not provide technical specifications.

Sustainable: Tourism must "contribute to the conservation of nature over the long term, not just briefly or sporadically, and ensure that conservation is not compromised by inappropriate or poorly managed visitor use." (Pg. 2)

- What kind and scale of infrastructure is appropriate and where should it be located?
- What level of impacts to biodiversity and the physical environment is acceptable given the mission and objectives of the protected area?

Protection of Resources: The guide prioritizes conservation above visitor use for design and management decisions. Framework to manage visitor impact are outlined such as the Recreation Opportunity Spectrum and Limits of Acceptable Change.

Visitor Impact: Can be positive or negative; but negative impacts are inevitable.

Planning Process: 10 Principles of Tourism are discussed in depth. These principles support a positive planning and management process. Key principles include: Proactive planning; Separate technical descriptions from value judgments; Engage with affected groups; and Communication to increase knowledge about sustainability.

- Value judgments: This guide refers to making design and management decisions to protect natural resources. Universal access should be added as value judgment.
- Engage with affected groups: This section could be deepened by discussing the importance of inviting participants representing a spectrum of abilities and needs.
- Communication: This section could also emphasize the importance of sharing knowledge about universal design and access best management practices.

Discussion of Compatibility with Universal Access: None

Table 4.6 Contents overview document 1.

Law and Policy	Technical considerations for trail design ✱	Sustainability	Resource Protection	
Visitor Impact ✕	User experience	Accessibility	Planning process ✱	Compatibility

2. Visitor Use Management Framework A Guide to Providing Sustainable Outdoor Recreation

Visitor Use Management | (Interagency Visitor Use Management Council 2016)

This is a framework for managing visitor use on federally managed lands and waters in the United States. The six federal agencies of the IVUM are the: Bureau of Land Management; National Park Service; U.S. Fish and Wildlife Service; U.S. Forest Service; National Oceanic and Atmospheric Administration; and U.S. Army Corp of Engineers. The guide aims to uphold desired conditions for both resource and visitor experiences. This framework addresses limitations found in commonly used frameworks and aligns with procedural requirements like NEPA and NHPA and the specific federal agency's existing standards and procedures.

Visitor Impact: The intent of visitor management planning is to minimize harmful impact, but specific examples of impact or specific mitigation strategies are not outline.

Planning Process:

- Sliding Scale: The framework is applied on a sliding scale where the amount of time, money, and resources to analyze a site and visitor use is proportionate to the size and complexity of the project. A sliding scale helps overcome some perceived limitations of previous visitor management frameworks that any management plan would require excessive time, money, and resources.
- The guide uses the Visitor Use Management Framework with four iterative elements: 1) Build the Foundation; 2) Define Visitor Use Management Direction; 3) Identify Management Strategies; 4) Implement, Monitor, Evaluate, and Adjust. Each of the 4 steps includes: Purpose Statement; Further Steps; Tips to get started; Summary.
- Application of the framework requires: 1) Proactively apply the framework; 2) Monitor to refine management actions; 3) Document all conditions, rationale, and decisions. Documentation will support decisions over time and withstand challenges.
- Public Engagement: A public involvement and outreach strategy should be developed using the sliding scale approach. The involvement plan should outline: 1) How and when the public will participate; 2) How the project team will interact with the public and address concerns; and 3) identify the tools and techniques for engagement.

Discussion of Compatibility with Universal Access: None

Table 4.7 Contents overview document 2.

Law and Policy	Technical considerations for trail design ✕	Sustainability ✱	Resource Protection ✱	
Visitor Impact ✱	User experience ✕	Accessibility	Planning process	Compatibility

3. Management Planning for Nature Conservation

Visitor Use Management | (Alexander 2007)

This guidebook explains the importance of decision-making processes and the structure of management plans. The book also reviews common management frameworks and approaches and could help land managers reflect on the appropriateness of their management approach to their site and objectives. The book recognizes various weaknesses of the U.S. planning frameworks and offers a management strategy that addresses these issues. The guide stresses that each part of the management plan, including the access plan, must be integrated (not over-compartmentalized) and created using a common planning team and approach. This document does not discuss technical considerations, accessibility, or user experience.

Protection of Resources: "Functions of a conservation site management plan include: 1) To collate all the relevant information about a site and its features; 2) To identify or confirm the most important wildlife and natural features; 3) To identify all the important cultural features: historic, archaeological, religious, landscape, etc." (Pg. 6)
Visitor Impact: Visitors are 'factors' that can have both negative and positive impacts. 'Factors' are anything that impact or change a (natural, geologic, or cultural) feature. Several management frameworks are identified like the 'Measures of Success, Designing, Managing, and Monitoring Conservation and Development Projects' that identified direct and indirect threats and opportunities which are 'factors' with positive effects.
Access Planning: Access does not refer to accessibility; but the management of visitor access to specific areas on the site.
Planning Process: Planning always comes before management. Planning process is iterative and can be revised as needed. Do not outsource management planning to save money or time. Ensure the site manager is directly involved in all planning to create a sense of ownership. Otherwise, the management plan will likely not be implemented.

- Functions of a conservation site management plan: 1) To collate all the relevant information about a site and its features; 2) To identify or confirm the most important wildlife and natural features and cultural features: historic, archaeological, religious; 3) develop objectives for all the identified, important wildlife and cultural features.

Discussion of Compatibility with Universal Access: None

Table 4.8 Contents overview document 3.

Law and Policy ✕	Technical considerations for trail design ✱	Sustainability ✱	Resource Protection	
Visitor Impact	User experience ✱	Accessibility ✕	Planning process ✱	Compatibility ✕

4. Trails Guidelines and Best Practices Manual

Visitor Use Management | (MA Department of Conservation and Recreation 2014)

This guide focuses on the planning, design, and maintenance of new and existing trails. The goal is to design sustainable trails that provide a positive visitor experience and minimize negative ecological impacts. The guide explores aspects of quality experiences, including sustainable design and fostering stewardship. The DCR also uses Trail Classes to guide the development of trails. Section III discusses trail attributes (traffic flow, obstacles, constructed features, signs, and experiences) related to the assigned Trail Class (1-5). Unlike the other guides, this guide addresses (briefly) the accessibility provisions. Finally, this document is for trails in Massachusetts, so certain law, and examples are state specific. However, much of the information is applicable to other states.

Technical Considerations: Design Parameter are technical specifications for trail construction and maintenance. These are based on the designed use and trail class.
Sustainability: a trail must serve the needs of users for generations to come, while preserving the sense of place and protecting the quality of the surrounding environment.

- Building Sustainable Trails: A sustainable trail will lead users to desired destinations such as water features, historic sites, and vistas; while avoiding wet areas, steep slopes, critical habitats, and other sensitive areas. Keep users on the trail and meet desired user experiences so visitors don't leave, widen, or create desire trails.

User Experience: Create "a sense of place and a sequence of events that add interest and offer challenge are essential to good trail design." (Pg. 2)

- Manage viewsheds, Trail layouts that create different recreational experiences, Create destinations with landscape features to provide a sense of accomplishment, Trail entrance or gateways (bridge, large trees, visual gateways), and anchors to provide interest (vertical features, trees, boulders, hills, valleys).

Accessibility: "We certainly don't want to pave the wilderness, nor do people with disabilities only wish to experience highly developed settings."

- When constructing or altering a trail, staff must ask "Will a person with a disability have an equal opportunity to use this trail?" (Pg. 27)
- Improve accessibility through regular maintenance.

Discussion of Compatibility with Universal Access: Minimal

Table 4.9 Contents overview document 4.

Law and Policy ✱	Technical considerations for trail design	Sustainability	Resource Protection ✱	
Visitor Impact ✱	User experience	Accessibility	Planning process ✱	Compatibility

5. Environmentally Sustainable Trail Management

Visitor Use Management | (Marion and Leung 2004)

This chapter in the book “Environmental Impacts of Ecotourism” gives a brief overview of planning, design, and trail maintenance strategies. The guide focuses on technical trail design and construction techniques to mitigate land degradation. This chapter also gives recommendations for building trails in certain conditions, such as stream crossings, soil limitations, and slopes. Because the scope of the chapter is limited, this guide directs the reader to several relevant and more in-depth resources. Overall, this is a quick read that can provide trail managers with strategies to reduce visitor impacts, construct trails, and provide appropriate maintenance.

Technical Considerations:

- Design: Discusses trail grade, slop alignment angle, stream crossing, designing with various soil types and limitations, and design for special uses (beyond waking/hiking)
- Trail construction techniques: Sidehill trails, outsloping treads (at 5%) so water can drain across and off the tread, and rolling grade dips which force water off the tread. These techniques are highlighted in ‘Trails for All People’ as ways to support universal design. This guide shows how these construction techniques work.

Planning Process: Create a trail system plan to guide management decision making. 1) Management guidance (goals, objectives, desired conditions); 2) Identify the decision-making framework (indicators, standards, monitoring methods, management action); 3) Evaluate existing trail resources in relation to recreational needs; 4) Describe the actions and resources necessary to develop and manage a trail system.

Trail System Assessment: Conduct assessments to decide which trails are suitable or should be removed.
1. Omit: Get rid of trail segments that harm or threaten natural or cultural resources, have significant degradation that is too expensive to fix, or are unsafe.
2. Suitability: evaluate trails from numerous perspectives such as access to backcountry locations, recreational objectives, etc.
3. Technical assessment: Evaluate the existing trail location, construction methods, and maintenance to identify the trails that are most suitable for heavy recreational traffic.
4. One more assessment for trail barriers and accessibility potential would be useful to support universal design and access.

Discussion of Compatibility with Universal Access: None

Table 4.10 Contents overview document 5.

Law and Policy	Technical considerations for trail design *	Sustainability	Resource Protection	
Visitor Impact x	User experience	Accessibility	Planning process *	Compatibility

Visitor Use Contents Summary

Except for ‘Tourism and Visitor Management in Protected Areas’, all the documents gave detailed planning and design recommendations and planning frameworks. Only two documents, ‘Tourism and Visitor Management in Protected Areas’ and ‘Trails Guidelines and Best Practices Manual Overall,’ discuss how to design high-quality user experiences, which are essential for successfully supporting visitor activities and universal access. Further, only one document briefly discusses accessibility or the compatibility between universal access and visitor use or conservation objectives. Not considering universal access in visitor use and trail design is a significant barrier to creating inclusive experiences for all visitors in protected natural areas.

1.

Law and Policy	Technical considerations for trail design *	Sustainability	Resource Protection	
Visitor Impact x	User experience	Accessibility	Planning process *	Compatibility

2.

Law and Policy	Technical considerations for trail design x	Sustainability *	Resource Protection *	
Visitor Impact *	User experience x	Accessibility	Planning process	Compatibility

3.

Law and Policy x	Technical considerations for trail design *	Sustainability *	Resource Protection	
Visitor Impact	User experience *	Accessibility x	Planning process *	Compatibility x

4.

Law and Policy *	Technical considerations for trail design	Sustainability	Resource Protection *	
Visitor Impact *	User experience	Accessibility	Planning process *	Compatibility

5.

Law and Policy	Technical considerations for trail design *	Sustainability	Resource Protection	
Visitor Impact x	User experience	Accessibility	Planning process *	Compatibility

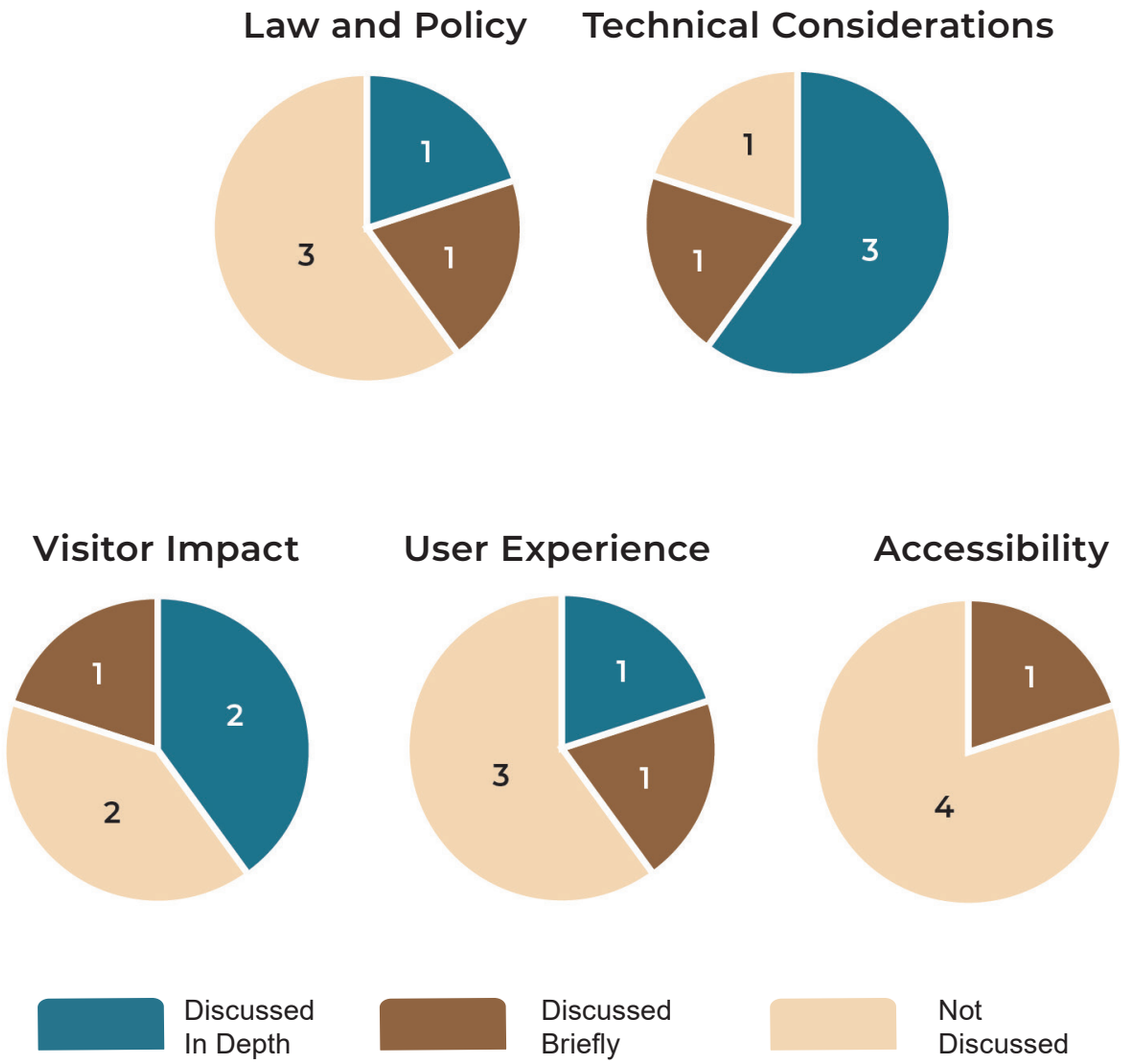
Visitor Use Document Findings

3/5 3 of 5 documents cover technical requirements in depth while only 2 covered user experience. This indicates a focus on meeting standards and not considering what the actual experience is.

4/5 4 of 5 documents discuss planning processes and/or provide a planning framework. This indicates a high level of guidance and structure.

1/5 1 of 5 documents address accessibility issues or strategies briefly. This indicates that it is often not considered in visitor use and management.

1/5 1 of 5 documents discuss the compatibility between universal design and visitor use. This also indicates a knowledge and resource gap for integrating universal access in protected natural areas.



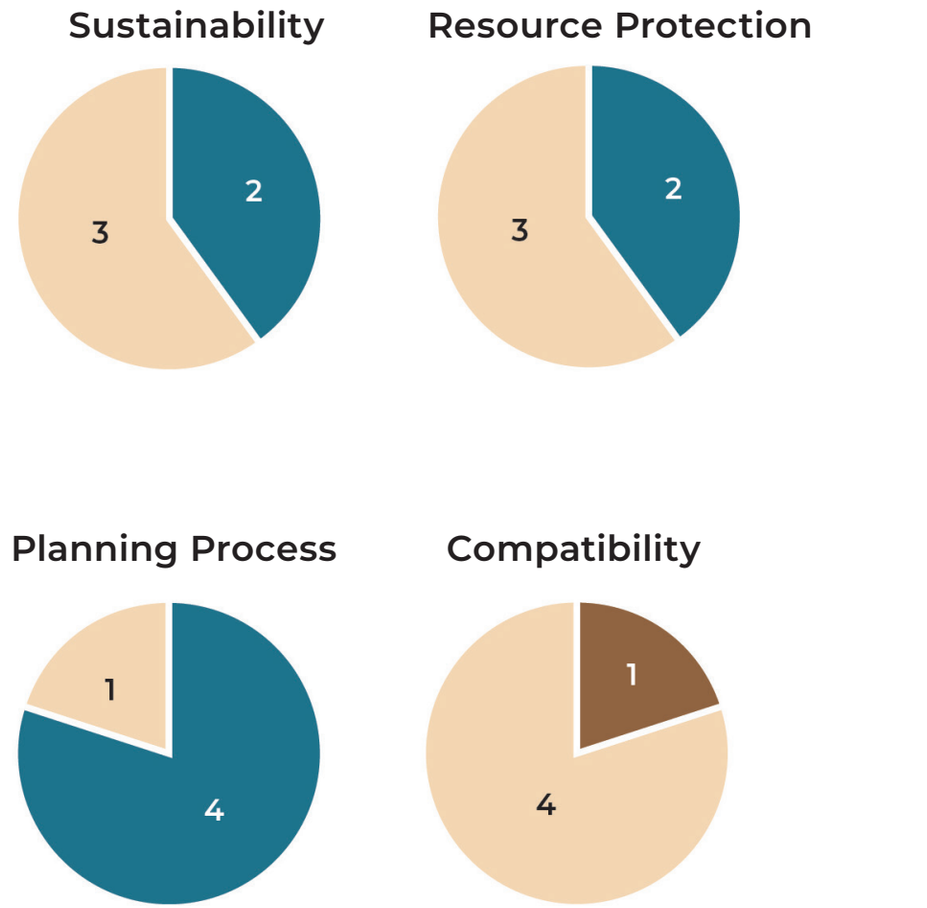


Fig 4.9 Visitor use document findings pie graphs.

Visitor Use

Planning and Design Process

1. Project Initiation

1a. Identify Core Features
1b. Conduct Assessments
1c. Legal Requirements

2. Stakeholder Engagement

3. Visitor Use Management

3a. Create Project Area Vision
3b. Management plan
3c. Create Action Plan

4. Access Planning

4a. Conduct Groundwork
4b. Define Visitor Provisions
4c. Plan Quality Experiences
4d. Create the Site Plan
4e. Impact Assessments

5. Construction

5c. Contract Preparation

6. Post Construction

6a. Evaluate & Monitor Management Actions
6b. Adjust Management
6c. Ongoing Maintenance

Fig 4.10 Visitor Use Planning and Design Process Flowchart.

1. Identify the project purpose and needs. Identify the project team and the possible time and resources needed for the project (Interagency Visitor Use Management Council 2016).

1a. Identify significant wildlife, natural, and cultural features. This includes historic, archaeological, religious, and landscape elements. Also, note any factors that may have a positive or negative impact on the site's features. Analyze the existing conditions and prioritize the importance of identified features (Alexander 2007; Interagency Visitor Use Management Council 2016).

1b. Conduct a Trail System Assessment: 1) Identify trail segments that are unsafe or too degraded. Decide if these segments should be removed or restored; 2) Identify trails suitable for continued visitor use based on trail locations, construction methods, and maintenance (Marion and Leung 2004).

1c. Coordinate with other federal and state agencies, user groups, etc. to obtain any pertinent existing data and information. Review applicable legislation, agency policies, and other management direction (Alexander 2007; Interagency Visitor Use Management Council 2016).

2. Identify stakeholders involved in the site's management and those affected by management decisions. Conduct participatory planning and build stakeholder capacity: empowerment, Providing sufficient and timely training, funding, and information, giving timely notification of opportunities to participate, etc. (Alexander 2007; Leung et al. 2018).

3a. Describe the desired conditions for the project area. Understand the level of acceptable impact on resources and the site. Then, define appropriate visitor activities based on those conditions. Finally, actionable and specific objectives must be set to achieve the desired conditions for natural and cultural features (Alexander 2007).

3b. Compare and document the differences between existing and desired conditions and current visitor use impacts. Then, identify visitor use management strategies that will achieve the desired conditions. Finally, define performance indicators that will be monitored. Monitoring provides evidence that the proposed management plan is meeting the desired conditions and outcomes (Alexander 2007; Interagency Visitor Use Management Council 2016; Leung et al. 2018).

3c. The action plan describes all the work that needs to be carried out across the site to meet the identified objectives for the natural, geologic, and cultural features and access planning (Alexander 2007).

4. Access planning dives into the details and design of the visitor experience, provisions, and management to ensure that visitor experiences are compatible with the management goals defined by the project team.

4a. If not previously completed, determine the carrying capacity and objectives for the site's natural and cultural features (Alexander 2007). Ask what level of environmental impact is acceptable given the mission and objectives of the protected area (Leung et al. 2018).

1. Project Initiation

1a. Identify Core Features
1b. Conduct Assessments
1c. Legal Requirements

2. Stakeholder Engagement

3. Visitor Use Management

3a. Create Project Area Vision
3b. Management plan
3c. Create Action Plan

4. Access Planning

4a. Conduct Groundwork
4b. Define Visitor Provisions
4c. Plan Quality Experiences
4d. Create the Site Plan
4e. Impact Assessments

5. Construction

5c. Contract Preparation

6. Post Construction

6a. Evaluate & Monitor Management Actions
6b. Adjust Management
6c. Ongoing Maintenance

Visitor Use

4b. Continue defining the appropriate visitor activities identified in Phase 3. Also consider the type of facilities and services necessary to facilitate these activities (Interagency Visitor Use Management Council 2016; Leung et al. 2018).

4c. Develop the experiences visitors will have when participating in activities. This step includes planning the level of risk, sensory experiences, wayfinding, educational signage, etc. Strive to create a sense of place and a sequence of engaging experiences that provide interest and opportunities for challenge when appropriate (MA Department of Conservation and Recreation 2014).

When planning to alter or construct a trail, staff should ask: Will visitors with a range of abilities and needs have an equal opportunity to experience this trail or amenity? This will help identify where visitor infrastructure supporting accessibility is appropriate or needed (MA Department of Conservation and Recreation 2014).

4d. Based on the previous planning, create a site plan for visitor infrastructure and programs (Marion and Leung 2004). Determine the trail class, trail conditions, designed use, and design parameters (MA Department of Conservation and Recreation 2014).

4e. The project team should conduct an environmental impact assessment to analyze and mitigate the site design's likely negative impacts. All development proposals should be assessed for impacts on the biophysical conditions, flora and fauna, and social and cultural factors. This step must be completed prior to construction (Leung et al. 2018).

Planning and Design Process

5a. After awarding the contract, conduct a pre-work meeting to provide building developers and contractors with knowledge of the natural process of ecosystems to avoid potential ecosystem degradation during construction (Leung et al. 2018).

6a. Continue to monitor the site and features to evaluate the effectiveness of management actions in achieving the desired conditions for the natural and cultural resources. Document all findings (Interagency Visitor Use Management Council 2016; Marion and Leung 2004).

6b. Adjust management actions if needed to achieve desired conditions and document the rationale for any changes (Interagency Visitor Use Management Council 2016; Marion and Leung 2004).

6c. Conduct ongoing maintenance to support sustainable and high quality visitor experiences. This includes routine maintenance and fixing severely degraded infrastructure.

If a major fix is needed, analyze the root cause of any problem (wet soil, steep grades, heavy traffic, etc.). Then, determine if the trail or infrastructure should be relocated to reduce future degradation or if in-place treatments like trail hardening or reconstruction are appropriate (Marion and Leung 2004).

5.

GUIDEBOOK

5a. Chapter Overview
5b. Guidebook

FIVE

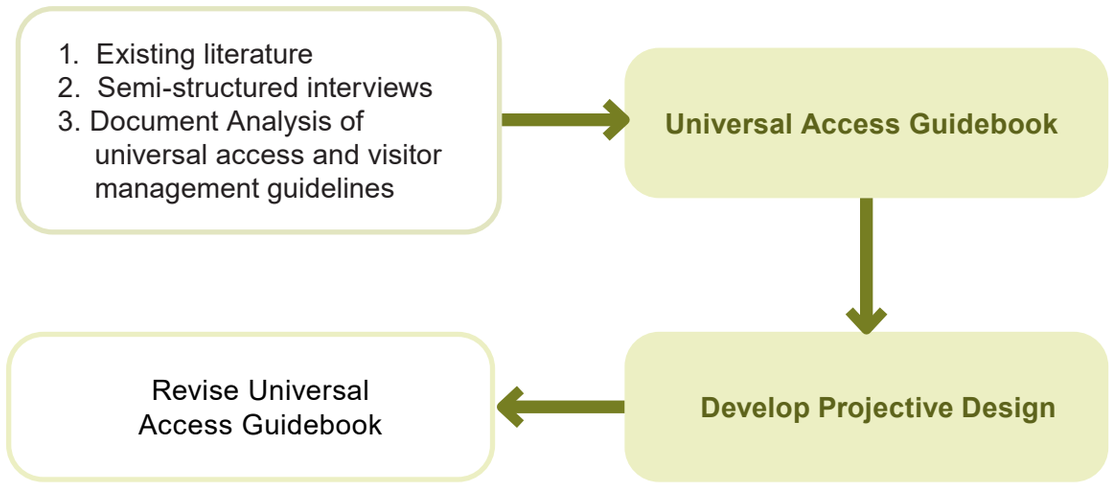
5a. Chapter Overview

Guidebook development process

This Universal Access Guidebook incorporates the specific challenges and opportunities identified by the interview participants (Chapter 4) and existing literature (Chapter 2). The document analysis (Chapter 4) informed the strategies and proposed integrated planning and design process.

This Guidebook is geared toward retrofit projects but can be applied to new projects as well. This is relevant since the majority of protected natural areas to date have not been designed with universal access in mind. Although legal standards like the Americans With Disabilities Act and Architectural Barriers Act legally apply to new and altered projects, land managers and designers can and should update existing infrastructure to be universally accessible.

Overall, the guidebook provides actionable strategies and considerations to help land managers and natural area staff, to create high quality, inclusive visitor experiences.



5b. Guidebook

Future work

Developing a Guidebook that addresses universal access in protected natural areas is a complex process requiring more time than this master's report allowed. Projects like this should not be rushed (Vaughn 2023) and should continue to be develped as more research and testing is done. Further, the Guidebook needs input and review by people with lived experience and other subject matter experts. People representing a range of abilities should not only be engaged but be leaders in this effort to provide universal access in protected natural areas.

A guide to

UNIVERSAL ACCESS

in protected natural areas

Maly Sears 2024



Fig 5.1 The Konza Prairie. Courtesy of Jill Haukos.



Improving universal access in protected natural areas translates to all people being empowered to enjoy the outdoors.

Call to action

Barriers disproportionately exclude visitors with disabilities from enjoying, recreating, and learning in protected natural areas. As land managers, visitor program directors, accessibility specialists, and designers it is our responsibility to ensure all people, regardless of ability, can enjoy the wonders of nature just like everyone else.

Source Information

This guidebook was developed as a part of a graduate research report. The author is a landscape architecture student based in the Flint Hills Tallgrass Prairie Ecoregion. The guidebook draws from three sources of information:

1. Literature review of existing research.

2. Comparative document analysis of existing universal access and visitor use guidelines (listed in Section 4 of this guidebook).

3. Semi-structured interviews with land managers, visitor program directors, and accessibility specialists (listed in the acknowledgments section of this guidebook).

Context

Setting: This guide is specific to protected natural areas with a mission of providing visitor opportunities and protecting natural resources. The natural area may be publicly or privately owned.

Who is this guide for? Land managers who are new to universal access or want to learn more.

How should I use the guide? The guide is geared toward retrofitting existing infrastructure and single-use pedestrian trails. However, the principles can be applied to new projects. Use the guidebook to supplement the guidelines and policies your natural area uses for design and decision making. Be ready to learn, reflect, and strategize how to appropriately implement the following universal access strategies in the context of your natural area.

Disclaimers: This guidebook is **not** a comprehensive framework or legal document. This guidebook does not cover every issue but strives to raise awareness of common challenges found in natural areas and provide appropriate recommendations.

CONTENTS

Section 1. Who Benefits?

Section 2. Mindset

Section 3. Barriers

Section 4. Decision Making

Section 5. Resource & References





Icons

Resource

The Book Icon indicates a link to an exterior resources. Click on linked resources to explore information in more depth.



Mobility



Vision



Hearing



Vision & Hearing

Movement and Sensory Icons indicate barriers and solutions relevant to specific types of disabilities.

Benefits for All People: While specific consideration may be critical for certain users, the implementation of the consideration will help a range of visitors beyond the target user (Aguilar-Carrasco et al. 2023; Bandukda et al. 2020).

Section 1

WHO BENEFITS?

Section One introduces the concept of universal access and how it supports equitable visitor opportunities and visitor use goals. Although universal access strives to support all people, this guide focuses on strategies for supporting people with mobility, vision, and hearing related disabilities.

Fig 5.2 A steep, rocky trail. Courtesy of Jill Haukos..

Universal Access Benefits All People!

Instead of thinking of able-bodied as normal and disabled as different, **universal access recognizes that there is a natural range of abilities and needs. It emphasizes inclusive design that is usable by all people** instead of providing separate accommodations or expecting people to adapt.

Universal design creates inclusive environments to participate for individuals and groups with a range of abilities:

1. Mobility: upper and lower
2. Vision: blind and low vision
3. Hearing: deaf and deaf-blind
4. Neuro-cognitive
5. Health challenges
6. Older folks
7. Families with children
8. Strollers
9. Everyone!

*This guide focuses on mobility, vision, and hearing related disabilities

Mobility Related Disabilities

Common challenges: Walking distances or steep trail segments, climbing stairs, standing, sitting, and crouching. The most common limitation is walking a quarter mile (Taylor 2018).

Key universal design considerations: Establish a strong sense of place at the arrival point since some visitors cannot or do not want to venture far into the site (Stoneham and Thoday 1996). At minimum, meet technical specifications like slope and tread width. Provide rest spaces at the top and bottom of trail segments greater than 5%. Provide passing spaces along steep segments and at the end of trails. Indicate where the last turn around is with clear signage (Goldstein and Knutson 2014).

Vision Related Disabilities

Common challenges: Independent navigation (without a guide), engaging with signage and information formatted for those who are sighted, and obstacle avoidance (Bandukda et al. 2020; Brown 2023).

Key universal design considerations: Provide multi-sensory experiences like walking near moving water and touching textured elements to build mental images (Bandukda et al. 2020). Provide tactile maps and interpretative signage with braille and relief images (Bandukda et al. 2020; Landscape Architect One 2023). Provide written descriptions of images on websites for screen readers to read (American Foundation for the Blind, n.d.).

Hearing Related Disabilities

Common challenges: Engaging in facilitated programs including tours due to lack of alternative media (Landscape Architect One 2023); signing in groups on narrow trails.

Key universal design considerations: Provide visual signage (Taylor 2018). Consider the spatial needs for sign language communication by providing wide paths and areas to stop and talk. Minimize tripping hazards through routine maintenance and using gently sloping switchbacks instead of stairs so people can sign without watching the ground plane (Vaughn n.d.).

Disabilities are experienced in different ways and intensities. Have compassion by considering access through other's perspective. Strive to learn more about the range of needs, barriers, and expectations of specific communities (Brown 2023). This will help make decisions based in empathy.



Fig 5.3 Children with cerebral palsy and volunteers hike over rough terrain.

Natural areas benefit from universal access too!

This guidebook considers the goals, responsibilities, and limitations of land managers and natural areas.

"Accessible trails ARE sustainable trails — There is almost no difference between a trail that is designed to maximize access to persons with disabilities and one that is well-designed to fit the environment, properly built according to industry best practices, and is sustainable for years to come." (Passo 2022)

"Universal access would help visitor use because it's just allowing that many more people the opportunity to see what we have and to learn the value of tallgrass prairie and the species that live here." (Land Manager One 2023)

"Being able to provide a prairie experience for additional people with disabilities or other challenges would enhance public appreciation of the prairie and it might actually increase financial support." (Blair 2023)

Universal design strives to maximize accessibly while being practical and aligned with the management priorities, constraints, and opportunities of the environment (Driskell and Wohlford 1993).

Section 2

STAFF MINDSET

Section Two focuses on natural area staff related topics from mindset and management practices to addressing common questions staff have about providing universal access.

Providing universal access starts with the site's staff. For universal access to succeed, staff must understand what it is and be committed to it through all planning, management, and maintenance activities. The goal is for site staff to develop an ethos for equitable and inclusive practices that support all people in enjoying natural areas.

"Right now in Colorado there's such a growing love and demand for outdoor recreation. And of course, we have these amazing natural resources as well that we're trying to protect. So we are always striving to find that balance." (Lowe 2023)

Fig 5.4 A steep, rocky trail. Courtesy of Jill Haukos.

2a. Leadership and Staff

Improving universal access means addressing natural areas' staff practices, management, and mindset. This will help develop an equity lens for visitor use and access decisions.

Opportunities

Shifting attitudes and mindset of staff.

Improving staff capacity.

Improving staff knowledge of universal design strategies.

Incorporating universal access as a planning and management lens.

Focus on providing high quality experiences instead of checking accessibility boxes.

Staff culture and internal policies

Challenge: Natural areas staff may not have diverse expertise, experience, or inclusive mindsets to create universally accessible experiences for all visitors.

Recommendations: Hire and work with individuals with diverse expertise, experience, and a range of disabilities to:

1. Increase equitable employment (Groulx et al. 2021).

2. Cultivate a culture and attitude where staff recognize and promote the rights of all people, regardless of ability, to access high-quality recreational activities (Voight et al. 2008).

3. Develop and deliver inclusive facilitated programming experiences (Groulx et al. 2021; Voight et al. 2008).

4. Problem solve when universal access, conservation, visitor management, or other priorities conflict (Landscape Architect One; Lowe 2023).

5. Establish policies that facilitate and promote universally accessible visitor infrastructure and programs. It is a best practice to have internal policies to exceed minimum accessibility requirements (Voight et al. 2008).

Universal access knowledge and training

Challenge: There is a ton to learn, especially since universal access in protected natural areas is an emerging mindset and design approach.

Recommendations:

1. Be open to learning; it is a process! (Lowe 2023; Brown 2023).

2. Work with accessibility specialists to train managers, staff, and volunteers on what universal access is and how to integrate equitable and inclusive thinking into the staff culture, current management practices, and visitor programming (Groulx et al. 2021; Landscape Architect One 2023; Voight et al. 2008).

3. Train managers, staff, and volunteers to know what accommodations and amenities are available to support universal access. People get 'disability fatigue' having to ask what accommodations are available for certain disabilities when the response is often, "we have accessible parking stalls." (Landscape Architect One 2023).

4. Provide opportunities for staff to gain knowledge on universal access and design. This can be achieved through short course, workshops, staff exchanges, conferences, mentoring, and educational leaves. Staff capacity building should be built into the staff program instead of separate, one-off activities (Groulx et al. 2021; Leung et al. 2018).

Collaboration

Challenge: Many natural areas have limited staff capacity. Staff members already have numerous responsibilities so planning, implementing, and maintaining universal access improvements can become overwhelming (landscape Architect One 2023; Haukos 2023).

Recommendations:

1. Partner with experts, consultants, nearby natural areas, non-profits, and universities to tap into their knowledge and resources. Partnerships are great for supporting and learning from one another (Brown 2023; Lowe 2023; Facilities Manager with BOEC 2023).

2. Provide opportunities for volunteers to assist running programs, maintaining infrastructure, and participating in planning processes. Land managers and volunteer coordinators should seek to understand what motivates volunteers to design volunteer programs that are meaningful and appealing (Leung et al. 2018).

Addressing Common Questions

Is universal access and accessibility different?

Yes! **Accessibility** is a legal term requiring that minimum technical specifications are met. Adhering to codes and requirements does not guarantee the most effective or convenient solution for visitors with disabilities to access a site (Landscape Architect One 2023).

Universal access strives to provide the most inclusive experiences for all people by encompassing technical and experiential aspects. This Guidebook encourages the use of technical standards set by the ADA and ABA as a baseline. Land managers and designers are encouraged to exceed this baseline to find strategies that support the broadest range of abilities and needs. The experiential aspect means that the amenities and space are usable by all, and the experiences are equitable, engaging, and empowering (Schahfer and Robison, n.d.; Knutson et al. 2021).

What if universal access isn't our priority?

This question assumes the mindset that universal access is separate from the usual visitor access planning. Visitor access and management planning goals aim to provide positive experiences while minimizing impacts on resources. Universal access is another layer of visitor access that reinforces positive experiences and often supports conservation.

How do we balance different goals?

Natural areas often have a dual mission: preserving natural and cultural aspects while facilitating visitor activities (Alexander 2007). It is often challenging to achieve both, especially when providing universal access. It is best to balance the objectives rather than prioritizing either conservation goals or universal access (Gissen 2023). Collaborating with an interdisciplinary team (Landscape Architect One 2023) and creative problem solving is useful when balancing objectives and priorities (Brown 2023).

Does universal access mean allowing visitors to access the entire site?

Universal access means making visitor experiences more welcoming and inclusive. It does not mean granting access to every area of a site. Determining the appropriate scope of universal access depends on factors like visitor safety and conservation priorities. In essence, universal access should be prioritized in areas where visitors currently have access, while areas where visitors are prohibited do not require universal access.

Making Universal Access More Approachable.

Will we have to alter the entire site?

Providing universal access may seem impossible if it requires completely altering the site's physical characteristics. A trail supervisor at Rocky Mountain explains their experience talking with Quinn Brett, an accessibility specialist for the National Park Service.

"I thought we'd have to clear every single rock out of here, but it turns out that's not an issue." Instead, small details and simple shifts can vastly improve universal access (Greenberg 2022).

Even if altering a trail is required to improve universally access, it is not always a major undertaking. Joe Stone, a colleague of Brett who uses adaptive devices to hike, talks about their experience talking with a trail crew. The crew indicated, "Actually, it's pretty easy. Rocks that don't require blasting can be chiseled away; cross slope can be adjusted. We could have this trail totally done in three months." (Greenberg 2022).

We don't want to pave paths. Now what?

Embracing the idea of paved paths in natural environments can significantly expand who can enjoy natural areas. The recreation opportunity spectrum, adopted by the U.S. Forest Service, indicates that paved paths do not fit in natural areas and are more appropriate to urban settings. To counter this perspective, human activity has already altered many natural areas we strive to protect. Although widely accepted in natural areas, trails are inherently man-made structures within already altered landscapes. Given this perspective, Is accessibility inherently out of place in 'natural' settings? Why should a universally accessible trail be inappropriate (Vaughn 2023; Gissen 2023)?

Joe Stone, an incomplete quadriplegic and a leader of Teton Adaptive expresses, "It was okay to build this trail for you to walk on. We can scar the land for all the walkers in the world, but we can't scar it a little differently so everyone has access?" (Greenberg 2022).

Will universal access fix every problem?

There is no one-design-fits-all, and an area cannot be made accessible for all people. This is not the goal of universal access. Instead, the idea is to simply **improve from where you are so more people can participate** (Vaughn, n.d.).

Section 3

BARRIERS

Section Three focuses on barriers that can inhibit visitors from participating in recreation, education, and other facilitated programs how and when they want.

Physical, information, and program barriers are common throughout natural areas from the inherent barriers like uneven terrain to not providing proper accessibility information at trailheads for visitors to make informed decisions. The section explores different barriers and makes recommendations to address them.

It is important for visitors to be “able to experience the site personally, at their own speed and on their own terms, and be able to find and be safe on a trail.” (Haukos 2023)

Fig 5.5 Children with cerebral palsy and volunteers hike over rough terrain

Section 3: Contents

Universal design can be applied to three different ‘environments’ which represent a three major types of barriers (Groulx et al. 2021).

3A. Physical Barriers

3B. Information Barriers

3C. Program Barriers

3D. Overarching Considerations



Fig 5.6 Winter on the prairie. Courtesy of Eva Horne.

3a. Physical Barriers

Common Physical Barriers

1. The most common barrier for people with lower mobility issues is walking up to a quarter mile (0.25) miles (Taylor 2018). Therefore, some visitors cannot or do not want to go far from the parking lot (Stoneham and Thoday 1996).

2. Getting visitors deep into the site is challenging due to distance and time limitations for hikers (Brown 2023).

3. Folks who use a wheelchair or other adaptive devices may need rest areas more frequently (Blair 2023; Vaughn 2023; Lowe 2023; Facilities Manager with BOEC 2023).

Arrival Point

Some visitors may not venture past the arrival point, which is often the parking lot. Establish a strong sense of place and best views from the handicap parking spaces. A drop-off point near points of interest can improve access (Stoneham and Thoday 1996).

Technical Requirements

Universal design improves universal access by building on technical requirements. The Architectural Barriers Act (ABA) defines technical requirements and mandates the items noted by a: * to be included on trailhead signage. Include the typical and minimum or maximum allowable for each of the following items (United States Access Board 2014).

* **Grade / Slope**
  10% Max
* **Cross Slope**
  3% Max
* **Trail Width**
  Minimum 32 inches
* **Surface**
  Firm and Stable
* **Obstacles**
  Less than 2” from trail surface

United States Access Board: Accessibility Standards | Pg. 29–30

Legal Minimums Exclude Visitors

The United States Access Board outlines the required dimensions of turn around and passing spaces based on typical wheelchair dimensions. In reality, the dimensions are often too small for visitors using mobility devices like handcycles to turn around or pass. For this reason, exceed minimum requirements when possible.

Dimensions of Two Adaptive Devices



Fig 5.8 Nuke Off Road Recumbent Handcycle.



Fig 5.7 Bomber Offroad Handcycle.

Rest Areas

1. Locate at the top and bottom of trail segments greater than 5%.

2. Be consistent with the interval distance so visitors can anticipate where rest spots will be available. This supports the universal design principle of being intuitive to use and consistent with user expectations (NC State University 1997).

3. Minimum length: 60”. Longer is more inclusive.

4. Provide rest options in the shade and sun.

Turn Arounds and Passing Spaces

1. Minimum trail width for mobility devices to pass: 60”. Wider is more inclusive.

2. For narrower trail segments, Passing spaces must be every 1,000 feet.

3. Turn around spaces can be a pad with a minimum 60” diameter or a T-shape with the arms a minimum of 60” long x 36” wide. Larger is more inclusive.

4. Mark the last opportunity to turn around since this may not be obvious.

Source information: (Knutson et al. 2021; United States Access Board 2014).

Terrain, Slope, and Surface Materials

Terrain, slope, and surface material can be a barriers that end a hike and/or creates an unsafe path for visitors with mobility, vision, and hearing related disabilities.



Rocks and Tree Roots protruding more than 2”



Erosion Control Bars



Narrow Trails



Unstable Surfaces (sand, wood chips, etc)



Nonflush, Unstable, Narrow Bridges



Stairs

Fig 5.9 Trail Photos.

Maintaining Trails

Maintaining trails is a key aspect of trail sustainability and universal access (Groulx et al. 2021). “For users with disabilities, they **r**equire upkeep to access spaces as opposed to those who have the ability to step over logs and twigs and roots in the ground that a wheelchair caster would go over rather poorly” (Facilities Manager with BOEC 2023).

> “You have to get out there really quickly if there are downed trees to steward and manage those trails. That's key to being able to provide universal access and make sure that the trail conditions are holding up; that the trails aren't eroding away.” (Lowe 2023)

Maintenance plans should outline desirable conditions for resources, infrastructure (Knutson et al. 2021), and ensure any universal access feature is functioning as intended.

Considerations:

1. **Correcting conditions:** Identify where universal design was not achieved as intended during construction. Identify aspects that can be corrected through maintenance activities (Driskell and Wohlford 1993).

2. **Maintaining desired conditions:** If earth is intended to be mounded over tree roots so wheels can easily pass, then this condition should to be upheld through routine maintenance.

3. **Improving Conditions:** Routine maintenance should improve universal access. If a downed tree needs to be cut and cleared, the cut should be a minimum 32” wide for visitors to easily pass (MA Department of Conservation and Recreation 2014).

Check for:

Locations

Park entrances
Trailheads & Trails
Campsites
Picnic areas
Observation points

Obstacles

Fallen branches
Tree roots
Leaves
Rocks
Snow and ice
Erosion

Mobility & Adaptive Devices

Many activities from hiking to biking, skiing to paddling can become accessible to people with disabilities with the right equipment and adaptations. There are both electric powered and human powered devices, both offering ways for people to get out into the rugged outdoors.

Historical Context

Wheelchairs did not have to be considered in the Wilderness Act since the Americans with Disability Act (ADA) didn't pass for another 25 years (Greenberg 2022).

'64

"Here shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport" (Wilderness Act).

National Park Service's mindset, "No wheels in the wilderness" (Greenberg 2022).

'90

ADA affirms that nothing in the Wilderness Act prohibits wheelchair use in federal wilderness areas (Forest Service, n.d.).

What Devices are Allowed on Trails?

The Forest Service, Bureau of Land Management and the National Park Service (Code 36 of Federal Regulation (CFR) 212.1) and the Forest Service (Forest Service Manual 2363.05) specify:

'08

"A device, including one that is battery-powered, designed solely for use by a mobility-impaired person for locomotion and suitable for use in an indoor pedestrian area. A person whose disability requires use of a wheelchair or mobility device **may use either device if it meets this definition anywhere foot travel is allowed even in federally designated Wilderness**" (Trail Access Project, n.d.).

Changes in policy opens conversations about the use of mobility devices including battery-operated and the new and growing range of adaptive mobility devices (Greenberg 2022).

Balancing Legal Requirements

The Wilderness Act and Americans with Disability Act (ADA) are applicable in federally owned or funded protected natural areas. Deciding which adaptive devices are allowed in what areas requires balancing these acts. Decisions can be made on a case by case basis (Thomson & Schiffler, 2024).

Why are Adaptive Devices Important?

1. To support fun, quality experiences for all!

2. Broaden opportunities for facilitated program participation (Schrader 2023).

3. To get visitors deeper into the backcountry to experience wild nature and solitude (Blair 2023; Brown 2023).

4. Provide access in traditionally hard to reach areas like beaches and fishing ponds while limiting physical alterations to the site (Brown 2023; Facilities Manager with BOEC 2023). Adaptive devices do not require paved trails (Greenberg 2022).

> "Thanks to these devices, users can travel terrain they never could before, and they're pushing the National Park Service to rethink how people with disabilities fit into the wilderness." (Greenberg 2022)



Fig 5.10 Nuke Offroad Recumbent Handcycle rolling over rocky terrain. Courtesy of ReActive Adaptations.



Fig 5.11 Adaptive skiing. Courtesy of Jackson Hole.



Fig 5.12 Adaptive paddling. Courtesy of Teton Adaptive.

Opportunities and Limitations of Devices

Ensure that the terrain and infrastructure is **compatible** with the specifications of the adaptive devices. One-size-fits-all doesn't apply to adaptive devices; their performance varies based on the conditions of the environment and meeting specific spatial needs (Driskell and Wohlford 1993; Greenberg 2022).

1. Maximum height change (2"). A bridge slat that is a couple inches higher than the trail can end a hike for someone in a wheelchair but may work for someone using an adaptive mobility device.

2. The width of trails and bridges need to be wide enough for adaptive devices and groups to pass.

3. Boulders and potholes along trails may work for some devices like a handcycle but end a hike for an electric or human powered chair.

4. Steps built into a hill can end a hike if the rise and run of each step is incompatible with the adaptive device. Adaptive devices will specify the maximum rise, run, and slope that is required to function.

Test Adaptive Devices

1. Test any adaptive device on the trails and areas your facility may offer.

2. Invite and compensate people with disabilities to test the site with various adaptive devices (Schahfer and Robison, n.d.).

Reduce Financial Burden

Due to financial burden, having an adaptive devices may not feasible for individuals or natural areas.

1. Share resources between parks. Allow visitors to request adaptive devices in advance and move devices between participating parks to lessen the costs (Schrader 2023).

2. Partner with organizations like non-profits who own equipment (Lowe 2023; Facilities Manager with BOEC 2023; Schrader 2023).

3. Rent adaptive devices to visitors to lessen the cost for facilities.

Resources

Move United: Find information on adaptive equipment and connect with organizations focused on inclusion and access using a database. The database can be filtered by location and sport / activity type.

Resolving User Conflicts

Adaptive devices could conflict with existing uses. For example, a motorized device in a hunting area could disturb other hunters and wildlife (Schrader 2023) or harm the natural environment.

1. Communicate expectations and rules with all visitors.

2. If sound from a motor-powered device conflicts with the natural soundscape or is disturbing wildlife, consider human-powered devices versus motor-powered.

3. Consider the size, weight, dimensions, and speed of different devices to ensure it will not harm the natural areas and is safe for the user and all other visitors (Zeller 2015).

4. Discuss and decide in the facility's guiding documents what type of adaptive mobility devices are allowed (human powered, motor-powered, maximum speed, etc.), in what areas (all trails, specific trails, etc.), and with or without special use permits (Zeller 2015).

Eliminating Social Barriers

Signs stating 'Motorized Vehicles Prohibited' pose social barriers since visitors often interpret them as prohibiting use adaptive and motor-powered mobility devices. Land managers must communicate and proactively encourage the use of appropriate adaptive devices so all visitors know what is allowed (Zeller 2015).



"It would be nice at a certain point to be able to go out on trails and have people not think it's amazing because it's normal and not get mad that we're out there because they've seen it enough that it's normal. To have it be a non-event" (Greenberg 2022).

3b. Information Barriers

"The single greatest barrier to accessibility on public lands is a lack of information, especially for new trail users. The most effective way to improve access to Federal public lands is to provide clear objective information to the public on what exists." (Passo 2022)

Effective Communication with Visitors

Effective communication reduces information barriers and supports numerous visitor management objectives as well as universal access.

1. Communicate so visitors understand the level of permitted public use and any available amenities and universal access features on site. This can help visitors make informed decisions and respect the natural area (Schrader 2023).

2. Communicate so visitors can clearly understand etiquette and safety rules (Blair 2023; Lowe 2023).

3. Use wayfinding and other signage to reduce visitors getting lost or creating traffic jams (Lowe 2023).

Trail information

Common Barriers ✗

1. Lack of objective trail information at trailheads.

2. Lack of accessibility information online.

Objective, Standardized Trail Information

Providing information about trails on site and on the official park website is a key part of providing quality visitor experiences (Blair 2023; Lowe 2023). Trail rating systems that classify trails as easy, medium, or hard are ineffective since everyone's definition of easy and hard are different. If an easy to hard rating continues to be used, an objective set of criteria (trail surface material, slope, distance between key points) for each rating must be defined and communicated to all visitors.

A more inclusive approach is following the U.S. Access Board's standards for objective trail information. Objective information empowers visitors with a range of needs and abilities to decide if a trail or experience fits their own personal requirements (Passo 2022).

"In this way, without touching a shovel or a mini-excavator, trail accessibility can be improved by simply letting people know where they can go to get the experience they desire." (Passo 2022)

Trailhead Information Requirements

ABA Standards require in Chapter 10: Recreational Facilities 1017 Trails (pg. 249) that facilities designed, built, altered, or leased by federal funds must include the following trailhead information (Beneficial Designs 2023):

1. Length of the trail or trail segment
2. Surface type
3. Typical and minimum tread width
4. Typical and maximum running slope
5. Typical and maximum cross slope



beneficialdesigns.com

A trail is exempt from compliance if it hasn't been altered recently or is not created with federal funds. However, to improve universal access and meet future legal requirements, it is best practice to include this information regardless of the site's status (Beneficial Designs 2023; Greenberg 2022).

Trail Information Online

Objective trail information needs to be on the official natural areas' website so visitors can confidently plan their trip (Aguilar-Carrasco et al. 2023). More website accessibility information on page 162. In the text below, Quinn Brett explains the challenge of finding trail information online from the perspective of someone who hikes using adaptive devices.

"[Quinn Brett] takes me through the research she needs to do before a hike: combing the Internet for trail photos and tidbits that might hint at how wide it is, how steep, and whether there are significant boulders or trees she won't be able to get around. Do trail maps show bridges that might be too narrow for her handcycle? If the trail goes up a mountain, is it level enough that she won't tip?" (Greenberg 2022)

Tools to Measure Objective Trail Information

Trail Assessments like HETAP are useful tools!

Site assessments to measure slope, cross slope, and trail width can require a lot of staff and time. Tools like the High-Efficiency Trail Assessment Process (HETAP) by Beneficial Designs is an option for getting necessary trail data with less staff and time. HETAP allows a single person to capture accurate data at one mile per hour by pushing a cart with various sensors along the trail. The following will be collected and converted by Beneficial Designs into summary trail reports for land managers and visitors:

1. Distance
2. Grade
3. Cross Slope

Signage Text, Font, and Language

Common Barriers

1. Certain color combinations are more challenging for people with low-vision, blind, or colorblindness. This can make content illegible.

2. Low contrast between background colors and text colors can be illegible.

3. Lots of text and few icons or images can pose a challenge for visitors who don't speak the language or visitors with a range of cognitive abilities.

4. Content is not in the visitor's language.

Recommendations

1. Strive to communicate information in a universal way where anyone regardless of ability, trail experience, or language can understand the trailhead signage, wayfinding, safety information, and interpretation (Lowe 2023).

2. Have empathy for potential visitors. Become knowledgeable about the various types of visual impairments including low-vision, blind, and colorblind. Understand how colors and font size impact legibility of your signage (Venngage 2024).

3. Use colors with high contrast and avoid color combinations that are challenging with various types of colorblindness. Many people can't distinguish between red and green. Bright colors are more legible than pastels for people with low-vision (Venngage 2024).

4. Provide information in multiple formats such as tactile, audio, and other sensory features (Landscape Architect One 2023).

5. Use less text, more icons, and images that can stand alone since some will only look at the graphics or cannot read English (Knutson et al. 2021).

6. Consider what languages should be included (Blair 2023; Lowe 2023). Think of current visitors And other groups who may currently feel excluded by the delivery of information.

Alternative Information Formats

1. Provide tactile elements at trailheads and exhibits so visitors who are blind and low vision can feel the distance of a trail and other information. Examples include braille, relief maps, models, and raised images. Tactile elements should be above waist height unless the audience are children (Landscape Architect One 2023; Harpers Ferry Center 2019).

2. Offer audio descriptions at waysides and exhibits so people can choose how to engage with information. The device or exhibit should not require visual cues or input like a numbering system (Harpers Ferry Center 2019).

3. Add captions to all video exhibits and offer listening devices (Brown 2023; Landscape Architect One 2023). The captions should always be on, not just by request (Harpers Ferry Center 2019).

4. Consider using QR Codes to provide additional ways to interact with information through video, audio, text, or language options. Ensure WIFI signal is strong throughout site (Blair 2023; Haukos 2023; Lowe 2023).

Example of a Tactile Wayfinding Map

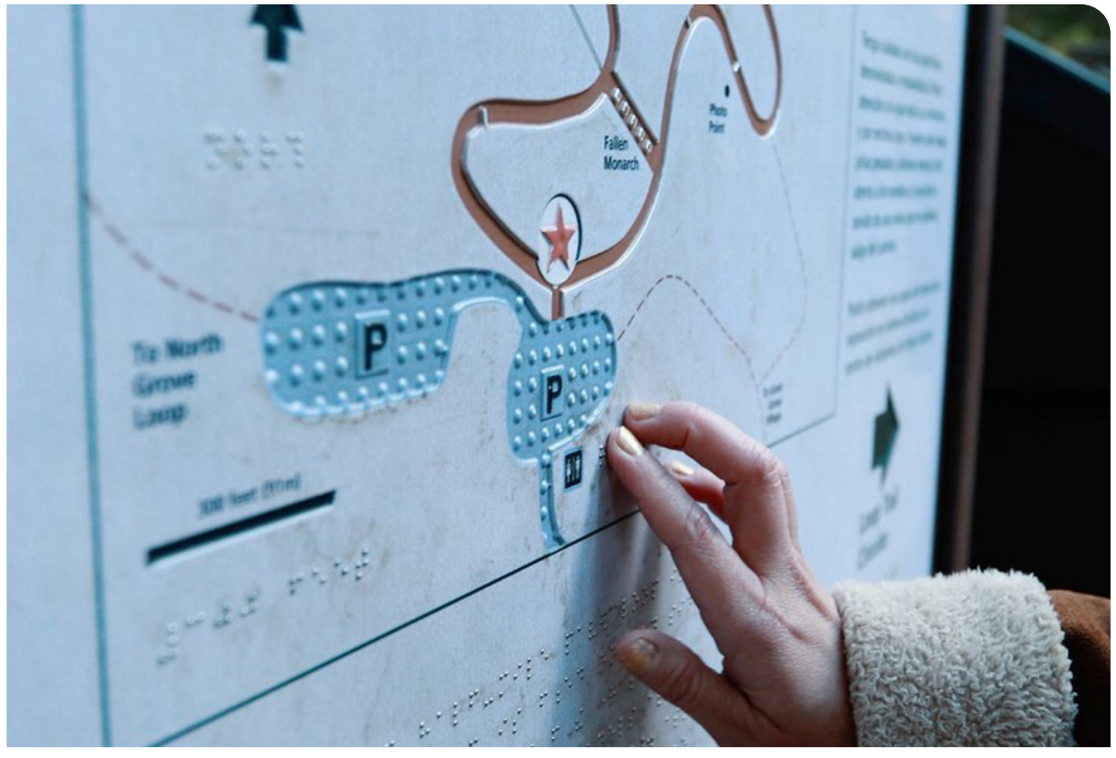


Fig 5.13 Tactile outdoor wayfinding map along Grant Tree Trail in Kings Canyon National Park. Photo by Brian Petersen. Courtesy of the National Park Service.

Resources

1. Harpers Ferry Center: *Programmatic Accessibility Guidelines for National Park Service Interpretive Media* (Version 2.4; October 2019).

- The section on *Park Signage* provides standards for typeface; type size; letter, line, and word spacing; line length; color and contrast; and content and layout.

2. Web Content Accessibility Guidelines (WCAG 2.2; October 2023).

- WCAG 2.2 provides accessibility standards for websites and web content.

3. Color Contrast Checkers ensures text and background color have enough contrast to be legible at various font sizes.

- Venngage (Free): Learn about color contrast accessibility. Use to create accessible color palettes.
- Adobe Color (Pay to use): Use to check contrast for small font, large font, and graphics / icons. Tests palettes with WCAG standards.

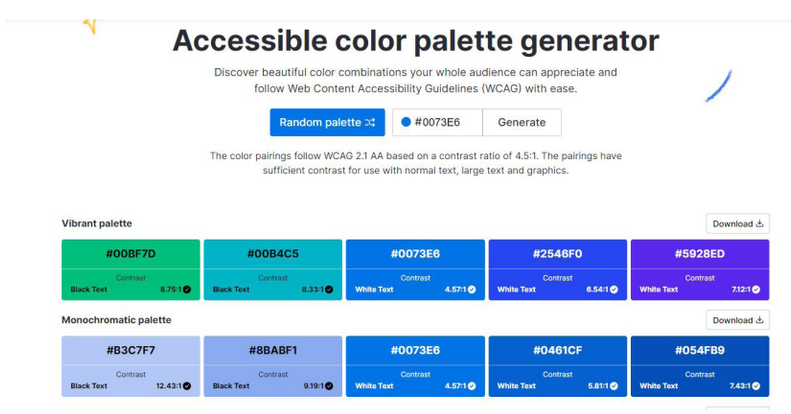


Fig 5.14 Venngage Color Contrast Checker.

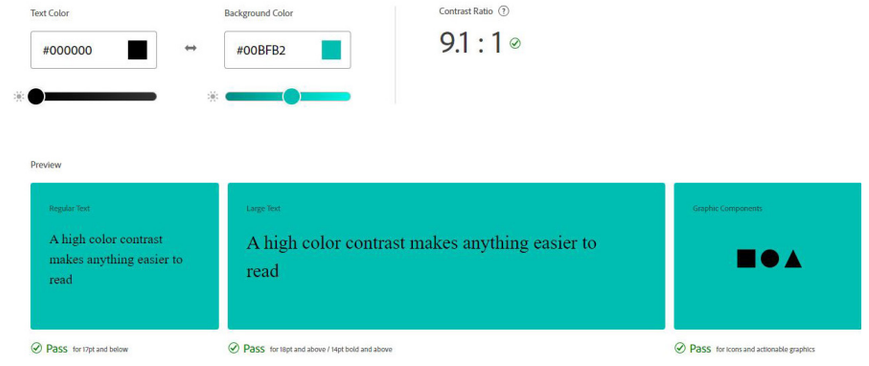


Fig 5.15 Adobe Color Contrast Checker.

Visual Guide to Accessible Signage

Signage Content Formula (Knutson et al. 2021)

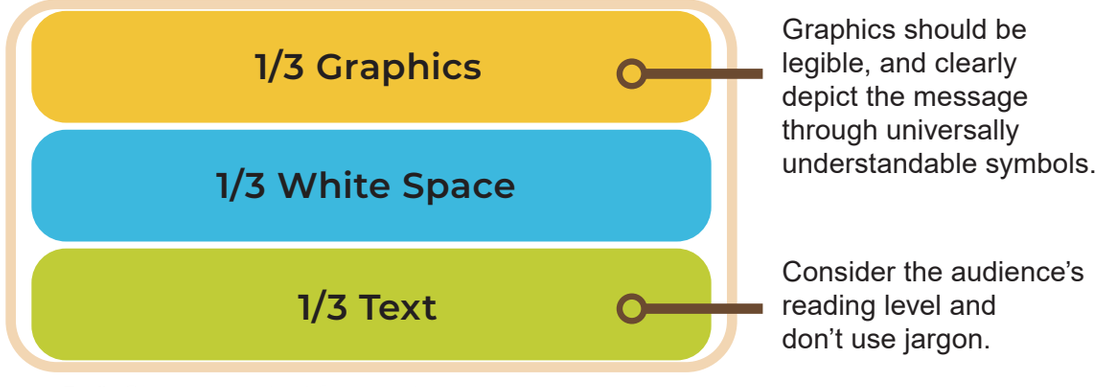


Fig 5.16 Signage content formula to improve universal access.

Accessible san-serif fonts (Harpers Ferry Center 2019)

Arial	Optima	Frutiger	Tahoma
Futura	Treburchet	Helvetica	Univers

Type Size by Viewing Distance for Exhibits

Viewing Distance	Height (Inches)	Size (Point)
< 1 Meter	3/16 inch	24
1 Meter | 39 Inches	3/8 inch	48
2 Meter | 78 Inches	3/4 inch	100

Fig 5.17 Type size by viewing distance guide for exhibits.

Typical exhibit font size is 24 but this can be challenging for people with low vision. Sizing is intended for informational exhibits in Helvetica font. Example is using Nimbus sans, a similar font (Harpers Ferry Center 2019).

Website Accessibility

Before visiting a natural area, people with disabilities require information on accessibility features and barriers. The official park website is the most used tool to find this information (Aguilar-Carrasco et al. 2023).

It is essential for natural parks to have up-to-date and accurate information on accessibility on their official website so all visitors, including those with disabilities, know what activities they can participate in (Aguilar-Carrasco et al. 2023).

Section 508

Complying to Section 508 can ensure that official park websites are usable by all. Under the 1973 Rehabilitation Act, federal agencies are required to make their information and communications technology (ICT) accessible to people with disabilities. Non-federal agencies should also adopt Section 508.

Technology Covered:

1. Software and websites
2. Electronic documents (PDFs)
3. Multimedia content
4. Phones and call centers

Considers:

1. Physical disabilities
2. Auditory disabilities
3. Visual disabilities
4. Cognitive disabilities

The ADA and Section 508 reference Web Content Accessibility Guidelines (WCAG) technical standards. WCAG 2.2 is the most updated version as of 2024 with three levels of testable accessibility criteria: A (minimum accessibility), AA, AAA (maximum accessibility). Section 508 requires compliance with level AA (Level access 2023).

3c. Program Barriers

"With any type of disability, it's always about having options and variety. When providing alternate formats for programs — depending on the limitation that somebody may have in their life, they can still participate and feel like it's not an all or nothing." (Vaughn 2023)

Considerations for Facilitated Programs

1. Tours, educational programs, and other facilitated programs should be held in the most accessible areas (fewest barriers). This will allow a wider range of visitors to participate (Schrader 2023).

2. Communicate to visitors the amenities and accommodations available to visitors for facilitated programs (Schrader 2023).

3. Tours covering a long distance can offer accessible buses or vans. This can allow visitors to participate with mobility and health challenges or visitors who prefer to ride instead of walk (Brown 2023; Haukos 2023).

Alternative Media Formats

1. Make programs multi-sensory so visitors can engage and participate in a variety of ways (Groulx et al. 2021).

2. Typically, ranger programs held outside don't provide printed materials. Provide printed materials in a variety of formats including large print and braille (Harpers Ferry Center 2019; Landscape Architect One 2023).

3. A ranger or other staff member should be trained in sign language. Although writing out a program is helpful, this requires reading which may be slower to ask and answer questions than sign language (Land Manager One 2023).

4. If a facilitated tour cannot be held in an accessible area, then video media like a GoPro can be used as a temporary solution until a fully accessible solution can be implemented (Brown 2023). Ensure closed captions are on.

Vehicular Transportation

Providing bus or van transportation for tours and education programs can vastly increase participation for a range of visitors.

Who Benefits (Brown 2023)**:**

1. Visitors who can't or don't want to walk due to health, disability, or preference.

2. Visitors with mobility or adaptive devices like wheelchairs.

3. Families with children and/or strollers.

4. Visitors with limited time to experience the entire site.

Considerations:

1. Vehicles can disturb wildlife. If this is an issue, considering using smaller, quieter vehicles and limiting the number of vehicular tours or programs per day (Brown 2023; Schrader 2023).

2. Stay near the bus if a bus tour has stops so nobody is left behind. All visitors should have an equal opportunity to experience the stop and talk to the ranger or guide (Brown 2023).



Fig 5.18 A bus tour at the Tallgrass Prairie National Preserve. Courtesy of Heather Brown.

3d. Overarching Considerations

Lack of Opportunity & Options

A lack of options is a barrier since it limits the extent of participation and ability to choose one's recreational experiences.

Not many parks and natural areas offer adaptive equipment or adaptive programming like kayaking, cycling, and skiing. The few parks and organizations that do are often overwhelmed because of the high demand for adaptive activities. Adaptive equipment is also expensive and can be a barrier for both individuals and parks to purchase (Facilities Manager with BOEC 2023).

Parks and organizations should strive to support and include people with disabilities in recreation activities. Assistance and funding for parks and organizations can often be found through partnerships and grants.

Breckenridge Outdoor Education Center (BOEC)

Teton Adaptive

Social Barriers

Social barriers are often overlooked but can be the reason a person decides to not visit a site. These barriers send the message that certain people are not welcome. Social barriers include (Schahfer and Robison, n.d.):

1. Only able-bodied people featured in marketing for the park and programming.
2. Cost of equipment.
3. Harassment from other visitors (especially when using mobility devices).
4. Historical exclusion on public lands.

Lack of Autonomy

Unclear or incomplete information on the accessibility of the park infrastructure and programming is another form of social barriers (Schahfer and Robison, n.d.). Providing accessibility information in a variety of formats on the official park website and in person will help minimize unexpected issues, reduce barriers, and allow disabled people to plan their visit to a natural area (Bandukda et al. 2020; Voight et al. 2008).

Incomplete Accessibility

Universal access must be viewed as a series of interconnected experiences, where each step needs to be accessible. Failure to ensure accessibility at any point may unintentionally exclude visitors with disabilities (Brown 2023; Groulx et al. 2021). To illustrate, an accessible bathroom with a trash can blocking part of the entrance or approach is no longer accessible.



Fig 5.19 Educational program for students. Courtesy of Jill Haukos.

Section 4

DECISION MAKING

Section Four outlines several considerations and steps that help guide the universal design and visitor use decision making process.

The section brings together the principles throughout the Guidebook into an integrated design and planning process. This process will help land managers understand how visitor use planning and universal access can be considered together to achieve and maintain sustainable and inclusive visitor experiences.

“We shouldn’t be doing any projects on accessibility without including disabled stakeholders in the process.” (Vaughn 2023)

Fig 5.20 Autumn on the prairie. Courtesy of Jill Haukos.

Section Four: Contents

4A. Design and Planning Process

4B. Resource Protection Planning

4C. Accessibility Assessment

4D. Considerations for Universally Accessible Trails

4E. Inclusive Engagement



Fig 5.21 Bullfrog in the water. Courtesy of Eva Horne.

4a. Design and Planning Process

Dilemma

Existing visitor management standards and guidelines overlook universal access considerations. Therefore, land managers do not have the guidance and support to make visitor access and management decisions with a universal access lens. To address this resource gap, the author analyzed existing visitor use management and universal design guidelines to identify how these seemingly separate processes can be integrated.

Referenced guidelines

Visitor use management

1. **Tourism and Visitor Management in Protected Areas: Guidelines for Sustainability** (Leung et al. 2018)

2. **Visitor Use Management Framework A Guide to Providing Sustainable Outdoor Recreation** (Interagency Visitor Use Management Council 2016)

3. **Management Planning for Nature Conservation** (Alexander 2007)

4. **Trails Guidelines and Best Practices Manual** (MA Department of Conservation and Recreation 2014)

5. **Environmentally Sustainable Trail Management** (Marion and Leung 2004)

Universal design and accessibility

1. **Professional Practice: Universal Design** (Dillon and Jared Green 2019)

2. **Principles of Accessibility Design for Landscape Architecture** (Braley et al. 2023)

3. **Outdoor Developed Areas: Accessibility Guidelines** (United States Access Board 2014)

4. **Trails for All People: Guidance for Accessibility** (Knutson et al. 2021)

5. **Universal Access to Outdoor Recreation: A Design Guide** (Driskell and Wohlford 1993)

Putting it into practice

This guidebook offers strategies and considerations to provide a more equitable and inclusive visitor experience. This proposed framework demonstrates how key principles from universal design and visitor management planning can be integrated into one planning and design framework. The goal is for land managers to integrate this resource into their existing processes to make informed, inclusive, and sustainable visitor use decisions.

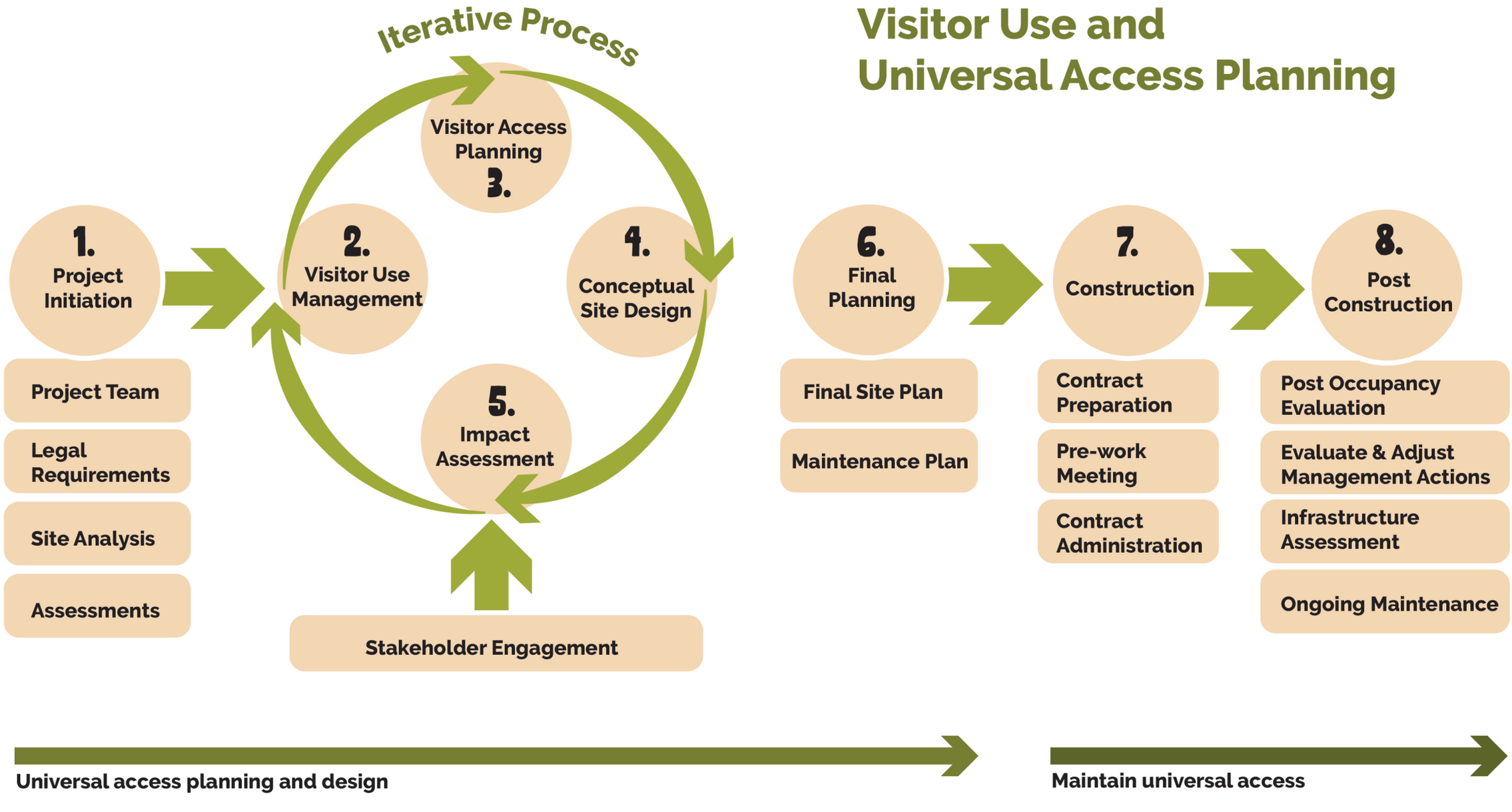


Fig 5.22 Integrated Design and Planning Process Flowchart

Phase 1: Project Initiation

The project initiation phase builds the necessary foundation to make informed visitor use and universal access decisions.

Step 1. Assemble the Project Team

Identify an interdisciplinary team that represents a range of expertise, priorities, and abilities. This team can include the land manager, landscape architects, engineers, accessibility specialists, other resource specialists (Driskell and Wohlford 1993).

Step 2. Understand the Legal Requirements

Legal requirements are often the foundation of visitor use management and universal access planning. Review all applicable legislation, agency policies, and other management direction (Alexander 2007; Interagency Visitor Use Management Council 2016). Understand the legal requirements of the ADA & ABA and determine their applicability to your project site. Even if not legally mandated, consider adopting these standards as best practices. Further, the design team should strive to exceed the minimum ADA and ABA requirements to enhance universal access (Braley et al., 2023; Knutson et al., 2021).

Step 3. Conduct Site Inventory & Analysis

The site inventory is an objective study of factors that may impact planning and design decisions. Note any factors that may have positive or negative impact on the site's features. Also, identify and confirm any site conditions and significant wildlife, natural, and cultural features (Alexander 2007).

The analysis is a process of identifying constraints and opportunities. For universal access planning, analysis guides the selection and placement of required modifications. (Driskell and Wohlford 1993). For visitor use management, prioritize the importance of identified features. These steps help ensure that visitors' needs are balanced with any environmental concerns (Alexander 2007; Interagency Visitor Use Management Council 2016).

Step 4. Conduct Assessments

Assessments help identify constraints and opportunities. **Trail System & Accessibility Assessment: 1)** Identify trails suitable for visitor use based on trail locations, construction methods, and maintenance (Marion and Leung 2004); **2)** Identify trail segments that are unsafe or too degraded. Decide if these segments should be removed or repaired; **3)** Identify barriers to universal access and opportunities for universal design improvements.

Phase 2: Visitor Use Management

The visitor use management phase recognizes the relationship between the site's features and the potential visitors to the site.

This phase must be completed before phases 3–5. However, as those phases are completed, the planning and design team should frequently revisit the Visitor Use Management Phase to ensure everything is harmonious. Continue to readjust phases 2–5 as needed before moving on to Phase 6 (Final Site Planning).

Step 1. Establish the Vision for the Project

Describe the desired conditions for the project area. Ask what level of environmental impact (due to visitors) is acceptable given the mission and objectives of the protected area. This is sometimes called the 'carrying capacity' (Leung et al. 2018). Once the desired conditions and level of acceptable impact is established, write specific and actionable objectives for the site's natural and cultural features.

Define what visitor activities are appropriate given the carrying capacity and objectives (Alexander 2007). Ensure visitor opportunities are equitable. If decisions or strategies to protect cultural or natural resources restrict only certain visitors then that is a problem. When balancing resource protection and visitor use, strategies need to be implemented with an equitable lens and not restricting access for one person over another (Landscape Architect One). Consider involving the the design team at this stage if alterations to the site is necessary. This can help ensure the team understands the conservation needs.

Step 2. Develop the Management Plan

1) Compare and document the differences between existing and desired conditions and to what extent visitor use is impacting the site. **2)** Identify visitor use management strategies to achieve the desired conditions. **3)** Define performance indicators that will be monitored. Monitoring provides evidence that the desired conditions and outcomes are being met by the proposed management plan (Alexander 2007; Interagency Visitor Use Management Council 2016; Leung et al. 2018).

Step 3. Create the Action Plan

The action plan is the culmination of the previous steps. The plan outlines the required tasks to achieve the level and type of visitor use and the identified objectives concerning the natural, geological, and cultural features (Alexander 2007).

Phase 3: Visitor Access Planning

The Visitor Access Planning Phase focuses on providing high-quality visitor experiences and planning the essential visitor infrastructure required to facilitate the desired visitor activities. Consider including the project design team (landscape architects, architects, engineers) for guidance and so Phase 4 closely aligns to the site staff's visitor use vision.

Step 1. Define Visitor Provisions

Continue to define the appropriate visitor activities identified in Phase 2. Also consider the type of facilities and services necessary to facilitate these activities. Ask questions such as: What kind and scale of infrastructure is appropriate and where should it be located (e.g. lodging)? What visitor experience opportunities does management seek to facilitate and which are inappropriate for the site? (Interagency Visitor Use Management Council 2016; Leung et al. 2018).

Step 2. Plan Quality Experiences

The quality of visitor experiences is an essential but overlooked aspect of visitor use planning. The design team should not only identify the type of activities but also the level of risk, sensory experience, wayfinding, educational signage, etc. Strive to create a sense of place and a sequence of engaging experiences that provide interest and opportunities for challenge when appropriate (MA Department of Conservation and Recreation 2014).

When planning to alter or construct a trail, staff should ask: Will visitors with a range of abilities and needs have an equal opportunity to experience this trail or amenity? This will help identify where visitor infrastructure supporting accessibility is appropriate or needed (MA Department of Conservation and Recreation 2014).

Phase 4: Conceptual Site Design

The Conceptual Site Design phase is an iterative process develops a physical site design based on the previous planning phases. As specific situations arise, the project team will have to balance technical requirements and value judgments to balance conservation objectives and visitor use. Land managers must be in close conversation with the design team to ensure they respect the parameters and intention of the site and visitor use.

Step 1. Apply Technical Requirements

Understand and apply the technical requirements set by the applicable standards (ADA & ABA). Reference the "Outdoor Developed Areas" and "Trails for All People" Guidelines for a comprehensive review of these standards. This step ensures the foundations of universally accessible infrastructure are integrated in the earliest design phases instead of tacked on to the end (Driskell and Wohlford 1993).

Step 2. Apply a Universal Design Lens

Many accessibility standards focus on addressing physical barriers for people with mobility challenges, especially those who use a wheelchair. The project team should strive to think more broadly on how design standards and best practices can be adapted to support a broader spectrum of needs. For example, a resting space is usually sized for person using a wheelchair but should be made large enough for multiple people to face each other and sign.

Step 3. Apply Value Judgments

Visitor use management and the provision of universal access depends on the objectives of the protected area and any values the project team draws on to make planning and design decisions. Adhering to accessibility standards is essential for many visitors to participate in natural areas. However, a blind adherence to technical requirements can lead to negative impacts to the environment and the visitor experience (Braley et al. 2023).

Value judgments help determine when and where to provide universal access and/or protect certain natural or cultural features. Values can include protecting certain wildlife species and providing equitable visitor experience. Use best judgments and creative problem solving on a case by case basis to ensure both site objectives and values are balanced (Leung et al. 2018).

Phase 5: Impact Assessment

The Impact Assessment phase aims to mitigate possible negative impact of conceptual site design. Continue to revisit and adjust Phases 2-5 until objectives are met satisfactorily. Then move on to Phase 6 (Final Site Design).

Step 1. Conduct Impact Assessments

The management team should conduct an environmental impact assessment to analyze and mitigate likely [negative] impacts that the proposed site design(s) may cause. All development proposals should be assessed for impacts to the biophysical conditions, flora, and fauna and social and cultural features (Leung et al. 2018).

Step 2. Resolve Conflicts

Identify and resolve situations where implementing universal design may significantly alter the character of the site. Refer to the **'Conditions for Exceptions'** which recognize that constraints and limitations in the outdoor environment may make compliance with technical requirements inappropriate. These conditions are explained by the Outdoor Developed Areas" (U.S. Access Board) and "Trails for All People" (Knutson et al. 2021).

Stakeholder Engagement

Stakeholder engagement can happen anytime during Phases 2-5. Learn more about conducting stakeholder engagement in the "Trails for All People" (Knutson et al. 2021) and "Tourism and Visitor Management in Protected Areas" (Leung et al. 2018).

Inclusive Engagement

Inclusive engagement, also known as 'Participatory design', focuses on learning from people with a range of perspectives and experiences and being open to hearing and integrating challenging and alternative ideas (Knutson et al. 2021).

Identify entities who are involved in site's management and those who will be affected by the management decisions. Avoid alienating stakeholders by making the process truly accessible and safe. Finally, strive to co-design with people with disabilities (Dillon and Jared Green 2019; Knutson et al. 2021; Leung et al. 2018).

Phase 6: Final Site Plan

The Final Site Plan phase finalizes the design decisions and should include a detailed maintenance plan. Proper maintenance is essential to the physical and ecological sustainability of the site and infrastructure.

Step 1. Develop the Final Site Plan

Finalize the conceptual designs into a final site plan. This includes specifying the materials, surfaces, design details and cost estimate. The construction documents must clearly depict the level of work and detail required by the contractor to ensure the aspects of universal design are not lost during construction. Require the contractor to submit an "as-built" drawing prior to closing the contract (Driskell and Wohlford 1993).

Step 2. Develop a Maintenance Plan

Create a maintenance plan to maintain continued positive user experience after a trail is built. The staff who will execute the maintenance actions should be deeply involved with the maintenance planning. "Ad hoc maintenance decisions and actions can unintentionally and swiftly damage design elements of the trail intended to optimize accessibility and enjoyment of the trail" (Knutson et al. 2021).

This plan should address maintenance issues and contain information about the original tread materials, grades, structures, natural features, and constructed amenities so management actions do not unintentionally alter the original design parameters (Knutson et al. 2021). The design team can contribute to the maintenance plan since they know the intended design best.

Phase 7: Construction

The Construction Phase focuses on ensuring the building developers and contractors have sufficient knowledge of ecological and universal design concepts to carry out work with sensitivity to the goals and values of the project.

Step 1. Contract Preparation

The contract should outline the type of experience expected from the contractors and the expectations for the work. This is an important step to ensuring the construction team has experience working in natural areas and meeting accessibility requirements (Facilities Manager with BOEC 2023).

Step 2. Conduct Pre-work Meetings

After awarding the contract, conduct a pre-work meeting to discuss the project's "purpose, objectives, and desired outcomes" concerning universal design (Driskell and Wohlford 1993). Also, provide building developers and contractors with knowledge of natural processes and ecosystems to avoid potential ecosystem degradation during construction (Leung et al. 2018).

Step 3. Contract Administration

Select the contract administration team who will ensure the contract is being met throughout construction, especially related to universal design aspects. Ideally the administration is the same as the design team and/or administrators who have experience and sensitivity for recreation construction (Driskell and Wohlford 1993).

Phase 8: Post Construction

The Post Construction Phase ensures that the planning and design intent is upheld over time. This requires ongoing monitoring, evaluation, and maintenance.

Step 1. Conduct a Post Occupancy Evaluation

Review and critique what does and doesn't work and what the project team would change. Consider whether universal design strategies are successfully integrated into the site. This assessment aims to minimize the recurrence of similar problems in the future and identify aspects that can be corrected through proper maintenance (Driskell and Wohlford 1993).

Step 2. Evaluate and Adjust Management Actions

Continue to monitor the site and features to evaluate the effectiveness of management actions in achieving the desired conditions for the site's natural and cultural features. Document the findings. Adjust management actions if needed and document rationale (Interagency Visitor Use Management Council 2016; Marion and Leung 2004).

Step 3. Conduct Infrastructure Assessments

Regularly schedule in-person inventory and observation assessments of trail features including slope, cross slope, width, surface, and obstacles. This will provide objective and reliable data to create work tasks for maintenance and management (Knutson et al. 2021).

Step 4. Conduct Ongoing Maintenance

Proper maintenance is critical for supporting high quality visitor experiences (Marion and Leung 2004). Improperly maintained trails can create barriers. Ensure the maintenance staff understand the the universal design features so they can uphold the design intent and avoid creating new obstacles (Driskell and Wohlford 1993). Routine tasks such as clearing branches or fixing degraded trails helps maintain accessibility levels (Knutson et al. 2021; Marion and Leung 2004).

Sections 4b. – 4f. Overview

The following sections provide further guidance for some of the key steps outlined in the integrated planning an design framework.

4b. Resource Protection Planning

4c. Accessibility Assessment

4d. Site Limitations

4e. Considerations for Universally Accessible Trails

4f. Inclusive Engagement

4b. Resource Protection Planning

Resource planning should inform visitor access decisions, including universal access, can be made. Conduct studies to identify where the most important resources are such as sensitive wildlife corridors and habitat (Alexander 2007; Lowe 2023).

1. These are areas to prioritize for conservation. Avoid locating trails and universal access amenities (Lowe 2023; Schrader 2023; Land Manger One 2023).

2. Universal access and visitor use planning both emphasize safety. Do not provide universal access in unsafe areas like near a bison herd (Brown 2023).

3. Create spatial restrictions to avoid conflicts with other area functions such as monitoring and research. Do not provide universal access there (Blair 2023).



Management Planning
for Nature Conservation

Common frameworks like the Recreation Opportunities Spectrum and Limits of Acceptable Change are tools that help determine the allowable relationship and use between visitors and natural areas (Alexander 2007).

4c. Accessibility Assessments

Purpose

Accessibility assessments are important to **increase staff awareness of barriers and actionable strategies t**o address them. Accessibility experts should analyze the natural area's buildings, site, and programming for barriers and make recommendations to improve universal access.

1. Services

Site Assessment

Program Assessment

Policies Practices and Procedures Assessment

2. Product

Transition Plan

Implementation Plan

Financial Planning

Services for Conducting Accessibility Audits

1. **Accessibility Self-Evaluation Transition Plan (SETP)** | Denver Service Center National Park Service (NPS)

A team of National Park Service landscape architects and natural area staff collaborate to create the SETP's that evaluate sites and make recommendations related to staff, physical and information barriers, and programming (Landscape Architect One 2023).

2. **Accessibility Assessments** | National Center on Accessibility (NCA)

The NCA conducts assessments for the site and facility; program accessibility; and policies, practices, and procedures evaluations and provides technical assistance for design development and public meeting facilitation. The NCA works with national parks, state parks, and non-profit organizations (National Center on Accessibility, n.d.).

3. **Disability Equity and Inclusion Consulting** | Empowering Access

Empowering Access is an Oregon-based consultant with varying backgrounds and lived experience. They conduct site and program assessments, strategic planning, workshops, and toolkits. They also provide recommendations and implementation plans outlining strategies and financial and programmatic considerations (Empowering Access n.d.).

Recommendation: Search for regional and local organizations with a similar mission and services near your natural area.

SETP Examples: Search "SETP" in keyword search

NCA Accessibility Assessments NCA Examples: Portfolio

Empowering Access Services

4d. Site Limitations

Accessibility Versus Usability

Context: "No park could ever make all of its trails legally wheelchair accessible. Some routes are hemmed in by cliffs and can't be widened; some are studded with huge boulders that can't be moved" (Greenberg 2022). The planning and design of trails should "maximize accessibility while recognizing and protecting the unique characteristics of the natural setting of each trail" (Knutson et al. 2021).

> "We may not be able to get a trail to 100% of the legal definition, but what if we could do it to 90%?" (Greenberg 2022)

Accessibility: A legal requirement defining the technical specifications of infrastructure outlined by the Americans with Disabilities Act and Architectural Barriers Act standards.

Usability: A design lens that focuses on making trails usable rather than accessible in situations where a trail cannot fully meet legal requirements (Greenberg 2022).

Where appropriate, apply quick fixes for usability (Greenberg 2022)**:**

- Minimize obstacles that create narrow spots on the trail.
- Mound up earth around obstacles to make them easier to roll over.
- Construct cross slopes for water to runs off the trail without being so steep that it wheeled mobility devices will tipping. Where cross slope is too steep use "bumper rocks" along the trail to keep a mobility device from tipping or slipping off a trail.
- Round off steps rather than squared and construct pad lengths that help prevent mobility devices like handcycles from getting stuck climbing up.

Conditions for Exception

The U.S. Access Board recognizes that providing full trail accessibility may be not practical or accomplished under four different conditions:

1. Compliance is not practicable due to terrain.

2. Compliance cannot be accomplished with prevailing construction practices.

3. Compliance would fundamentally alter the function or purpose of the facility or setting.

4. Compliance is limited or precluded by other laws.

These conditions are used to screen a trail for the level of accessibility that can be provided given the site-specific context. The project team must c**onsider all design options before applying a condition for exception.** The conditions only applies to the specific trail segment it impacts, not the entire trail (U.S. Access Board; Knutson et al. 2021).

U.S. Access Board Outdoor Developed Areas

Trails for All People pg. 56

4e. Considerations for Universally Accessible Trails

Creating and maintaining an accessible trail experience for all people requires park staff and project teams to ask questions from many perspectives. For example, a person with mobility limitations versus vision limitations will have different requirements for the park's arrival point. Section 4e. provides key considerations specific to different user groups.

Ecological, Economic, and Social Considerations

1. **Ecological:** What, if any, level of impact is acceptable to make the trail experience available to more people? Will improving accessibility alter the landforms, natural resources, and ecosystems beyond acceptable conditions? What are the trade-offs? (Knutson et al. 2021)

2. **Economic:** How much additional energy and money would it take to construct and maintain a universally accessible trail? Does you have the capacity for the additional expense? How can existing or new financial resources be leveraged to improve accessibility? (Knutson et al. 2021).

3. **Social:** Who are the various trail users? Will certain design decisions benefit some users while creating barriers for others? Can the visitor experience or safety be improved? (Knutson et al. 2021; Facilities Manager with BOEC 2023).

Mobility Related Considerations

1. **Arrival Point:** Is there a strong sense of place with great views from the accessible parking spaces? Are there engaging experiences near the parking lot? Are current drop off points well placed to improve access? Are new drop-off points needed? (Stoneham and Thoday 1996).

2. **Tread Material:** Do the trail materials fit with the context (near visitor center versus backcountry) while creating a firm and stable surface? To test, see if various types of wheelchairs or a stroller with narrow plastic wheels can be easily pushed across the surface without creating ruts (Driskell and Wohlford 1993; Knutson et al. 2021).

3. **Trail Amenities:** Are there cutbacks and loops for shorter hiking options? Are there enough rest areas and passing areas appropriately located to alleviate mobility challenges and improve human comfort? (United States Access Board 2014).

Vision Related Considerations

1. **Arrival Point:** Can the entrances and exists be found without relying on visual signage? Consider that a large open space and multiple entrances can become barriers to locating the park entrance (Bandukda et al. 2020).

2. **Navigation:** Are paths structured to prevent veering? How can bright colors and material change be used to indicate points of interest such as an educational wayside or trail intersections? (Bandukda et al. 2020).

3. **Tactile Elements:** How can maps and waysides with raised lines, relief images, and braille be incorporated to improve wayfinding? Can the maps be made portable and integrate audio information (Bandukda et al. 2020; Landscape Architect One 2023)?

4. **Obstacle Avoidance:** Are paths designed and maintained to minimize obstacles? Can paths be to avoid overhead obstacles since cane detection is challenging? (Knutson et al. 2021; United States Access Board 2014).

Hearing Related Considerations

1. **Spatial Needs:** Do trails, rest areas, and gathering spaces have enough space to sign and feel comfortable? Do these spaces have forward-facing views of trail and public activity with a solid element behind like walls or trees to create sense of security? (Vaughn n.d.).

2. **Visual Conversation:** Are trails wide enough with adequate lighting and areas to stop and talk? Are there places where ramps can be installed in place of steps and/or trails can be better maintained to minimize tripping hazards while signing. Are there conveniently placed surfaces to set things down to sign? (Vaughn n.d.).

3. **Visual and Tactile Cues:** How can visual cues be incorporated to improve navigation and safety along trails? Consider spacing of elements, textured transitions, color, topography, and landmarks to help with orientation, provide contrast for signing, and limit hazards when walking (Vaughn n.d.).

4. **Adaptable Environment:** Can seating be moved to allow people to join in signed conversation? (Vaughn n.d.). If tables are moveable, such as at a campsite, ensure staff that checks people in asks if they need help moving (National Center on Accessibility 2021).

Is one Accessible Hiking Trail Enough?

Although it may fulfill ADA or ABA requirements, providing limited or no options creates a significantly limited experience for visitors. A principle of universal access is going beyond legal minimums to make all infrastructure and amenities as inclusive as possible.

> “Having one accessible trail or one trail designated accessible isn’t usually a good idea. Folks want to have options and accessibility means different things to different people.” (Vaughn 2023)

One accessible hiking trail

1. No options.

2. Doesn’t get visitors to the Aha! moment, the reason why people come.

3. Likely to be hyper focused on physical accessibility.

4. **Focus on legal requirements** but misses opportunities to make inclusive or equitable experiences.

Universally accessible trail system

1. Options for types of experience and challenge level.

2. Equal opportunity to have the same Aha! moment.

3. Able to accommodate a spectrum of user needs and interests.

4. Meets legal requirements while **focusing on making inclusive and equitable experiences.**

4f. Inclusive Engagement

- ✓ Engagement is integral to making visitor use and universal access decisions, whether it is mandated by law, internal policies, or not typically sought.
- ✓ Engagement is meant to be a tool for two-way communication and feedback throughout the entire planning and design process.
- ✗ Community engagement is often used as a one time, check the box activity. Actually integrating stakeholder feedback does not happen often, especially with disabled stakeholder groups.
- ✗ Tokenism is often used as a crutch instead of truly engaging disabled stakeholders. Tokenism singles out visitors to answer questions and represent all disabled people’s needs (Schahfer and Robison, n.d.).

Recommendations:

1. **Inclusive Engagement:** Identify those historically excluded from planning and why (Blair 2023). Build relationships with these groups instead of only focusing on those already engaged and supportive of the project (Knutson et al. 2021).

2. **Disabled Stakeholders:** Invite and compensate people with various disabilities to test the site and participate in disabled stakeholder meetings and focus groups (Vaughn 2023; Brown 2023). Do not assume universal access is being achieved without asking disabled folks for feedback (Vaughn 2023).

3. **Engagement Format:** Provide multiple options to participate in community engagement via Zoom and phone calls, online surveys, and in person. Alway use closed captioning for Zoom meetings, regardless if it is requested or not. In person meetings should be in accessible locations with materials provided in alternate formats (Vaughn 2023).

4. **Transparency:** Be open to challenging perspectives and communicate to the stakeholders how those perspectives are being addressed. It is important to ensure visitors feel heard and taken care of (Knutson et al. 2021; Vaughn 2023).

Section 5

RESOURCES + REFERENCES

Fig 5.23 Stream on the prairie. Courtesy of Eva Horne.

Resources

Universal Access Guidelines

USDA Accessibility Guidebook for Outdoor Recreation and Trails
Overview of variety of topics
https://www.fs.usda.gov/sites/default/files/Accessibility-Guide-Book.pdf

WeConservePA: Trails for All People: Guidance for Accessibility and Inclusive Design
Overview of variety of topics
https://library.weconservepa.org/library_items/1345-Trails-for-All-People-Guidance-for-Accessibility-and-Inclusive-Design

Open To All: A disability inclusion guide for land trusts
Case studies & Where to Get Started Checklist
https://s3.amazonaws.com/landtrustalliance.org/Open%20to%20All_DisabilityInclusion%20guide.LTA-NCHPAD.12-21.pdf

Empowering Access: Accessibility Toolkit for Land Managers
Visual guide with emphasis on equity and inclusion beyond the ADA
https://www.empoweringaccess.com/project-01

Harpers Ferry Center NPS Accessibility Guidelines
Accessible media guide and checklist
https://www.nps.gov/subjects/hfc/accessibility.htm

Malibu Parks Public Access Enhancement Plan Park and Trail Accessibility Design Guidelines
Best practices for designing accessible trails - trail construction diagrams
https://cdn2.assets-servd.host/material-civet/production/images/documents/Trail-Accessibility-Design-Malibu.pdf

Oregon Parks and Recreation Department Accessibility Design Standards for all Future Projects
Design principles and goals for specific visitor infrastructure and site elements
https://www.oregon.gov/oprd/AO/Documents/ACCESS-Accessibility-Design-Standards-112023.pdf

Visitor Use Planning and Management Guidelines

Tourism and visitor management in protected areas (IUCN)
Overview of issues and recommendations
https://portals.iucn.org/library/node/47918

Interagency Visitor Use Management Council (IVUM)
Visitor use management, monitoring, and visitor capacity guidebooks
https://visitorusemanagement.nps.gov/VUM/Framework

Guidelines for Management Planning of Protected Areas (IUCN)
Practical guide to creating a management plan
https://portals.iucn.org/library/efiles/documents/pag-010.pdf

Management Planning for Nature Conservation
Practical guide to creating a management plan
https://link.springer.com/book/10.1007/978-1-4020-6581-1

Colorado's Guide to Planning Trails with Wildlife in Mind
Sustainable and sensitive trail planning
https://cpw.state.co.us/aboutus/Pages/Planning-Trails-for-Wildlife.aspx

Open Space & Trails Master Plan Breckenridge, Colorado
Example of a guiding masterplan
https://www.breckenridgerecreation.com/home/showpublisheddocument/22867/638150863844000000

Resources

Learning Resources

American Trails: Trail Accessibility Hub
https://www.americantrails.org/resources/accessibility-hub

Interagency Visitor Use Management Council: Resources
https://visitorusemanagement.nps.gov/VUM/Resources

Interagency Visitor Use Management Council: Training
https://visitorusemanagement.nps.gov/VUM/Training

Adaptive Recreation Nonprofits

Teton Adaptive
https://tetonadaptive.org/

Breckenridge Outdoor Education Center
https://boec.org/?gad_source=1&gclid=Cj0KCQjwq86wBhDiARIsAJhuphlomklvEbtwnhJ0c6h0q0TSb9lHp3H2N_dG-7VpWhMSFHyIOJT_NToaAlKnEALw_wcB

Move United
https://moveunitedsport.org/about-us/our-mission-impact/

Adventures Without Limits
https://awloutdoors.org/aboutawl

Consulting and Accessibility Audits

Empowering Access
Toolkits and accessibility audits
https://www.empoweringaccess.com/

University at Buffalo Center for Inclusive Design and Environmental Access
Universal design consulting
https://idea.ap.buffalo.edu/services/universal-design-consulting/

National Center on Accessibility
Training and accessibility audits
https://ncaonline.org/services/

Deafscape: design with disabled people now
Toolkits and various services
https://www.designwithdisabledpeoplenow.com/services

References

Interview Acknowledgments

Thank you to the eight individuals who participated in an interview. Responses from these interviewees helped inform the guidebook.

1. **John Blair:** Field Station Director at Konza Prairie Biological Station

2. **Anne Lowe:** Open Space and Trails Manager Town of Breckenridge; Director of CO Open Space Alliance

3. **Land Manager One**

4. **Jill Haukos:** Education Director at Konza Prairie Biological Station

5. **Emily Schrader:** Prior Recreational Use Specialist with Missouri Department of Conservation

6. **Heather Brown:** Chief of Interpretation Tallgrass Prairie National Preserve

7. **Alexa Vaughn:** Accessibility and Deafscape Specialist

8. **Landscape Architect One:** National Park Service

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6.

PROJECTIVE DESIGN

6a. Chapter Overview
6b. Site Analysis
6c. Projective Design

SIX

6a. Chapter Overview

The projective design of the Konza Prairie Biological Station (KPBS) explores site specific strategies to improve universal access. The design and recommendations are based on information gathered from the semi-structured interviews, document analysis, and site analysis.



Fig 6.1 Limestone boulders at the Konza Prairie. Courtesy of Eva Horne.

Relationship Between Methods

Interview Findings (Chapter 4)

The issues and strategies identified by the interviewees guided the site inventory and analysis, selection of improvement areas and recommendations for the projective design.

Document Analysis (Chapter 4)

The process flowcharts developed from the document analysis guided the projective design such as conducting a site inventory and analysis and collaborating with the natural areas staff.

Guidebook (Chapter 5)

The guidebook guided the recommendations for the projective design. As the projective design was developed, the Guidebook sections were revised to improve usability when applying the guidelines to an actual site. One revision was adding a site inventory and analysis discussion in the decision making section.

Site Inventory and Analysis (Section 6b.)

The site inventory and analysis guided the selection of improvement areas based on opportunities and constraints.

Projective Design (Section 6c.)

The projective design is an example of how the interview findings, document analysis, and guidebook can be applied to a real site. The projective design also helped refine the guidebook contents.

6b. Site Analysis

Site Analysis Process

The site analysis seeks to understand all pertinent factors that will impact the projective design of the Konza Prairie Biological Station (KPBS).

Website and Book Resources
Site Visits
Geographic Information Systems
Google Earth
Discussions with Site Staff

→ **Identify opportunities and constraints for projective design**

Tallgrass Prairie Ecoregion Overview

The KPBS is located in the Tallgrass Prairie Ecoregion. The tallgrass prairie is a rich ecosystem that provides for over 600 plant species, and a variety of wildlife including endemic grassland species. The prairie also performs essential ecosystem services like nutrient cycling, water retention and filtration, and carbon sequestration.

For thousands of years, indigenous tribes lived and relied on this land and its natural resources as hunters and farmers (Haukos n.d.; Reichman 1987). Since the 1830s, the tallgrass prairie has been rapidly converted for other uses, especially agricultural due to the invention of the steel plow. More recently, human development, fire suppression, woody vegetation, and poor grazing management threaten the landscape (Haukos n.d.; Blair 2023).

This ecoregion is now the most modified and threatened biome. Of the original 170 million acres, only 4% of the original tallgrass prairie is intact (Glaser 2012; Haukos n.d.; Reichman 1987). Further 98% of remaining prairie is private land, emphasizing the importance of visitors being able to access and experience the Konza Prairie (John Blair, Personal Communication, 2023).

> “Grasslands are the least protected and most modified major biome.” (Glaser 2012 pg. 64)

Konza Prairie Biological Station Overview

75% of the remaining tallgrass prairie is found in the Flint Hills region of eastern Kansas. The KPBS, in the Flint Hills, is an 8,616 acre preserve currently co-owned by The Nature Conservancy and Kansas State University (Glaser 2012; Haukos n.d.; Reichman 1987). Research, conservation, and education are the core missions of the KPBS. The general public can use three hiking trails to enjoy hiking, wildlife, and views.

75% of tallgrass prairie found in eastern Kansas

8,616 ACRES Total area of KPBS

History and Founding in 1971

The original land to create the Konza Prairie Biological Station was purchased in 1971 following work by Kansas State University Professor Lloyd Hulbert. Further land purchases were made between 1971 and 1979 including the addition of the Dewey Ranch adding 7223 acres. The station’s headquarters facilities was renovated from an early 1900’s limestone house and barn. These headquarter buildings include an ecology laboratory, fire station, maintenance building, staff offices, living quarters for visiting researchers, and student classrooms (Reichman 1987).

The visitor trails were first established so the general public would know what Kansas State University and the Nature Conservancy are doing on the land (John Blair, Personal Communication, 2023).

Site Context

The Konza Prairie Biological Station is south of the City of Manhattan, Kansas.

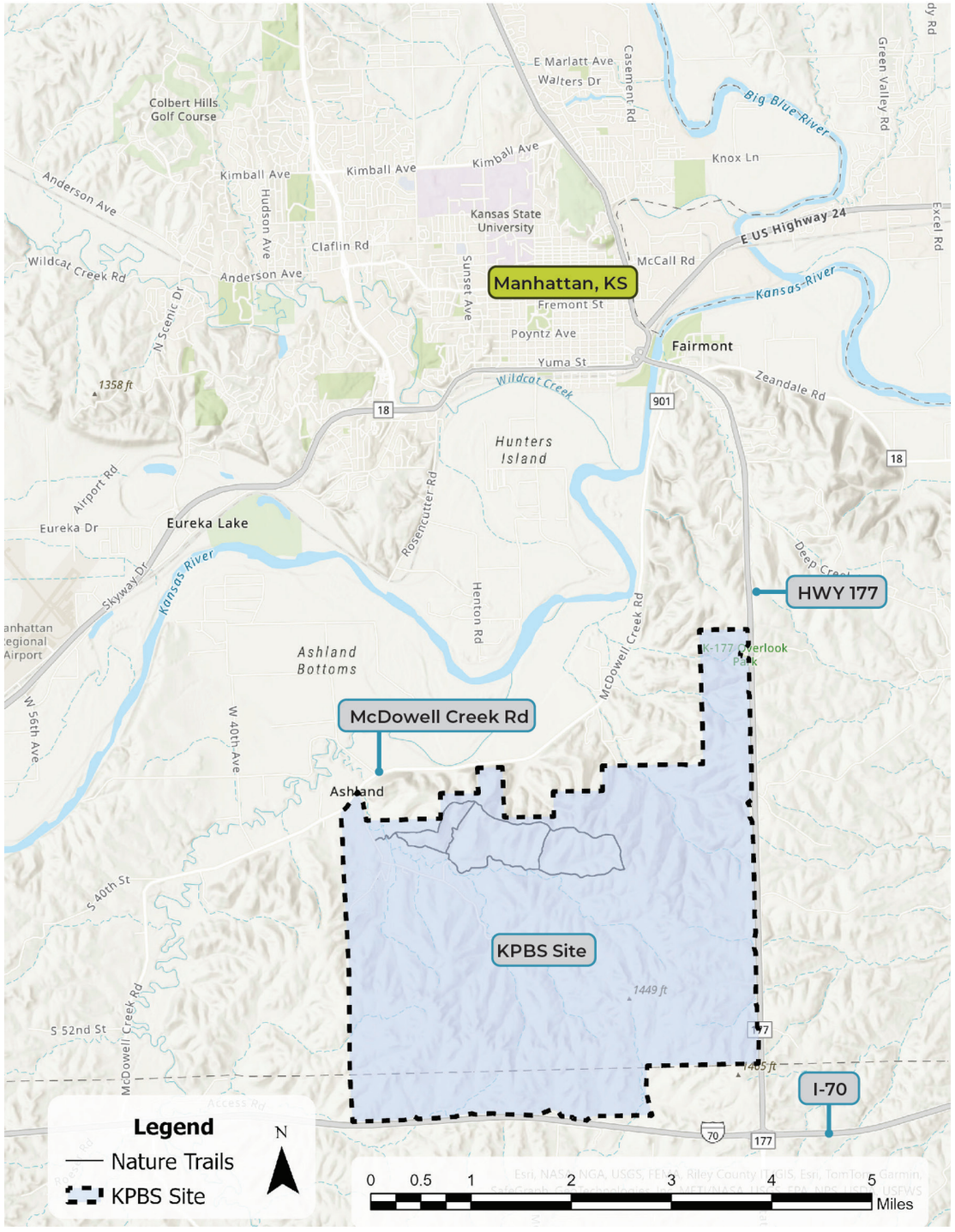


Fig 6.2 Site context.

Site Overview

The site map shows the KPBS boundary. Notice that the nature trails for public access are within the northwest portion of the site.

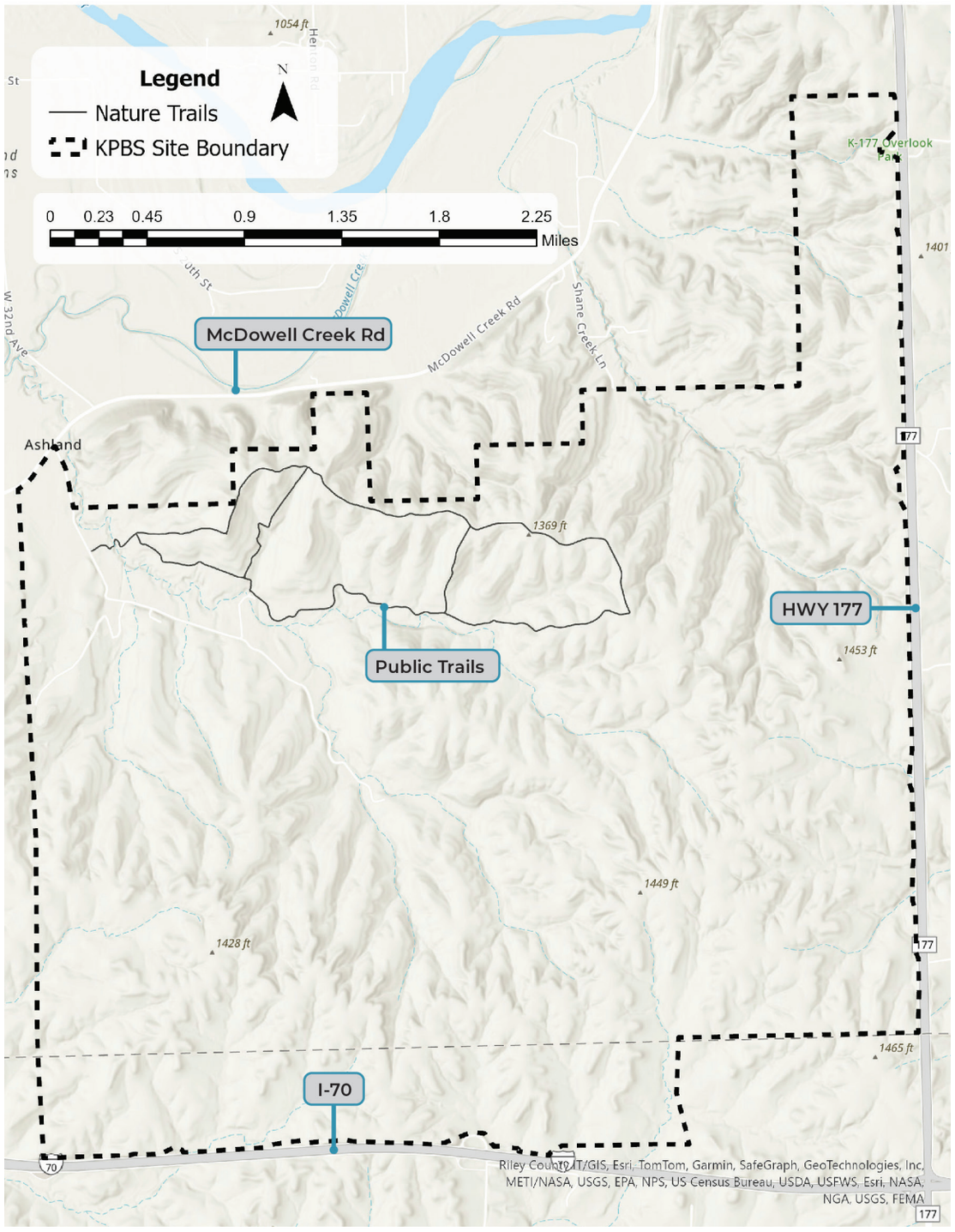


Fig 6.3 Site overview.

Mission

Research is the focus of the Konza Prairie with conservation and education for students K-12 and graduate research being major components. The site is not managed solely to restore and maintain pristine prairie as research requires different management approaches (John Blair, Personal Communication, 2023).

When making universal access decisions, research and conservation may need to be prioritized. Although visitor use and accessibility are not priorities, universal access would support the researchers, education programs, and conservation initiatives.



Fig 6.4 KPBS Mission.

Site Character

The Flint Hills consists of alternating sedimentary layers of limestone and shale that formed around 280 million years ago. The relative hardness of the rock layers caused the land to erode at different rates forming the distinguishable hills or cuestas that are iconic to the Flint Hills and Konza Prairie (Reichman & Miller, 1987). The result of these erosion patterns creates steep climbs and rough, rocky terrain for those hiking the landscape.

The soil composition varies across the Konza Prairie. Two soil types dominate this region: Florence and Tully. The Florence soil series is on uplands and parts of the slopes where top soil is thinner than 1 foot and subsoil of less than 20 inches. Upland prairie vegetation is found here. The lowlands have Tully soil which is much deeper and formed by stream (alluvial) deposits. Tully soil have a 10 inch topsoil, a lower horizon with less organic material of 1 foot, and a subsoil of 4 feet. Tully soils are rich and support tallgrasses. Vegetation composition across the prairie are strongly associated with landforms, soil type, and moisture available (Reichman 1987).

Two major creeks run through the site: Kings Creek and Shane Creek. Gallery forests or forested habitat along the creeks cover around 7%, providing distinct habitat from the tallgrass prairie. Visitors can walk along Kings Creek on the Nature Trail and make a shallow crossing over Shane Creek on the Godwin Trail (Kansas Sate University 2023a).



Fig 6.5 Site character of the Konza Prairie.

Natural and Cultural Resources

Knowing the natural and cultural resources on site as well as their vulnerability to disturbance influences suitability for visitor use and universal access. Further, sharing this information is an important aspect of education and interpretation.

Streams and Watersheds

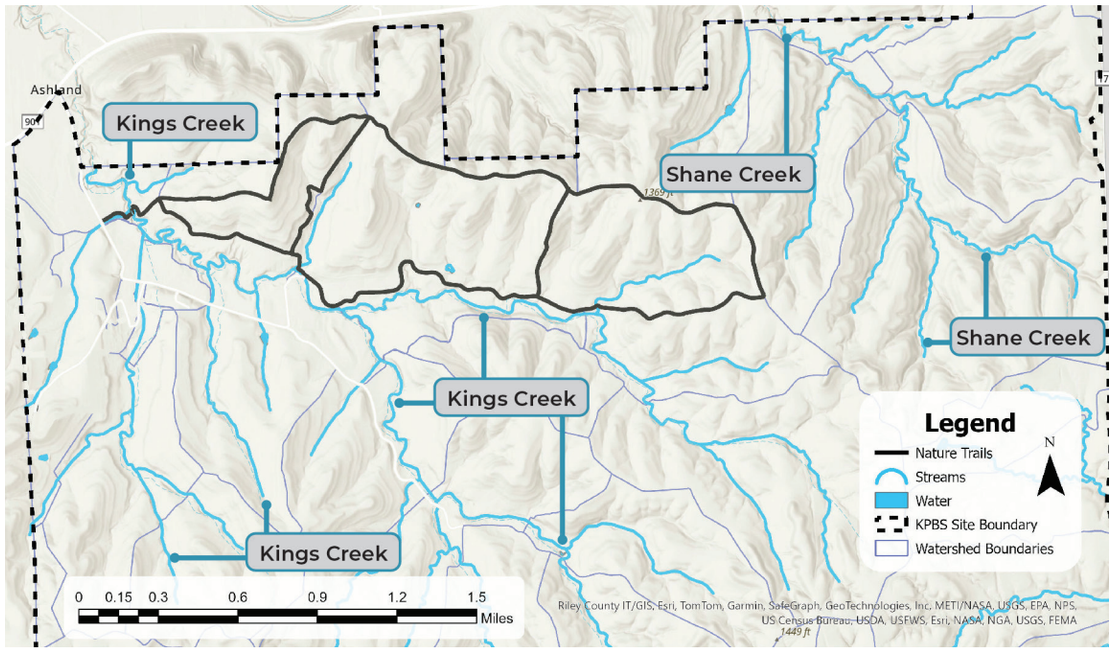


Fig 6.6 Watershed boundaries and streams.

Water quality monitoring and protection is essential to the ecosystems found here. Two major creeks run through the site, Kings Creek and Shane Creek.

Common Vegetation and Wildlife

The majority (93%) of the Konza Prairie Biological Station (KPBS) is **native tallgrass prairie** that varies in composition with topographic position (upland, lowland, and slopes) and associated differences in soil properties. The composition of the prairie plant communities also varies with management (fire return intervals and presence or absence of large grazers such as bison and cattle). The four dominant grasses of the tallgrass prairie are big bluestem, indiangrass, little bluestem, and switchgrass (John Blair, Email, 2024).

Areas of mixed hardwood riparian forest line the major reaches of Kings Creek and Shane Creek. The current nature trail area is mainly through native prairie and the riparian forest areas. Finally, cultivated agricultural fields are near the headquarters area and several areas of restored prairie are also present (John Blair, Email, 2024).

Wildlife at the KPBS includes birds, mammals, reptiles, and fishes. The following are a sample of wildlife abundantly found at the KPBS. **Birds:** greater prairie chicken, mourning dove, and red-headed woodpecker. **Mammals:** Elliot's short-tailed shrew, coyote, eastern cottontail, and white tailed deer. **Reptiles:** barred tiger salamander, bullfrog, common snapping turtle, eastern collared lizard, and common king snake. **Fish:** bluegill, red shiner, and creek chub (Long Term Ecological Research 2021).

There are no areas with especially vulnerable or rare species. However, visitors are asked to not leave the trails and enter the surrounding prairie, forest, and stream ecosystems to limit negative impact to ecosystems and research (John Blair, Email, 2024).



Fig 6.7 Prairie grasses.
Fig 6.8 Wooded trail.
Fig 6.9 Copper grasses in the fall.



Fig 6.10 Collared lizard. Fig 6.12 Snake.
Fig 6.11 Dung beetles. Fig 6.13 Widow skimmer.

Cultural Resources



Fig 6.14 Early 1900's limestone buildings from the Dewey Ranch serve as KPBS headquarters.



Fig 6.15 The Hokanson Homestead was built in 1878 by settlers.

Alongside natural resources, staff should inventory and decide the level of protection for cultural resources. The limestone buildings have been renovated for use by the KPBS staff and researchers. **The Hokanson Homestead was once part of the educational programs, but it is no longer a major point of interest** (Jill Haukos, Personal Communication, 2023).

Indigenous history The Kansa (Kaw Nation), Pawnee, Wichita, and Osage people once thrived in the Flint Hills region. These nations used the flint for arrowheads and the land for bison hunting. Due to European settlement, the Kansa people were forced onto reservations near Council Grove, Kansas in 1847 and then removed to Oklahoma. The Konza Prairie is named after the Kansa People (National Park Service 2021). **It is important for visitors to understand the indigenous history of this land** (John Blair, Personal Communication, 2023).

Research Initiatives

The Konza Prairie Biological Station (KPBS) is a field station that welcomes researchers from across the country to study grassland ecosystems. The research focuses on the dynamics of fire, grazing, and climate as factors that form, maintain function, and sustain the prairie ecosystem (Blair 2023).

Fire: Research on prescribed burns at varying frequency (1, 2, 4, and 20 year fire return intervals) in each season is an important part of the management and research of the field station. The KPBS collaborates with agencies like the EPA, USFS, and university scientists. The field station also provides site tours for policy makers, agency scientists, conservations, and land managers (Blair 2023).

Grazing: Bison are also a part of the management and research. A 1,000 ha fenced bison enclosure is divided into 10 watersheds with 4 different fire treatments. The field station runs comparative studies of bison versus cattle grazing (Blair 2023).

Climate Variability: Research on the ecological responses to climate variation is critical as climate change increasingly impacts the region. The field station studies responses to variation in climate over time and through artificial manipulations like creating covered areas over the grassland (Blair 2023).

The KPBS hosts major research programs including the NSF Long-Term Ecological Research (LTER) Program and National Ecological Observatory Network (NEON). The figure to the right shows the NEON research areas on the KPBS. Equipment for these research programs is located across the site, emphasizing the need for visitors to stay on the designated hiking trails (Blair 2023).

Partnerships: The KPBS partners with several agencies and observatory networks alongside the major research programs (Blair 2023). These include:

1. National Atmospheric Deposition Program (NADP)
2. Clean Air Status and Trends Network (CASTNET) (EPA)
3. NOAA Climate Reference Network
4. USGS Hydrologic Benchmark Network
5. FLUXNET
6. PhenoCam Network
7. Advanced National Seismic System

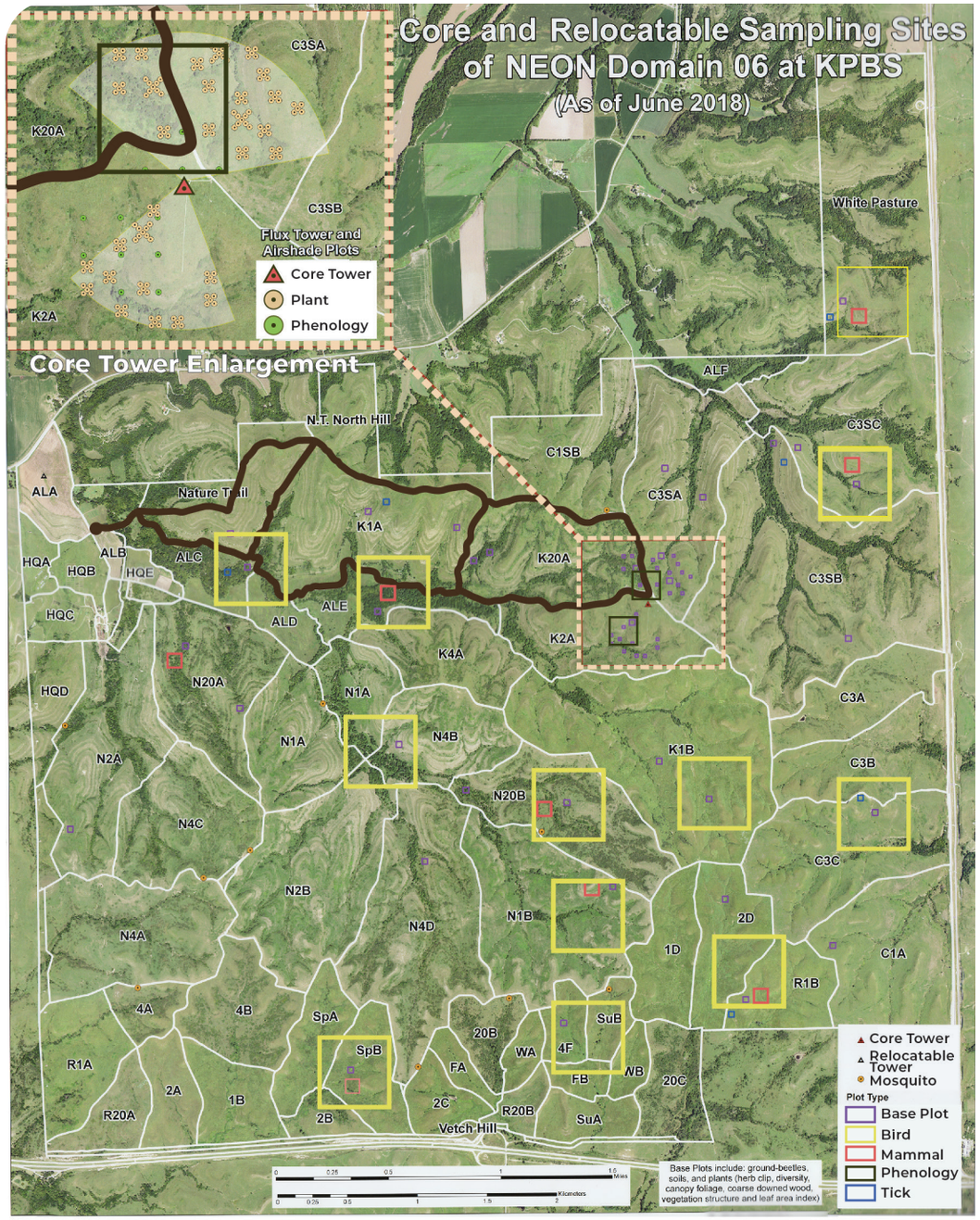


Fig 6.16 National Ecological Observatory Network (NEON) at the KPBS.

Analysis **On site research activities should guide visitor use decisions including where to improve universal access.** Note that not all research sites are represented on this map. A design team would need to map all research sites before making a detailed design concept. The majority of research is located away from the publicly accessible trails but some sites are near the trails. For example, the NEON air tower can be seen from the Godwin loop and visitors should not be allowed access. However, **improved interpretative signage** can help all visitors understand the purpose and importance of the research.

Visitor use

The KPBS is visited and loved by the local community and visitors across the US and around the world. There are very few places where people can experience expansive, pristine prairie, making the Konza a cultural and ecological treasure (Blair 2023). **Providing opportunities to experience this rare ecosystem and learn about its legacy and natural resources is important.** At the same time, managing visitor use and disturbance is essential to protecting the integrity of the land and ecosystems.

Site Zoning

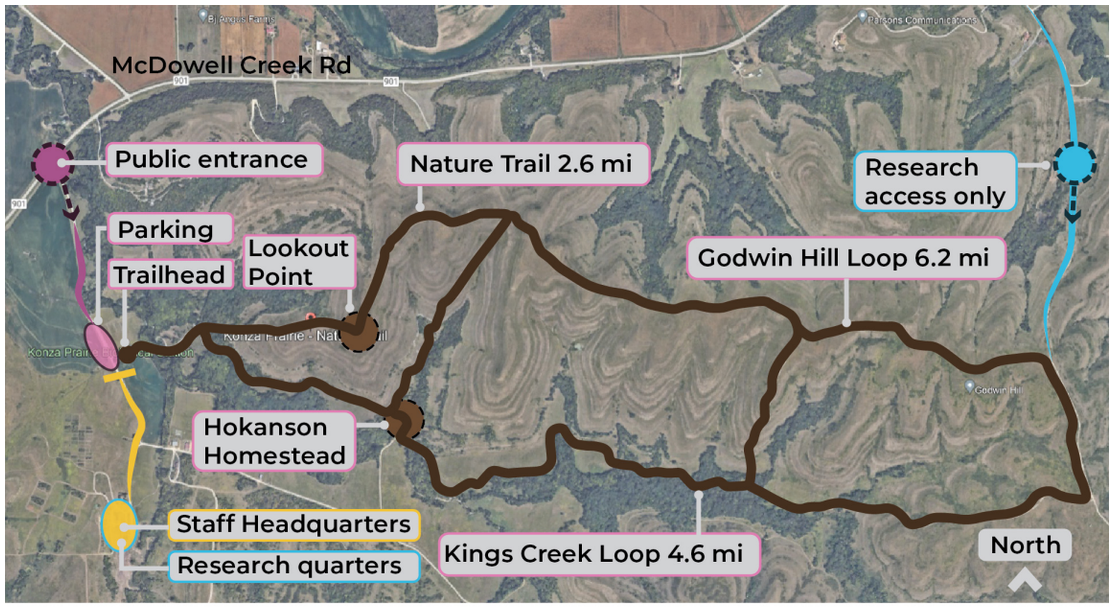


Fig 6.17 Site zoning map.

The site zoning map shows the portion of the KPBS open to the general public. General public access is off McDowell Creek Road on the west side of the map. Visitors can park and reach all three hiking trails from the same trailhead. Two points of interest are the lookout point offering expansive views and the Hokanson Homestead. The road on the east edge of the map is only accessible to researchers. The staff headquarters and research quarters are further south and are not open to the general public. Some facilitated educational programming is held at the headquarters.

Visitor Use and Programs

Although visitor outreach is not a core mission, education programs, tours, and hiking trails are offered on at the KPBS. Visitors come for hiking, trail running, enjoying sweeping views and wildlife, education, and tours.

The Konza Environmental Education Program (KEEP) exposes school groups (K-12) to the prairie through interactive programs and tours (Kansas State University 2023b). Guided hikes and tours for school groups include:

1. Nature Trail Hike
2. Butterfly Hill Hike
3. Hokanson Homestead
4. Bison Loop Driving Tour
5. Watching Wildlife on the Prairie
6. Konza Experience

Hands on science activities are offered as well (Kansas State University 2023(b)):

1. Catching Grasshoppers on the Prairie
2. Stream Macroinvertebrates
3. Stream Chemistry
4. Effects of Fire on the Prairie
5. Grazing Ecology

Analysis of program and information barriers: Overall, **accessibility information** like slope, accommodations, and accessible parking **is not present on site** for visitors to make informed decisions which is an information barrier.

KEEP webpage: Descriptions of the hikes are brief (1-3 sentences) and include the expected amount of time to spend, if a guide (trained naturalist) is needed, and points of interest or learning opportunities. **The website does not include accessbility information** like a description of the terrain, possible barriers, or level of accessibility. Accommodations and possible assistance like adaptive mobility devices or a sign language translator are also not listed with the exception of the Bison Loop stating that a vehicle is not provided. A link takes you to a new page ‘Guidelines for Students and Group Tours’. The page notes that water is not available and there is full sun and wind conditions on the trails. Restrooms and designated parking are available but the website does not clarify if there are accessible options.

Tours: Educational tours are lead by volunteer, trained docents. Currently, tours for the general public are not offered due to budget cuts and few staff. For a tour to be permitted, the purpose must align with the mission of the field station. Tours for school groups, conservationists, scientists, and the Friends of the Konza Prairie are offered (John Blair, Personal Communication, 2024).

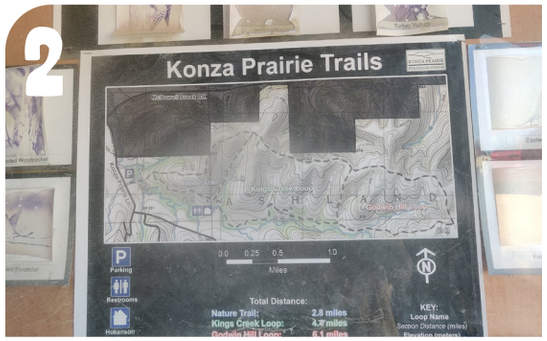
Trail Experience

Visitors will encounter the following areas when hiking any of the three trails. The trail photos and descriptions highlight necessary improvements to achieve universal access.

Fig 6.18 Trail experience photos.



There is one **parking area** for visitors with a gravel surface. There is not an accessible parking spot. View from parking lot is a restored prairie field.



The **kiosk** at the trailhead has a trail map and posters displayed in a wood structure. The map may be hard to read due to size of font and glare.



The trails start with a fairly flat gravel path. Groups can easily pass each other. To the left is a restored prairie where a shorter trail may be built.



The first bridge is flush with the trail and stable. However, it is not very wide, potentially making it difficult for mobility devices or multiple people to pass.



The second bridge is not flush with the trail or stable. To access all the current trails, a visitor has to pass this bridge.



The terrain becomes more steep and rocky with limestone steps leading up to the first major overlook.

Trail Experience Key Map

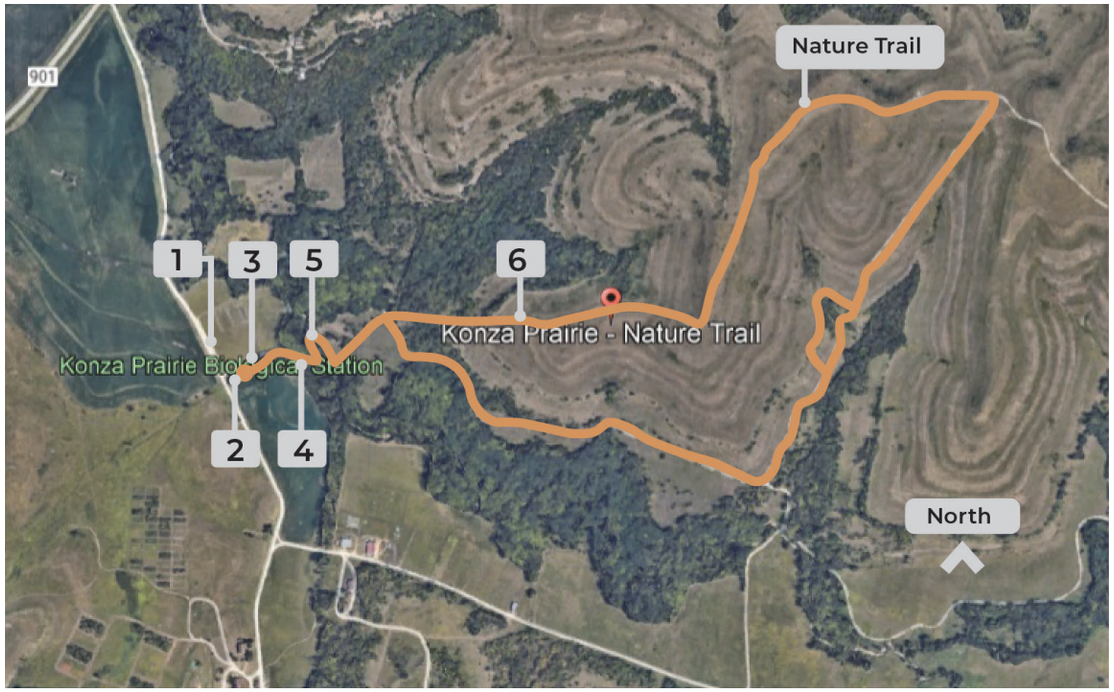


Fig 6.19 Trail experience key map.

Elevation Profiles Key Map

Refer to the following page for the hiking trail elevation profiles used for preliminary slope analysis. The letters indicate the start and end point of the profiles.

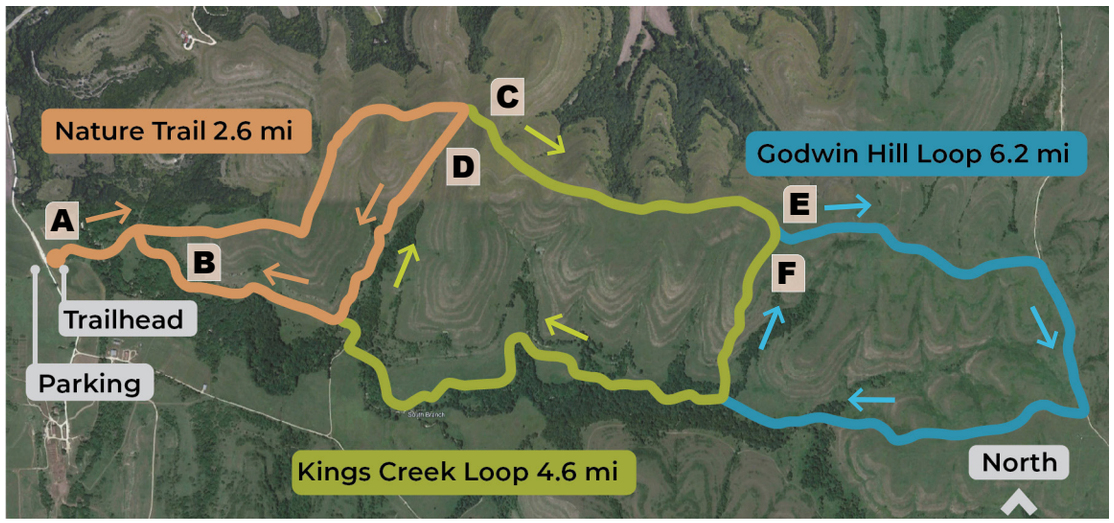


Fig 6.20 Three publicly accessible trails. Distances are total starting at shared trailhead.

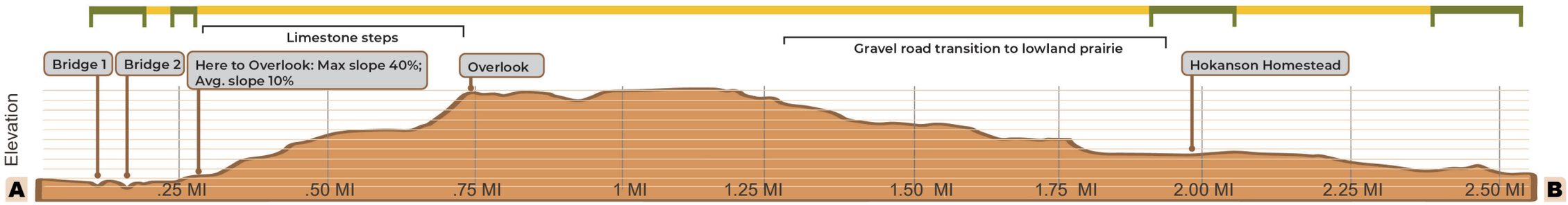
Elevation Profiles

Analysis: **Accessibility Information** based on the elevation profiles should be provided at trailheads for visitors (Knutson et al. 2021). **The Nature Trail,** the first loop, **presents numerous physical obstacles** in the first .75 miles including two bridges and steep slopes to the overlook. To reach the other loops, a visitor would have to pass the first two bridges which could be challenging.

Nature Trail

Elevation Min. 1055 ft Max 1310 ft
Elevation Gain 378 ft

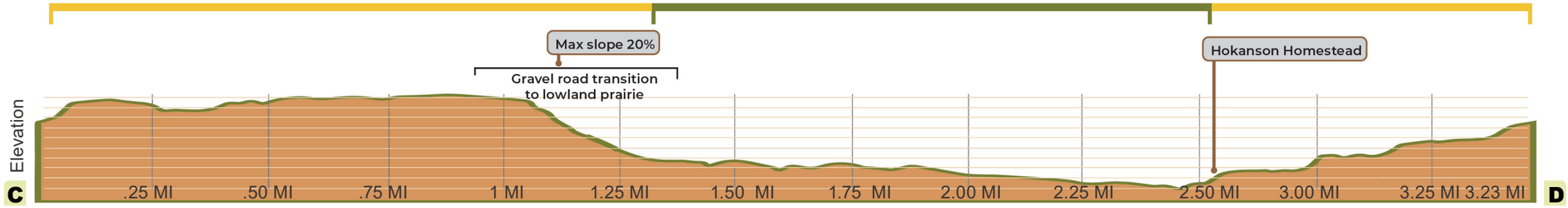
Max Slope 27.9%
Average slope 5.4%



Kings Creek Loop

Elevation Min. 1097 ft Max 1334 ft
Elevation Gain 388 ft

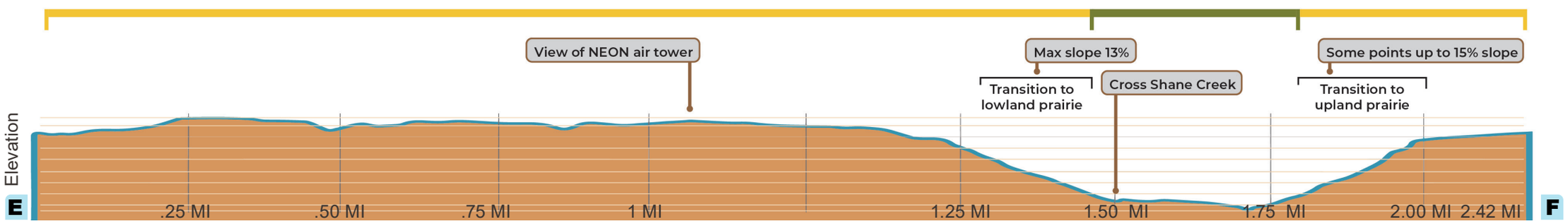
Max Slope 24.6%
Average slope 4.2%



Godwin Hill Loop

Elevation Min. 1166 ft Max 1367 ft
Elevation Gain 287 ft

Max Slope 25.2%
Average slope 4.6%



Land Cover Prairie Gallery Forest *25 Foot Elevation Interval

Fig 6.21 Elevation profiles for each public trail.

Existing Signage and Information

Fig 6.22 KPBS signage



Trail Map



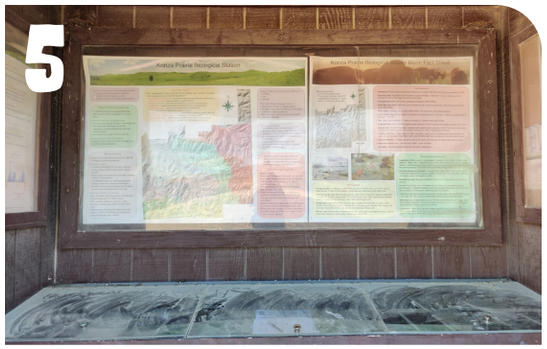
Wayfinding



Restrictions near parking lot



Restricted areas for research



Information kiosk at trailhead



Interpretation

Trail Experience Key Map



Fig 6.23 Trail experience key map.

Analysis:

Text and Color: The style of signage is inconsistent with varying text size, fonts, and colors. However, color contrast seems to be appropriate.

Alternate Formats: Further, the signage relies on vision without alternative ways to engage with the information. Wayfinding would be difficult for the visitors who are blind and low-vision (1, 2).

Accessibility Information: The trailhead has an information kiosk (5) with history about the site and a trail map that lists distances in miles. However, it lacks pertinent information like slope, cross slope, trail width, and surface. The trail map (1), located further on the trail, also lacks the above information.

Visibility: Finally, glare on glass (5, 6) could make it difficult for some to read. There is opportunity to improve the information offered, remove glare, and provide alternative ways to engage like relief images on the signs.

Discussion with Site Staff

The site staff should be an integral part of the planning and design team to ensure everyone understands and agrees on the made decisions (Alexander 2007; Land Manager One 2023). Talking with the Konza Prairie site staff throughout this research project has helped inform the contents of the guidebook and ensured the projective design responds appropriately to the barriers, constraints, and opportunities of the site.

Who

John Blair
Jill Haukos

How

1) Phone call
2) In–person
3) Email
4) Formal interview

Why

1) Identify barriers
2) Identify constraints
3) Identify previous and current accessibility efforts
4) Identify opportunities

Identified Barriers

2) **Steep Trail Segments:** Slopes >5% in many areas combined with challenging, rocky terrain (Blair 2023; Haukos 2023).

3) **Bridges:** The bridges that cross Kings Creek are impassible for wheelchairs or other wheeled devices (Blair 2023).

4) **ASL Translator:** There is not a translator for programs or tours (Haukos 2023).

5) **Signage:** Lack multilingual or braille signage (Blair 2023).

Implementation Constraints

1) **Altering the site:** Since the tallgrass prairie is a highly impacted ecosystem, keeping this natural site as intact as possible is priority (Haukos 2023).

2) **Limited Staff Capacity:** There are only a couple full time staff who already have numerous responsibilities. Attending to universal design and access changes would be challenging with the current workload (John Blair, Personal Communication, 2023).

3) **Limited Staff Knowledge:** Staff would need to research and learn more about opportunities to improve universal access (Jill Haukos, Personal Communication, 2023).

4) **Limited Funding:** Any expenses to improve universal access would have to come from donors and grants. The KPBS does not receive any funding assistance through Kansas State University or the Nature Conservancy to improve access (Blair 2023; Haukos 2023).

Previous and Current Accessibility Efforts

Overview: Universal access is not something the KPBS has addressed, especially for public visitation. For facilitated programs, universal access is addressed on a case by case basis as issues appear (Jill Haukos, Personal Communication, 2023).

1) **Parking:** The staff looked into creating accessible parking spots but this did not happen since it would require expensive earthwork (John Blair, Personal Communication, 2023).

2) **Trailhead and Information Kiosk:** The staff is working with an architecture firm on preliminary designs. The staff are considering what languages to include and how to make the information more engaging. The new information would focus on conservation, the site's history, and indigenous history. The current cost estimate is too high (John Blair, Personal Communication, 2023).

3) **Transportation:** Buses and vans can be used for certain facilitated programs to help people with mobility challenges to participate (Haukos 2023)

4) **Benches and Steps:** Staff placed limestone steps leading up to the overlook with a bench at the top to make the climb easier (Blair 2023).

Opportunities to Improve Universal Access

1) **New Trail:** Staff have discussed constructing an additional trail near the parking lot that would be mostly flat and paved. The trail would be around .25 miles and provide key opportunities to experience the restored riparian and gallery forest ecosystems (John Blair, Personal Communication, 2023).

2) **Replacing the Second Bridge:** Staff acknowledged that redesigning the second bridge would not have major impacts on conservation and would improve accessibility. The challenge is finding a solution that is universally accessible and resilient against flood damage from Kings Creek (Blair 2023).

3) **Signage and Information:** Interpretative signage needs to be improved so visitors can learn more about the ecosystems on the trail and at the trailhead (Haukos 2023).

4) **Community Engagement:** The KPBS does not typically look for public input due to being a private preserve (Haukos 2023).

Based on the interview and document analysis findings, there is need and opportunity to engage the local Manhattan community and visitors representing a range of disabilities to provide feedback about universal access improvements.

Potential Sites for Trails and Entrances

Key map

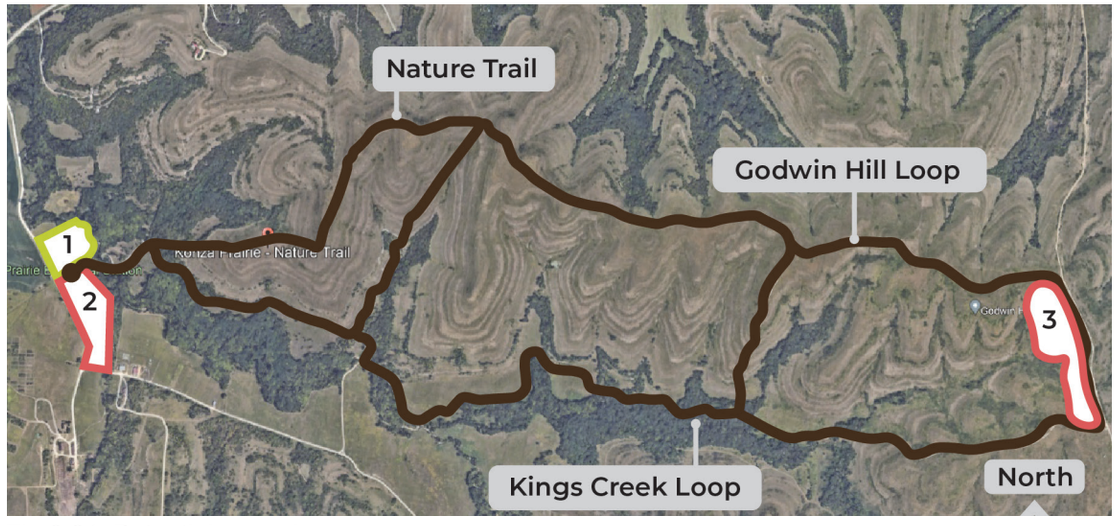


Fig 6.24 Potential areas key map.

Area 1 and 2

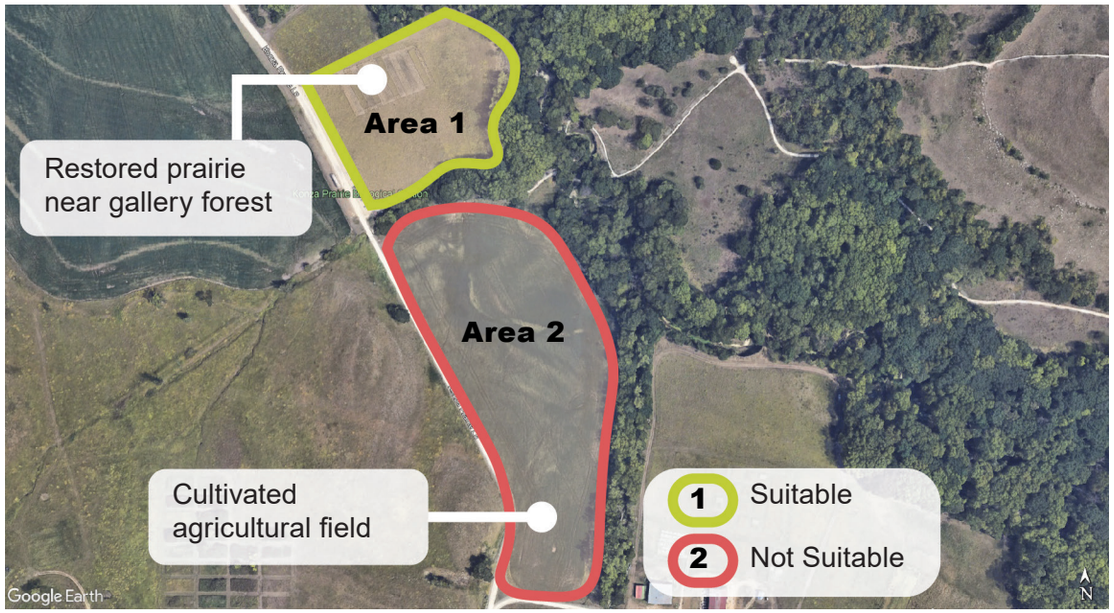


Fig 6.25 Suitability of Area 1 and 2 for trail development.

Area 1 (Suitable for new trail): This site/trail would use the same public parking area and information kiosk. The area is a restored prairie with good stands of a variety of native grasses. The trail would allow visitors to experience both a prairie system and gallery forest, with potential views of the Kings Creek stream (John Blair, Email, 2024).

Area 2 (Not Suitable for new trail): Not ideal for a trail since it is a cultivated agriculture field and not prairie vegetation (John Blair, Email, 2024).

Potential Sites: The location of the proposed new trail has not been decided. These preliminary sites for the new trail were presented to John Blair, Director of the KPBS, as potential sites. The responses, recorded below, informed the projective design recommendations.

Areas 1 and 2 shown in Figure 2.25 were identified due to their proximity to the existing parking lot and trailhead. These areas would be ideal for visitors who cannot or do not want to walk the existing trails.

Area 3 shown in Figure 7.26 was identified as a potential new visitor entrance so the general public can easily get deeper onto the site. The site staff both stated in their formal interviews that high quality experiences include getting deeper into the site and experiencing solitude.

Area 3

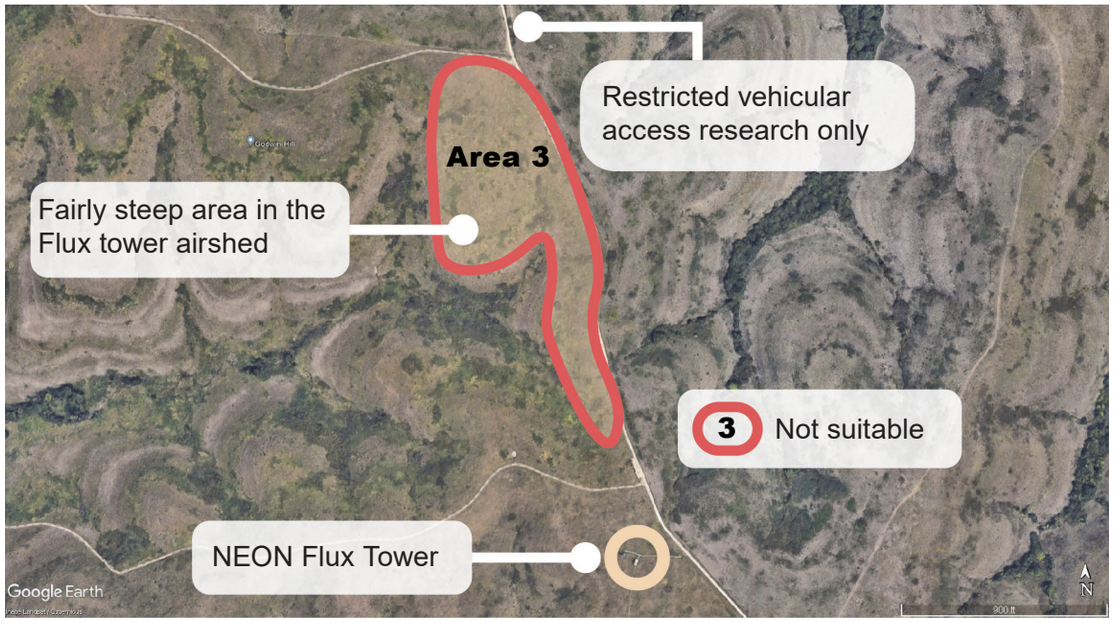


Fig 6.26 Suitability of Area 3 for trail development and public access.

Area 3 (Not Suitable for new trail or entrance): The area is fairly steep and KPBS staff would not, “be open to putting a paved or otherwise passable trail for people with walkers or wheelchairs, as it is in the air-shed of the NEON flux tower” (John Blair, Email, 2024).

6c. Projective Design

Projective Design Process

The projective design of the Konza Prairie Biological Station demonstrates how the research findings can be applied to a real site. The goal is to give the field station staff initial ideas for improving universal access on their site while considering its specific opportunities and constraints.

1. Site Inventory and Analysis
2. Discussion with Site Staff

→ **Select Improvement Areas**

1. Literature Review Findings
2. Interview Findings
3. Document Analysis Findings
4. Proposed Guidebook

→ **Develop Universal Access Recommendations**

These recommendations are for exploratory purposes. Additional measures would be necessary to develop and implement real changes to the site and programming:

Assessments and Planning

1. Resource protection planning
2. Accessibility assessment
3. Field inventory and analysis

Engagement

1. Collaboration and input with all site staff
2. Engagement with disabled stakeholders

Improvement Areas

1. Parking and Arrival
2. Trailhead and Information Kiosk
3. Restored Prairie and Riparian Loop
4. Bridges Crossing Kings Creek
5. Steep Trail Segment to Overlook
6. Facilitated Visitor Programs
7. Signage
8. Partnerships and Collaboration

Improvements Areas Key Map



Fig 6.27 Areas of improvement key map.

Parking and Arrival

Infrastructure	Issue
Parking lot	1. The existing parking lot does not have delineated accessible parking spaces. 2. The existing parking lot surface may not have appropriate slope and surfacing (firm and stable). 3. Lack of information on KPBS website about accessible visitor parking.
Path to trailhead	1. The path between the proposed accessible parking spaces and the trailhead is not a firm and stable surface.

Physical Recommendations

#1: Regrade and/or resurface the areas of the parking lot closest to the trailhead in order to create accessible parking spaces.

#2: Design and construct an accessible route between the proposed accessible parking spaces and the trailhead and information kiosk.

#3: Provide interpretive signage and interactive areas near the parking lot so people who cannot or do not want to leave the parking area can interact with the site.

#4: Provide a place for at least 2-3 people to sit away from the road and enjoy the view of the restored prairie

Information Recommendations

#1: Clearly indicate whether accessible parking is provided or not on the official KPBS website so visitors can plan their trip.

#2: Encourage monetary donations online to support trail maintenance and accommodation of various conservation and universal access needs.

Information Kiosk and Trailhead

Infrastructure	Issue
Information Kiosk	1. Lack of additional lighting and glare on the glass cases may make it challenging to read informational signage. 2. The trail map in the information kiosk is small and challenging to read due to text size and busy background. 3. The existing information kiosk is a three-walled, narrow structure which could make it challenging for groups who are signing or using mobility devices to gather around the information together.
Trailhead	1. The trailhead does not have an overview map with pertinent information including slope, cross slope, surface, and trail width.

Physical Recommendations

#1: Provide even lighting around informational signage so people who are blind or low-vision can easily read.

#2: The kiosk width should be a minimum of 8 feet to allow groups to gather. Wider is preferable. Create enough space off the main path so others can easily pass.

#3: Provide a flat, stable surface in front of the trailhead sign for ease of reading.

Information Recommendations

#1: Improve legibility of the information kiosk and trailhead maps by increasing the size of the trail map. Ensure proper text formatting for easy readability.

#2: Include slope, cross slope, surface, trail width and description of the experience on the trailhead signage.

#3: If/when the trails are officially accessed for accessibility, indicate the distance to the point of the first exception to accessibility standards on the trailhead signage.

#4: Provide alternate formats to engage with the information including tactile and/or auditory components.

Restored Prairie and Riparian Loop

Infrastructure	Issue
Trail Network	1. The existing trail network does not offer a trail less than .25 miles. Walking this distance is one of the most common mobility challenge.
Proposed Restored Prairie and Riparian Loop	1. Create a new trail through the restored prairie field adjacent to the parking lot.

Physical Recommendations

#1: The trail should have the least barriers of all the trails with a paved surface and a slope less than 5%. The trail should make a loop beginning and ending at the parking area with potential for additional loops.

#2: Provide rest areas with seating and eddies off the main path and at regular intervals. This provides a moment to rest and space to sign. (Apply to all trails).

Information Recommendations

#1: Visitors who cannot or do not want to walk far will stay near the parking area. The trail should be clearly marked and visible from the parking area so these visitors are aware of this trail as an option.

#2: Provide alternate formats to deepen the experience at observation points and waysides. For example, a map of the river could be created as a relief image for people to trace.



Fig 6.28 Tactile map of Big Sink Trail. Courtesy of the NHS Abraham Lincoln Home.



Fig 6.29 Tactile model of Memorial Building. Courtesy of the NHS Abraham Lincoln Home.

Proposed Trail Loops

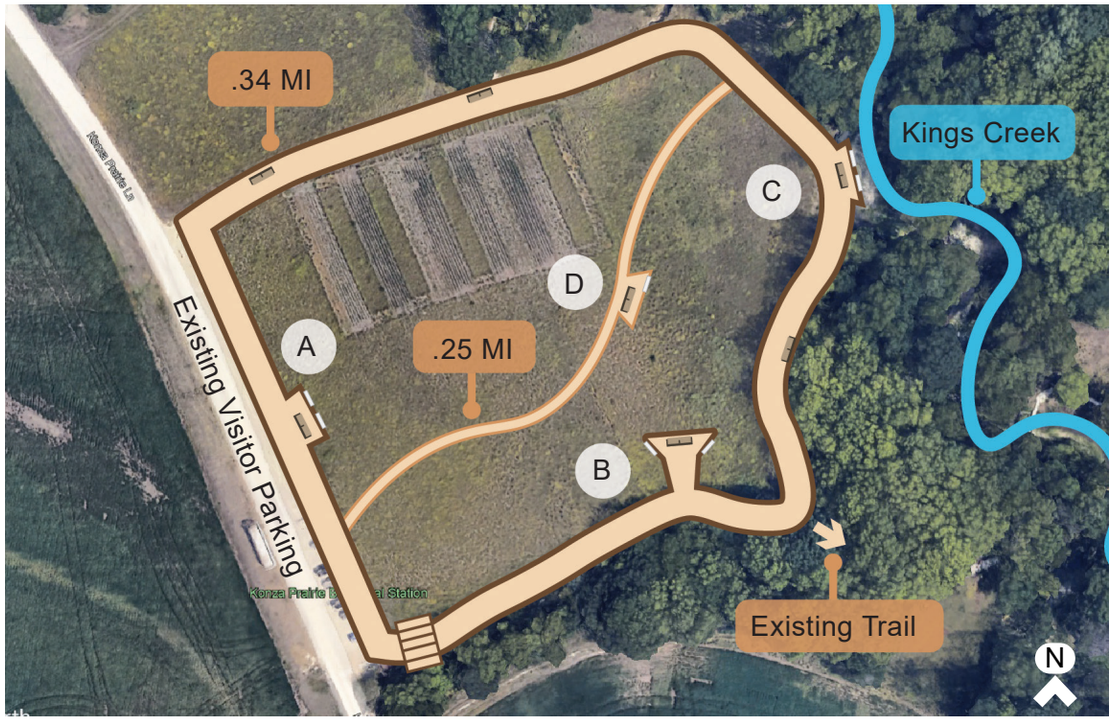


Fig 6.30 Proposed trail loops.

Paved trail loops

.35 mile loop, 10’ wide path: Comfortable for strollers and mobility devices to pass and people to sign while walking.

.25 mile loop, 7’ wide path: Minimum width to comfortably pass. Minimizes disturbance to the prairie.

Amenities

Proposed, fully accessible kiosk with protected seating.

Proposed observation decks with interpretive signage and benches to rest. Decks should be flush with walking path and sized to accommodate groups and mobility devices.

Example interpretive signage themes

A. Overview of the restored prairie and riparian ecosystems.

B. Research of fire on the prairie and the varying burn intervals that help restore the prairie.

C. Research and ecosystems of Kings Creek. Opportunity for a tactile image or map of Kings Creek.

D. History of the site including Indigenous tribes who used the land for hunting.

Bridges Crossing Kings Creek

Infrastructure	Issue
Bridge #1	1. Without maintenance, the difference between the trail and bridge surface could become greater than two inches in height with further erosion. Width may not accommodate some mobility devices.
Bridge #2	1. The difference between the trail and bridge surface is greater than two inches in height. The structure is not a stable surface.





Fig 6.31 Existing bridge #1 Fig 6.32 Existing bridge #2

Physical Recommendations

#1: Maintain the difference between the bridge and trail surfaces to be less than two inches in height.

#2: Delineate the change between the trail and bridge surface with a textured or tactile transition for visitors who are blind and low-vision.

#3: Both bridges should be a minimum of 36 inches but wider is preferred.

#4: Replace the second bridge with a structure that can withstand flooding and still provide a universally accessible route.

Information Recommendations

#1: Provide descriptions of each bridge and its status as accessible (or not) and show pictures on the website. This allows visitors to plan their trips before arrival.

Recommendation #4: Replace the Second Bridge

Example: The Hocking Hills Bridge offers an innovative solution to both flood and access challenges which are issues that the Konza Prairie's 2nd bridge has.
Location: Hocking Hills State Park, Ohio
Project Client: Ohio Department of Natural Resources (ODNR)
Design Firm: Woolpert

Goals: Sensitivity to context, public safety, low maintenance, and durability.

Challenges: Site's remote location, cannot use off-the-shelf solutions installed with heavy equipment.

Context: The bridge is in a shallow floodplain that floods regularly with concern that floating debris may damage the bridge.

Project Firm: Woolpert: an architecture, engineering, geospatial firm.

Solution: A floating foundation system. "When the water rises, the lower deck attachments can rise as well, allowing the walkway to lift out of the way of debris being swept downstream. It can then be reset by park staff after the flood subsides" (O'Keefe 2022).

Other Design Considerations:
Select contextually sensitive materials. Tower Members: Weathering steel turns rust-brown. Cables and Concrete: Coat with matte, earth toned finish sealers. Connectors can be galvanized steel connectors.

Work with design build firms so finding qualifying bidders is not a problem once the design is set.



Fig 6.33 Hocking Hills Bridge.

Steep Trail Segment to Overlook

Infrastructure	Issue
Trail Segment	1. The trail between the start of the nature trail to the top of the overlook is an average slope of 10.3% but a max slope of 40.4%. This can be highly challenging for visitors to climb.





Fig 6.34 Overview of trail segment.
Fig 6.35 Limestone steps.

Physical Recommendations

#1: Provide rest areas at frequent intervals and in relatively flat parts of this trail segment. Locate them off the main path so people can pass.

#2: Verify accurate slopes in the field. For new trails, follow topography, create switchbacks, and use rolling grade dips instead of water bars to control water, and reduce slope to increase physical access.

#3: When regrading and/or altering stairs, consider the range of motion for commonly used mobility devices. Some devices can climb stairs and slopes up to a certain degree.

#4: Minimize visual impact by routing new trail segments behind existing vegetation.

Information Recommendations

#1: For trail information include: the total trail segment length to the top of the overlook, the frequency of rest stops, and the average and maximum height of the limestone steps.

Slope Suitability for Trail Additions

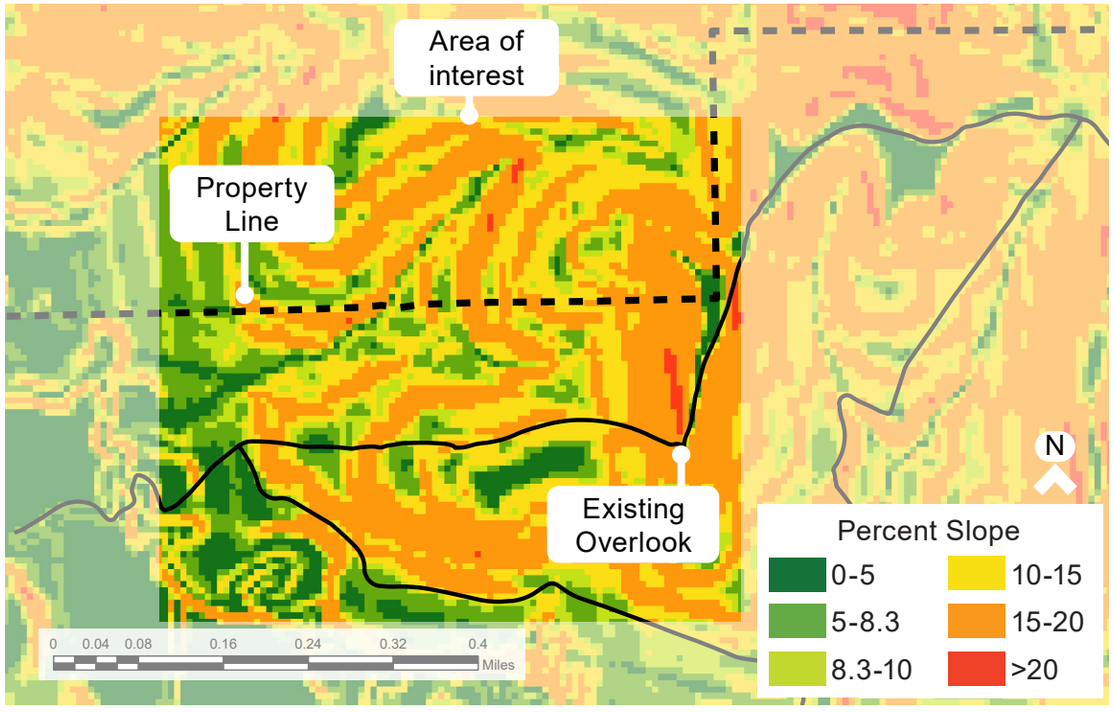


Fig 6.36 Most suitable slope is 0-8.3% for accessibility and erosion control. Will need to add switchback in areas exceeding this slope range.

Solution #1 and #2 Plan View

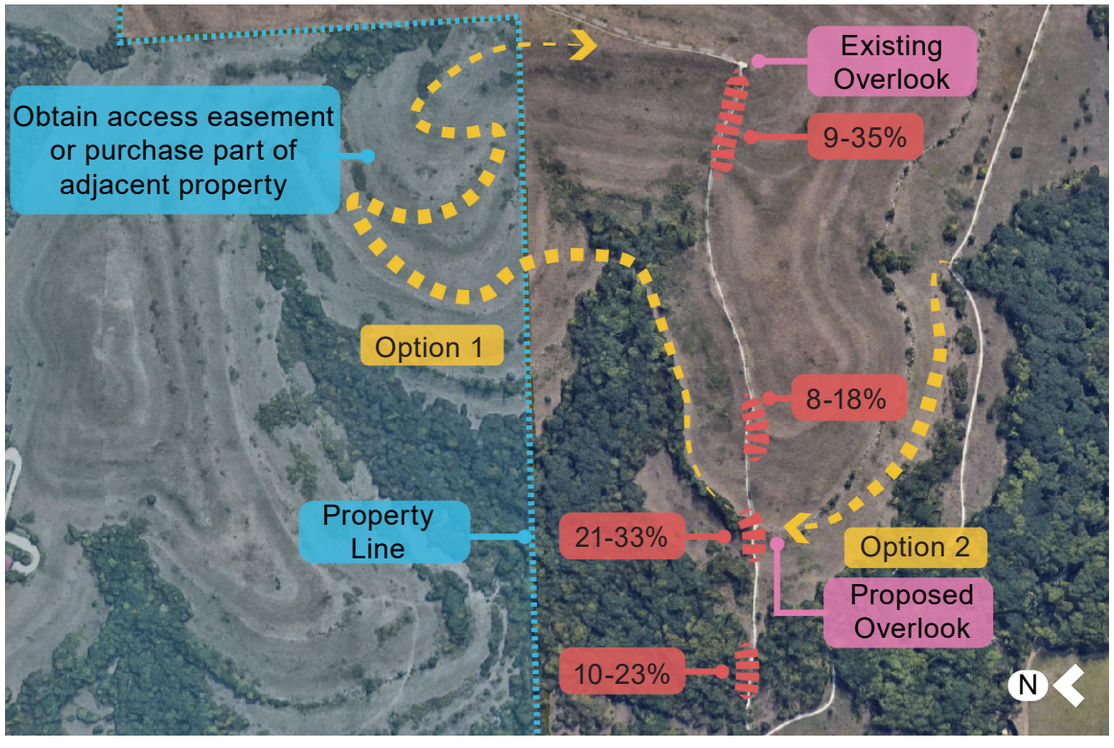


Fig 6.37 Solution #1 and #2 plan view.

Solution 1: Reroute Trail to Existing Overlook

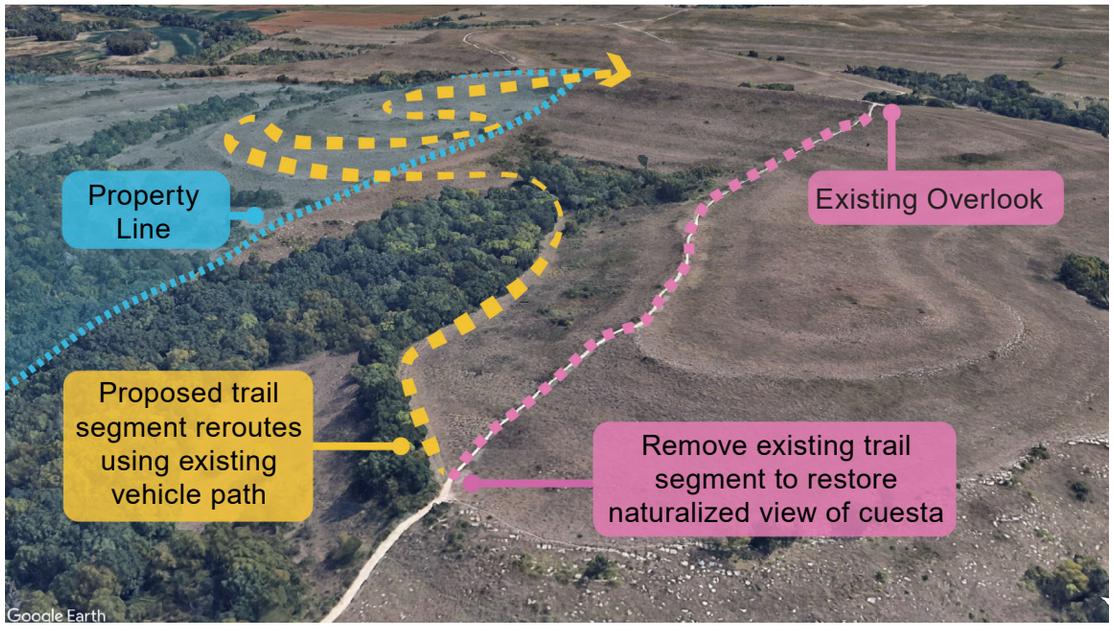


Fig 6.38 Solution 1: Reroute Trail to Existing Overlook.

Opportunities

1. Reduce erosion: Use rolling grade dips and switchbacks.

2. Improve viewshed: Remove the existing trail segment and restore with prairie vegetation.

3. Increase access for all visitors (including those using mobility devices): Reduce slope and use of stairs.

4. Improve comfort: Route the trail near the gallery forest for shade.

Drawbacks

1. Ecological Impact: Larger area of disturbance. Trail users may take shortcuts between switchbacks, increasing vegetation disturbance and soil erosion.

2. Permissions: Need to get an access easement or purchase adjacent lot.

Solution 2: Provide a New Overlook at a Lower Elevation

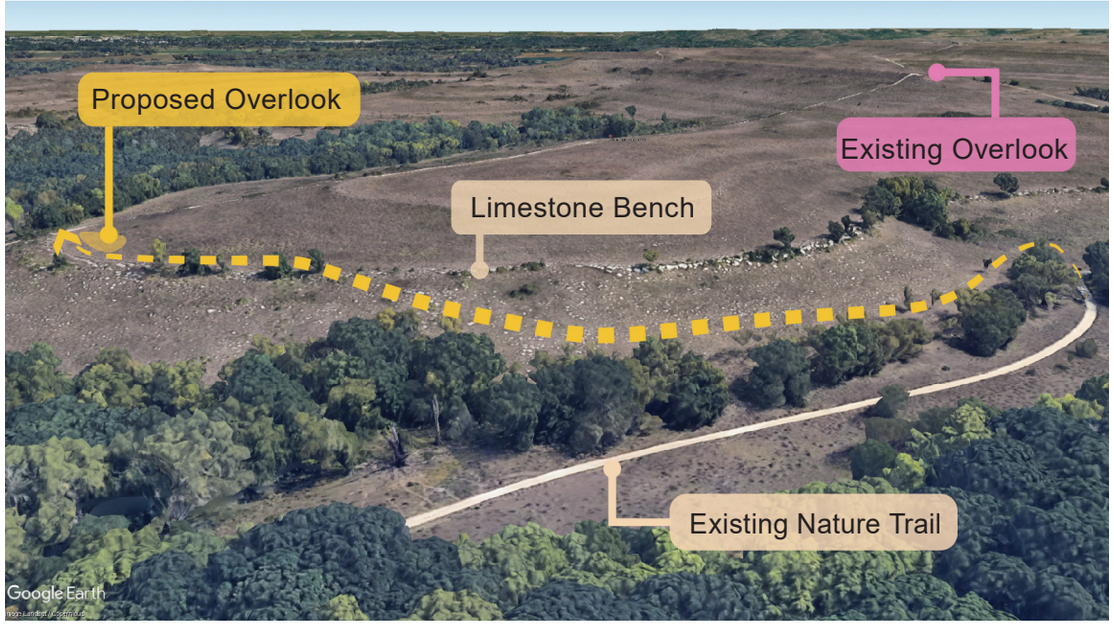


Fig 6.39 Solution 2: Provide a New Overlook at a Lower Elevation.

Opportunities

1. Improve access for all visitors: create a shorter loop option that takes less time to hike and has less elevation change.

2. Increase options: Allow visitors to enjoy a scenic view and learn about the landscape without hiking to the existing overlook.

Drawbacks

1. Equitable Access: Does not improve access to the existing overlook.

2. Impact: Construction through the limestone bench may alter the landforms beyond acceptable conditions.

Facilitated Visitor Programs

Infrastructure	Issue
Programming Description Online	1. A description of the terrain, possible barriers, possible assistance during a facilitated program is not provided on the KEEP website.
Programming	1. A sign language translator is not available. 2. Educational material is not providing in multiple formats. 3. Visitors may not be able to participate in all facilitated programs if the visitor depending on their specific needs and programmatic barriers.

Information Recommendations

#1: Provide thorough descriptions of the terrain, potential barriers, and whether certain accommodations and assistance are available.

#2: Provide the contact information of the staff member who can answer any accessibility questions and concerns.

Programming Recommendations

#1: Have a staff manager or volunteer available for sign language. The Whole Person Organization in the KC Metro area offers Deaf Cultural Awareness Training and ASL Workshops.

#2: Provide educational materials in alternative formats including videos with closed captions, braille, and large text formats.

#3: Identify and assess common barriers during facilitated programs. Brainstorm ways to provide the same educational experience to all. Can the activity be held in a different location? Does an adaptive device exist that could make the activity possible?

#4: Invite participants representing a range of abilities to 'test' the facilitated programs. Be open to any feedback and willing to adjust the programs to be more inclusive. Appropriately compensate any participants for their time.

Signage

Infrastructure	Issue
Signage	1. The content, material, and format of existing signage could present a barrier for visitors.

Information Recommendations

#1 Content: Wayfinding signage and maps should include slope, material, width, barriers, and experience information.

#2 Material: Eliminate use of plexiglass over signage to reduce glare. Make signs from durable, non-metallic or glossy materials.

#3 Format: Create a visually cohesive signage package and make trail maps larger for legibility. Consult the Harpers Ferry Interpretive Media guide for typeface, size, and contrast standards.

#4 Format: Explore alternative means to engage with interpretive information like audio and tactile features. Consider use of QR codes and wifi service on site.

Partnerships and Collaboration

Infrastructure	Issue
Partnerships	1. The KPBS has limited staff capacity and funding to implement universal design strategies.

Recommendations

#1: Partner with Kansas State University students to conduct visitor use surveys, help with trail maintenance, and any tasks.

#2: Partner with the Tallgrass Prairie National Preserve to share knowledge and resources. There is potential to share mobility devices between the preserves for visitor use.

#3: Hire a part time intern in landscape architecture, graphic design, etc. to design community engagement events and signage packages.

#4: Leverage the Friends of the Konza Prairie as a way to discuss and advance diversity, equity, and inclusion (DEI) issues.

7.

CONCLUSION

7a. Conclusion

SEVEN

7a. Conclusion

Findings of Research Questions

How can universal design strategies be adapted for use in protected natural areas to create inclusive and quality experiences for visitors with mobility, vision, and hearing disabilities?

Literature Review | Interviews | Document Analysis

The research projected demonstrated how universal design strategies geared toward indoor and urban spaces can be adapted for use in protected natural areas.

Interviewee Alexa Vaughn indicated that the existing guidelines are still applicable. We just need to think outside the box to make them applicable. While this is true, researchers, natural area staff, and designers must also examine existing design guidelines in the context of natural areas (terrain, ecosystems, visitor use, goals, etc.), identify what strategies can be adapted, and what new strategies need to be developed.

Subquestion How can existing standards and guidelines be adapted to better accomplish universal access alongside conservation and visitor use objectives within protected natural areas?

Interviews | Document Analysis | Guidebook

The research project achieved this question by providing an adapted guidebook specific for land managers of protected natural areas.

Further, the findings need to be adopted by nature conservation entities like the Interagency Visitor Use Management Council (IVUM - National) and the International Union for Conservation of Nature (IUCN - International). In addition, this research should be funded by the Association of Landscape Architects (ASLA - National) and integrated into their design guidelines.

Subquestion What are the key factors and design strategies to address barriers and create high quality, inclusive nature-based activities for individuals with mobility, vision, and hearing disabilities?

Literature Review | Interviews | Document Analysis | Guidebook

The factors and strategies are in the interview findings section and guidebook. Most notably, working in an interdisciplinary project team and engaging people with disabilities are the most effective strategies to providing inclusive, high-quality experiences.

Subquestion What are the big picture and site-specific challenges that influence the provision of universal access in protected natural areas and how can those challenges be overcome?

Interviews | Document Analysis | Literature Review

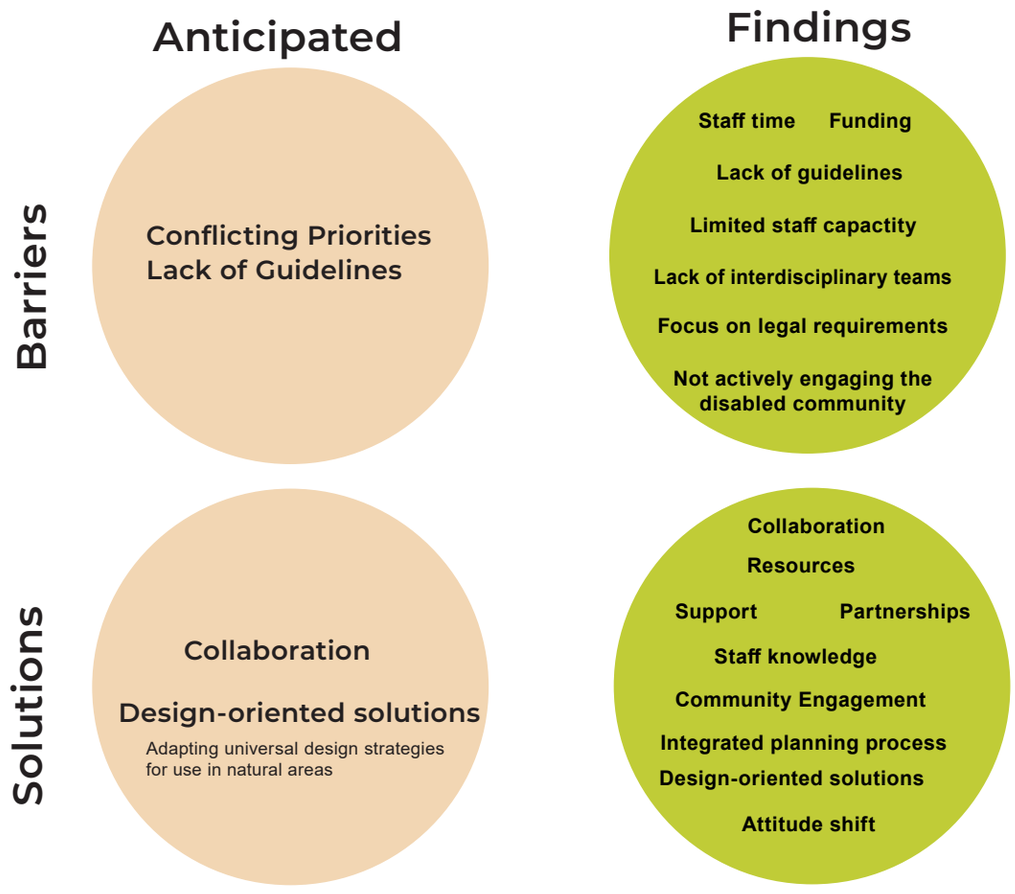


Fig 7.1 Findings of barriers and solutions.

Subquestion How can collaboration between natural area staff, the public, accessibility specialists, and landscape architects improve decision-making and universal access strategies in alignment with each of their responsibilities and priorities?

Interviews

Projective Design

Collaboration and partnerships were emphasized throughout the findings. This supports balancing various prioritizes, creative problem solving, resource sharing, and learning from others. The revised framework below also shows that collaboration between the design team, land managers / site staff, and stakeholders happens throughout the entire planning and design process for visitor use and site design.

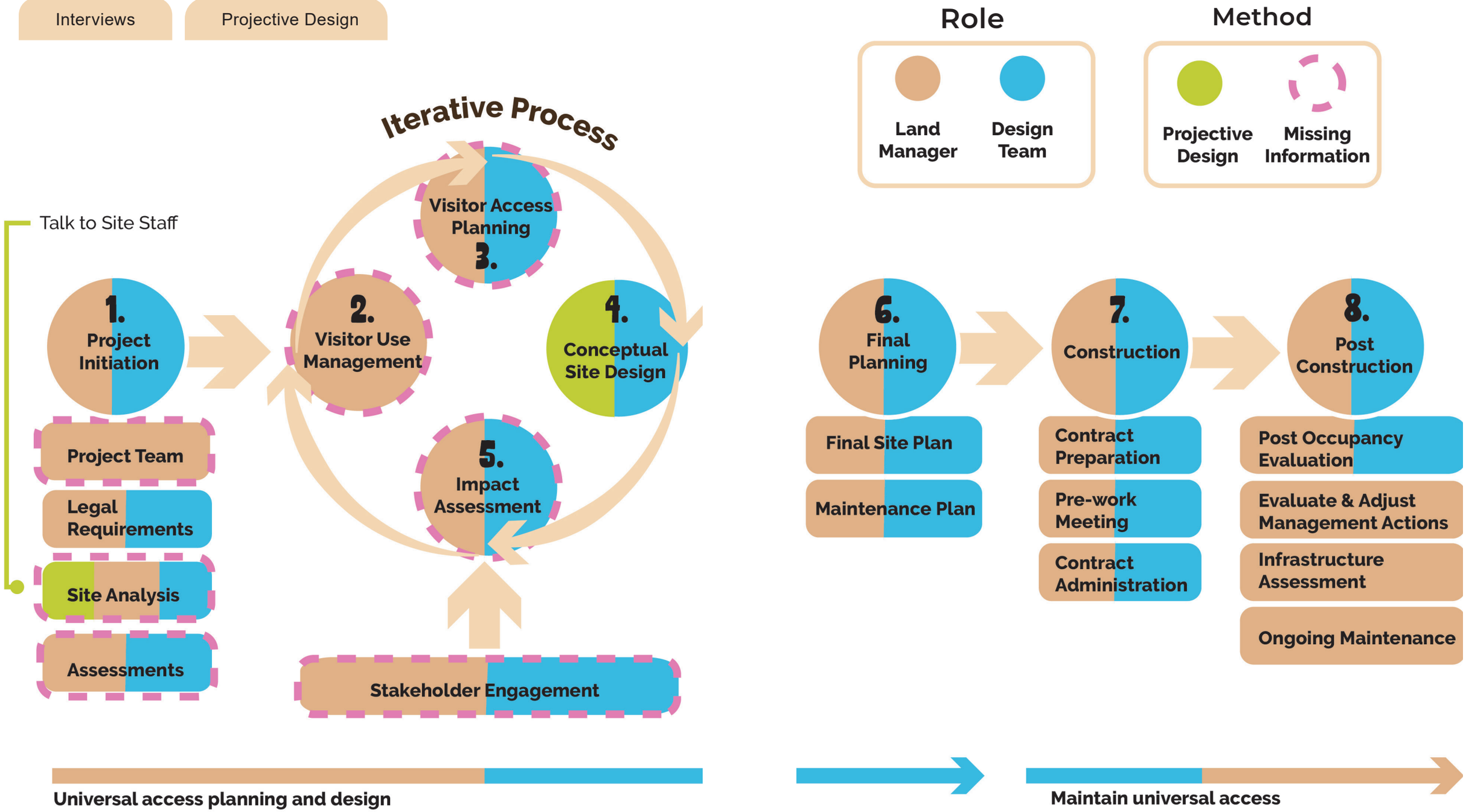
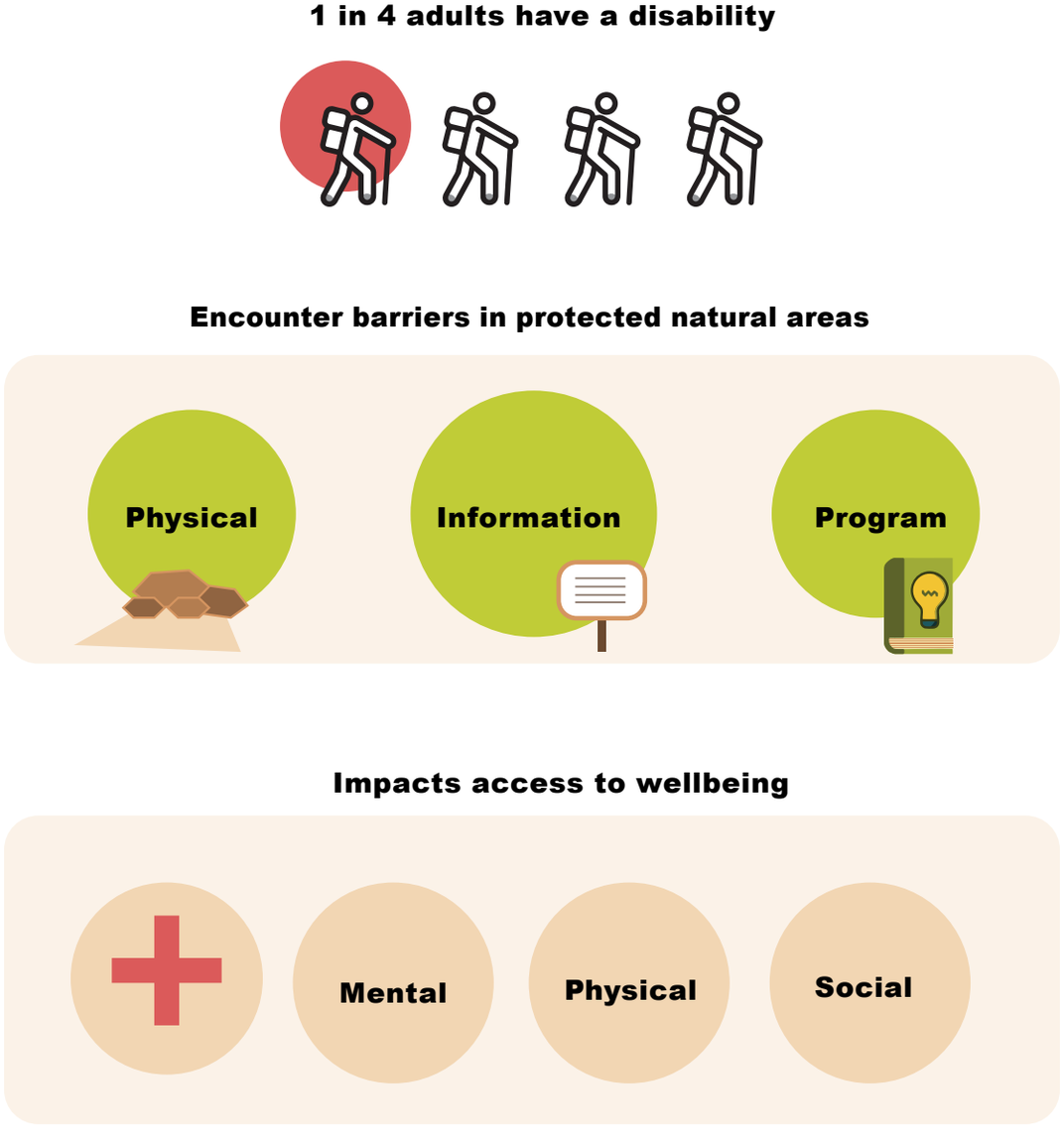


Fig 7.2 Revised Integrated Planning and Design Framework based on projective design findings.

Personal Reflection

When I started this journey, I knew little about universal access or the challenges people with disabilities face when accessing and participating in nature-based activities. My understanding was like vague shapes of knowing: knowing there are barriers, knowing there are implementation challenges specific to natural settings, knowing that universal access was uncommon in protected natural areas. During the course of this research, my understanding of the challenges, opportunities, and significance of this work grew. What I didn't anticipate was the passion that landscape architects, land managers, visitor program directors, and accessibility specialists have to tackle these barriers and create equitable opportunities. This openness to change the way things are is an essential first step of providing universal access. Overall, I believe landscape architects and natural area staff have to be willing to embark on a process of trial and error, have tough conversations, show compassion, and break the status quo that natural areas are 'inherently inaccessible'. In addition, the diagram below shows the various roles landscape architects have in providing universal access in natural areas. Providing universal access and developing guidelines is a continuous and challenging learning process. The best way to effect change is simply to start!



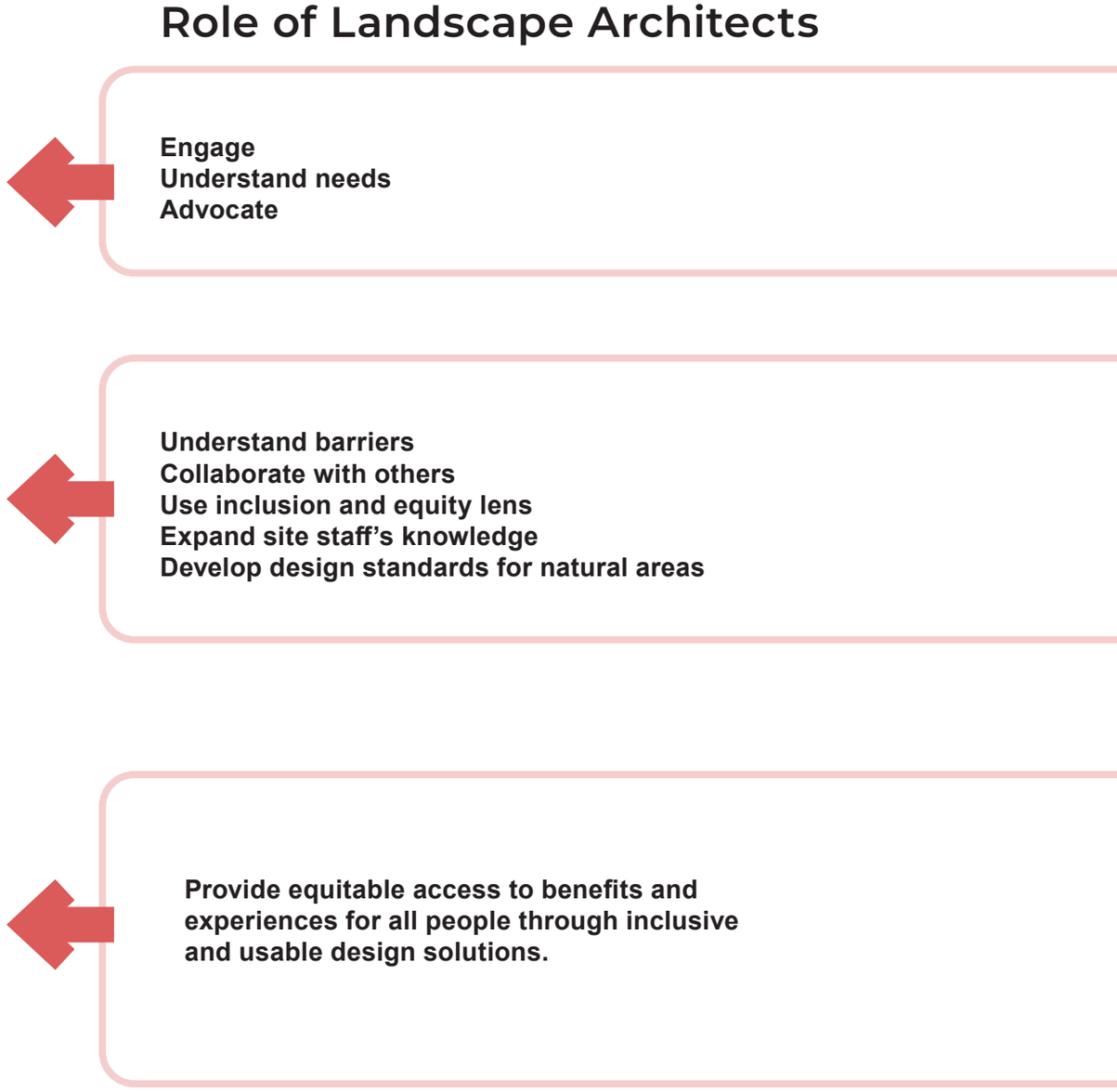


Fig 7.3 Role of landscape architects.

Project Limitations

The semi-structured interviews represented a small sample of perspectives and experiences. The Accessibility Specialist group had the fewest interviewees, and one did not have specific experience working with protected natural areas. The interviews were also only analyzed by one person and was not verified by another researcher.

The proposed Guidebook was limited by time since it was developed in the course of one semester. Further the proposed Guidebook was not reviewed by any subject-matter experts or individuals with lived experience with a disability. Feedback from these individuals would have refined and strengthened the guidelines.

The projective design was highly conceptual and limited by the time constraint, limited site analysis, and lack of a project team. The site analysis, which informed the projective design was limited since tools were not available to accurately measure slope and cross slope of existing or proposed trails. To develop a real project several factors would be necessary. These include more information and detailed planning by the site staff, a project team representing a range of expertise, and engagement with the general community, stakeholders, and people representing diverse abilities.

Future Research

1. Refine guidebook with input and feedback of:

Subject matter experts

People representing a range of abilities



Fig 7.4 Refine guidebook.

Future research should include people who enjoy visiting natural areas and represent a range of disabilities. Their perspectives and feedback should be used to refine and expand the universal access recommendations before formally publishing the guidebook.

2. Expand research to represent a wider range of abilities:

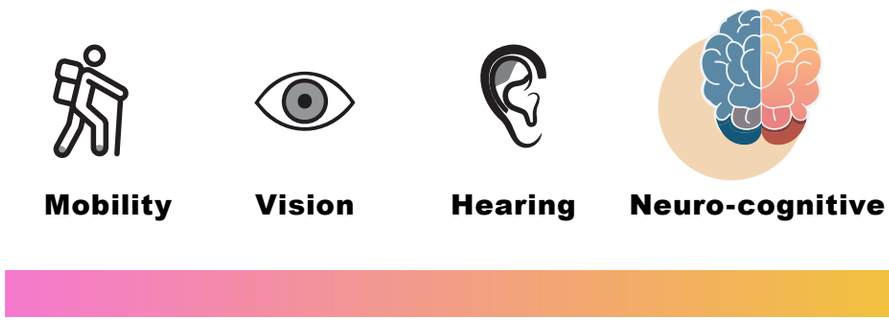


Fig 7.5
Expand research.

Future research should also include disabilities beyond those researched in this project (mobility, vision, and hearing). Neuro-cognitive disabilities are underrepresented in current research and guidelines.

3. Investigate strategies for facilitated visitor programs:



Fig 7.6 Tallgrass Prairie National Preserve Bus tours.

There is a knowledge gap for making facilitated programs like tours and educational programs universally accessible. Additional research to create guidelines specific to inclusive facilitated programs is needed. I suggest looking at existing research on universally accessible school programs and adapting them for the needs of natural area programs.

END MATTER

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