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The Restorative Design Scale (RDS) An Assessment Guide: Measuring the Potential for Mental Restoration in Urban Green Spaces

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THE RESTORATIVE DESIGN SCALE (RDS): AN ASSESSMENT GUIDE MEASURING THE POTENTIAL FOR MENTAL RESTORATION IN URBAN GREEN SPACES

by

Corinne M. Bahr

A thesis submitted in partial fulfillment
of the requirements for the degree

of

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in

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Approved:

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The Restorative Design Scale (RDS)

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Public Abstract

Mental health is a growing national priority, and green space has been proven to benefit mental health. There is a massive amount of recent research studying the influence of green space characteristics on mental health improvement and restoration. However, professional landscape architects, designers, and planners involved in creating physical spaces have not been able to assess and therefore prioritize mental health in their designs due to the sheer quantity of information that has not yet been synthesized and applied efficiently. The Restorative Design Scale (RDS) Assessment condenses this material into a scientifically inspired resource for professionals to easily understand and apply. This tool enables professionals to assess the strengths and weaknesses of existing public green spaces in providing mental health benefits. This tool also empowers professionals to improve mental health aspects of design in the public realm by guiding upgrades and new designs, communicating scientifically supported priorities, focusing funding, and thus providing a better quality of life for green space users.

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Abstract

BACKGROUND: Mental health is a growing national priority. However, professional landscape architects, designers, and planners involved in creating physical spaces have not been able to assess and therefore prioritize mental health in their designs due to the sheer quantity of information that has not yet been synthesized and applied efficiently. The Restorative Design Scale (RDS) Assessment condenses this material into a scientifically backed resource for professionals to easily understand and apply.

METHODS: The Restorative Design Scale Assessment synthesizes four previously developed restorativeness theories, two accredited assessments, two additional assessment tools, and extensive individual scientific articles. All of these were reviewed to identify a means to assess the quality of mentally restorative green space. The assessment contains questions that reflect the findings of significant green space features influencing green space restorativeness. The score system is patterned after WELL Building Codes and SITES assessments. The assessment was tested and revised with four different groups of professional landscape architects, designers, and planners in Utah to ensure professional applicability.

FINDINGS: The scale synthesizes related theories and assessments into five overarching themes: 1) Novelty & Intrigue (Soft Fascination), 2) Environmental Diversity, 3) Sociality & Movement, 4) Mindfulness, and 5) Design Principles. Evaluating questions are called Components and are organized under the five themes. All Components are scored between 1-10 points with a recommended multiplier to weight the components that are most influential to mental restoration. The RDS does not require a specific score to be restorative, rather, it provides a relative score that represents the restorative values of the site.

INTERPRETATION: This tool enables professionals to assess the strengths and weaknesses of existing public green spaces in providing mental health benefits. This tool also empowers professionals to improve mental health aspects of design in the public realm by guiding upgrades and new designs, communicating scientifically supported priorities, focusing funding, and providing a better quality of life for green space users.

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My mother was my cheerleader as she mirrored my excitement and reignited mine when it was gone. She helped ground my expectations but keep my hopes soaring high. At moments she was my research assistant, my friend, and my therapist, and her contributions made it possible for me to complete this project.

My family was the inspiration for this project and they continually cheered me on. My coworkers and friends who frequently checked up on me, wanted me to succeed, and offered their skills and feedback during the review processes. My countless new professional friends and mentors who helped me through the testing and refining phases of the project.

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Table of Contents

List of Figures

List of Tables

Chapter One: Project Purpose & Background

Mental health is an increasing challenge and priority for individuals and society. Mental health disorders currently affect approximately 1 in 4 adults (Johns Hopkins Medicine, 2023) and account for several top causes of disability in established economic markets. In the United States, the number of people experiencing serious psychological distress between 2008 and 2017 increased by 71% (Twenge et al., 2017). Depressive and anxiety disorders ranked among the top 25 leading causes of global health-related burden in 2019 (Santomauro et al., 2021). Despite increased interventions to reduce their impact, there has been no reduction in global prevalence or burden since 1990 (Santomauro et al., 2021). Mental health deterioration is particularly a concern in urban or developing areas (Peen et al, 2009). Additionally, the global population is concentrating in cities creating the concern that we are becoming increasingly isolated from nature. Access to green spaces increases mental restoration which decreases the intensity and progression of mental health disorders (Jimenez et al., 2021; Chen et al., 2021; Barton & Rogerson, 2017; van den Berg et al., 2007; van den Berg et al., 2010; Bowler et al., 2010). Urban public greenspace is where many people's daily contact with nature occurs, and such contact has measurable physical and psychological benefits (Fuller et al., 2007).

Pandemic conditions increased the prevalence of those experiencing symptoms of at least one current mental disorder from a baseline of 20% in 2017 to 29.63% in 2020 during the COVID-19 pandemic (Winkler et al., 2020). Due to increased stress and isolation of pandemic times, the prevalence of major depressive disorders and suicide risk tripled, and current anxiety disorders almost doubled (Winkler et al., 2020). In an attempt to mitigate this problem, there was a migration to the outdoors as the population sought to cope with the stresses experienced during pandemic conditions (Beery et al., 2021).

Access to green space increases mental restoration which decreases the intensity and progression of mental health disorders through the promotion of physical exercise, social interaction,

aesthetic appreciation, and through the opportunity for attention restoration (Vanaken & Danckaerts, 2018). Further, research supports associations between green space exposure and improved cognitive function, higher brain activity, lower blood pressure, increased physical activity, and better sleep patterns (Jimenez et al., 2021), all of which increase psychological abilities to cope with mental health disorders.

However, some green spaces are more restorative than others, thus more effectively mitigating effects of mental health disorders (Wood et al., 2018; Barnes et al., 2019; Francis et al., 2012; Brito et al., 2022). Topics of recent interest for those who study green spaces are determining which characteristics provide greater mental restoration and how we measure the holistic effect of these characteristics? Many studies that offer strong evidence of a correlation between mental health improvements and green space also treated all vegetation covers as equal (Wood et al., 2018). Studies on green space and mental health often measure green space as a singular entity, using the normalized difference vegetation index (NDVI) instead of looking at the qualities of the green spaces, due to the complexity involved in quantifying and categorizing various qualities of green space (Barnes et al., 2019). While measuring green space as a uniform concept simplifies the analysis and allows for broader comparisons across diverse urban environments, differentiating between green spaces based on specific qualities is crucial for understanding the why and how of restorative green space. Researchers often face challenges in standardizing and objectively classifying these qualities.

There is a growing recognition of the need for more nuanced research, acknowledging that not all green spaces offer the same mental health benefits. Barnes et al.'s (2019) integrative review related nature experiences that improved mental health. They evaluated the natural elements in the articles, contacted researchers, and used google earth to try to define the natural elements in those studies. Barnes et al. (2019) along with other researchers recognized the need of researchers to better identify and share the specific natural elements included in studies related to mental health (Olszewska-Guizzo et al., 2022). Future studies may increasingly focus on distinguishing different qualities, such as size, biodiversity, accessibility, and design features, to provide more detailed insights into the specific attributes that contribute to positive mental health outcomes.

Unfortunately, those who are often responsible for designing green spaces do not have access to research-based design principles that define which characteristics of green spaces create

the most restorative sites (Olszewska-Guizzo et al., 2022; Barnes et al., 2019; Wood et al., 2018; Nordh et al., 2009; Tsai et al., 2018).According to the American Society of Landscape Architects (ASLA), Landscape Architects and designers actively seek to “promote public health, safety, and welfare,” (ASLA, 2024). In order to achieve this goal, both landscape designers and urban planners work with multiple complexities (ADA accessibility, sustainability, grading and drainage, transportation, policy and code, etc) that are well defined. Restorativeness, as a poorly understood complexity, frequently falls by the wayside. Designers and decision makers could benefit from a tool and the knowledge that it gives for how to create a restorative world. Unfortunately, it is typically not feasible for professionals to access, comprehend, and apply the growing body of disjointed literature that exists on restorative landscapes

The creation of a comprehensive and simple assessment will allow professionals to easily assess the strengths and weaknesses of existing public green spaces in providing mental health benefits. This type of tool empowers professionals to work with clients to improve mental health aspects of design in the public realm by guiding upgrades and new designs, communicating scientifically supported priorities, focusing funding, and providing a better quality of life for green space users. Ultimately, providing quality green spaces in communities improves the mental health of residents (Barnes et al., 2019). Improving mental health and quality of life for residents through restorative green space design could decrease monetary medical burdens, increase productivity in employment, increase commercial revenue, increase social participation, increase community spirit, and improve quality of life (Engemann, et al. 2019).

To address these challenges, I created the Restorative Design Scale (RDS) — a research-based design assessment — for landscape designers and planners to quantify the mental restorativeness of public green spaces. RDS aggregates, translates, and distills recent research on mentally restorative green spaces into an assessment, similar to LEED (USGBC, 2019) or SITES (SITES, 2015). However, instead of measuring sustainability (as LEED and SITES do), the RDS measures mental restorativeness. The purpose of the RDS is to bridge the gap between research and professional application, and provide designers and planners an easy-to-use form that will measure the restorative nature and potential of existing public spaces. This is now possible by assessing existing sites and identifying strengths and weaknesses of the site, thus enabling designers and planners to refine and create public green spaces with increased restorative potential and to empower positive mental health among their communities.

Chapter Two: Literature Review

Summary

The literature review provides an overview of the relationship between mental health and green space, particularly in urban environments. It delves into how green spaces influence mental well-being. The review then analyzes existing theories such as James's theory, ART, SRT, and PSD, along with individual characteristics of green spaces that affect mental health, and existing assessment methods like WELL, SITES, and CLM. These discussions underscore the need for bridging scientific knowledge with practical application, which is the main aim of this project. It is important to note that the field of mental health and green space correlation is rapidly evolving, and ongoing literature review will be necessary.

Mental Health

The intensity and prevalence of mental illness diagnoses in the United State are increasing. In the United States, mental health disorders currently affect approximately 26% of adults (John Hopkins Medicine, 2023), or over 1 in 4 adults, and account for several top causes of disability in established economic markets. Moreover, more than 30% of adults are expected to experience a mental health condition at some point in their lives (WELL, 2021). Research indicates that mood, anxiety, and substance use disorders typically manifest in childhood, early adolescence, or early adulthood, usually before the age of 25 years old. Rates of experiencing at least one major depressive episode in the last year among teenagers ages 12 to 17 increased 52% (from 8.7% to 13.2%) and increased 63% (from 8.1% to 13.2%) among young adults ages 18 to 25 between the years of 2008 to 2017. This represents a 71% increase in serious psychological distress (Twenge et al., 2017). In contrast, older adults aged 55 and above face a heightened vulnerability to developing anxiety, mood disorders, cognitive impairment, and a higher risk of suicide compared to other age demographics (WELL, 2021.).

Depressive and anxiety disorders rank among the top 25 leading causes of global health-related burden in 2019 (Santomauro et al., 2021). This burden extends across lifespans of all sexes and across many locations (Santomauro et al., 2021). Santomauro et al (2021) also found that despite increased interventions to reduce their impact, there has been no reduction in global prevalence or burden since 1990.

Mental Health in Urban Contexts

More than half of the global population currently resides in urban settings, and projections indicate that this number is likely to rise to two-thirds by the year 2050 (WELL, 2021). The ongoing global trend toward urbanization, coupled with lifestyle changes leading to the depletion of natural resources, aligns with this urban shift and distances people even more from the natural environment. According to the American Psychiatric Association (2021), living in urban areas is associated with an increased risk of mental disorders. People in urban areas experience mood

disorders up to 39%, anxiety disorders up to 21%, and double the risk of schizophrenia (Peen et al, 2009). According to the United States Census Bureau (2021), 80.7% of the United States population currently lives in urban areas, and it is estimated that 89% of the population will live in cities by 2050 (United Nations, 2019). With increasing urban concentrations of the population, urban public greenspace is where many people's daily contact with nature occurs, and such greenspace interaction has measurable physical and mental benefits (Fuller et al., 2007).

The Effects of the COVID-19 Pandemic on Mental Health

Pandemic conditions increased the prevalence of those experiencing symptoms of at least one current mental disorder from a baseline of 20% in 2017 to 29.63% in 2020 during the COVID-19 pandemic. Due to increased stress and isolation of pandemic times, the prevalence of major depressive disorders and suicide risk tripled, and current anxiety disorders almost doubled (Winkler et al., 2020). The pandemic created an urgency to strengthen mental health systems and implement mitigation strategies. Santomauro and colleagues (2021) state the importance of addressing this rising dilemma when they write, "taking no action to address the burden of major depressive disorders and anxiety disorders should not be an option." Populations sought to cope with the stresses experienced during pandemic conditions resulting in a migration to the outdoors (Beery et al., 2021).

Green Space and Mental Health

Green space has been tied to improving health and wellness in extensive research across decades. According to Vanaken and Danckaerts (2018), access to green space increases mental restoration which decreases the intensity and progression of mental health disorders through the promotion of physical exercise, social interaction, aesthetic appreciation, and the opportunity for attention restoration. Research supports associations between green space exposure and improved cognitive function, higher brain activity, lower blood pressure, increased physical activity, and better sleep patterns (Jimenez et al., 2021), all of which increase psychological abilities to cope with mental health disorders.

The presence of green space decreases the mental fatigue accrued through daily demands, which moderates procrastination and allows residents to view major life issues as less severe and more solvable (Kuo, 2001), thus mitigating causes of symptoms for depressive and anxiety disorders. People in areas without green space show symptoms of greater mental fatigue, which causes increased aggression, violence, and increased intensity of depressive disorders (Kuo & Sullivan, 2001).

A recent study by Brito et al. (2022) confirmed that the restorative benefits of green space are unrelated to age, gender, or ethnic background and can, therefore, benefit all people. Engemann et al. (2019) found, unlike Brito's study, age does influence the developmental benefits of green space experienced by an individual. Engemann et al's (2019) nationwide study in Denmark found that children who grew up with low levels of green space exposure had a 55% higher risk of developing psychiatric disorders. GIS analysis of green space around residences from birth to age ten showed that exposure to green space in those formative years had more of an impact on lifelong mental health than single-year greenspace exposure later. Also, children with attention deficit disorder (ADD) obtain attentional support from green space and focus better than usual after activities in green settings, and the "greener" the play area the less severe were the symptoms of attention deficit (Taylor et al., 2001). Quantity of available green space has a greater impact on attentiveness and motor skills of children under the age of 12. In addition, access to higher recreational quality of green spaces decreased depressive symptoms of adolescents and adults (Vanaken & Danckaerts, 2018). While both quantity and quality of streetscape greenery are linked to mental health, the relationships are generally stronger for quality than quantity. Tangible qualities, such as water features and walking paths, display a more robust association with mental health than subjective aspects like perceived friendliness (Francis et al., 2012). Notably, high-quality public open space is more crucial for residents' mental well-being than public open space quantity, irrespective of usage (de Vries et al., 2013; Francis et al., 2012).

Green spaces are also associated with a reduction of frailty, especially in females, people aged 100 and older, illiterate people, urban residents, unmarried people, and individuals with other increased risks (He et al., 2022). Research affirms that integrating natural environments into

urban planning offers promising results to improve mental health and reduce the rising burden of psychiatric disorders (Engemann et al., 2019). A short supply of public green space or inappropriate planning of such spaces would exacerbate the rising mental health crisis (Shan et al., 2022). However, some green spaces are more restorative than others, thus more effectively mitigating effects of mental health disorders.

Restorativeness

A greater, and recent, scientific interest is to determine which characteristics of a green space provide greater mental restoration and how we can effectively measure them. Many studies that supported correlation between mental health improvements and green space also treated all vegetation covers as equal (Wood et al., 2018). Barnes et al.'s (2019) integrative review related nature experiences that improved mental health. They evaluated the natural elements in the articles, contacted researchers and used google earth to try to define the natural elements in those studies. Barnes also recognized the need for researchers to better identify and share the specific natural elements included in studies related to mental health. One of many examples, de Vries et al (2013) and Francis et al (2012) both studied what characteristics give a public green space "quality." de Vries et al (2013) came to the conclusion that quality green spaces include stress reduction, stimulating physical activity, and facilitating social cohesion. Frances et al (2012) synthesized that tangible qualities–including water features, wildlife, and walking paths–have a stronger association with mental health than subjective qualities such as perceived friendliness, comfort, and safety. Meanwhile, another study says that functions such as physical exercise or sociocultural events hold more benefit (Lee et al., 2015). Another states that biodiversity is more important than groomed recreation fields (Hand et al., 2016). While there is debate about the mediators of improved mental health related to green space, there are patterns appearing in the research suggesting that there are multiple mediators of mental health improvement through access to greenspace including, natural, social, exercise, and environmental improvements among others. However, there is ongoing debate over which qualities hold more weight and importance.

Despite the myriad of definitions for "quality" green spaces, most researchers agree, and frequently articulate, that decision-makers who seek to improve mental health in cities have minimal guidance about what elements of nature and types of experiences may lead to positive health outcomes. By understanding restorative characteristics of green space and theories of restoration, the gap between research and application can be bridged (Olszewska-Guizzo et al., 2022; Barnes et al., 2019; Wood et al., 2018; Nordh et al., 2009; Tsai et al., 2018).

Theories of Mental Restoration

Frederick Law Olmstead's early design and conservation work in creating urban parks was a visionary precursor to the current recognition of the value of connecting with nature (Olmstead Network, 2023). Many theories have been developed since to explain how and why connections with nature matter. The existence of multiple theories on green space and mental restoration can be attributed to the complex and multidimensional nature of the relationship between nature exposure and mental well-being. Researchers approach this topic from diverse perspectives, considering various psychological, physiological, and environmental factors. The uniqueness of each theory lies in its emphasis on specific mechanisms, contexts, or outcomes related to mental restoration.

These theories are not redundant but complementary, providing a more comprehensive understanding of the intricate processes involved. Different scholars might focus on distinct aspects, such as stress reduction, attention restoration, or social interactions, leading to the development of varied theories. Each theory offers valuable perspectives, accommodating the diversity of human experiences and environmental contexts, thereby enhancing the overall understanding of the complex interplay between nature and mental well-being. Moreover, the field of environmental psychology is continually evolving, and researchers build upon existing knowledge to refine and expand theoretical frameworks.

James' Theory (1890): A pioneer in the field of psychology, William James transitioned the field of psychology to one of science and laid the groundwork that is still used by researchers today. Within his extensive work in psychology, James defines attention as the act of focusing your mind clearly and vividly on one thing out of many possible options. He says this focused state

involves being aware and concentrated, which helps you ignore distractions and think effectively. James contrasts this with feeling confused or scattered (James, 2018). James defines active or voluntary attention as the state when we give our attention to something. Active attention can only be maintained for a few seconds at a time, being most often "sustained …[by] a repetition of successive efforts which bring back the topic to the mind." Modern terminology has renamed voluntary attention as directed attention. Directed attention fatigue (DAF) occurs when used repetitively over extended periods of time and may damage the prefrontal cortex of the brain if not given time to recover. Passive attention, or non-voluntary attention, is engaged by interesting topics that do not make excessive demands of the mind. Passive attention is restorative attention (Kaplan, 1995).

Wilson's early theory on Biophilia (1984) suggests that psychological restoration from green spaces results from a genetic predisposition to seek and benefit from nature (Wilson, 1984). This connection includes both physical and psychological dimensions, with humans benefiting from the outdoor environment as a source of nourishment, shelter, security, and restoration (WELL, 2021). The psychological aspect of this connection reflects an inherent attraction that can be experienced both by being in proximity to nature and by engaging with biomimetic environments, which incorporate nature-inspired designs (Dinu Roman Szabo et al., 2023).

On the other hand, biophobia represents the opposite spectrum, encompassing the fear or aversion to certain aspects of the natural world. This concept recognizes that, despite the innate affinity for nature, individuals may develop anxieties or phobias related to specific elements, such as snakes, spiders, or heights. Biophobia highlights the complex relationship humans have with nature, acknowledging that while there is a fundamental attraction, there can also be elements that evoke fear or discomfort (Olszewska-Guizzo, et al., 2023; Gatersleben & Andrews, 2013). Both biophilia and biophobia play roles in shaping our perceptions and interactions with the environment.

Kaplan's Attention Restoration Theory (ART) (1989) emphasizes the restoration of concentration and attentional functioning through exposure to natural environments. It incorporates four key components: extent (the degree of immersion in the environment), being away (distancing

from routine activities), “soft” fascination (captivating attention effortlessly), and compatibility (individual’s choice to be in a particular place) (Kaplan, 1995). ART is comprehensive in addressing attention restoration, considers various psychological aspects, and provides specific factors to enhance the restorative experience; however, the subjective nature of some components may make it challenging to measure and apply universally. Notably, ART has proven enduring since its inception. The Perceived Restorativeness Scale (PRS), a visual-based assessment developed by Hartig et al. (1997), was derived from ART, quantifying the restorative experiences individuals have in a given environment. PRS, along with the principles of ART, serves not only as a standalone measure but also as a validation tool for other theories, including the Perceived Sensory Dimension (Peschart & Stigsdotter, 2013). Later, Marcus & Sachs (2014) synthesized four design principles from ART including coherence, complexity, legibility, and mystery. These design principles support mental restoration by creating sensory engagement, memorability, a sense of discovery, and a sense of safety. This underlines the adaptability and utility of ART and its associated scales in the broader context of assessing the psychological impact of environments.

The Stress Reduction Theory (SRT) by Roger Ulrich (1991) suggests that natural environments invoke calming responses, decreasing mental fatigue and indicating general reduction of psychological symptoms of stress from viewing natural settings with restorative qualities (Ulrich, et al. 1991). Ulrich et al. (1991) defined and summarized the elements needed to reduce stress:

1. A sense of control (actual or perceived) and access to privacy,
2. Social support,
3. Physical movement and exercise, and
4. Positive natural distractions.

SRT provides a broader understanding of stress reduction in natural environments and offers practical elements to achieve stress reduction. However, the emphasis on stress might not cover the entire spectrum of psychological well-being, and the theory’s application may vary based on individual differences.

ART and SRT, developed within a span of three years, offer nuanced perspectives on the factors influencing restorativeness in public green spaces. Their primary distinctions lie in focus and

mechanisms: ART is predominantly concerned with restoring attention and concentration through exposure to nature, whereas SRT centers around the stress-reducing impacts of natural environments. Another notable difference is in their components. ART introduces theoretical principles like extent, being away, fascination, and compatibility, while SRT places emphasis on function and perception such as control, social support, physical movement, and positive distractions. These variations highlight the multifaceted nature of restorative experiences and the diverse pathways through which nature contributes to well-being.

Perceived Sensory Dimension (PSD) is a tool developed by Grahn and Stigsdotter (2010) that provides a comprehensive assessment of cultural ecosystem services through eight sensory dimensions that align with basic human needs. The eight sensory dimensions are outlined by Grahn and Stigsdotter (2010) (see also Figure 2 in the Appendix) and are succinctly explained by Memari et al. (2021):

1. Natural (a wild environment that does not seem to be created by humans),
2. Richness of Species (a sense of complexity and species richness in the environment),
3. Cohesive Space (the sense of spatial unity with the potential to contain and surround the individual with potential to explore),
4. Prospect (a potentially mixed-use open area),
5. Refuge (a haven or relatively enclosed space),
6. Social (presence of people and a place for social activities),
7. Serene (a safe peaceful and calm place, with no disturbances), and
8. Cultural (cultivated and man-made surroundings combined with cultural elements).

Its strengths include a holistic understanding of restoration factors, a human-centric approach, cultural relevance, and flexibility in addressing diverse needs. However, subjectivity, complexity in application, cultural variation, and reliance on qualitative data could pose challenges.

The Prospect-Refuge Theory proposed by Jay Appleton in 1975 is referenced heavily by PSD and used in support of elements in ART and SRT. The theory postulates that people seek areas where they can find information by seeing the area around them (prospect), while having a safe area to watch from (refuge).

Sensory-Therapeutic Gardens have been recognized for hundreds of years for their restorative potential in and near hospitals. Revitalized after the increased modernization and sterilization of modern medicine, these gardens provide insight for all restorative green spaces. The findings of Dinu Roman Szabo and colleagues (2023) consolidated recurring design principles found in existing literature specific to the creation of 10 elements needed in sensory-therapeutic gardens. These guiding principles include:

1. Contextual design to fit the climate and user demographic,
2. Organization to minimize confusion,
3. Accessibility and visibility,
4. Sensory stimulation through vegetation,
5. Encouragement of biodiversity,
6. Provision of shade and seating,
7. Softscape dominance,
8. Incorporation of water features,
9. Consideration of staff privacy, and
10. Promoting user interaction with nature.

These design elements aim to address the diverse needs of patients, staff, and visitors, promoting a restorative and therapeutic environment (Dinu Roman Szabo et al., 2023). Although Dinu Roman Szabo et al. (2023) included the design of a sensory-therapeutic garden with their study, their study consisted of summarizing the existing literature, not creating any new theories, and they did not have a way to measure the garden's actual restorative capacity.

In summary, the exploration of restorative theory paved the way for identification of specific restorative landscape characteristics through observational testing followed by medical testing (heart rate, blood pressure, skin response, and brain waves). Integrating components of these theories into understanding how and why specific characteristics influence restorative traits of green space can inform planners and designers to better alleviate mental health challenges of residents in urban spaces.

Figure 1: Theories of Restoration: a summary of theories influential to the RDS

MAJOR INFLUENCING THEORIES OF THE RDS

JAMES' THEORY

William James: Psychologist

(James, 1890)

- *Active or voluntary attention:* the state when we give our attention to something.
- *Directed Attention Fatigue (DAF):* when active attention is used repetitively over extended periods of time.
- *Passive/non-voluntary attention/ "Soft" attention:* engagement without excessive demands of the mind
- Passive attention is restorative attention

A.R.T

Attention Restoration Theory

(Kaplan & Kaplan, 1989)

- Extent
- Being Away
- Fascination
- Compatibility

S.R.T.

Stress Reduction Theory

(Ulrich, 1991)

- Sense of Privacy & Control
- Social Support
- Physical Movement & Exercise
- Positive Natural Distractions

P.S.D

Perceived Sensory Dimension

(Grahn & Stigsdotter, 2010)

- Natural
- Diverse
- Cohesive
- Open
- Sheltered
- Social
- Serene
- Cultural

ADDITIONAL INFLUENCES

PROSPECT-REFUGE

Jay Appleton: Geographer

(Appleton, 1975)

- *Prospect:* A clear and expansive view of the surrounding environment, typically vistas or open spaces.
- *Refuge:* A place of shelter, safety, or retreat where one can seek solace, privacy, or protection from stressors.
- *Prospect-Refuge:* Environments that provide both expansive views (prospect) and enclosed spaces (refuge) are perceived as more aesthetically pleasing, emotionally satisfying, and psychologically restorative.

BIOPHILIA

E.O. James: Psychologist

(Wilson, 1984)

- *Biophilia:* A genetic predisposition to seek and benefit from nature results in psychological restoration from green spaces.
- Evolutionary needs for food, shelter, safety, and restoration realized in psychological response to natural spaces.
- *Biophobia:* a fear or aversion to certain aspects of the natural world.
- *Biophilia* highlights the complex relationship humans have with nature.

SENSORY THERAPEUTIC GARDENS

(Dinu Roman Szabo et al, 2023)

- Contextual
- Organization
- Accessibility and Visibility
- Sensory Stimulation (through vegetation)
- Biodiversity
- Shade and Seating
- Softscape Dominance
- Water Features
- Privacy
- User interaction with nature

Green Space Characteristics Influencing Mental Restoration

As Wood et al. (2018) state, "not all green space is created equal." They conclude that "variations in ecologic environments… influence the mental restorative qualities endowed within a green space." This understanding is leading to specific components of restorative environments being studied more frequently with information gradually accruing in existing research as to the most beneficial characteristics for restoration and improvement of mental health.

Various studies have defined characteristics of value in improving mental health. The Substantiation chapter (Chapter 5) of this document discusses these characteristics at greater length. However, some of these include but are not limited to the following characteristics or experiences:

- Serenity, diversity in species, views, and refuge in nature (Stigsdotter et al., 2017);
- Percentage of visible turf, the number of visible trees, and greenspace size (Nordh et al., 2009);
- Biodiversity of flora and fauna and integrity of the ecologic process (Wood et al., 2018);
- Relaxation when walking alone, cheering of one's mood, being away from daily life, traffic safety, recovery from stress, and mental fascination (Shan et al., 2022);
- Large open spaces in complex shapes and grouping of recreation types (He et al., 2022);
- Forest, managed grass, water as dominant cover, water as a feature, and built features such as trails and paths (Barnes et al., 2019);
- Partially open green spaces with a high degree of naturalness, trees, shrubs, and water- with buildings and paving having a general negative effect (Liu et al., 2022);
- Tended green spaces, forests, and natural sounds (Shaffee & Shukor, 2018);
- Functionality of the green space for exercise, socio-cultural interaction, and mental attentiveness translate better to the reported benefits (Lee et al., 2015);
- Water features, wildlife, walking paths (Francis et al., 2012);
- Stress reduction, social cohesion, and physical activity (de Vries et al., 2013);
- Water, plants, topography, art, quiet place specifically for relaxation (Deng et al., 2020);
- Rich array of bird sounds and minimal traffic noise (Uebel et al., 2021);
- Color of plants and maintenance condition of the urban green space (Tan et al., 2019);
- Nature dose and actual and perceived botanical richness (Southon et al., 2018);

- Water surface area, the widths of pedestrian walkways, the function of recreational areas, plant composition, plant color composition, and plant species diversity (Polat & Akay, 2015);
- The design characteristics of urban parks' pathways including greater pathway width, more vegetation, tranquility along the pathways, and more comfortable pathway environments for pets (Paydar et al., 2023);
- Layers of the landscape, landform, vegetation, color and light, compatibility, archetypal elements and character of peace and silence (Olszewska-Guizzo et al., 2022);
- Flora and fauna species richness (Mavoa et al., 2019);
- Urban waterways (Haeffner et al., 2017);
- Reduction of crime and increased perceptions of safety (Garvin et al., 2012);
- Pathways with soft or even pavement, benches, flowers, and light fixtures that are long, between 3 - 3.9 meters wide, and without connection with activity zones. (Zhai & Baran, 2017);
- The sound of running water, bright colors, being outside in a garden, the flowers, plants, and greenery, artwork, feeling fresh air, sunshine, and breezes, the sense of enclosure, the opportunity for multisensory stimulation, fountain, with running water, things to climb or play on (Whitehouse et al., 2017); and
- Contextual design for the setting, clear organization and navigation, accessibility, stimulate senses, biodiversity, shade and seating, softscape dominance, water features, opportunities for interaction with nature (Dinu Roman Szabo et al., 2023).

These characteristics are not all comparable, mutually exclusive, or holistically inclusive. However, they do provide a starting point for analysis and design in improving green spaces to improve mental health outcomes.

Sowińska-Świerkosz & Michalik-Śnieżek (2020) suggest that the problem remains that there are too many criteria and a dire need to categorize and analyze each criterion. Viewing these pieces together within the puzzle of mental health, green space, and restorativeness opens doors for researched improvement and professional application.

Measuring Mental Restorativeness

Several assessments have been developed to try to connect research to application. Many of these have remained in a theoretical sphere and have not been directly applicable in design and planning of green spaces. Others that have very recently been published combine the theoretical and application but in a "snapshot" and not holistically.

The Perceived Restorative Survey (PRS) (Hartig et al., 1997) is a survey that was designed on the principles of ART (see Figure 1 in the Appendix for the complete list of questions). Originally composed of 26 items, it was designed to assess an individual's perception of five restorative factors believed to be present in varying degrees in the environment. Those five factors include compatibility, coherence, being away, fascination, and preference. The PRS is designed to assess individuals' subjective experiences and perceptions of the restorative qualities of outdoor environments. This survey captures the nuanced ways in which people interact with and derive restoration from natural settings.

International WELL Building Institute Architecture (WELL, 2021) and SITES Design certification requirement (SITES, 2015) provide additional frameworks for topics, methods, and scoring of mental wellness in a space. The International WELL Assessment measures mental health influences for building design in 10 topics: air, water, nourishment, light, thermal, materials, movement, sound, mind, and community. The WELL Assessment is the second closest framework to measuring restorativeness in public green spaces; however, it does not include any section for outdoor landscapes. SITES is an assessment for outdoor landscapes that measures sustainability of landscapes but has one section that briefly assesses human health and well being. These assessments are crucial to laying the framework for the genesis of a new assessment but also demonstrate a need for a tool directly applicable to evaluating mental health benefits in outdoor public green spaces.

The Contemplative Landscape Model (CLM) was initially developed in 2016 by Olszewska-Guizzo as a synthesis of neuroscience and green space design principles. Neuroscience tests included self-reported emotions and monitoring of brain waves associated with mindfulness, relaxation, and attention restoration. The results delineated seven key components: (1) Layers

of the Landscape, (2) Landform, (3) Biodiversity, (4) Color and Light, (5) Compatibility, (6) Archetypal Elements, and (7) Character of Peace and Silence. CLM underwent refinement in 2023 into a revised assessment that measures visual quality of viewsheds or images, as a snapshot of a site. It also scores the view based on a sliding rank of 1-7 for each of the seven design principles (Olszewska-Guizzo et al., 2023). The model serves as a scientifically grounded framework demonstrating the neural processes reinforcing contemplative landscapes. However, the application of this model is relatively broad and leaves room for supplementary assessment tools that refine the elements of restorative park design and allow for analysis and design in a variety of settings. Additionally, contemplative landscapes are also a unique and niche facet of holistic restorative design. Although the CLM is the closest assessment of mental restoration and the only expert-based design tool tested with neuroscience methods, there is still a need for an assessment that will evaluate entire spaces, not just single viewsheds, and measure mental restoration components, not just contemplation.

Project Need and Purpose: Synthesis of Literature + Bridging the Gap

In summary, the existing theories and assessments have laid a solid groundwork for the advancement of restorative practices. However, there remains a notable gap in research—a comprehensive assessment tool for measuring the holistic restorativeness of public green spaces. Assessments like WELL focus on restorability but for interiors and buildings, and SITES only incorporate a small section on human health and well-being. CLM comes closest to filling this gap, however, it measures from scenes or photos and also focuses on contemplation, which is merely a sub-facet of overall mental restorativeness, rather than holistically evaluating sites. Therefore, there is still a need for an assessment tool specifically tailored to recognize and evaluate the specific attributes of public green spaces and holistically evaluate the restorativeness of public urban green spaces. WELL Building, SITES, and CLM assessments provide valuable insights into question creation, phraseology, format, and evaluation methods (see Figure 2). The various theories, such as ART, SRT, PSD, PRS, James', and Biophilia, provide patterns of priority and topics that complement each other, underscoring the potential for specific themes.

Additionally, a wealth of research on various components and aspects of green spaces provides scientific support for the development of a new assessment tool that is user-friendly and can comprehensively evaluate public urban green spaces.

The problem remains that there are too many characteristics of green spaces and a dire need to categorize and analyze the criterion (Sowińska-Świerkosz & Michalik-Śnieżek, 2020). The extensive research related to green space, mental health, restorativeness, and qualities and elements of restorative green space demonstrates a need to process and synthesize this data to articulate the best opportunities to improve mental health in our communities through green space design. With an increased understanding of the research, a need arises to incorporate the knowledge into an assessment tool to evaluate and design green spaces to improve mental health.

The purpose of my project is to meld the concepts from restorative theories, various assessment tools, and design principles in a way that defines greenspace characteristics with beneficial mental health attributes. This synthesis of theories into an assessment tool is an essential step in making the research readily applicable.

This research analysis and synthesis aggregates, translates, and distills the most recent research on mentally restorative green spaces into an assessment (similar to SITES, or WELL Buildings) that provides designers and planners the tools to better understand, create, and refine restorative public green spaces and to empower positive mental health among their communities.

This tool will also empower professionals to work with clients to improve mental health aspects of design in the public realm by guiding upgrades and new designs, communicating scientifically supported priorities, focusing funding, and providing a better quality of life for green space users. Ultimately, providing quality green spaces in communities will improve the mental health of the residents. Improving residents' mental health and quality of life through restorative green space design will decrease monetary medical burdens, increase productivity in employment, increase commercial revenue, increase social participation, increase community spirit, and improve quality of life.

Figure 2: Existing Assessments: a summary of assessments influential to the RDS

ASSESSMENTS

INTERNATIONAL WELL BUILDING INSTITUTE (IWBI OR WELL)

(WELL, 2021)

- Air
- Water
- Nourishment
- Light
- Thermal
- Materials
- Movement
- Sound
- Mind
- Community

CONTEMPLATIVE LANDSCAPE MODEL (CLM)

(Olszewska-Guizzo, 2023)

- Layers in the Landscape
- Landform
- Biodiversity
- Color and Light
- Compatibility
- Archetypal Elements
- Character of Peace and Silence

SITE SECTION 6: HUMAN HEALTH + WELL BEING

(SITES, 2015)

- Protect & maintain cultural & historic places.
- Provide optimum site accessibility, safety, & way finding.
- Promote equitable site use.
- Support mental restoration
- Support physical connection.
- Provide on-site food productions.
- Reduce light pollution.
- Encourage fuel efficient & multi-modal transportation
- Minimize exposure to environmental tobacco smoke.
- Support local economy.

OTHER INFLUENCES

P.R.S

Perceived Restorative Survey

(Hartig et al., 1997)

- Compatibility
- Coherence
- Being Away
- Fascination
- Preference

**Note: these are the same categories as ART, with the addition of "Preference"*

Chapter Three: Summary of Methodology

Summary of the Methodology

This section provides a brief overview of the methodology employed in the development of the RDS Assessment. It addresses the approach to the literature review and synthesis of the initial RDS framework (with more details in Chapter 4), expands on the synthesis and molding of the RDS components (with more details in Chapter 5), and discusses the testing, revision, and refinement of the RDS to ensure professional usability (with more details in Chapter 6). Consequently, Chapter 3 encapsulates a summary of these processes and their key takeaways.

Inventory + Background Research

Literature was collected from ScienceDirect, Google Scholar, additional journal databases such as the National Institute of Health; recommendations from professors and colleagues; and citation lists for additional relevant material. Included research was classified into the five topics listed below under "Research Topics." Search terms included various combinations of the following elements: green space, mental restoration, public open space, benefits of green space, mental health, green space characteristics, green space attributes, urban green space, etc. Research conducted was categorized into the topics outlined below.

Research Topics (these topics are addressed by sections in the literature review chapter):

1. Mental health challenges and needs specifically in urban areas
2. Connection between green space and mental health
3. Theories of restoration
4. Green space attributes influencing mental health and restoration
5. Methods for evaluating green space for restorative qualities and mental health benefits

As noted in Chapter 2: Literature Review, early research focused on defining restoration and theories of understanding restoration and determining if green space actually did improve mental health. Once it was documented that green space does provide restorative value for mental health, the research turned to understanding the characteristics of green space that most improve mental health and the mechanism by which that occurs. Recent research has documented the need for assessments and connections that enable designers and planners to implement the research in the field to improve green spaces and, therefore, improve mental health. More information on the Inventory + Background Research Phase can be found in Chapter 4.

Creation of the RDS Assessment Framework

The development of the RDS involved categorizing and arranging the criteria into a user-friendly format suitable for professionals involved in evaluating and designing mentally restorative green spaces. This entailed analyzing existing assessments, synthesizing available research findings into elements that should be used in the RDS Assessment, and outlining the questions to be included in the RDS Assessment:

1. Reviewed assessment methods common to allied design professions. Reviewed assessments include WELL Building restorative certification (WELL, 2021), LEED sustainable site certification score cards (USGBC, 2019), and SITE design certification (SITES, 2015).

2. Identified key components similar across assessment methods to establish what makes an effective assessment strategy. All three assessments divided questions into overarching topics, provided weighted scores per question, included prerequisite subject information, included simplified scorecards to quickly tally results, and ensured understanding of the principles through thorough explanations. All analyzed assessments also included a point breakdown for thresholds or ranks of achievable certification. SITES and WELL have an additional PDF explanation of the assessment and a detailed description of each element and point options within each element. Furthermore, WELL has publicly available documented research and explanations for each topic.

3. Identified key themes and components of restorative design based on recurring principles and characteristics in restorative theories, mental health-based design assessments and current research findings (see Figure 3)**.** Key components are arranged into five overarching themes: 1) Novelty & Intrigue, 2) Environmental Diversity, 3) Sociality & Movement, 4) Mindfulness, and 5) Design Elements.

4. Developed an assessment worksheet to evaluate restorative potential and areas for improvement in green spaces that can be used in the field for a quick evaluation of existing public sites. The assessment is called the Restorative Design Scale (RDS) Assessment because it provides a scale by which an existing site may be measured to determine its restorative qualities.

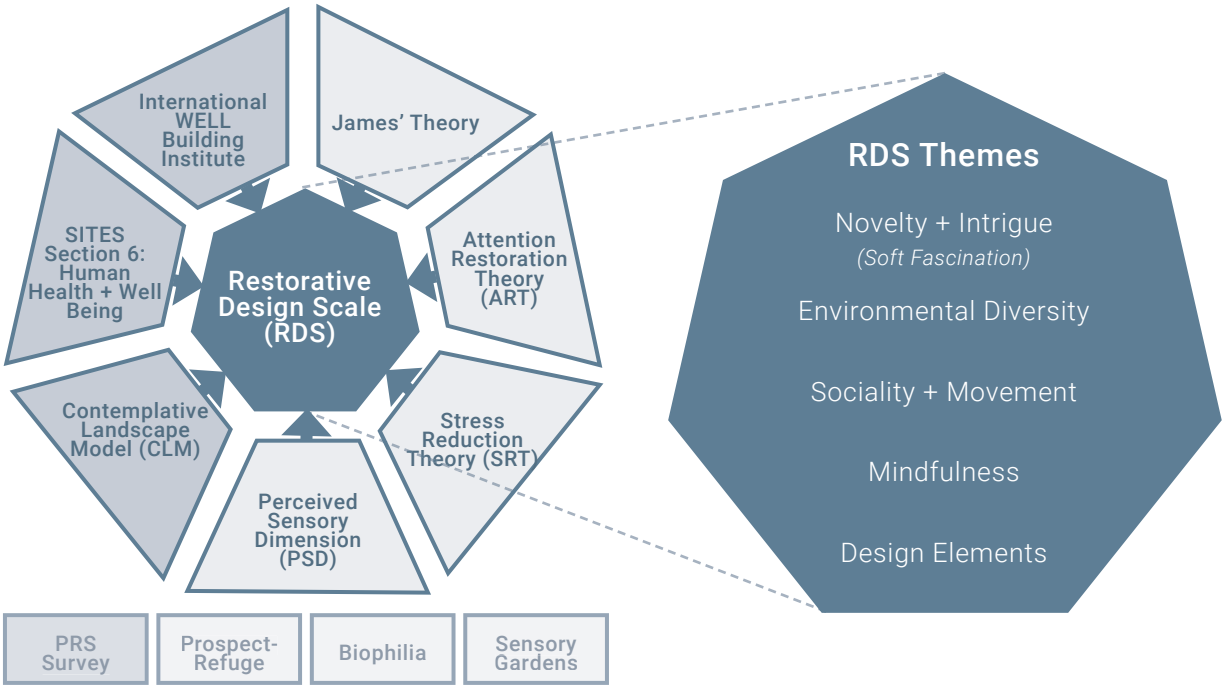
The Restorative Design Scale (RDS) combines existing research into one usable assessment. Unlike LEED, SITES or WELL, the RDS Assessment does not require a specific number of points to be considered restorative, rather it measures the overall restorativeness of a site. The assessment questions are organized under five general themes. **Themes** are broad, overarching categories synthesized from commonalities in the contributing restorative theories and assessments.

Components are subtopics that evaluate the prevalence and effectiveness of a principle in the green space being evaluated. They were identified through observation of recurring principles and characteristics from the contributing theories, assessments, and literature. Standardization of scale (0-10 points) for every component was implemented to improve scientific integrity. Recommended weighting is provided for each component and was guided by the number of times a topic was referenced in existing literature and how significant literature stated it.

Chapter 5, Substantiation of the RDS Assessment Components, shows a comprehensive list of the themes and components included in the Restorative Scale and contains a breakdown of literature used to formulate each component.

Figure 3: Simplified Synthesis of Existing Material to RDS Theme

(WELL, 2021; SITES, 2015; James, 1890; Kaplan, 1995; Ulrich, 1991; Olszewska-Guizzo et al., 2023; Grahn & Stigsdotter, 2010; Hartig et al., 1997; Appleton, 1975; Wilson, 1984; Dinu Roman Szabo et al, 2023)



Testing and Revision of the RDS Assessment

The goal of the RDS is to bridge the gap between restorative research and professional application. This phase included four rounds of testing in which professional designers and planners in the Salt Lake Area used the assessment on existing sites and gave feedback for adjusting the assessment to ensure accuracy, usefulness, and applicability. Testing consisted of 18 professionals using the assessment at various locations and participating in a 30-minute remote feedback session.

Assessment Testing Steps:

1. An IRB Exemption was obtained through Utah State University's Research System (more information can be found in Chapter 6 and the appendix). Recruitment targets included landscape architects, designers, or planners in the Salt Lake City, Utah region (IRB Protocol # 13741).

2. Four Rounds of Review were conducted with between 3-7 landscape architects, designers, or planners in the Salt Lake City (SLC), Utah region in each round. Eighteen professionals total were recruited with varied expertise and experience. The SLC Area was selected for its urbanization and its familiarity and proximity to the majority of design and planning professionals in Utah.

Sites were selected based on location, size, and usage in an attempt to expose vulnerabilities of the assessment. A summary of the rounds can be viewed in Figure 4 and a larger description of scores, site maps, and changes made will be discussed in Chapter 6: RDS Testing and Evolution.

3. Edits were made to the RDS following each round, based on professional suggestions, and observed limitations. After completing the four rounds of edits, a reevaluation of the literature was conducted to ensure that the changes made aligned with established scientific principles. This stage also involved exploring literature published since the inception of the project and initial literature review.

4. Creation of the final product. The final product transforms the assessment from a mere list of components into a visually appealing document. This final document encompasses a foreword, purpose statement, a brief overview of the guiding principles of the RDS, the assessment, an introspective analysis of its strengths and weaknesses, and visual illustrations exemplifying specific components. The full document is included in Chapter 7 of this document.

Figure 4: Summary of Testing Sites + Participants

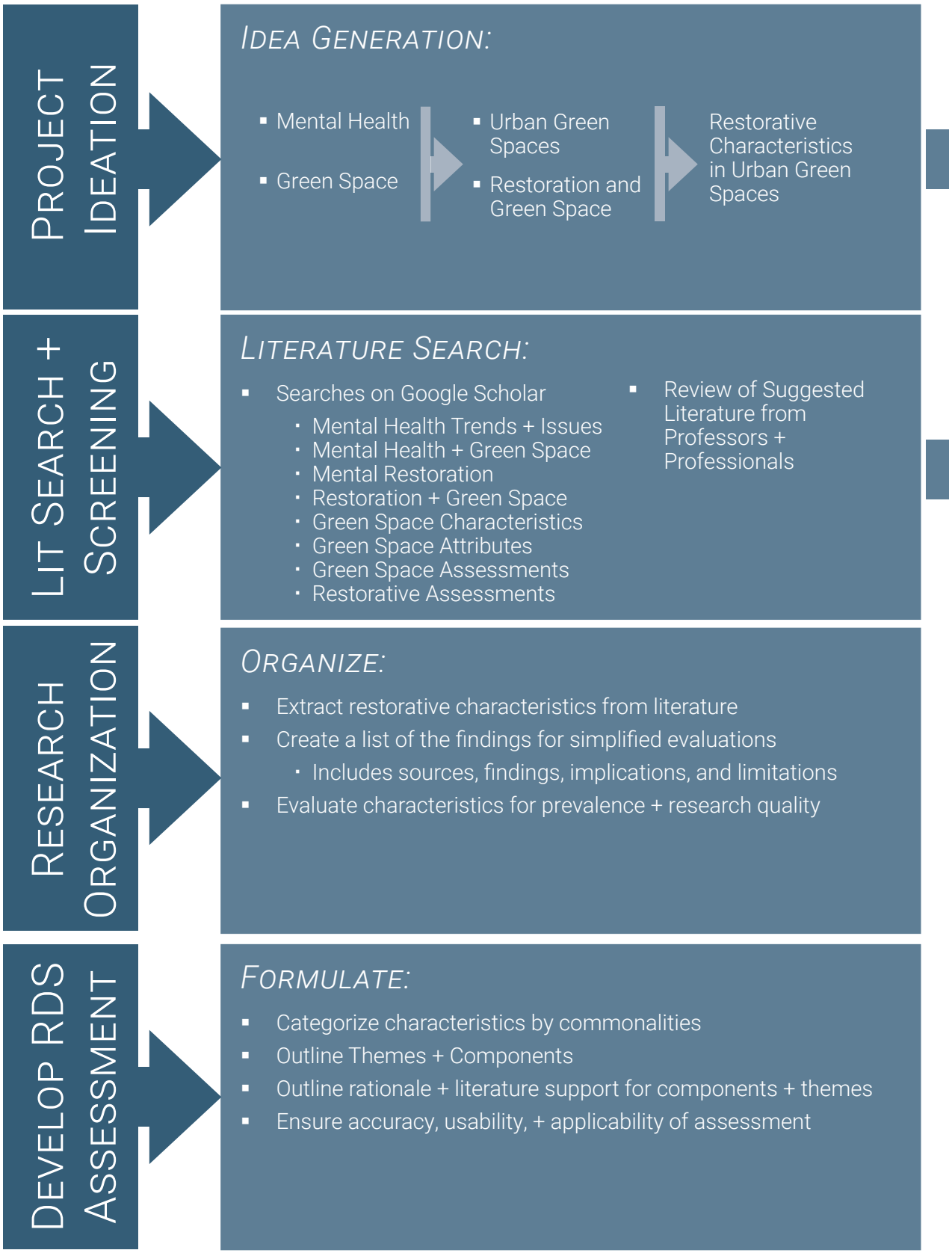
	SITES	PROFESSIONALS	OBJECTIVES
ROUND 1	CITY CREEK PARK Downtown SLC - by religious and commercial centers. 2.3 acres and includes a water feature.	▪ A: Principal, Landscape Architect (LA) + Planner (30+ years), on the design team for this park ▪ B: Principal, Landscape Architect (30+ years) ▪ C: Landscape Designer (LD) (1-3 years)	▪ Participants tested the assessment's clarity across different backgrounds and experience. ▪ As close to a "typical" site was used to minimize potential for site bias.
ROUND 2	LIBERTY PARK Edge of urban to suburban SLC. 80 acres and includes many amenities and is known for potential safety concerns.	▪ D: Office Manager, LA (10-30 years) ▪ E: Project Manager, LA + Planner (10-30 years) ▪ F: City Planner, LD (10-30 years) ▪ G: Retired Principal, LA + Planning (30+ years)	▪ Explored limitations related to green space size and safety perception. ▪ Participants have similar experience and backgrounds.
ROUND 3	POPLAR GROVE SPORTS PARK 9TH TRAIL CORRIDOR WETLAND PRESERVE INTL. PEACE GARDEN All parks within two blocks of each other, each park sizing 1/2 acre - 2 acres but varying in uses.	▪ H: Project Manager, LA (10-30 years) ▪ I: Project Manager, LD (3-10 years) ▪ J: Project Manager, LA (10-30 years) ▪ K: Public Health Coordinator & Educator, LD (10-30 years)	▪ Evaluated assessment's effectiveness across parks with different uses. ▪ Professionals from different specialties assessed four sites individually.
ROUND 4	LIBRARY SQUARE WASHINGTON SQUARE TAUFER PARK JEFFERSON PARK S-LINE	▪ Seven members of a city planning team: Visited and scored sites in partnerships that were assigned by their supervisor. Participants are referenced to as: AA, BB, CC, DD, EE, FF, GG	▪ Explored usability for planners. ▪ Explored group evaluations and possible influence or mitigation of bias. ▪ Retested types of public spaces that can be assessed.

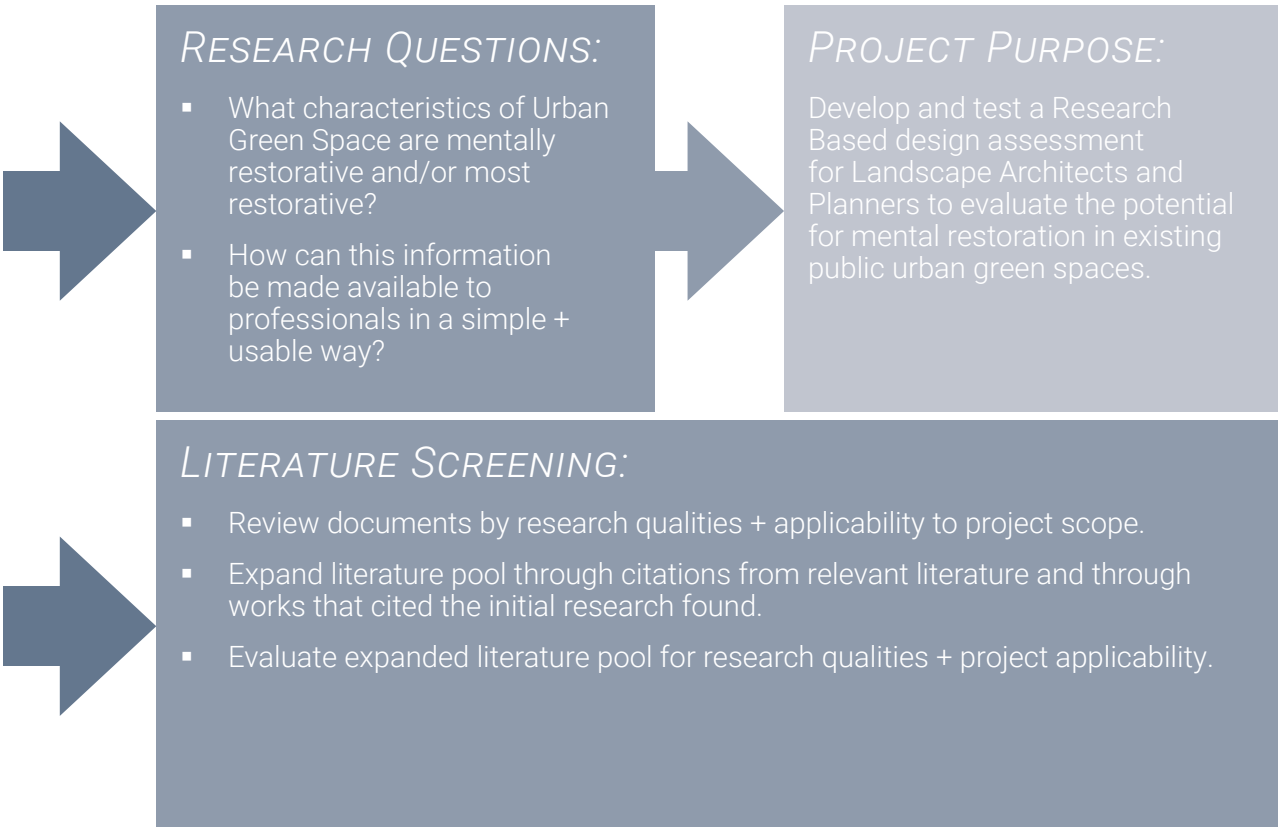
Chapter Four: Creation of the RDS

Summary of the Creation

The development process of the RDS encompassed four sequential stages: (1) Identification of gaps within the existing literature, (2) Collection and screening of literature to extract content most pertinent to the project's scope, (3) Synthesis of relevant research into concise, thematic categories, and (4) Segmentation of data into distinct components based on shared characteristics, with literature serving as a basis for the formulation of each RDS assessment element. Detailed discussion of these stages is provided in this chapter, accompanied by a graphical representation of the process (Figure 5) on the subsequent page.

Figure 5: Summary of RDS Creation Methodology





Project Ideation

The project commenced with a broad exploration of the literature concerning mental health and green spaces by the author. The focus transitioned to urban green spaces, specifically examining the interplay between mental restoration and green spaces, reflecting the author's evolving interests. This evolved to concentrate on the restorative characteristics of urban green spaces. The summation of these findings was discussed in Chapter 2: Literature Review and it highlighted a discernible gap, leading to the formulation of two research questions: 1. What characteristics of Urban Green Spaces contribute most significantly to mental restoration? and 2. How can this information be effectively communicated to professionals in an accessible and practical manner? These questions subsequently shaped the project's overarching aim: To develop and test a research-based design assessment for Landscape Architects and Planners, enabling them to evaluate the potential for mental restoration in existing public urban green spaces.

Literature Search + Screening

Literature Search

Literature was collected from ScienceDirect, Google Scholar and recommendations from professors and colleagues. Search terms include various combinations of the following elements: green space, mental restoration, public open space, benefits of green space, mental health, green space characteristics, green space attributes, urban green space, etc. (see Figure 5).

Research conducted was categorized into the topics outlined below (these topics are addressed by sections in the literature review chapter):

1. Mental health challenges and needs specifically in urban areas
2. Connection between green space and mental health
3. Theories of restoration
4. Green space attributes influencing mental health and restoration
5. Methods for evaluating green space for restorative qualities and mental health benefits

Literature Screening

Screening literature was a systematic process where documents were reviewed based on their research qualities, such as methodology, sample size, and validity, as well as their applicability to the project's scope. To expand the literature pool, additional sources were identified through citations from the initially selected relevant literature and by exploring works that cited the initial research findings. This expanded literature pool was then also reviewed for its research qualities and relevance to the project.

Organization of Research

Analysis of Existing Theories + Studies

Reviewed literature was organized by extracting restorative characteristics from the pertinent sources. A list of findings based on the extracted characteristics was then compiled. This list included details such as the sources of the findings, the specific restorative characteristics identified, their implications for the design of green spaces, and any limitations or constraints mentioned in the research. These extracted characteristics were evaluated based on their prevalence across the literature and the credibility of the research supporting them. Extracted characteristics were preliminarily organized into categories which became the overarching themes used for the RDS.

Analysis of Existing Assessments

Assessment methods common to allied design professions were identified. Reviewed assessments include WELL Building restorative certification (WELL, 2021), LEED sustainable site certification score cards (USGBC, 2019), and SITE design certification (SITES, 2015).

Key components similar across assessment methods establishing what makes an effective assessment strategy were identified. All three assessments divide questions into overarching topics (represented with simple iconography), provide weighted scores per question, include prerequisite subject information, include simplified scorecards to quickly tally results, and ensure understanding of the principles through thorough explanations. All analyzed assessments also include a point threshold for ranks of achievable certification. SITES and WELL have an additional PDF explanation of the assessment and a detailed description of each element and point options within each element. Furthermore, WELL has publicly available documented research and explanations for each topic.

The WELL certification revolves around the creation of restorative environments in built environments; however, its compilation of relevant research provides a foundational standard for this project. LEED and SITE have a good balance of simplicity and thoroughness in the scoresheet and explanations. The scorecard created for this project is a combination of the LEED and SITE format and also considers WELL's topics (air, water, nourishment, light comfort, fitness, mind) and topics in SITES Section 6: Human Health + Wellbeing.

Development of the RDS Assessment: Synthesis of Existing Literature into RDS

Characteristics related to mental restoration in urban green spaces based on commonalities identified in existing literature were categorized. This categorization led to the outlining of overarching themes and their corresponding components, which form the structural basis of the assessment.

Themes

Five general themes based on recurring principles and characteristics in restorative theories and current research findings (see Figure 6 and Figure 7) were identified. These overarching themes are 1) Novelty & Intrigue, 2) Environmental Diversity, 3) Sociality & Movement, 4) Mindfulness, and 5) Design Elements.

Figure 6: Simplified Synthesis of Existing Material to RDS Themes + Restorative Scale

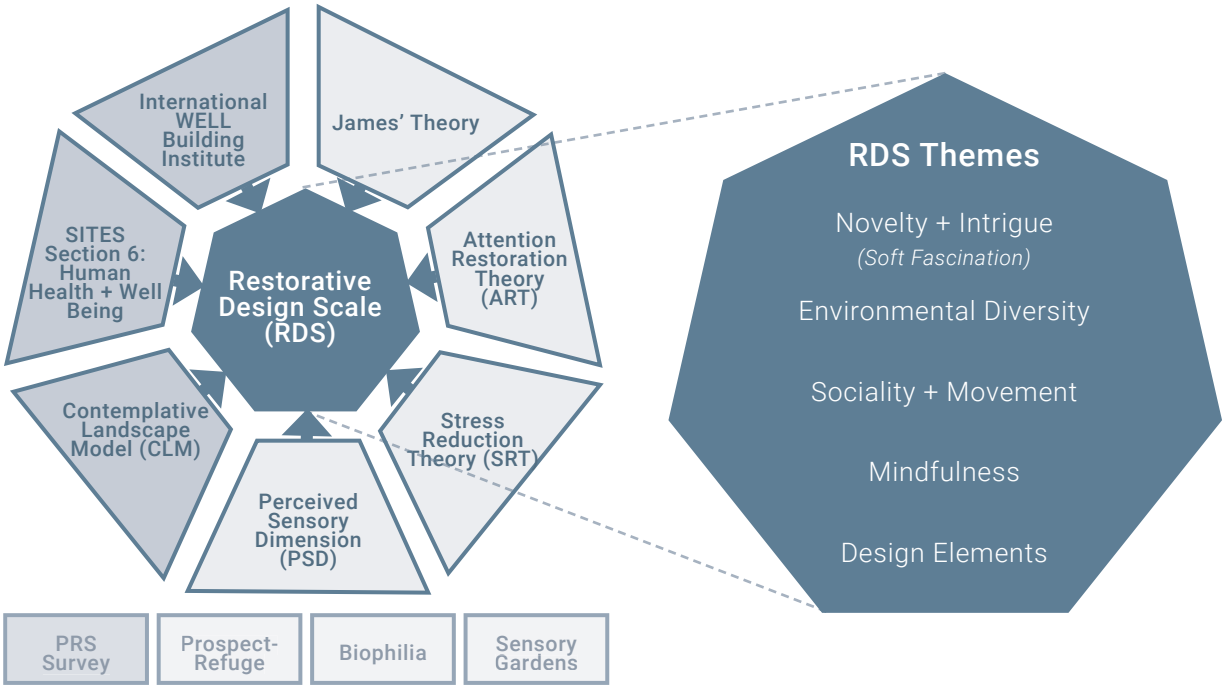
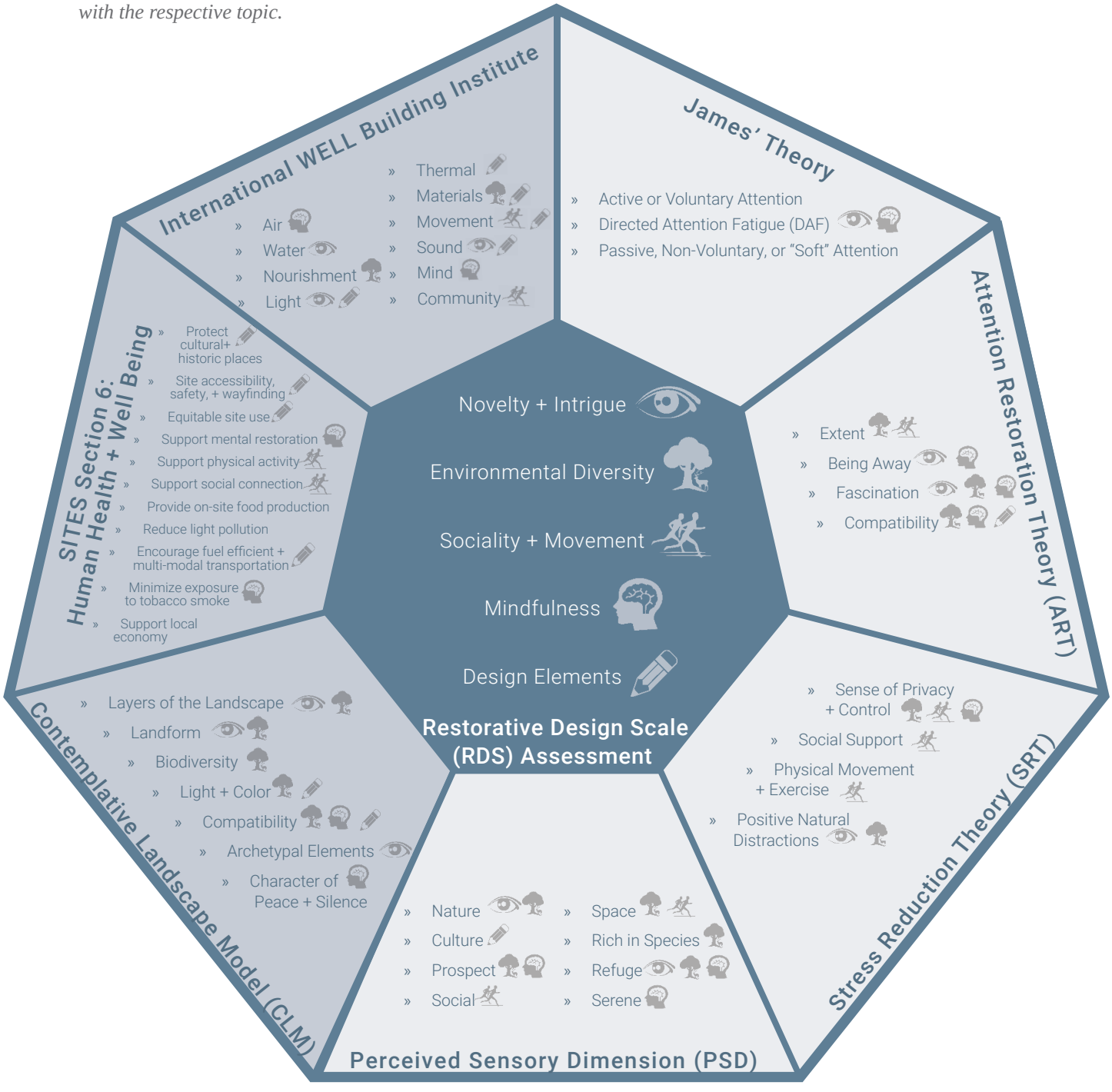


Figure 7: Detailed Synthesis of Existing Material to RDS Themes

The diagram illustrates the categorization of elements from existing theories and assessments, integrating them into the RDS Themes. The inner circle displays the RDS themes alongside their corresponding icons. Each existing element is paired with an icon representing its related RDS Theme, indicating the thematic components that align with the respective topic.



COMPONENTS

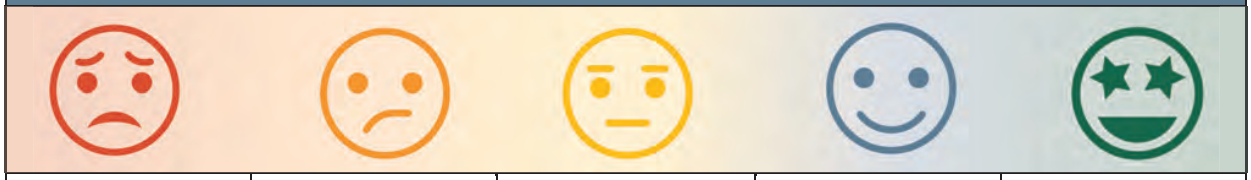
Components are subtopics within themes that provide specific characteristics for evaluation leading to an understanding of mental health restoration capabilities in the green space being evaluated. Initially, each component was assigned various points; however, the assessment later transitioned to a uniform 0-10 scale for all components. A scale of recommended weights to accompany the components is an optional tool that can be applied along with the standardized scale to account for variability in significance of the restorative characteristics. The weights proposed in this assessment reflect observations by the author and the research team based on existing literature. A list of Components and their recommended weights can be seen in Table 1. A comprehensive rationale for each component and theme was developed and supported by relevant literature to ensure their validity and relevance (found in Chapter 5: Substantiation of RDS Components).

EVALUATION SCALE

Unlike certifications such as LEED, SITES, or WELL, the RDS does not mandate a specific point threshold for restorativeness; instead, it evaluates the holistic restorative capacity of a site as a scalable tool to measure a site's overall restorative qualities (see Figure 8).

Figure 8: Restorative Scale

RESTORATIVE SCALE



Not Restorative	Somewhat Restorative	Moderately Restorative	Very Restorative	Extremely Restorative
The site is not restorative and needs major redesign or updates.	The site is somewhat restorative and would benefit from several updates in the areas that scored lowest.	The site is moderately restorative and could be considered good enough. Use minor updates to boost points.	Great job! The site is very restorative - be proud of your project!	Congratulations! You have created an exemplary restorative space and a model example of a restorative design!

Table 1:Restorative Design Scale (RDS) Component Summary

RDS COMPONENT SUMMARY	WEIGHT
Theme 1: Novelty & Intrigue (Soft Fascination)	
Component 1.1: Water Fascination	x5
Component 1.2: Sensory Fascination	x5
Component 1.3: Natural Mimics	x1
Component 1.4: Cohesiveness, Novelty, & Compatibility	x3
Theme 2: Environmental Diversity	
Component 2.1: Tree Canopy	x5
Component 2.2: Enclosure	x4
Component 2.3: Built vs Natural Space	x4
Component 2.4: Plant Diversity	x4
Component 2.5: Animal Diversity	x2
Theme 3: Sociality & Movement	
Component 3.1: Opportunities for Sociality	x4
Component 3.2: Seating Placement	x3
Component 3.3: Recreation	x3
Component 3.4: Pathways & Wayfinding	x3
Component 3.5: Education	x1
Theme 4: Mindfulness	
Component 4.1: Restorative Space	x5
Component 4.2: Mental Health Programming	x2
Component 4.3: Regulating Substance Use	x1
Theme 5: Design Principles	
Component 5.1: Culture & Art	x3
Component 5.2: Safety Infrastructure	x4
Component 5.3: Perceived Safety + Comfort	x3
Component 5.4: Accessibility	x2
Component 5.5: Pedestrian Connection	x2
Component 5.6: Climatic Response	x2
Component 5.7: Sound	x2
Component 5.8: Cleanliness	x3

Chapter Five: Substantiation of RDS Assessment Components

Summary

This section presents an overview of the literature that shaped each component in the final assessment. Each component is individually addressed, starting with its assessment criteria and then an analysis of relevant literature.

The holistic nature of the restorative experience in urban green spaces is a complex issue for assessment tools, as it requires consideration of multiple interconnected components rather than evaluating individual factors in isolation. Creating an assessment tool that accurately reflects the holistic nature of the problem is the next step to expanding the application of existing knowledge. The assessment must navigate the tradeoffs inherent in balancing complexity of confounding factors and simplicity of individual components, ensuring that it captures both aspects effectively. Recognizing and addressing these complexities remains an ongoing endeavor.

Order of Significance

To prioritize components based on their influence on mental restoration in urban green spaces and their prevalence in existing literature, weights are assigned to each component rather than points. Weighting related to each component was guided by existing literature and can be used as an additional scoring tool to improve visualization of components that can quickly and inexpensively improve sites when that is needed. The higher the multiplying weight assigned to a component, the more significant its role in promoting mental restoration. It is important to acknowledge that assigning weights or points to components may lead to disagreements among professionals and scientists due to varying perspectives and lack of clarity in existing

research of components' influence compared to each other. The weights proposed in this assessment reflect the author and the research team's observations based on existing literature. While they serve as a starting point, they should be viewed as a foundational guide and are open to refinement as knowledge evolves. Below are the components ranked by their recommended weights:

Table 2:RDS Components by Recommended Weights

x5	Restorative Spaces	Component 4.1
	Water Fascination	Component 1.1
	Sensory Fascination	Component 1.2
	Tree Canopy	Component 2.1
x4	Opportunities for Sociality	Component 3.1
	Enclosure	Component 2.2
	Built vs Natural Space	Component 2.3
	Plant Diversity	Component 2.4
	Safety Infrastructure	Component 5.2
x3	Perceived Safety + Comfort	Component 5.3
	Cohesiveness, Novelty, & Compatibility	Component 1.4
	Cleanliness	Component 5.8
	Culture & Art	Component 5.1
	Seating Placement	Component 3.2
	Recreation	Component 3.3
	Pathways & Wayfinding	Component 3.4
x2	Animal Diversity	Component 2.5
	Sound	Component 5.7
	Mental Health Programming	Component 4.2
	Accessibility	Component 5.4
	Pedestrian Connection	Component 5.5
	Climatic Response	Component 5.6
x1	Regulating Substance Abuse	Component 4.3
	Natural Mimics	Component 1.3
	Education	Component 3.5

Theme 1: Novelty & Intrigue (Soft Fascination)

Kaplan's Attention Restoration Theory (ART) explains that fascination plays a crucial role in the process of mental restoration (Kaplan & Kaplan, 1989). Achieving a state of fascination involves immersing oneself in an environment that effortlessly captures attention without significant cognitive strain. The Kaplans' research explains that green spaces designed to elicit fascination often feature sensory-engaging elements such as vibrant plants, dynamic water features, and diverse wildlife, contributing to the restorative potential of the space. The intricate patterns and textures found in well-designed green environments create a sense of novelty and captivation, providing individuals with a temporary escape from the demands of daily life. By incorporating elements that induce fascination, green spaces become valuable tools for cognitive renewal and attention recovery.

Multiple theoretical frameworks explain the essential nature of creating intriguing relationships between individuals and the environment. Kaplans' ART theory (1989) explains the value of water and similar sensory experiences; Ulrich's SRT (1991) describes positive natural distractions; Grahn & Stigdotter's PSD (2010) details natural, cohesive, and serene components; and Olszewska-Guizzo et al. (2016) discuss the CLM components of archetype elements.

Urban green spaces rich in natural elements and sensory experiences with low demands are theorized to offer opportunities for restoring health and well-being, aligning with the biophilia hypothesis that posits an innate human affinity, due to evolution, for the natural world (Wilson, 1984; Grahn & Stigsdotter, 2010; WELL, 2021). Biophilia suggests that exposure to nature triggers the release of natural opiates in specific regions of the brain (Dinu Roman Szabo et al., 2023). These neurochemical responses are linked to reduced depressive symptoms, accelerated healing after stressful situations, and enhanced cognitive function (Dinu Roman Szabo et al., 2023). Strategies in biophilic design, such as integrating natural elements, fostering biodiversity, creating wildlife habitats, and incorporating bodies of water, contribute to the restorative impact of outdoor spaces (Dinu Roman Szabo, 2023). User interaction with nature enhances the connection between individuals and the natural environment (Dinu Roman Szabo, 2023). The relationship between individuals and the environment, especially with plants and animals is crucial for well-being and recovery from crises (Grahn & Stigsdotter, 2010).

Component 1.1: Water Fascination

Provide one of the following features:

- **Option 1:** a water feature with a naturalistic appearance is visible or audible to at least 25% of the space (most restorative). OR
- **Option 2:** a water feature with obvious human-made construction is visible or audible to at least 25% of the space (restorative). OR
- **Option 3:** a storm water garden with implied water pathway is visible for at least 25% of the space (detention/retention basins do not count for this option) (moderately restorative).

Access: safe interaction is possible with the water feature (e.g. wading area).

Quality + Condition: subject to the observer's judgment, an additional point may be awarded for good quality and condition of the water feature.

The positive effects of water features on mental health are among the most consistently and positively supported by research, as indicated below. Hence, why it is has the highest value for the optional score weighting. Three options allow for design and climate adaptability. The 25% stipulation is not backed by any one research project, rather it is an informed decision that balances feasibility in design and harnessing restorative qualities. Option 3 was suggested and added in Round 2 as an opportunity to promote climate adaptability in desert biomes. Although there is no research on the restorative benefit of dry river gardens, it can be deduced that the biophilic theory would support a lesser but still restorative reaction to the potential for water. Dinu Roman Szabo et al. (2023) assert that interaction with features in a park, including water, offers users opportunities for direct engagement with nature, offering greater sensory experiences and restorativeness.

The archetypal nature of water fosters a sense of connection to nature and landform fascination (Olszewska-Guizzo et al., 2022), contributing to the overall restorative experience within urban settings. The biophilia hypothesis, asserting humans' innate predisposition to seek out nature, further underscores the restorative perception of environments that include water, considering it an evolutionarily beneficial element (Ulrich, 1983; WELL, 2021).

Water features play a pivotal role in enhancing the quality of urban landscapes, providing numerous benefits to both mental and physical well-being. Well-designed urban environments with water elements contribute to stress reduction, mood enhancement, and improved cognitive function (Karmanov & Hamel, 2008). Adult garden users identified the sound of running water as one of the most helpful features, underlining the sensory and therapeutic qualities associated with water (Whitehouse et al., 2001). Wu et al. (2023) suggest that incorporating water bodies and colorful plants maintains high levels of greenery and naturalness, reinforcing positive impacts on visual quality and overall well-being. Water features are significant predictors of perceived restorativeness, which emphasizes their role in enhancing the overall human experience (Deng et al., 2020). The presence of water in urban areas, such as waterways, is associated with increased neighborhood quality of life and contributes to overall well-being (Haeffner et al., 2017).

Exposure to blue spaces (areas where waterways are the most prevalent feature), whether through views from home or intentional visits to the blue space, is linked to good general health and high well-being, particularly among older adults in Hong Kong (Garrett et al., 2019). Additionally, urban green and blue spaces, including water elements, have a mitigating effect on heat-related mortality, highlighting the multifaceted benefits of incorporating water into urban planning (Burkart et al., 2016). More is discussed on this topic in Component 5.6: Climatic Response.

Various studies have highlighted water's fascinating and captivating nature, contributing significantly to the restorative potential of green spaces (Nordh et al., 2009; White et al., 2010; Barton & Pretty, 2008). The visual quality of a landscape area is positively affected by water surface area (Arriaza et al., 2004; Polat & Akay, 2015). Urban waterways are recognized as positive amenities for neighborhood quality of life, and their presence has been linked to increased awareness and use of green spaces and the well-being of residents (Haeffner et al., 2017).

White et al. (2010) found that both natural and built scenes incorporating water were associated with higher preferences, greater positive affect, and higher perceived restorativeness compared to scenes without water. Notably, images of built environments with water were rated just as positively as natural green spaces, emphasizing the restorative potential of water in designed

urban settings. Furthermore, Karmanov and Hamel (2008) observed that a well-designed and attractive urban environment incorporating water as a special feature exhibited stress-reducing and mood-enhancing effects equivalent to those of attractive natural environments. The multifaceted benefits and positive associations with water features in green spaces emphasize their importance in promoting mental and physical well-being in urban environments.

COMPONENT 1.2: SENSORY FASCINATION

Provide amenities or vegetation that enhance a multi-sensory aesthetic experience by including the elements below (1 point per element with an additional point for each if access, quality or condition either does not detract from or increases the users experience):

Elements:

- Art + Materials (e.g., sculptures, murals, paving patterns, light sculptures, colored furniture)
- Scents (e.g., flowers or foliage for at least 4 months of the year)
- Tactile variation (e.g., flowers and foliage, construction materials)
- Natural Sound (e.g., birds chirping, wind chimes, pollinators, moving water, wind instruments)
- Taste (e.g., edible plants)

Access: an additional point may be awarded per element if safe interaction is possible.

Quality + Condition: subject to the observer's judgment, an additional point may be awarded, per element, for good condition and quality.

Urban green spaces play a crucial role in enhancing well-being through sensory stimulation, catering to various cognitive levels and processing modes. Component 1.2 weighs opportunities to explore sensory and multisensory experiences as very high in value due to its ability to so drastically elevate restorativeness in green space experiences. Garden users' prioritization of multisensory stimulation emphasizes the importance of engaging various senses for a more fulfilling and restorative environment. Multisensory stimulation should incite curiosity (Dinu Roman Szabo et al., 2023) and create a sense of diversity, complexity, and, at times, animation

or liveliness (Stoltz & Grahn, 2021). Grahn & Stigsdotter (2010) suggest that green spaces rich in sensations with minimal demands are processed subconsciously (soft fascination) and symbolically, offering potential for restoring health and well-being. These experiences include richness in shapes, colors, textures, smells, light, and sometimes edibles (Stoltz & Grahn, 2021).

Whitehouse et al. (2001) underscore the importance of multisensory stimulation in green spaces, with adult garden users ranking features like the sound of running water, bright colors, artwork (windmill, shadow wall, dinosaur, constellation wall, and animal tiles, etc.), wind and sun movement, and the overall opportunity for multisensory stimulation as highly beneficial. This highlights the diverse sensory elements that contribute to the restorative quality of urban green spaces. Dinu Roman Szabo et al. (2023) advocate for successful biophilic design emphasizing sensory experiences, thus fostering a stronger connection between individuals and nature. The CLM, as described by Olszewska-Guizzo et al. (2022), emphasizes the role of color and light in sensory experience, including the possibility of seeing light and shade movement, avoiding direct sun exposure, and incorporating fewer saturated colors. Additionally, Stoltz & Grahn (2021) link the PSD to perceptions of biodiversity and species richness (which is addressed in Component 2.4), further highlighting the importance of varied and abundant sensory experiences in green spaces. Artwork, as suggested by WELL (2021), is recognized for its ability to promote social interactions and elicit positive emotional responses and emphasizes the importance of aesthetic quality in the sensory experience. Accessibility to elements provides users opportunities to directly engage with nature, offering greater sensory experiences and restorativeness (Dinu Roman Szabo, 2023). Overall, these findings collectively underscore the significance of multisensory engagement in urban green spaces for mental restoration and well-being.

Pijanowski et al. (2011) emphasize the significance of unique and natural soundscapes, acting as powerful links between humans and their environment. They propose soundscape conservation as a more effective approach than simple noise mitigation, recognizing the integrative nature and multiple values of soundscapes. Whitehouse et al. (2001) identifies the sound of running water as one of the most valued features by adult garden users, accentuating the significance of auditory stimuli in enhancing the overall experience.

Component 1.3: Natural Mimics (3 points)

Provide amenities that mimic natural materials, patterns, shapes, colors, images, or sounds (0 points for no mimics and 10 points for multiple, high quality mimics).

Examples: Animal footprints in the pavement, leaf design in the back of benches, engraved animals on trash receptacles, dry riverbed in planting, naturalized play equipment, forest etched bridge or fence panels, etc.

Natural mimics in landscape design represent a compelling extension of sensory fascination, imbuing typically man-made elements with an additional layer of intrigue. Dinu Roman Szabo et al., (2023), encourage incorporating biomimetic elements inspired by nature into designed environments. This component distinguishes itself from general sensory fascination by specifically leveraging the power of biophilia within man-made items. The impact of biophilia, rooted in the innate human affinity for nature, extends to both direct interactions with natural elements and responses to biomimetic environments (Wilson, 1984; Dinu Roman Szabo et al., 2023). Natural mimics in landscape design also play a role in perpetuating archetypal elements, as highlighted in the Cultural Landscape Model (CLM) (Olszewska-Guizzo et al., 2022). By incorporating natural mimics inspired by elements from the natural world, designers tap into archetypal symbols deeply ingrained in the human psyche. Component 1.3 recognizes the power of natural mimics to enhance fascination (ART) and natural (PSD) restorativeness in landscapes. The optional score weighting for this component reflects the importance of this extension while still recognizing that there are many other influencing factors that are considered more restorative.

Component 1.4: Cohesiveness, Novelty, & Compatibility

Subject to the observer's judgment, ⅓ of the rating for this element may come from each element described below:

- **Cohesiveness:** The space feels cohesive (e.g., similar plantings, design styles, themes).
- **Novelty:** A variety of novel (unique or diverse) soft fascination elements are strategically placed to engage interest on many levels of detail. The site is designed to facilitate exploration and creates a feeling of mystery and/or exploration without creating pressure to move through the space.
- **Compatibility:** The space has a variety of types of spaces and materials that can facilitate diverse user preferences.

Urban landscapes that promote ease of mind, while igniting a desire to explore, possess key features that align with principles from different models. The PSD emphasizes the importance of diversity, cohesiveness, and compatibility in creating an environment that supports a unified and cohesive spatial experience, allowing for extended exploration (Stoltz & Grahn, 2021). This idea is reinforced by the CLM, which assesses the way factors like landform and compatibility enhance spatial harmony and balance and contribute to a more appealing and interesting environment (Olszewska-Guizzo et al., 2022).

Furthermore, the significance of intricate spatial layouts and the presence of features that enhance legibility are highlighted in literature. Karmanov & Hamel (2008) suggest that landmarks facilitate orientation, providing a sense of ease and rest, while complex layouts induce a sense of mystery and the potential for exploration. Legibility is also crucial in Component 3.4: Pathways & Wayfinding, because it is about making urban spaces easy to understand and navigate. Clear pathways and signs help people find their way around comfortably. This component ensures that the layout and signage in a green space are designed to make navigation simple and straightforward but also balances the needs for complexity that can stimulate exploration.

The concept of complexity, in terms of the number and dissimilarity of elements in a scene, adds another layer to the idea that moderate levels of complexity are associated with higher aesthetic

preference (Ulrich, 1983). Additionally, enhanced aesthetics, including non-rectangular building shapes, accent colors, and public art, contribute to creating cleaner, safer, and more interesting outdoor spaces (WELL, 2021). Ultimately, this component emphasizes the need to balance complexity and simplicity in landscape design. Designers must carefully manage this balance to ensure that the assessment adequately captures both aspects.

Compatibility is also essentially a connection between the needs of the user and the resources provided. The concept of compatibility emerges as a recurring and significant element in restorative theories, mentioned by name in two existing theories. Kaplan and Kaplan (1989) identify compatibility as a crucial restorative element within ART. Similarly, Olszewska-Guizzo et al. (2022) acknowledge compatibility as a key element in contemplative landscapes (CLM). While not explicitly named, elements expressing opposite features within the framework of PSD (Grahn & Stigsdotter, 2010), such as diverse and cohesive and open versus sheltered, implicitly point to the importance of creating a sense of control for the user. This aligns with Ulrich's (1991) SRT, which emphasizes the significance of control in enhancing the restorative potential of natural environments. When the needs of the user and resources provided align, compatibility is achieved and needs are met, allowing for restoration. Thus, compatibility stands out as a shared and vital component in restorative design.

The balance between mystery and landmarks to provide orientation is crucial in creating restorative urban environments, with legibility playing a central role in achieving this balance. Legibility refers to the ease with which users can navigate and understand their surroundings or the way the presence of recognizable landmarks and clear spatial layouts facilitate the experience. Research suggests that environments with high legibility, characterized by prominent landmarks and intuitive spatial organization, promote feelings of ease and relaxation (Karmanov & Hamel, 2008). Conversely, overly complex layouts lacking clear landmarks may evoke a sense of disorientation, detracting from the restorative potential of the space (Karmanov & Hamel, 2008). Additionally, Ulrich (1983) suggests that moderate levels of complexity, balanced with legibility, are associated with higher aesthetic preference, further highlighting the importance of achieving a harmonious balance between mystery and legibility in urban landscapes. Thus, legibility emerges as a crucial factor in creating restorative environments that promote ease of mind and inspire exploration.

Theme 2: Environmental Diversity

Environmental Diversity in the structure and available natural elements of a space empowers mental restoration by creating a sense of control in which the individual may choose what environment would be the most restorative to their mental state in that moment. The underlying principles of environmental diversity are thus choice and control. As demonstrated in the points of this theme, greater restorativeness is experienced when natural elements have some demonstration of human influence. For example, a trail through the woods or trees planted in a line. Creating diverse types of environments provides a sense of control and feelings of safety and engagement through soft fascination.

Component 2.1: Tree Canopy

- Provide Tree Canopy Coverage for a minimum of 30% of the site. (6 points)
  (Partial points may be awarded if the potential growth will reach the required coverage.)
- Deciduous + Conifer trees exist with at least a 4:3 (deciduous:conifer) ratio. (4 points)
- A Variety or Cohesiveness of tree planting patterns, such as formal lines or clusters, are used. (2 points)

**Recommend preserving desirable existing trees, not including weak or invasive species.*

Trees and canopy cover in urban green spaces significantly contribute to promoting mental health and well-being. Studies consistently show that the presence of trees is linked to increased use of outdoor spaces and greater social activity among residents (Kuo et al., 1998; Sullivan et al., 2004). The positive association between well-being and tree cover, considered a proxy for naturalness, underscores the mental health benefits associated with an increased percentage of tree canopy (Dallimer et al., 2012) and predicts positive mental health outcomes (Nordh et al., 2009). Beyond psychological benefits, trees act as natural barriers, providing shade, reducing air pollution, and acting as sound barriers, thereby contributing to a healthier and more pleasant environment in urban areas (Lee et al., 2015). This aligns with the broader understanding that pollution, including air and noise pollution, significantly impacts mental health, and green spaces, particularly those with trees, serve as protective buffers against these negative influences (Gascon et al., 2018; Hematian & Ranjbar, 2022).

Moreover, trees play a multifaceted role in restorative theory, influencing components of the CLM framework, such as landform, biodiversity, and layers of the landscape (Olszewska-Guizzo et al., 2022). Their presence introduces levels and depth, creating a dynamic perspective in the environment. As critical indicators of naturalness, trees contribute to the creation of diverse, sheltered, and serene landscapes aligning with restorative qualities highlighted by PSD (Stoltz & Grahn, 2021). Edible tree varieties further extend their impact by providing nourishment, aligning with the WELL framework's focus on materials, emphasizing the importance of the types of trees in landscape design (WELL, 2021; SITES, 2015). When considering mental health, incorporating both deciduous and coniferous trees becomes crucial, as they offer varied environments that meet varied restorative needs.

Ultimately, the planting of trees is one of the most cost-effective strategies for promoting long-lasting restorativeness in urban green spaces due to a myriad of benefits that positively impact mental health including shade, enclosure, filtration of pollution, and the aesthetics of built environments. The points of this component are dissected into three parts: coverage, type, and planting patterns.

Coverage: Notably, the percentage of tree canopy has been associated with positive mental health outcomes, suggesting that the extent of tree cover influences well-being (Beyer et al., 2014). Ample tree coverage creates shaded areas, contributes to temperature regulation, and instills a sense of tranquility and relaxation, vital elements for mental well-being. Research indicates that even a 25% increase in the proportion of tree canopy in a neighborhood is associated with a notable decrease in depression symptoms (Beyer et al., 2014). The link between tree canopy and mental health outcomes is evident across age groups, with a higher percentage of tree canopy correlating with more positive mental health, particularly among populations aged 55 and older (Beyer et al., 2014). The restorative effects of landscapes resembling natural mountain forests further underscore the positive impact of well-designed green spaces with tree cover (Deng et al., 2020). Based on the research of Beyer et al. (2014) a 25% increase imbues the site with greater restorative potential and 30% is the optimal coverage for urban areas to obtain heat reduction benefits (see Component 5.6). Then it can be deduced that a 30% minimum would provide restorative benefit and still be achievable across many different sites.

Type: Tree type and shape play a pivotal role in influencing mental restoration in urban green spaces. Research consistently indicates a preference for trees with broad canopies, with spreading and globular shapes rather than narrow ones (Summit & Sommer, 1999; Gerstenberg & Hoffman, 2016). The choice between deciduous and coniferous trees in urban open spaces is a nuanced decision, since both types offer distinct advantages and drawbacks. Deciduous trees, known for their larger canopies, excel at providing effective shade in the summer while allowing sunlight in the winter. Evergreens, on the other hand, with their persistent greenery offer visual restoration even in the winter months. Both tree types have strengths and weaknesses and contribute significantly to the restorative qualities of urban green spaces. However, considerations must be made, since evergreens can be perceived as anything from magical to sinister (Stigsdotter et al., 2017) and can lead to reduced visibility and potentially lessen the feeling of safety. This suggests a 4:3 ratio in assessments to balance these potential negative associations. The visual quality of landscapes is positively affected by tree diversity and naturalness, which highlights the importance of maintaining high levels of greenery and biodiversity (Polat & Akay, 2015). Urban planning measures, as proposed by Wu et al. (2023), emphasize the significance of maintaining high levels of greenery and biodiversity with diverse tree species since they play a crucial role in creating visually appealing and restorative environments.

Planting Patterns: The alignment and planting patterns of trees in public green spaces play a crucial role in influencing mental health through components such as mystery, exploration, shade, prospect refuge, safety, comfort, layers, and cohesiveness. While some individuals may appreciate greater symmetry in tree arrangements due to the almost universal appeal of symmetrical patterns for humans (Lindal & Hartig, 2015; Enquist & Arak, 1994), asymmetrical yet still patterned and strategic planting patterns can create intrigue and fascination (Hansen, 2017). Clumping emerges as the most common pattern-based planting approach because it provides both visual interest and a sense of order. However, caution is necessary to ensure that the planting pattern is not overly complex and therefore overwhelming. It is important to strike a balance between symmetry, which allows quick understanding, and intrigue, which is facilitated by more intricate patterns. Designing public green spaces with thoughtful consideration of tree alignment and planting patterns becomes a delicate endeavor, aiming to enhance mental well-being by fostering a harmonious and engaging environment.

COMPONENT 2.2: ENCLOSURE

Provide at least 3 of the 4 states of enclosure as depicted below:

- Low Enclosure (e.g., field, small planters, travel paths)
- Moderate-to-Low Enclosure (e.g., raised planters, small berms, seat walls)
- Moderate-to-High Enclosure (e.g., tree-lined walk, buildings, arbors)
- High Enclosure (e.g., wooded trail, terraced wall, 2-3 story buildings)

Note: The most restorative enclosures are typically moderate levels, however, including a variety of types provides a sense of control for the visitor to choose what best fills the need of their mental status.

Enclosure, in the context of landscape architecture and urban design, refers to the degree of openness or containment within a space. It involves the physical and visual attributes that create a sense of definition and separation in an environment. Enclosure can be achieved through various elements such as vegetation, structures, topography, or architectural features that delineate and define a space.

Different types of enclosures in urban green spaces play a vital role in promoting mental health, addressing the diverse needs of individuals in varying settings and times. Enclosures can be evaluated based on their extent, compatibility, and the sense of privacy they provide (Kaplan & Kaplan, 1989; Stigsdotter et al., 2017). Research suggests that the perceived restorative experience is influenced by the physical and psychological enclosure created by elements like vegetation and green walls in parks (Nordh et al., 2009). This aligns with the Prospect-Refuge Theory, emphasizing the importance of spaces that offer clear sight lines while providing a sense of safety and refuge (Grahn & Stigsdotter, 2010; Stoltz & Grahn, 2021).

Sheltered spaces serve a multifaceted role by providing secure environments for diverse activities like play, observation, and contemplation, offering individuals a safe haven to engage without external disturbances. Intimately connected to the concept of serenity, these areas serve as retreats, fostering feelings of security and tranquility, contributing to overall well-being and

providing a refuge for individuals to unwind and recharge (Stigsdotter et al., 2017). Nordh et al. (2009) suggest that a park with bushes and trees can offer enclosure, creating a “room” effect that may physically and psychologically allow individuals to escape demands on directed attention capacity. The amount of enclosure, determined by the size and density of green walls, can influence the restorative experience.

Open spaces evoke a sense of freedom and provide clear sight lines with interesting sensory experiences, enhancing the prospect and intrigue (Stigsdotter et al., 2017). The sense of safety associated with prospect, as identified in Ulrich’s (1991) SRT, is complemented by an increased perception of spaciousness and accessibility in open environments. These spaces promote social interactions by allowing for unobstructed communication and shared activities, fostering a sense of community and connectivity among individuals (Grahn & Stigsdotter, 2010). Additionally, openness in urban green spaces encourages physical activities and recreational pursuits, contributing to a healthier and more active lifestyle, while the unobstructed views and expansive layouts create a visually stimulating environment, promoting positive mental well-being and reducing feelings of confinement (Grahn & Stigsdotter, 2003). Overall, the benefits of open spaces extend beyond the sense of freedom and prospect, encompassing aspects of social interaction, physical health, and visual stimulation.

CLM highlights the significance of layers in the landscape, including vertical layers, and the depth of views in urban green spaces (Olszewska-Guizzo et al., 2022). Additionally, Gatersleben and Andrews (2013) found that exposure to natural environments with high levels of prospect and low levels of refuge is restorative, while environments low in prospect and high in refuge may not be, potentially increasing stress and attention fatigue. This highlights the nuanced role of sheltered spaces in providing restorative benefits based on the interplay between prospect and refuge.

PSD acknowledges the importance of enclosure levels (sheltered/refuge, and openness), with different types catering to varied preferences and needs. Moderate levels of enclosure are typically considered the most restorative due to the potential to provide both refuge and prospect, but providing a variety allows visitors to choose what suits their mental state best, enhancing a

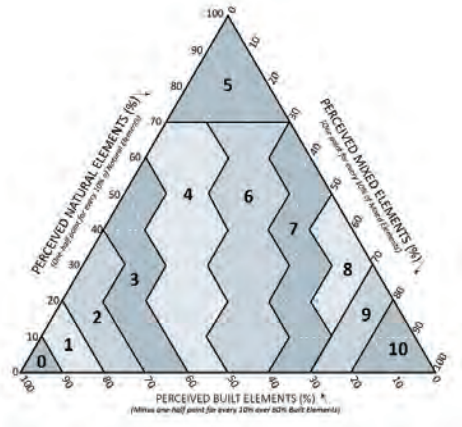
sense of control (Stoltz & Grahn, 2021) and compatibility (Kaplan & Kaplan, 1989; Olszewska-Guizzo et al., 2022). The idea is reinforced by Hand et al. (2016), who found that different urban habitats, including enclosed spaces like woodlands and gardens, contribute to perceived connections with nature.

The integration of diverse enclosures in urban green spaces, ranging from low to high levels, is essential for meeting the multifaceted needs of individuals. This variety allows for a nuanced approach to mental well-being, offering choices that align with visitors' preferences and mental states at different times, contributing to a more comprehensive and restorative urban environment.

COMPONENT 2.3: BUILT VS NATURAL SPACE

Perception of environments is a quick, observer-based decision of the amenity's look as natural looking (streams, forest), built looking (buildings, plazas, stairs), or mixed (trails, terraced gardens) and should account for how the observer interacts with the amenity. Use the triangle below to determine the number of points.

For the purpose of these calculations, natural elements were given ½ point per 10% prevalence in the site (visible along the left side of the triangle). Points are neutral for built environments, but have one point subtracted for every 10% that is over 60% of the landscape (seen along the bottom of the triangle). The triangle gives one point for every 10% of mixed built-natural elements (right side), therefore giving mixed elements the highest point-per-percentage value. By triangulating all three percentages a point value can be determined.



The balance of natural and built elements in urban green spaces plays a crucial role in the restorative experience and psychological well-being of individuals. Comparatively, quantifying these elements is managed using a three-sided scale of natural, built, and mixed built-natural environments. This triangle quantification tool evolved from a need to simplify in-field calculations and streamline the scoring process.

Natural: Previous research highlights distinctions in the restorative potential of built mixed-built, and natural environments (Peschardt & Stigsdotter, 2013). Softscape dominance, where vegetation prevails over hardscape elements, is highly appreciated, indicating a preference for more natural features (Dinu Roman Szabo et al., 2023). The PSD element of nature states that the presence of nature is perhaps one of the most crucial dimensions in urban green spaces, with studies emphasizing the essential contrast between “nature” and “non-nature” (Grahn & Stigsdotter, 2010).

Research suggests that individuals with more natural views may have an additional mode of restoration and emphasize the unique benefits of nature in promoting mental health (Tennessen & Cimprich, 1995). Elements perceived as built within natural settings are generally rated negatively. This emphasizes a preference for a more authentic natural environment (Stigsdotter et al., 2017). Scene types dominated by built elements are considered less restorative, while those predominantly natural or featuring mixed built/natural environments are viewed as more restorative (Tenngart Ivarsson & Hagerhall, 2008). The positive correlation between site facilities, ecological quality, and biodiversity in parks suggests that higher-quality parks serve both amenity and biodiversity functions (Wood et al., 2018). For the purpose of these calculations, natural elements were given ½ point per 10% prevalence in the site.

Natural landscapes contribute significantly to mental restoration, surpassing built environments in restorative potential. The high influence of biodiversity in natural landscapes, coupled with their capacity to reduce pollution, further enhances their restorative qualities. Areas with lower visibility due to higher vegetation density have been recognized as impacting feelings of safety (Jorgensen, 2002). It is possible to balance nature and safety through careful design, vegetation choice, and park maintenance (Jansson et al., 2013; Coles & Bussey, 2000). Those settings that do not feel safe diminish restorativeness. Striking a balance that maximizes the benefits of natural elements while minimizing negative responses to nature is essential in creating mentally restorative urban green spaces. The allocation of points for natural, mixed, and built environments aims to simplify the complex balance of landscape types into ratios generally deemed most restorative.

Built: In a study, Hand and colleagues (2016) attempted to capture how biodiversity was perceived by children in their neighborhood as they went about their day. They established that the habitats with the lowest scores included open public areas, paved recreational areas, and streets, as these exhibited minimal values in terms of green cover and species richness and increased levels of management. (Hand et al., 2016). Lindal and Hartig (2013) emphasize that architectural variation in the environment offers opportunities for engaging effortless attention, exploration, and discovery, which contributes to attentional restoration. The perceived negativity of man-made elements within natural environments suggests that maintaining a balance and aesthetic integration is crucial to avoid disrupting the natural aesthetic (Stigsdotter et al., 2017). However, some proponents of urbanization argue that modern technologies can provide alternative sources of well-being and challenge the necessity of a direct connection with nature. For example, White and colleagues (2010) found that built environments with water features were equally restorative to natural environments with water. This intriguing discovery demonstrates the natural feature of water to have a restorative effect in multiple settings.

Packer and Bond (2010) explored built environments that can also provide avenues for recovery from mental fatigue. Their study, involving visitors to a history museum, an art museum, an aquarium, and a botanical garden, revealed that, for some individuals, museums can be as restorative as natural environments. While this information may not directly pertain to the current assessment, further research could be leveraged to specify the types of built environments most conducive to restorative interactions in urban green spaces. Such findings might also suggest that the influence and significance of green spaces for restoration are less pronounced than previously believed, and built environments may carry more weight in this regard. Integrating this research with existing knowledge could help elucidate the strengths of both built and natural environments as restorative elements, facilitating a more accurate triangulation of influential factors in creating restorative spaces.

In urban settings, the purpose of green spaces is often to offer a respite from the surrounding built environments. Over-integration of built elements within these green spaces can counteract their intended benefits. Roads, parking lots, and materials contributing to the urban heat island effect not only diminish the aesthetic appeal of the green space but also introduce pollutants, detracting

from the quality of the environment. The essence of green spaces lies in providing individuals with a break from the monotony of urban structures, allowing them to “be away” as suggested by ART (Kaplan & Kaplan, 1989). Moreover, emphasizing natural elements over built structures is crucial for fostering positive distractions, aligning with SRT and PSD theories. For these reasons, points are neutral for built environments but have one point subtracted for every 10% that is over 60% of the landscape. This reinforces that many built elements still have some restorative value but that too much can disturb the restorative potential of an urban green space.

Mixed: The preference for softscape dominance where vegetation dominates over hardscape elements suggests a preference for more natural elements. The inclusion of well-preserved man-made elements (“mixed-spaces”) can also enhance perceived visual quality and demonstrate the potential for a harmonious coexistence of both elements (Dinu Roman Szabo et al., 2023; Arriaza et al., 2004). The presence of terraced housing and mixed built/natural environments has been associated with lower risks of psychological distress. This highlights the potential benefits of well-designed built environments (Sarkar et al., 2013). The triangle gives one point for every 10% of mixed built-natural elements, therefore giving mixed elements the highest point-per-percentage value. This reflects the effort to meet compatibility and preference. The challenge lies in creating a balanced, cohesive environment that maximizes the benefits of both natural and built elements while minimizing potential drawbacks.

It is important to note that different individuals may have varied preferences and responses to natural and built elements. The prospect-refuge theory underscores the significance of higher enclosed areas with clear sightlines. This allows people to see without being seen and creates the most restorative environments (Grahn & Stigsdotter, 2010). Therefore, providing a variety of enclosure types, including natural and built elements, becomes essential to cater to diverse needs at different times.

Component 2.4: Plant Diversity

Provide diverse vegetation by including at least four of the six elements below:

- Planting Patterns (e.g., arranged using massing or patterns to provide variety and unity)
- Plant Heights (e.g., plant selections provide a variety of differing heights)
- Plant Flowers (e.g., flowers appear actively blooming for at least 4-5 months of the year)
- Plant Colors/Texture (e.g., the site uses a variety of plants that have different colors and textures)
- Maintenance Condition Well-Kept (e.g., bushes are trimmed, flowers are deadheaded, mulches are within the planting bed, etc.)
- All-Season Interest (e.g., the unique seasonal properties of plants are used within the site to create interest across all seasons)

The integration of diverse plant material stands out as a key determinant in enhancing the restorative potential of urban green spaces. Wood et al. (2018) contribute to the growing evidence by noting that the restorative benefits of urban parks are primarily predicted by biodiversity rather than site facilities. The intricate interrelation between biodiversity of plants and animals (see Component 2.5) is evident, emphasizing the synergy between different elements of the ecosystem. Additionally, Lindemann-Matthies et al. (2010) find that plant diversity, in itself, is attractive to humans, adding another layer to the overall well-being impact of biodiversity.

Several studies highlight the positive associations between greenness, biodiversity, and subjective well-being. Mavoa et al. (2019) found that higher levels of greenness and biodiversity are linked to greater subjective well-being in adults. The perceived richness of vegetation, including aspects such as height, evenness, and colorfulness, contributes to the overall restorative experience (Southon et al., 2018). Designs should leverage plant diversity that stimulates the senses (Dinu Roman Szabo et al., 2023). Interestingly, the lack of bushy plants in the planting design can have a negative effect on visual quality (Polat & Akay, 2015). Actual and perceived botanical richness correlates positively with self-estimated mental health, indicating a strong connection between biodiversity and psychological well-being (Southon et al., 2018).

Plant diversity plays a pivotal role in restorative design. The choice of plants can evoke fascination, as proposed by Kaplan & Kaplan (1989), which aligns with the concept of positive natural distractions in Ulrich's (1991) SRT. In Grahn & Stigsdotter's (2010) PSD theory, richness in species, planting, and trees emerge as prominent indicators of natural spaces, emphasizing the significance of diverse flora. Moreover, plants contribute to the reinforcement of material diversity, serenity, and cultural aspects within the PSD framework. The impact of diverse flora extends to every component of the CLM by including layers in the landscape, landform, biodiversity, light and color, compatibility, archetypal elements, and the character of peace and silence, as outlined by Olszewska-Guizzo et al. (2016). In essence, the careful selection and integration of diverse plant species become cornerstones in creating restorative environments that cater to various psychological and sensory dimensions.

The importance of plant diversity extends beyond visual aesthetics and influences the subjective assessment of aesthetic quality. The color of plants and the maintenance condition of urban green spaces significantly affect perceptions of safety and overall satisfaction and provide benefits particularly for older populations (Tan et al., 2019). Additionally, plant cover percentage is identified as a factor affecting perceived visual quality, emphasizing the role of plant presence in shaping the environment's aesthetic appeal (Arriaza et al., 2004). The benefits of biodiversity are not confined to the conscious realm. Visitors derive well-being from locations perceived as biodiverse, even when unable to identify specific diverse species (Dallimer et al., 2012).

Despite these positive attributes, there are potential drawbacks to consider. While biodiversity positively affects well-being, the challenge lies in finding a balance that enhances nature's benefits without overwhelming individuals. The sheer volume and diversity of plants may lead to sensory overload and thus negatively affect the restorative experience. Careful consideration of plant material composition, density, and arrangement is essential to create a harmonious environment that maximizes the positive effects of biodiversity without causing unintended stress. This component currently does not measure this balance. However, the balance between complexity and simplicity of planting design should be taken into consideration in Component 1.4, which emphasizes legibility and coherence in landscape design.

The incorporation of diverse plant material, including various elements such as planting patterns, heights, colors, flowers, and all-season interest, is pivotal in creating restorative urban green spaces. The multifaceted benefits ranging from subjective well-being to ecological richness underscore the significance of thoughtful plant selection and design.

Component 2.5: Animal Diversity

Provide amenities or vegetation that enhance the potential for animal habitation while maintaining human safety by including at least three of the five elements below:

- Presence of Non-Invasive Plants Favored by Fauna (e.g., oak trees, pollinator attractive flowers)
- Wildlife Watering Places (e.g., bird/bee baths, small bubbler, small ponds)
- Wildlife Food Sources (e.g., hummingbird feeders, squirrel feeders)
- Living Habitat (e.g., bird boxes, dense trees, fishponds)
- Existing Presence of Fauna (e.g., squirrels, birds, pollinators, fish)

The biodiversity of fauna in urban green spaces emerges as another key factor for public mental health and the restorative qualities. Studies consistently emphasize the positive influence of fauna biodiversity on emotional well-being and the perceived restorative quality of natural settings. Component 2.5 builds on the biodiversity supported in Component 2.4 (Plant Diversity) but has points geared specifically toward creating safe and natural habitats that attract and provide for fauna.

Marselle et al. (2016) highlight the role of naturalness and bird biodiversity on positive emotional well-being. This supports the emotional benefits of biodiverse environments (CLM) associated with gaining psychological distance (ART), attending to fascinating nature (ART, SRT), or achieving a person-environment fit (ART, CLM) with a perceived natural or bird species-rich environment. Furthermore, Mavoa et al. (2019) establish statistically significant relationships between subjective well-being and both fauna and flora species richness,

underscoring the importance of a diverse ecosystem. Hoyle et al. (2019) also found that the richness of species impacts human aesthetic response and pollinator behavior.

While the presence of wildlife contributes positively to the overall perception of urban green spaces, careful planning is essential to address potential drawbacks. Urban wildlife must be considered by type, size, population, and available resources to keep everyone, fauna included, safe. Habitat must be planned to minimize negative human-wildlife encounters. Uebel et al. (2021) suggest that excessive urban noise may hinder the positive effects of fauna biodiversity, necessitating a balance between benefits and disturbances. The promotion of highly natural soundscapes and the reduction of traffic noise are suggested nature-based solutions for human health and the health of fauna in urban areas. Some of the key safe species include bees, butterflies, and squirrels (Dinu Roman Szabo et al., 2023). Hedblom et al. (2014) found bird song was a restorative component of urban green spaces and that urban settings combined with bird song were more highly appreciated than the settings alone and even more so where there was singing by several species rather than just one.

The interconnectedness of biodiversity and emotional well-being calls for holistic planning that considers both plant and animal life. While the benefits are significant, a nuanced approach is required to address potential challenges and to ensure that wildlife presence contributes positively to the overall well-being of urban residents. Implementing amenities and vegetation, such as non-invasive plants, wildlife watering places, and living habitats that enhance animal habitation while ensuring human safety can further enhance the positive impact of fauna biodiversity on urban green spaces.

Theme 3: Sociality & Movement

Sociality and movement are among the most frequently used non-medicated methods for managing mental health. However, restorativeness is not constrained to a single degree of sociality or movement. Rather, it varies by the personality and current mental state of an individual. For example, different people find different restorative benefits in reflecting privately versus gathering with friends or playing basketball versus meditating. While the previous themes focused on passive attention, this theme emphasizes restorativeness in active attention. The following components address the diverse aspects of active attention in sociality and movement in supporting mental restoration.

Component 3.1: Opportunities for Sociality

Provide spaces for various levels of privacy with at least one space for each of the following categories per 10 acres (if the site is smaller than five acres, then only one of each space is required in the site):

Public/Social Space: areas that encourage social connection (restorative)

- Seating to accommodate large group sizes (e.g., amphitheater, large pavilion)
- Amenities, services, or activity spaces (e.g., access to water utilities, concessions or dining, farmers markets)

Semi-Private: areas where social interaction could or could not occur. These types of spaces provide the most sense of control and should be prioritized (most restorative)

- Seating to accommodate small groups or individuals (e.g., small picnic pavilions, tables or benches slightly removed from arterial circulation)

Private Space: areas for 1-3 people that are secluded or not obviously observed (e.g., bench or swing away from main activity/circulation) (very restorative)

Apart from water, sensory fascination, and tree canopy, sociality is the next most mentioned and restorative element in literature on urban green space, and it plays a pivotal role in shaping the

social fabric and mental well-being of individuals in urban environments. Green spaces have been identified as influential factors in reducing loneliness and enhancing a sense of community through place attachment and identity (Maas et al., 2009). The use and characteristics of outdoor common spaces contribute significantly to the formation and maintenance of social ties and sense of community among residents, particularly older adults (Kweon et al., 1998; Kuo et al., 1998). Additionally, urban green spaces positively impact mental health and social functioning, and this emphasizes the importance of these environments in fostering well-being (Tan et al., 2019).

The phenomenon of sociality in outdoor environments represents a recurrent focal point across various seminal theories and evaluative frameworks. Ulrich's (1991) SRT prominently incorporates the concept of social support, while Grahn and Stigsdotter's (2010) PSD theory integrates social elements. Furthermore, the WELL Building Standard (2021) designates points towards fostering community cohesion, and the Sustainable Sites Initiative (SITES, 2015) allocates specific criteria for fostering social connections. These frameworks underscore the importance of catering to diverse social needs within outdoor spaces to enhance mental well-being. Notably, the adaptability of these spaces to accommodate various requirements is a strength of this component with semi-private areas garnering the highest point allocation due to their versatility and perceived safety. Private spaces follow suit, given their propensity to cater to individuals seeking solitude for reflective purposes amid stress. Conversely, large public gathering spaces are recognized for their proactive role in nurturing social cohesion.

Public spaces with areas for social gathering hold strengths in promoting collective efficacy, trust, and neighborhood social capital, ultimately contributing to positive health outcomes (Cohen et al., 2008). They offer venues for outdoor activities and communication, thus creating mentally healthier communities (Chen et al., 2021). Placemaking in public spaces cultivates social interactions, strengthens community relationships, and fosters a sense of belonging (WELL, 2021).

Private spaces, as described by Peschardt & Stigsdotter (2013), fulfill the expectation of providing silent and calm surroundings which allow individuals to retreat for relaxation and solitude. The connectivity and networked spatial arrangement of small linked spaces within public open spaces provide opportunities for social interaction, induce contemplative

psychological responses and offer restorative potential (Thwaites et al., 2005). Stigsdotter et al. (2017) found that participants appreciated spaces that were described as “dens,” areas of privacy where the main trail did not pass through, providing respite.

Semi-private spaces offer a balance between solitude and social interaction (Grahn & Stigsdotter, 2010; Stoltz & Grahn, 2021). These environments are equipped for both social activities and a sense of refuge and cater to diverse preferences. These types of spaces provide the most sense of control (SRT) and diverse compatibilities (ART, CLM) and should be prioritized. It is the quality, rather than the quantity, of landscape greenery and perceived social cohesion which highlights the importance of subjective perceptions in enhancing accessibility and mitigating experiential barriers (de Vries, 2013). While social interaction in semi-private spaces is essential for well-being, it is crucial to consider the potential impact of anti-social behavior on individuals’ feelings of integration and inclusion in these areas (Lee et al., 2015; Seaman et al., 2010).

Component 3.2: Seating Placement

Provide a variety of seating options along pathways and near special features and active recreation areas. Consider providing comfortable, movable seating in both sun and shade. Place at least one seating option along at least 80% of the following:

- Pathway Seating: at least every 200 ft along the pathway (e.g., border walking path).
- Special Features Seating: at least every 20 ft along the perimeter or within viewing distance of the feature (e.g., water, art, viewsheds).
- Active Recreation Seating: at least every 30 ft along the perimeter of the recreation area or within viewing distance for built hardscape areas (e.g., playgrounds) AND quantities to be used by at least 5% of regular occupants.
- At least 50% of the seating is shaded during the hottest part of the day primarily during the summer.
- If at least 10% of seating options are movable, add an additional point to this score.

Note: Seating options may include benches, stone blocks, seat walls, etc. Berms may be counted as up to half of the required seating for recreational areas only.

Seating in landscape locations plays a crucial role in allowing visitors opportunities to extend time spent in green areas and increase the restorative potential of urban green spaces. Designing seating in urban green spaces is a thoughtful and user-centric process that requires careful consideration of usage patterns, preferences, and the purpose of different areas within the space. Strategic placement of seating in high-traffic locations, such as trails, recreation areas, and viewpoints, ensures that users can enjoy these spaces comfortably. Seating in shade is the most agreed on stipulation from existing research. Movable seating, preferred by many, provides a sense of control (ART) and adaptability (ART, CLM) to the environment, enhancing the overall experience. SITES (2015) emphasizes the significance of site accessibility, physical activity, and social connection, aligning with the research from WELL (2021), which underscores the importance of community and movement. Additionally, PSD highlights social needs while SRT incorporates both physical movement and social support with seating serving as a facilitator for these aspects.

Seating is not only about physical comfort but also about mental well-being. Peschardt & Stigsdotter (2013) highlight the significance of seating, among other factors, such as entertainment, lighting, and paths, in influencing the restorative process. Enclosed structures, such as private paths leading to bench areas, enhance restoration, as noted by Stigsdotter et al. (2017). O'Campo et al. (2009) found that green trees, bike paths, parks, and walkable areas are strongly related to good mental well-being and are key for the placement of seating. Seating design, as proposed by Dinu Roman Szabo et al. (2023), should prioritize user needs for relaxation and rest, emphasizing the importance of shade provision. Paydar et al. (2023) note that attributes like the presence of benches along pathways contribute to increased walking tendencies in urban parks, showcasing the important interplay between seating and physical activity.

Furthermore, the variety and distribution of seating options contribute to the overall restorative quality. Whitehouse et al. (2001) identified features like the sound of running water, bright colors, and the sense of enclosure provided by walls as helpful in garden spaces, emphasizing the multisensory stimulation associated with seating areas. Polat & Akay (2015) underline the positive impact of well-designed landscapes, including seating, on visual quality.

However, concerns regarding seating may include potential misuse or misplacement, which could lead to the degradation of the natural aesthetic and diminish the restorative experience. Therefore, a thoughtful approach to seating design, considering the needs of diverse users and the integration of shade, becomes essential for creating mentally restorative urban green spaces.

The quantity of seating should align with the expected usage of the space, ensuring that there is adequate seating to accommodate the users' diverse needs. Various types of seating, such as benches, seat walls, amphitheaters, and berms, offer versatility and cater to different preferences. Seating should be purpose-driven with secluded areas designed for contemplation that feature high refuge and open spaces, facilitating activity observations with high prospect. Balancing areas that promote social interaction with those offering seclusion is essential to meet the compatibility needs of diverse users.

While specific recommendations for optimal seating spacing in each use type may not be available in existing research, observations from precedents and restorative environments have informed the component stipulations. It is crucial to acknowledge that these numbers should be subject to revision as relevant research becomes available to ensure that urban green spaces continue to evolve to meet users' changing needs and preferences.

Component 3.3: Active and Passive Recreation

PART A - Passive Recreation: Provide at least two of the following outdoor passive physical activity spaces on site and available at no cost and in quantities that allow use by at least 5% of regular occupants at any time:

- Green space (e.g., area(s) that support yoga, meditation, photography, painting, viewsheds)
- Blue space (e.g., area(s) that support wading, fishing, kayaking)
- Covered shelters (e.g., area(s) that support picnics, hammocking)
- Play space geared toward children or areas built for children (e.g., sandbox, drawing wall)

AND

PART B - Active Recreation: Provide at least two of the following outdoor active physical activity spaces on site and available at no cost and in quantities that allow use by at least 5% of regular occupants at any time:

- Green space (e.g., area(s) that support walking/biking trail, disc golf)
- Blue space (e.g., area(s) that support swimming, splash pad)
- Recreational field, court, or fitness zone that includes all-weather equipment
- Play space geared toward children or areas built for children (e.g., playground)

Physical exercise is one of the most frequently used non-medicated or self-medication techniques for moderating mental health. Green exercise is activity in natural settings. Regular exercise, especially in green environments, has been recognized for its positive impact on mental health, contributing to improved self-esteem and mood (Barton & Pretty, 2008). Physical activity as a non-medicated technique for mental health moderation aligns with Stress Reduction Theory (Ulrich et al., 1991), which emphasizes the stress-reducing benefits of physical movement (SITES, 2015; WELL, 2021). Urban green spaces, such as parks, play a crucial role in promoting physical activity, particularly through intensity, frequency, and duration of activities by providing venues for outdoor activities and facilitating mental well-being (Lee et al., 2015).

Both passive and active recreation have unique strengths in promoting mental health (Chen et al., 2021). Passive recreation provides opportunities for quiet reflection while active recreation offers

the benefits of physical exercise and social interaction. Balancing these two forms of recreation in urban green spaces is crucial to accommodate diverse preferences and needs and to ensure compatibility for users seeking different modes of restoration and mental well-being. Hence, this component consists of two parts: Part A for passive recreation and Part B for active recreation. While not every green space may offer both options, providing choices allows for greater inclusivity and flexibility.

Passive recreation, often associated with quiet and calm surroundings, can positively influence mental health by offering opportunities for contemplation and serenity (Peschardt & Stigsdotter, 2013). Studies indicate that access to green spaces with tangible features like water, walking paths, and green cover correlates with better mental health outcomes (Francis et al., 2012; Hand et al., 2016). In discussing restorative experiences, Peschardt & Stigsdotter (2013) suggest that "individuals first and foremost expect to find silent and calm surroundings ('serene') and room for social interaction ('social'), followed by space with many trees, sun and shade ('space') and safe areas with bushes and the opportunity for play ('refuge')."

Active recreation spaces, such as parks designed for sports and physical activities, contribute to mental well-being by promoting physical exercise, pleasant natural environments, and social interaction (Wood et al., 2017). Urban parks that allow for exploratory activities, resembling parkour, activate cognitive and perceptual-motor capacities, enhancing mental health (Brito et al., 2022). In a survey of children, Whitehouse and colleagues (2001) observed that the majority of healthy children want more physical activities in green spaces. Children are drawn to environments that allow them to participate in activities involving "manipulative play," such as digging in sand, building with blocks, and moving rocks, as well as "active play," including activities like climbing and tumbling. The benefits of active recreation include stress reduction, improved mood, and increased social cohesion (de Vries et al., 2013).

Active and passive recreation promote restoration through different mechanisms, but both have benefits in improving mental health. Some facilities provide both experience types, such as a children's playground where children have the opportunity to play actively while caregivers can find rest and relaxation. Finding the balance of active and passive opportunities within urban green space is essential to meet diverse user needs.

Component 3.4: Pathways & Wayfinding

PART A - Pathways: Provide easy access pathways with the following attributes:

- Naturally flows in a way that facilitates exploration and creates a feeling of mystery and/or exploration without creating pressure to move through the space
- Routes to and around recreation areas and include loops
- Paths are wide enough for people to walk side-by-side (at least 5 ft)
- Surface is smooth, allowing all ages to walk easily
- Seating is consistent and well-placed in shaded areas with high prospect
- Hierarchy in pedestrian and vehicular circulation is evident

AND

PART B - Wayfinding: Provide an environment that makes it clear and intuitive for users to orient themselves and navigate from place to place by providing the following elements:

- Clear entrances, gateways, and landmarks
- Points-of-decision or nodes
- Distinct areas and regions
- Orientation devices and systems

Pathways: Green space pathways play a surprisingly pivotal role in influencing mental health, catering to different demographics' preferences and needs. Seniors, as highlighted by Zhai & Baran (2017), exhibit a preference for pathways with soft or plastic track pavements, emphasizing the significance of well-designed circulation for specific age groups. Pathways, whether gravel, dirt, or paved, are nearly ubiquitous in green spaces, serving as essential elements for guiding movement and fostering engagement (Barnes et al., 2019). Hierarchy of circulation creates subconscious wayfinding and organizes circulation. Allowing circulation to various design features contributes to minimizing ambiguity and confusion and enhances user navigation within the space (Dinu Roman Szabo et al., 2023).

In urban regeneration, the provision of public open spaces is increasingly seen as interconnected networks of smaller spaces, which, as Thwaites et al. (2005) suggest, can have a restorative

potential by facilitating social interaction. Paydar et al. (2023) further emphasize the positive impact of pathways on walking tendencies, attributing benefits to factors like the presence of trees, green spaces, vegetation, tranquility along pathways, shade, and connectivity with different parts of the park. To maximize restorative benefits, the spatial arrangement should induce reflective contemplation, combine mental and physical experiences, allow the mind to wander, stimulate wonderment, and align with user expectations (Helleur, 2001). Overall, well-designed pathways in green spaces contribute significantly to users' mental well-being and guide their journey through space by creating an environment conducive to both physical and psychological health.

Allowing circulation to embrace moments of prospect and refuge along the paths creates a dynamic and enriching experience for users. As individuals traverse green space pathways, the integration of prospect, providing open and visually engaging views, and refuge, offering secluded and contemplative spots, adds depth to the overall experience. This design approach aligns with principles highlighted by Dinu Roman Szabo et al. (2023), emphasizing the importance of well-organized pathways that facilitate user navigation through the space.

By incorporating opportunities for prospect and refuge, pathways become more than mere conduits; they become immersive elements that contribute to mental restoration. Users can enjoy the benefits of both active engagement with the surroundings, stimulated by prospect moments, and moments of calm introspection and relaxation in refuge areas. This thoughtful integration aligns with the findings of Paydar et al. (2023), where pathways providing tranquility and connectivity contribute positively to both active and passive restorative activities and overall well-being.

Wayfinding: Effective wayfinding is indispensable for mental well-being in urban green spaces, because it significantly shapes users' experiences by alleviating stress and enhancing a sense of contentment (Ryan & Hill, 2022). Clear and user-friendly wayfinding systems, featuring elements such as distinct entrances, landmarks, and orientation devices, play a pivotal role in cultivating a positive and stress-free environment. These systems not only reduce anxiety associated with navigating unfamiliar spaces but also promote efficient and enjoyable exploration

(Ryan et al, 2023). Well-marked areas encourage users to discover different facets of the green space and foster positive emotions and a deeper connection with nature. Additionally, improved accessibility through maps and brochures ensures inclusivity, benefiting individuals with mobility challenges. Establishing a sense of place through recognizable landmarks also contributes to a feeling of security while efficient navigation supports overall positive and restorative experiences for users in larger urban green spaces. In essence, prioritizing wayfinding elements in design contributes to environments that actively support mental health.

In the initial phase of the research, it was not anticipated that pathways would be such an influential aspect of restorative design. The preliminary drafts and the initial four rounds of testing lacked a dedicated component for pathways. Upon revisiting the literature post-testing, it became more evident that wayfinding, the original component, had a smaller impact compared to the significant influence of pathways. The sole contributing assessment that acknowledged both was SITES (2015), emphasizing site accessibility, safety, and wayfinding. Consequently, the modification of this component to center on pathways occurred in the final stages of the research. This adjustment drew inspiration from the potential of pathways to facilitate connections (WELL, 2021), provide access to the extent of green spaces (ART), and encourage exercise and movement (SRT).

Legibility in pathways and wayfinding is connected to Component 1.4: Cohesiveness, Novelty, & Compatibility. As previously stated, clear pathways and effective wayfinding systems contribute to the legibility of urban environments by providing users with intuitive navigational cues and facilitating ease of movement throughout the space. Pathways serve as physical landmarks, guiding users along designated routes and helping them orient themselves within the environment (Francis et al., 2012). Effective wayfinding elements such as signage and directional markers further enhance legibility by providing explicit instructions and visual cues to assist users in reaching their destinations.

COMPONENT 3.5: EDUCATION

Provide at least one of the following options and rate based on inclusion of education services and quality of the educational elements

- **Option 1:** General Education Events - Hold at least four free public educational events every year. OR
- **Option 2:** Educational Signage - Two or more educational signs are accessible for engagement that introduce/explain a principle taught in K-12 education through labels, upright signs, or embedded ground materials (e.g., plant labels and facts, historic plaques, ecological system diagrams). OR
- **Option 3:** Educational Design Elements + Signage - One or more educational objects are accessible for engagement that introduce/explain a principle of general K-12 education on the site environment through play equipment, sculptures, paving, or other embedded ground materials (e.g., play equipment designed after a scientific concept). Supplemental signage should be included to explain the educational purpose of the element.

Engaging in educational activities can be controversial regarding whether it is restorative or not since James (1890) and Rachel and Stephen Kaplan (1989) state that “soft” fascination is the most restorative type of attention. Children are particularly avid learners when given opportunities for diverse activities in outdoor spaces. Studies suggest that museum environments, similar to natural settings, can contribute to mental restoration, reinforcing the importance of learning in educational leisure settings (Packer & Bond, 2010; Packer & Ballantyne, 2002). Dinu Roman Szabo and colleagues (2023) observe that in a botanical garden, the information plaques allowed visitors to recognize and learn about the medicinal plants and their healing properties. While the influence of education on mental health is not as scientifically backed as other components, it still holds significance contributing to the overall understanding of factors that positively impact mental well-being. Thus, why this component was included but given a lesser weight value.

Theme 4: Mindfulness

Although many green spaces inherently possess varying degrees of restorative qualities, the primary focus of this assessment centers on the recognition that not all green spaces are intentionally designed for restorative purposes. The points allocated to these components aim to provide sufficient significance to ensure that achieving an "extremely restorative" score necessitates meeting them. Simultaneously, these components are structured to avoid detrimentally impacting the score of a well-designed green space that may not have been explicitly intended for mental restoration. Component 4.1 - Restorative Space is the most desirable amalgamation of all the theories that contributed to this assessment. Component 4.2 Mental Health Programming and Component 4.3 - Regulating Substance Abuse are supported by WELL (2021) and SITES (2015).

Component 4.1: Restorative Space

Provide at least one space that meets significant portions of the following requirements (0 no elements through 10 with most of the elements present or multiple areas that provide several elements):

- The main purpose is for relaxation and restoration
- Includes signage or education resources explaining purpose and intended use
- Provides a calming & comfortable environment by incorporating at least four of the following:
    - Elements that reduce noise and mitigate negative distractions (e.g., water, natural sounds, topography, plant barriers)
    - Elements that address microclimate & other site-specific conditions (e.g., sun/shade, wind)
    - Seating arrangements that accommodate a range of user preferences (e.g., movable chairs, benches, seat walls)
    - Visual and physical access to vegetation and other natural features
    - Comfortable lighting (e.g., little to no glare with consistent lighting)

Note: Comfortable lighting will fluctuate based on time of day. Additionally, some elements will be better measured at night or seasonally. Use your best judgment to score the typical lighting.

Studies affirm that small environments with no distracting stimuli, designed explicitly for rest and rejuvenation, emerge as the favored settings for mental restoration. Within the context of

PSD, the elements “serene,” “refuge,” and “natural” are the most influential factors. Additionally, prevalent motivations for engaging with green spaces include relaxation, stress reduction, tranquility, and immersion in natural surroundings (Lee et al., 2015).

Restorative green spaces, designed with considerations of Prospect-Refuge theory and key perceived sensory dimensions (PSDs), emerge as paramount for enhancing mental health. PSD Serene embodies tranquility, safety, and the capacity for introspection, offering an environment conducive to stress restoration and attention fatigue relief (Stoltz & Grahn, 2021). Refuge, recognized as an enclosed and secure setting for play or observation, complements the serene quality, providing a virtually holy and safe retreat (Grahn & Stigsdotter, 2010).

Contemplative landscapes are a subset of the broader restorative landscapes. They are defined by compatibility, scale, balance, harmony, and archetypal elements such as water or solitary oak trees and foster rest and relaxation through their peaceful and silent character (Olszewska-Guizzo et al., 2016). Urban landscapes assessed through the CLM exhibit associations with self-reported positive emotions and brain activity linked to mindfulness, relaxation, and attention restoration (Olszewska-Guizzo et al., 2022). The CLM scores urban green spaces based on key categories, such as the “Character of Peace and Silence,” through assessing the potential for rest, comfort, and solitude amid the urban hustle (Olszewska-Guizzo et al., 2023). EEG studies affirm the unconscious salutogenic influence of landscape scenes, which reinforces the restorative impact of well-designed urban green spaces (Olszewska-Guizzo et al., 2023). Emphasizing the significance of silent and calm surroundings, coupled with spaces for social interaction, users prioritize “serene” and “social” PSDs for perceived restorativeness (Peschardt & Stigsdotter, 2013). Overall, these findings underscore the crucial role of restorative green spaces in nurturing mental well-being by offering a harmonious blend of tranquility, safety, and social interaction. The elements listed in this component are physical manifestations of things that can create peaceful and restorative spaces.

Component 4.2: Mental Health Programming

Address at least two of the following topics in educational signage or in courses (offered at least four times a year). If you are unsure, contact your local program coordinator:

- Define mindfulness and/or cover developing mentally healthy habits and self-care practices, fostering relationships and social connections.
- Common mental health conditions or concerns such as depression, anxiety, substance use, stress, burnout, loneliness, and social isolation.
- Signs and symptoms of mental health distress, including how to identify emotional distress and appropriately respond.
- Mindfulness courses for formal (e.g., meditation, yoga) and informal practices (e.g., mindful eating, mindful listening).

Health literacy involves understanding basic health information and having the resources to act on that understanding. Self-efficacy relates to an individual's perception of their ability to influence various aspects and occurrences in their life. It is connected to their capacity to nurture a sense of personal empowerment (WELL, 2021).

A crucial part of health literacy, mental health literacy, involves understanding mental health conditions, promoting health-seeking behaviors, and challenging stigma (WELL, 2021). Enhancing mental health literacy is crucial for individual and community well-being. This encompasses the ability to access and comprehend health information and resources (WELL, 2021). Shockingly, up to 70% of individuals with mental health conditions worldwide go untreated, emphasizing the need for increased awareness and education (WELL, 2021). Mental health education plays a pivotal role in enabling individuals to recognize signs of illness and take appropriate action, and it contributes to a potential 13% reduction in persistent depression risk (WELL, 2021). Point-of-decision prompts, proven effective in promoting physical activity, may similarly apply to mental health information signage offering a practical approach in diverse settings like offices, transportation hubs, and healthcare facilities (WELL, 2021). While mental health education is not extensively explored in standalone research, it finds emphasis in WELL and briefly in SITES. Implementing mental health education programs and signage in

urban green spaces is important. Education equips individuals to address mental health issues independently, enhance health literacy, promote self-efficacy, and foster compatibility for seeking mental health help (WELL, 2021; SITES, 2015). The integration of mental health education within green spaces not only provides tools for immediate mental health relief but also empowers individuals to apply these skills in their everyday lives. This creates a symbiotic relationship between restorative locations and mental health education.

Component 4.3: Regulating Substance Use

Designate substance-free zones.

- Clearly designate smoking areas and provide adequate waste disposal.
- Permanent signage indicating the policy must be present.

Regulating substance use in urban green spaces is a contributing factor for fostering a sense of safety and promoting mental well-being (WELL, 2021; SITES, 2015). The influence of neighborhood problems, including substance abuse, on adverse mental health outcomes is well-documented (O'Campo et al., 2009). Minimizing tobacco smoke and drug use aligns with the goal of enhancing mental health in shared urban environments since there is no safe level of exposure to tobacco smoke (WELL, 2021). WELL (2021) completed extensive research on the consequences of substance use on restoration and allotted several sections of points for the management of substance use. SITES (2015) also included points with the restriction of substance use. While some may perceive smoking and substance use as relaxing, research suggests that it contributes to anxiety and tension. This impacts both individual users and the overall experience of the public. Therefore, prioritizing cleaner air quality through reduced exposure to harmful substances is essential for creating a positive and mentally supportive environment in urban green spaces.

Theme 5: Design Principles

Designers often rely on an intuitive understanding of what makes good design. This intuition is gained through educational training, mentoring, and exposure to other designs deemed noteworthy. Good design creates spaces where people want to be, which is often restorative. Therefore, good design usually indicates a restorative environment. This theme highlights elements of design that are important, but not imperative to restorative design, along with general markers of design success. Hence why the points per component are fewer than in the earlier themes. Many of these subtle details have substantial backing from WELL (2021) and SITES (2015) and consider safety, identity, lighting, climate, sound, transportation, equitable use, etc.

Component 5.1: Culture & Art

Integrate design elements that brand the location by addressing at least one of the following (0 points for no cultural or artistic elements and 10 points for well-integrated cultural or artistic elements):

- Celebration of culture (e.g., culture of occupants, surrounding community)
- Celebration of place (e.g., local architecture, materials, flora, artists)
- Celebration of history (e.g., preservation of historic buildings and landscapes)
- Integration of art (e.g., statues, memorials, sculptures, etc)

Culture, as defined by Stoltz & Grahn (2021), encompasses a broad spectrum of purposeful human activities such as spiritual or artistic endeavors, old artifacts, cultivated land, and socially transmitted living patterns. This rich tapestry of human expression forms the essence of culture and is integral to restorative landscape design. Deng et al. (2020) emphasize the positive effects of culture-related components such as corridors and pavilions in stimulating reflection and enhancing perceived restorativeness. Additionally, Grahn & Stigsdotter (2010) assert that understanding the surrounding environment in terms of nature or culture is essential for individuals. This underlines the importance of cultural integration in landscape design.

Place expresses the connections to local communities. It incorporates traditions and themes that make an area unique and create identity. Design elements that identify and share these themes, stories, and connections build a sense of place and can increase restorative potential.

Contextual design as a facet of place is advocated by Dinu Roman Szabo et al. (2023) and emphasizes the alignment of vegetation choices and spatial design within the specific context of a healthcare facility. Factors such as climate, native species, and user demographics guide design decisions, ensuring that the environment caters to the needs of its users. This tailored approach enhances the therapeutic potential of green spaces, making them more effective in promoting mental well-being. This component addresses some elements (such as art and planting) that may have been briefly mentioned in previous components, however, they were not given significant weight until this component. They play a crucial role in addressing climatic context differences across diverse landscapes. Although this component does not fully address a weakness of the assessment by accounting for location-specific variations, it represents a step towards accommodating such differences and broadening the applicability of the assessment beyond its original biome. Further refinement of the assessment is recommended to better meet the unique needs of diverse biomes and ensure comprehensive coverage of contextual factors.

History plays a crucial role in shaping the identity of landscapes and contributes significantly to their restorative potential. Karmanov & Hamel (2008) demonstrate that the addition of cultural and historical information to natural and urban environments increases their perceived attractiveness and intrigue. This suggests that narratives embedded in the physical properties of spaces enhance their appeal, providing a deeper appreciation of their significance. Furthermore, Olszewska-Guizzo et al. (2022) highlight the presence of archetypal elements in landscapes, such as waterfalls and trees, which carry symbolic and universal meanings, further underscoring the importance of historical context in restorative landscape design.

The integration of art in restorative landscapes offers numerous strengths, enhances the aesthetic appeal and provides opportunities for contemplation and reflection. Artistic elements, such as sculptures, murals, and installations, can evoke emotional responses and contribute to a sense of place, as highlighted by Deng et al. (2020) and Olszewska-Guizzo et al. (2022). Additionally, art-related components have been shown to stimulate reflection and enhance perceived restorativeness, thus amplifying the therapeutic benefits of green spaces (Deng et al., 2020). Furthermore, art fosters cultural enrichment and diversity which aligns with the broader goals of cultural integration in landscape design advocated by Grahn & Stigsdotter (2010).

However, there are potential weaknesses associated with incorporating art into landscapes. Challenges may arise in maintaining and preserving artistic installations, especially in outdoor environments subject to weathering and vandalism. Additionally, the subjective nature of art may result in varying interpretations among users, potentially leading to discord or confusion within the space (Peschardt & Stigsdotter, 2013). Despite these challenges, the strategic integration of art can significantly enhance the restorative potential of landscapes, contributing to the overall well-being of individuals.

Despite the advantages of integrating culture, history, and context into landscape design, there may be challenges in balancing diverse needs and preferences within a given space, especially in densely populated urban areas where space is limited. Additionally, Karmanov & Hamel (2008) note that while narratives can enhance the attractiveness of environments, significant parts of the story may remain inaccessible to observers without explicit commentary and potentially limit their impact.

Component 5.2: Safety Infrastructure

Improve safety of site users by providing some of the following:

- Clearly defined spaces and access control
- Easy surveillance with adequate lighting levels
- Easy surveillance at entrances and walkways
- Clear visibility and good sight lines from access points and crucial junctions
- A variety of options for access
- Site design elements that improve the effectiveness of police and security efforts
- Safety strategies that support easy access to all spaces and amenities and minimize risk of injury, confusion, or discomfort (e.g., night lighting, emergency access)

**See CPTED Safety Guidelines for more information and implementation guidelines.*

Safety plays a paramount role in mental restoration in urban green spaces. Nasar & Jones (1997) emphasize that fear, triggered by factors like physical entrapment and concealment, hinders stress reduction. Ou et al. (2016) note that knowledge of crime in an area negatively impacts physical activity which emphasizes the critical role of safe social environments. Peschardt & Stigsdotter (2013) highlight the expectation of safety among individuals in green spaces, aligning it with serene and social surroundings.

Lyytimäki et al. (2008) draw attention to safety issues as disservices in urban green areas. Francis et al. (2012) underline tangible qualities like safety having a stronger association with mental health than subjective qualities. El-Metwally et al. (2021) stress the importance of prospects and maintenance in creating perceived safety. Garvin et al. (2012) link greening to improved perceptions of safety.

Stafford et al. (2007) establish that a link between fear of crime and mental health affects physical and social activities. Lee et al. (2015) note the impact of perceptions of security on open space use. Olszewska-Guizzo et al. (2023) assert that safety cues in landscapes trigger relaxation and provide vitality and positive emotions. Collectively, these findings underscore the pivotal role of safety in fostering mental well-being, making it a crucial consideration in urban green space design.

One of the most effective strategies for mitigating fear in urban spaces is to prioritize clear sight lines, also known as prospect, and to ensure multiple easily accessible entry points. Clear sight lines allow individuals to maintain visibility of their surroundings, reduce feelings of vulnerability, and enhance a sense of safety (El-Metwally et al., 2021). By providing unobstructed views of pathways, gathering areas, and potential points of interest, clear sight lines facilitate situational awareness and promote a sense of control over one’s environment. Additionally, having multiple easily accessible entry points enhances mobility and facilitates swift ingress and egress, offering individuals a possibility of escape routes and options for seeking refuge if needed. Together, these design principles contribute to creating urban spaces that are perceived as safer and more welcoming, thereby fostering a conducive environment for well-being and relaxation.

Fear can, indeed, obstruct the restorative potential of a space. This underscores the critical importance of ensuring safety and comfort within environments intended for well-being. However, quantifying safety presents a complex challenge as technical measures alone may not capture the full spectrum of factors influencing perceived safety. Recognizing this gap necessitated the addition of a new component. Comfort, which incorporates perceived safety, was introduced during the testing process to address this discrepancy. The combination of Component 5.2 - Safety and Component 5.3 - Comfort encompasses both objective and subjective and quantitative and qualitative measures of safety. This comprehensive approach aims to holistically measure the safety of a space. By integrating both quantitative and qualitative metrics, this component endeavors to enhance the restorative benefits of spaces by addressing the multifaceted nature of safety concerns.

Component 5.3: Perceived Safety + Comfort

Maintain an environment in which vulnerable populations (e.g., elderly, single women, children) would feel safe and at-ease. Use the observer's best judgment to assign points based on the level of comfort vulnerable populations would experience in this space (0 points for feeling unsafe or threatened, 10 points for feeling safe and comfortable).

Note: Comfort is crucial for experiencing restorative benefits. While this component may vary individually and by situation (e.g., time of day), incorporating it is essential.

Safety is paramount for mental restoration in urban green spaces, as indicated by multiple studies. Branas et al. (2011) and Garvin et al. (2012) associate greening with reduced crimes and enhanced safety perceptions. Peschardt & Stigsdotter (2013) emphasize the importance of safe areas for play, while Nasar & Jones (1997) highlight fear triggers such as entrapment and concealment.

Studies like Ou et al. (2016) underscore the impact of safe social environments on physical activity which is crucial for mental health. El-Metwally et al. (2021) identify panoramic views and good maintenance as contributors to perceived safety in parks. Fear of crime is linked to

poorer mental health, reduced physical functioning, and curtailed activities (Stafford et al., 2007). Lee et al. (2015) stresses the role of perceptions of security in open spaces.

Notably, Olszewska-Guizzo et al. (2023) argue that safety cues in landscapes, whether from static elements invoking peace or dynamic elements providing vitality, enable positive responses in the human nervous system. Recognizing that safety goes beyond standard measurements, the feeling or perception of safety is crucial in ensuring urban green spaces contribute significantly to mental well-being; hence the addition of this component.

While subjective measures of safety offer valuable insights into the perceived comfort and security of a space, they are inherently susceptible to variation based on the individual perspectives of the professionals scoring them. This subjectivity introduces a potential weakness as interpretations of safety may differ widely among assessors. However, efforts have been made to mitigate this limitation through carefully crafted wording designed to elicit consideration for vulnerable populations. By incorporating both subjective measures, as seen in component 5.2, and objective assessments, as seen in component 5.3, a balanced approach is employed to triangulate the true measure of safety. This multifaceted evaluation strategy aims to capture a comprehensive understanding of safety within urban spaces and to encompass both quantitative technical aspects and qualitative perceptions, ultimately enhancing the reliability and validity of safety assessments.

Component 5.4: Accessibility

- Provide site access and usability as required by local and national accessibility standards (e.g., Americans with Disabilities Act - ADA)
- Provide site access and usability for developmental and intellectual health, including sensory requirements of people who are neurodiverse (having a brain that works differently from the average person or having atypical patterns of thought and behavior, usually associated with autism spectrum disorder or other diverse conditions), for example, strategies that use color, texture, images, and other multi-sensory, visually perceptible information.

In restorative landscape design, ensuring accessibility for people with any disability is imperative for fostering inclusivity and promoting well-being. Dinu Roman Szabo et al. (2023) emphasize the importance of gardens being visible, inviting, and easily accessible. This aligns with the Universal Design (UD) principles that advocate for equitable use and flexibility (WELL, 2021). However, while providing physical access is essential, there are both strengths and weaknesses associated with this aspect of design. Strengths include the promotion of equal participation and integration within communities, as well as the facilitation of movement and exploration for individuals with diverse abilities (Seaman et al., 2010). Conversely, weaknesses may arise in ensuring full usability and comfort for physically challenged individuals, particularly in landscapes with complex terrain or inadequate infrastructure.

Mental accessibility for neurodiverse individuals is equally crucial in creating restorative landscapes that cater to diverse cognitive needs and promote well-being. Strategies that consider sensory requirements and utilize multi-sensory, visually perceptible information can enhance the experience of neurodiverse individuals within urban green spaces (WELL, 2021). By incorporating elements such as color, texture, and sound, designers can create environments that are stimulating yet calming for individuals with atypical patterns of thought and behavior. This approach aligns with the principles of Universal Design (UD), which advocate for perceptible information and tolerance for error (WELL, 2021). The Principles of UD include: 1-Equitable use, 2-Flexibility, 3-Simple, but Intuitive, 4-Perceptible Information, 5-Tolerance for Error,

6-Low Physical Effort, and 7- Size and Space for Approach and Use. Strengths of prioritizing mental accessibility include the promotion of cognitive engagement, emotional regulation, and social inclusion for neurodiverse individuals within green spaces. However, challenges may arise in accurately identifying and addressing the diverse needs of this population as well as in balancing sensory stimuli to ensure a comfortable and supportive environment for all users. Additionally, there may be limitations in the implementation of strategies to accommodate varying levels of cognitive abilities and preferences.

Component 5.5: Pedestrian Connection

Provide at least one functional entrance that opens to or connects with an existing pedestrian transportation network that meets at least two of the following requirements:

- Streets connect to bike/walking trails that continue for at least 1 mile outside the site boundaries
- Speed limits of 25 mph or less and street has buffer protections along sidewalks (e.g., curb extension, bioswales, bike lanes, parked cars, benches, trees, planters)
- Within 1/4 mile of the site boundary, 90% of the total street length has continuous sidewalks on both sides.
- Mass Transit is located within a 1/4 mile walk distance of an existing bus network stop, light or heavy rail stations, or commuter rail stations that provide regular weekday and weekend service

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Urban green spaces play a role in promoting positive mental health, particularly when easily accessible. Wood et al. (2017) underscore the importance of providing public green spaces within walking distance for the well-being of local residents, which also supports unplanned social interaction. Thwaites et al. (2005) emphasize the restorative potential of a network of interconnected green spaces, facilitating social interaction and creating a sense of connectivity.

Proximity is also a significant factor. Lee et al. (2015) note that people living in close proximity to green spaces are more likely to use them frequently. The optimal distance for accessibility is suggested to be less than ⅓ of a mile, or a 5-minute walking time. Pedestrian-friendly features,

such as cycle paths and minimal obstructions like busy roads, enhance ease of accessibility (Lee et al., 2015).

The study by Mowen et al. (2007) reveals that perceived park walking proximity directly influences physical activity and health through park use frequency. Safely connecting pedestrian systems to other transportation methods, including cycling paths and public transit, not only enhances accessibility but also encourages more extensive use of green spaces, which ultimately contributes to the well-being of urban residents.

Pedestrian connections, along with bike lanes and efficient public transit systems, play a vital role in reducing pollution and promoting mental well-being in urban green spaces. Hematian and Ranjbar's (2022) research underscores the detrimental impact of pollution on mental health, particularly in car-centric environments where air pollution and noise levels are elevated. By providing accessible pedestrian routes and promoting alternative modes of transportation, such as biking and public transit, urban green spaces can encourage less reliance on vehicles and thereby mitigate air pollution and noise levels (Lee et al., 2015). Gascon et al. (2018) further support the protective role of green spaces against mental health issues by highlighting their ability to mediate the adverse effects of air pollution. By reducing exposure to pollutants and creating healthier environments, pedestrian-friendly connections to green spaces contribute to improved mental health outcomes for individuals and foster a sense of well-being and connection to nature within urban settings. Additionally, the promotion of active transportation options aligns with the principles of sustainable urban planning and promotes environmental sustainability and public health simultaneously. Prioritizing pedestrian, bike, and public transit connections to green spaces not only decreases pollution but also enhances mental health outcomes, thus contributing to healthier and more livable cities.

Component 5.6: Climatic Response

Integrate design features to respond to the climate by addressing the following:

- Sun (e.g., tree canopy, awnings, pavilions, shade sails)
- Wind (e.g., protective wind breaks)
- Heat (e.g., increased vegetation, reflective surfacing, water features)
- Traffic or Unsightly Features (e.g., green walls, barriers)

Designing urban green spaces with climatic responses enhances mental health because it makes the green space tolerable and more serene (PSD) and promotes a sense of being away (ART). Arnberger et al. (2017) stress the significance of heat-adjusted green-space designed for the elderly, emphasizing the need for cool green spaces accessible with minimal exposure to high temperatures. Burkart et al. (2016) highlight the mitigating effect of urban green and blue spaces on heat-related mortality, emphasizing the benefits of increased vegetation in countering the adverse effects of heat. Lee et al. (2015) point out that urban greenery counteracts the urban heat island effect, thereby reducing energy costs and minimizing air, water, and noise pollution.

Gascon et al. (2018) suggest that green spaces have protective benefits for mental health in adults because green spaces reduce pollution and noise. Chen et al. (2021) also highlight the environmental factors related to urban green spaces as beneficial to residents' mental health through air quality improvement and noise absorption.

Micro-level physical features, including water and plants, contribute to a comfortable environment and positively influence mental health (Deng et al., 2020). Hematian & Ranjbar (2022) find that natural elements, including greenery, play a role in mental health on pedestrian streets.

James et al. (2016) reveal that greenness affects mortality through mental health, social engagement, physical activity, and air pollution buffering. Wu et al. (2023) emphasize the effectiveness of air and sound quality in increasing positive emotions. The provision of occupant control over the outdoor environment, akin to indoor climate control, enhances satisfaction (WELL, 2021).

Peschardt & Stigsdotter (2013) indicate that despite challenges in dense cities, small public urban green spaces (SPUGS) can fulfill people's desire for restorative environments by adapting PSD to smaller environments. Designing green spaces to provide refuge from heat, block unsightly views, and include a variety of climatic responses ensures effectiveness in promoting mental well-being.

Component 5.7: Sound

Provide spaces for various levels of sound with at least one space for each zone:

- **Loud Zone:** includes areas intended for loud equipment or activities (e.g., social spaces, music performances, sports events, etc).
- **Quiet Zone:** includes areas intended for concentration, wellness, rest, study and/or privacy (e.g., restorative spaces). Natural sounds (such as water) may also be used in the quiet zone to mask outside noise. The presence of outside noises (e.g., traffic) does not overwhelm the purpose of these zones.
- **Mixed Zone:** includes areas intended for learning and collaboration (e.g., outdoor classrooms, small pavilions/plazas). The presence of outside noises (e.g., traffic) does not overwhelm the purpose of these zones.
- **Reprogramming or mitigation** of sound transmission between loud zones that border quiet zones (if no need for buffer, still apply the point).

**Note: These zones may correlate with the spaces used for Opportunities for Sociality (Component 3.1) and such spaces may meet both requirements.*

The sound environment in urban parks significantly influences mental well being with various sounds contributing to positive values associated with green spaces and other sounds contributing negatively. Acoustic preference plays a crucial role in landscape evaluation, surpassing visual preference, and suggests the need to reconsider the role of soundscape in environment perception and landscape planning (Gan et al., 2014). Birdsong, particularly singing by multiple species, enhances the appreciation of urban green spaces and emphasizes the positive impact of natural sounds (Hedblom et al., 2014).

Influenced by factors like the presence of trees, natural features, and tranquility, the sound environment in urban parks is often rated positively, highlighting their impact on psychological states (Brambilla et al., 2013). Water sounds, known for their benefits, contribute positively to the soundscape, create fascination, and are becoming part of the growing area of natural soundscaping research (Dinu Roman Szabo et al., 2023; WELL, 2021). Positive effects of air and sound quality on emotions reveal the significance of these components in enhancing well-being (Wu et al., 2023). The PSD Serene element highlights the importance of tranquil sounds of nature for a sense of peace and safety (Stoltz & Grahn, 2021).

However, the presence of traffic noise can moderate the positive effect of natural sounds. This emphasizes the need to reduce traffic noise for optimal restoration in urban green spaces (Uebel et al., 2021). While natural soundscapes offer cultural, historical, recreational, aesthetic, and therapeutic values, mitigating environmental noise exposure becomes crucial for minimizing negative health effects (Pijanowski et al., 2011; WELL, 2021).

In designing urban parks, it is essential to create spaces that cater to a diverse range of needs and preferences, including both social gatherings and private contemplation. This necessitates a thoughtful consideration of different volumes of sound within the park environment. Loud areas can accommodate social gatherings, physical activities, and events and provide vibrant and dynamic spaces for community interaction. These areas may feature amenities such as amphitheaters, playgrounds, and picnic areas and encourage active engagement and socialization. On the other hand, quiet zones offer serene retreats for individuals seeking solitude and relaxation and are more conducive to restoration. Hence the reason two points are allotted for quiet zones. These areas may be nestled amidst greenery where intentional design elements keep them away from the hustle and bustle of the park's central areas and may feature tranquil elements, such as water features or secluded seating areas. Mixed-use spaces provide a balance between social activity and peaceful contemplation, cater to a broader range of visitor preferences, and, as a result, receive two points for this versatility. By incorporating a variety of spaces with different sound volumes, urban parks can offer visitors the opportunity to engage in activities that suit their mood and desired level of interaction. This ultimately enhances the overall experience and promotes mental well-being for all park users.

Component 5.8: Cleanliness

Maintain cleanliness of all spaces. Cleanliness includes, but is not limited to, having no litter, graffiti, or broken amenities (0 points for least clean, 10 points for a clean and maintained environment).

The maintenance and cleanliness of urban green spaces play a pivotal role in promoting positive mental health outcomes for users. Perceptions of environmental hygiene, security, and safety are crucial, since rundown spaces may be associated with unsavory activities, which may deter key user groups and thus impact overall mental well-being (Lee et al., 2015). Studies suggest that addressing blighted physical environments, including the maintenance of green spaces, can significantly reduce feelings of depression and worthlessness among community-dwelling adults (South et al., 2018). A high-quality restorative landscape should prioritize the positive impacts of management and maintenance on visual quality and restorative potential (Deng et al., 2020). Enhanced aesthetics, encompassing cleanliness, safety, and comfort, contribute to improved mental well-being in outdoor spaces (WELL, 2021). Therefore, emphasizing the management and maintenance of urban green spaces as integral components of their design not only enhances their visual appeal but also ensures a positive impact on users' mental health.

The cleanliness and maintenance component in the assessment process highlights an important evolution in understanding the significance of urban green spaces for mental health. Initially overlooked, this aspect was introduced during testing rounds due to the observations of professionals visiting the sites. This component also began with a very low points value, which increased with each round of testing. Subsequent revisiting of the literature provides new insights into the critical role of cleanliness and maintenance in fostering positive mental health outcomes in urban green spaces. This recognition underscores the importance of continually refining assessment criteria based on emerging research and real-world experiences to ensure that urban green spaces effectively support the well-being of their users.

Chapter Six: RDS Assessment Testing & Evolution

Summary

The Restorative Design Scale Assessment evolved throughout the research and testing process. This chapter describes that evolution, the requirements of the IRB, recruitment of professionals and selection of test sites, and changes that were made between each round of professional feedback.

IRB + Recruitment

The goal of the RDS is to bridge the gap between restorative research and professional application. This phase of the project included four rounds of testing in which professional designers and planners in the Salt Lake area used the assessment on existing sites and gave feedback for adjusting the assessment to ensure accuracy, usefulness, and applicability. Testing consisted of eighteen professionals using the assessment at various locations in Salt Lake City and following up with a 30-minute remote feedback session.

Assessment Testing Steps:

1. An IRB Exemption was necessary due to benign behavior intervention (asking each professional to physically visit a site and use the assessment) and for the interview following the site assessment that asked questions strictly relating to the critique of the Assessment. The IRB information was submitted and approved through Utah State University's Research System (more information and documentation can be found in the appendix). Recruitment targets included landscape architects, designers, or planners in the Salt Lake City, Utah region.

> IRB Protocol # 13741
> IRB Exemption Date: August 6, 2023
> Consent Document Expires and Project End: March 7, 2024

2. Four Rounds were conducted with between three and seven landscape architects, designers, or planners in the Salt Lake City, Utah region in each round. Eighteen professionals were recruited to achieve a distribution of experience and expertise. The Salt Lake City area was selected for its proximity to Utah State University, researchers' and professionals' familiarity with it, centrality to the majority of design and planning professionals, and the urbanization of the area.

Per the IRB approved process, recruiting was conducted by email or in-person and any further communication was conducted via email. Communications included obtaining signed consent forms, distributing a PDF of the current assessment draft and a map of the site, and scheduling an interview to discuss the strengths and weaknesses of the assessment. Interviews followed use of the assessment and were conducted through a non-recorded video call. Notes from the interviews

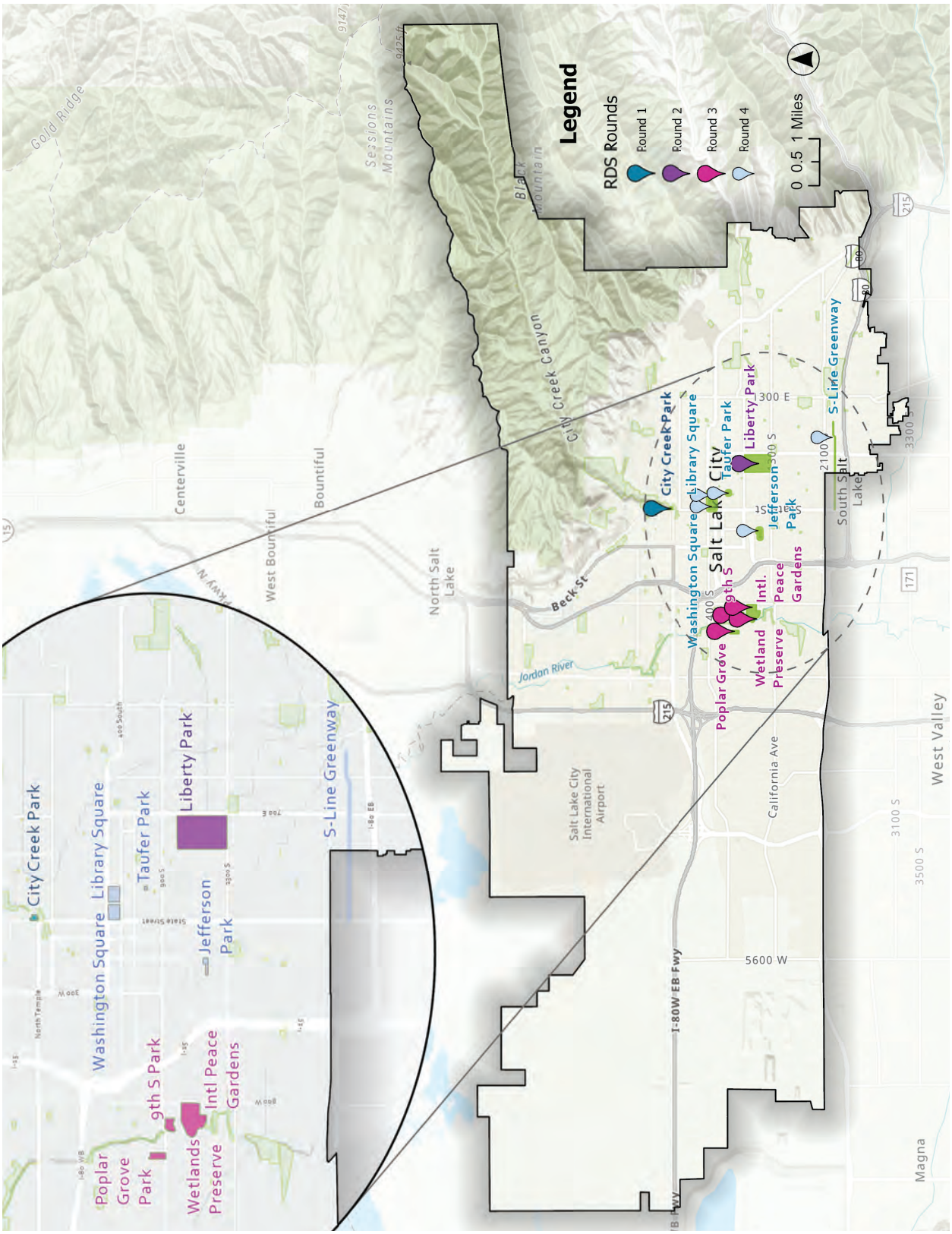
were recorded via word processor. As news of the assessment test spread, more professionals volunteered or asked to be included. Subsequently, the study expanded to encompass an additional professional in both the second and third rounds (four professionals in each round including two from the same office who participated in different rounds) and introduced a fourth round of testing that consisted of a city planning team. Limitations to the assessment were discovered and revisions were made with each round.

Sites were selected based on location, size, and usage. Professionals were recruited for varied areas of expertise and experience levels. This approach aimed to ensure a comprehensive array of perspectives and situations that could reveal the strengths and weaknesses of the assessment, which could subsequently lead to refinements throughout the review process. This facilitated an in-depth and robust critique process. A succinct overview of the discrepancies observed across the rounds is provided below and descriptions of the feedback and assessment evolution are located later in this chapter. Figure 9 shows a map of the sites visited.

3. Edits were made to the RDS Assessment following each round, based on professional suggestion and observed limitations. After completing the four rounds of edits, a thorough reevaluation of the literature was conducted to ensure that the changes made aligned with established scientific principles. Additionally, this stage involved exploring literature published since the inception of the project and literature review and revisiting previously explored research to confirm accuracy of interpretation (Olszewska-Guizzo et al, 2023; Dinu Roman Szabo et al, 2023; Branas et al., 2011; Garvin et al., 2012; Stafford et al., 2007). This iterative process highlights the project's position at the forefront of current research and emphasizes the necessity of ongoing monitoring and updating as new findings emerge in the field.

4. Creation of the final document. The final document transforms the assessment from a mere list of components into a visually appealing document. This comprehensive document encompasses a foreword, purpose statement, a brief overview of the guiding principles of the RDS, the assessment, an introspective analysis of its strengths and weaknesses, and visual illustrations exemplifying specific components. The full document is included in the following chapter of this document.

Figure 9: Locations Visited by Professionals for Each Round of Testing



Exposition for Round Details: A section for each round provides details of the sites visited, professionals who participated, feedback on what was provided, and changes that were made. Figure 9 shows all the sites visited in the context of Salt Lake City and Figure 10 is a map of City Creek Park, an overhead view of the site visited in Round 1.

Figure 10: Round 1 - City Creek Park Map (Corner of N Temple & State Street, SLC)

Round 1

Where: City Creek Park (2.3 acres) - This park was chosen for its centrality to SLC downtown, moderate size, and its water elements.

Who:

- Evaluator A: Principal, Landscape Architect & Planner, Experienced (30+ years)
- Evaluator B: Principal + Owner, Landscape Architect, Experienced (30+ years)
- Evaluator C: Landscape Designer, Entry Level (1-3 years)

Feedback/Changes:

Evaluator A said that the audience was not clear and that several of the components were confusing, however, the site received the highest score (by almost 50 points) from this evaluator. It should also be noted that Evaluator A was part of the design process for this park. Evaluator B thought the content was intuitive, extremely relevant, and confirmed what they have experienced in their career and personal life. This individual highly encouraged having a mental health professional critique the assessment. This person also encouraged inclusion of a design example of a mental health garden for reference, however, this is outside the current scope of this project.

Particular components discussed were Component 2.3: Built vs Natural Environments for a confusing way to calculate the score, and a request to move Sound from sociality to Design (now Component 5.6) and clarify the wording. Verbiage was clarified on several other components. One of the participants walked across the street and looked at the Brigham Young private park and noted the differences in cleanliness and how it made them feel. Component 5.7: Cleanliness was added as a user-observed qualitative scale of three points. The acreage number to amenities required in Component 3.1: Opportunities for Sociality was significantly decreased due to its previously extremely high and unachievable demand. Component 4.3: Substance-Use was initially restricted to substance use. However, it was discussed that for some people legal use of substances could be restorative and that anything else is already illegal. A need for more colloquial terminology was frequently discussed, and terminology was altered. The participants involved with the original design of the space appreciated the opportunity to evaluate their design through this lens and found it eye-opening.

Table 3: Round 1 (City Creek Park) Evaluator Scores

ROUND 1: CITY CREEK PARK						
		Possible	A	B	C	AVE
Theme 1 : Novelty & Intrigue	Comp 1.1 Water Fascination	15	12	9	12	11.0
	Comp 1.2 Sensory Fascination	18	15	10	11	12.0
	Comp 1.3 Natural Mimics	6	6	5	2	4.3
	Comp 1.4 Cohesiveness, Novelty, & Mystery	6	6	4	5	5.0
	Total	45	39	28	30	32.3
Theme 2: Environmental Diversity	Comp 2.1 Tree Canopy	12	12	10	12	11.3
	Comp 2.2 Enclosure	12	11	9	9	9.7
	Comp 2.3 Built vs Natural	19	12	16	11	13.0
	Comp 2.4 Plant Diversity	6	5	3	4	4.0
	Comp 2.5 Animal Diversity	4	4	2	2	2.7
	Total	53	44	40	38	40.7
Theme 3: Sociality & Movement	Comp 3.1 Opportunities for Sociality	9	6	8	2	5.3
	Comp 3.2 Seating Placement	3	2	2	1	1.7
	Comp 3.3 Recreation	18	8	10	6	8.0
	Comp 3.4 Wayfinding & Signage	5	6	5	5	5.3
	Comp 3.5 Education	3	3	1	0	1.3
	Total	38	25	26	14	21.7
Theme 4: Mindfulness	Comp 4.1 Restorative Space	12	12	8	8	9.3
	Comp 4.2 Mental Health Programming	8	0	0	0	0.0
	Comp 4.3 Regulating Substance Use	6	6	4	3	4.3
	Total	26	18	12	11	13.7
Theme 5: Design Principles	Comp 5.1 Identity	3	3	2	0	1.7
	Comp 5.2 Safety	6	6	5	4	5.0
	Comp 5.3 Accessibility	3	3	3	2	2.7
	Comp 5.4 Pedestrian Connection	4	3	4	4	3.7
	Comp 5.5 Climatic Response	3	5	4	2	3.7
	Comp 5.6 Sound	2	2	0.5	1	1.2
	Total	21	22	18.5	13	17.8
	TOTAL	183	148	124.5	106	126.2

ROUND 1: RESTORATIVE SCALE				
<75	75-100	101-125	126-150	151-183
Not Restorative	Somewhat Restorative	Moderately Restorative	Very Restorative	Extremely Restorative

Round 2

Where: Liberty Park (80 acres) - This park was chosen for its frequent use, variety of amenities, and ability to test the assessment's effectiveness on large park sizes and safety.

Who:

- Evaluator D: Office Manager, Landscape Architect, Experienced (10-30 years)
- Evaluator E: Project Manager, Landscape Architect & Planner, Experienced (10-30 years)
- Evaluator F: City Planner, Landscape Designer & Planner, Experienced (10-30 years)
- Evaluator G: Retired Principal + Owner, Landscape Architecture & Planning Firm, Experienced (30+ years)

Feedback/Changes:

Participants had drastically different scores. This site was so large that it exhibited almost all the elements of a restorative space at some place or another. The differences in evaluator scores distinguished between those who thought of the site holistically versus by actual restorative impact of specific areas. This demonstrated that the overall assessment has limitations in larger sites, however, it could be used on portions of the site and be more accurate.

Language simplification was asked for again. One professional asked for a workshop with their team to 1) test it again and 2) teach their team more about these principles. This person said that their team would desperately need adjustments/simplification to the verbiage.

Component 2.3 was still confusing but most of the professionals understood it after some time. One professional had minimal time and completely skipped that component because it was confusing and difficult to understand. They recommended graphically orienting the point system in some way. Component 5.7: Cleanliness was appreciated, however, they felt it should be worth more so it was changed from 3 to 5 points. The scale of this site also showed the need to lower the proportion of amenities per acreage in 3.1 again.

It was recommended to add a section in Component 1.1: Water for a dry river/water bed to count for some points. The implication of water still would have some restorative value although it would be significantly less than actual water. This suggestion was included, particularly taking

into account the needs of Utah to conserve water. It was also recommended that components be added that 1) measure how the site fits the immediate and regional context and needs of its surroundings, and 2) measure how well the site is maintained. These two suggestions were not implemented in this iteration of the assessment because maintenance can be included into Component 5.7 - Cleanliness, and a measurement of meeting the criteria can be very subjective.

Safety was a significant discussion, particularly due to the unsheltered population that resides in Liberty Park. Current points are only allotted for following safety guidelines. However, it is one thing to follow all guidelines and another to feel safe. How would we ensure consistency of safety rating for vulnerable populations? Additionally, how do we account for the restorativeness that unsheltered populations find in these same locations despite the potential impacts on the ability of other visitors to feel safe? How should this be balanced? Ultimately, the literature supports safety as one of the most influential components of restorative design. Since the intended (and largest population of) users for most public green spaces are for short-term visitors, prioritizing the restorativeness of this population would serve the largest population.

The assessment's key weakness, an inability to account for temporal differences, was heavily discussed in this round. There is potential for drastic differences in score between season, time of the day, day of the week, seasonal variation, and the impact of events. This is a weakness that can only be addressed with overall thinking or multiple visits to a site. Several disclaimers were added to the introduction of the assessment that addresses these weaknesses and makes recommendations to minimize them.

The future of the assessment was also brought up by two of the participants. One liked how the assessment is a self-governed, no-cost-required option. Another thought that future iterations could be incorporated into SITES design as its own section or sub-certification.

Figure 11: Round 2 - Liberty Park Map (600 Harvey Milk Blvd, Salt Lake City, UT)

Table 4: Round 2 (Liberty Park) Evaluator Scores

ROUND 2: LIBERTY PARK							
		Possible	D	E	F	G	AVE
Theme 1 : Novelty & Intrigue	Comp 1.1 Water Fascination	15	13	9	10	14	11.5
	Comp 1.2 Sensory Fascination	18	16	2	16	11	11.3
	Comp 1.3 Natural Mimics	6	1	1	6	4	3.0
	Comp 1.4 Cohesiveness, Novelty, & Mystery	6	6	3	6	6	5.3
	Total	**45**	**36**	**15**	**38**	**35**	**31.0**
Theme 2: Environmental Diversity	Comp 2.1 Tree Canopy	12	12	12	12	12	12.0
	Comp 2.2 Enclosure	12	12	9	12	12	11.3
	Comp 2.3 Built vs Natural	19	NA	8	19	13	13.3
	Comp 2.4 Plant Diversity	6	6	3	6	6	5.3
	Comp 2.5 Animal Diversity	4	3	3	2	4	3.0
	Total	**53**	**33**	**35**	**51**	**47**	**41.5**
Theme 3: Sociality & Movement	Comp 3.1 Opportunities for Sociality	9	9	9	9	9	9.0
	Comp 3.2 Seating Placement	3	2	0	2	3	1.8
	Comp 3.3 Recreation	18	14	10	15	16	13.8
	Comp 3.4 Wayfinding & Signage	5	5	5	5	5	5.0
	Comp 3.5 Education	3	2	0	2	2	1.5
	Total	**38**	**32**	**24**	**33**	**35**	**31.0**
Theme 4: Mindfulness	Comp 4.1 Restorative Space	12	5	6	6	5	5.5
	Comp 4.2 Mental Health Programming	10	2	2	0	0	1.0
	Comp 4.3 Regulating Substance Use	4	0	0	4	4	2.0
	Total	**26**	**7**	**8**	**10**	**9**	**8.5**
Theme 5: Design Principles	Comp 5.1 Identity	3	3	3	3	3	3.0
	Comp 5.2 Safety	6	5	4	6	6	5.3
	Comp 5.3 Accessibility	3	3	3	1	3	2.5
	Comp 5.4 Pedestrian Connection	4	4	3	3	4	3.5
	Comp 5.5 Climatic Response	3	3	2	3	3	2.8
	Comp 5.6 Sound	4	2	1	2	4	2.3
	Comp 5.7 Cleanliness	3	1	1	2	1	1.3
	Total	**26**	**21**	**17**	**20**	**24**	**20.5**
	TOTAL	**188**	**129**	**99**	**152**	**150**	**132.5**

<75	75-100	101-125	126-150	151-188
Not Restorative	Somewhat Restorative	Moderately Restorative	Very Restorative	Extremely Restorative

Round 3

Where: 9th South, International Peace Gardens, Poplar Grove, and the Wetlands Preserve - These sites fit within a smaller acreage that is more conducive to the abilities of the RDS. They also have diverse uses (recreation, botanical garden, natural habitat, open space). These sites exist within two blocks of each other on the west side of Interstate 15 in a lower socio-economic setting. These sites were selected to test for limitations by park type and to observe differences in higher poverty areas.

Who:

- Evaluator H: Project Manager, Landscape Architect, Experienced (10-30 years)
- Evaluator I: Project Manager, Landscape Designer, Beginner (3-10 years)
- Evaluator J: Project Manager, Landscape Architect, Experienced (10-30 years)
- Evaluator K: Public Health Coordinator & Educator, Landscape Designer, Experienced (10-30 years)

Feedback/Changes:

Feedback in this round heavily focused on two main topics and almost all recommended changes were opposite of the other recommendations. I theorize that this was due to the vast variability in types of sites and differences in participants' backgrounds and/or way of thinking. As a result, it was very difficult to implement changes from this round and not many of them were implemented. All participants agreed on one item, saying that more pictures would increase the legibility of several components. More pictures were included, however, they were not added until the layout of the final document and were not included in Round 4.

It was noted that it is difficult for people who don't know the site well to walk in and score it and that it would be different if they visited often or had designed it. This observation had been lightly mentioned by two participants in previous rounds as well. It is recognized that when professionals apply the assessment it will most likely be used for in-office projects that the professionals will be more familiar with despite the likelihood for the least biased responses to originate from assessors who are unfamiliar with the site.

The order of the themes was a large topic of discussion in this round. The opinion was expressed to reorder as 1, 2, 4, 3, 5 and another to reorder as 5, 3, 2, 1, 4, and a third to reorder the components by the easiest to evaluate first and the ones requiring a comprehensive understanding of the site to be at the end. One participant stated that the assessment felt too much like a design guide due to language such as “provide” while another said that its purpose as a site evaluation limited its potential and that it should be rewritten to be more like a design guide. Due to the differing opinions, no action was taken to address these recommendations. Evaluators from previous rounds (and the subsequent round) found the original order of the themes to be understandable.

The importance of comfort was again brought up when one of the participants visiting the Wetland preserve encountered an unsheltered population camp. Component 5.3: Comfort was added to provide a user-observed qualitative scale for measuring the feeling of safety, in which the component asks the observer to see through the lens of vulnerable populations and rank the feeling of safety. However, this qualitative measurement does not provide an answer for how to meet the safety needs of short-term visiting users *and* for users who are part of the unsheltered population. This is a weakness in the assessment that could be further developed in future research projects.

Figure 12: Round 3 - Park Maps (800 Emery St W & 952 S 1100 W, SLC, UT)

Table 5: Round 3 (Multiple Parks) Evaluator Scores

ROUND 3: MIXED USE PARKS (WEST OF I-15)						
		Possible Points	H	I	J	K
			Wet-land Reserve	Peace Garden	Poplar Grove Sports	9th S River Park
Theme 1 : Novelty & Intrigue	Comp 1.1 Water Fascination	16	16	4	0	12
	Comp 1.2 Sensory Fascination	18	13	16	6	5
	Comp 1.3 Natural Mimics	6	1	4	0	0
	Comp 1.4 Cohesiveness, Novelty, & Mystery	6	5	6	2	3
	Total	**46**	**35**	**30**	**8**	**20**
Theme 2: Environmental Diversity	Comp 2.1 Tree Canopy	12	10	8	11	10
	Comp 2.2 Enclosure	12	9	9	6	6
	Comp 2.3 Built vs Natural	18	18	14	3	8
	Comp 2.4 Plant Diversity	6	6	6	3	3
	Comp 2.5 Animal Diversity	4	4	1	0	0
	Total	**52**	**47**	**38**	**23**	**27**
Theme 3: Sociality & Movement	Comp 3.1 Opportunities for Sociality	9	9	9	6	7
	Comp 3.2 Seating Placement	3	3	3	3	1
	Comp 3.3 Recreation	20	14	8	12	8
	Comp 3.4 Wayfinding & Signage	5	5	5	5	5
	Comp 3.5 Education	3	2	0	0	0
	Total	**40**	**33**	**25**	**26**	**21**
Theme 4: Mindfulness	Comp 4.1 Restorative Space	11	10	7	5	7
	Comp 4.2 Mental Health Programming	10	0	0	0	0
	Comp 4.3 Regulating Substance Use	4	0	4	0	0
	Total	**25**	**10**	**11**	**5**	**7**
Theme 5: Design Principles	Comp 5.1 Identity	3	1	3	3	1
	Comp 5.2 Safety	12	8	12	12	6
	Comp 5.3 Accessibility	3	2	3	1	0
	Comp 5.4 Pedestrian Connection	4	4	0	4	4
	Comp 5.5 Climatic Response	4	2	4	1	3
	Comp 5.6 Sound	6	4	4	2	2
	Comp 5.7 Cleanliness	5	2	5	4	2
	Total	**37**	**23**	**31**	**27**	**18**
	TOTAL	**200**	**148**	**135**	**89**	**93**

<75	75-100	101-125	126-150	151-200
Not Restorative	Somewhat Restorative	Moderately Restorative	Very Restorative	Extremely Restorative

Round 4:
Workshop with a City Planning Team

Where:

- Taufer Park: a small park (0.84 acres) with a small plaza, playground, and substantial tree canopy
- Library Square: an 11-acre block with mixed green space and buildings
- Washington Square: an 11-acre park with walking paths, sitting areas, substantial tree canopy, and the state/county building in the center
- S-Line: a long strip park with an open path along the S-Line transportation
- Jefferson Park: a small (3.2 acres) park with play equipment and a large detention basin

Who:

Seven members of a planning team. Sites were visited in teams of two, then all members came together for a critical discussion of the assessment. Team leads assigned sites and partnerships. This round primarily tests the usability of the assessment for planners and retests types of public spaces that can be accurately tested. Participants will be referred to as AA, BB, CC, DD, EE, FF, and GG.

Feedback/Changes:

Scoring in partnerships allowed the professionals to balance each other's individual opinions, creating a central tendency effect. This averaged out any misunderstandings with the assessment question and any potential outlying perceptions providing more accurate scoring. Their team discussion also helped the planners to learn more from the assessment because their comments built on their experiences. In general, planners know less about general design principles than landscape architects. However, these planners felt that the RDS was educational as well as a guide and has helped them change perspective on what they can focus on in future projects.

Component 2.3: Built vs Natural Environments was hard to understand because not many of them had used a three-way measurement tool before (see the assessment). Between the partnerships, most were able to figure out how to use the triangle, but they recommended an example or instructions be included. They also felt that the number of points in Component

2.3 Built vs Natural were too large compared to the other components. Component 2.4: Plant Diversity was hard because planners don't know which plants bloom in what seasons, which is a standard skill for landscape designers. The planners wanted to ensure that Component 4.3: Substance Use included all substances being limited. They also recommended including more picture examples throughout the entire assessment and a section at the end of each theme that includes quick actions to get more points. More pictures were added, however, the section at the end of each theme was not included because priority areas will vary by site, and looking at what scored lowest will provide better guidance for priority areas by site.

It was recommended that multiple versions of the assessment be created that are tailored to the unique needs of each type of park classification: mini, neighborhood, community, and regional parks. Park classifications usually revolve around size of the park, number and types of amenities, and the service area of the park. This recommendation fell outside the scope and timeline of this project. However, this is an opportunity for the project lead or future researchers to continue research and development.

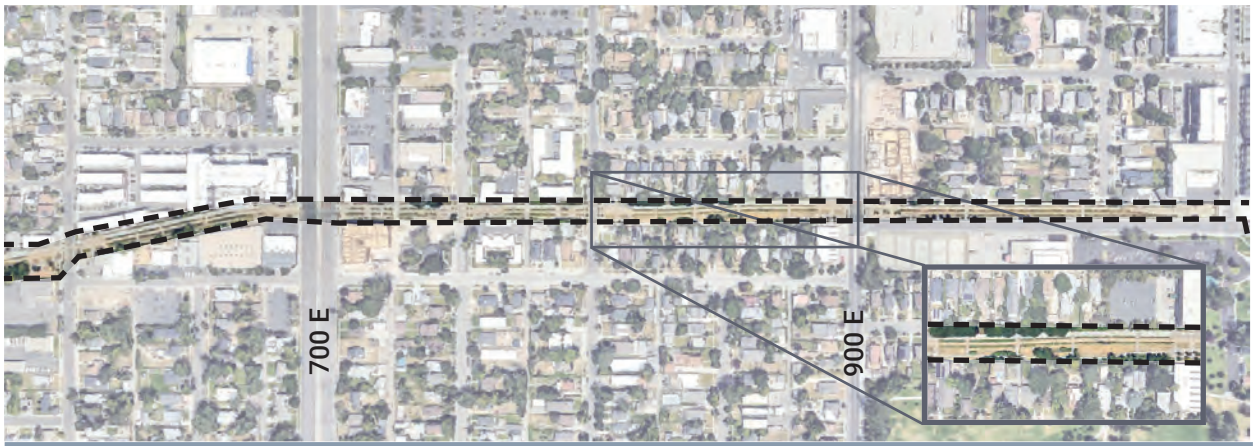
Figure 13: Round 4 - Multiple Salt Lake City Parks

Washington Square

Library Square

Jefferson Park

Taufer Park



S-Line Park

Table 6: Round 4 (Multiple SLC Parks) Evaluator Scores

ROUND 4: GROUP WORKSHOP W/ SLC PLANNERS								
		Possible Points	AABB S-Line	BBCC Wash-ington Park	BBCC Library Square	DDEE Taufer Park	FFGG Jeffer-son Park	SLC AVE
Theme 1 : Novelty & Intrigue	Comp 1.1 Water Fascination	16	4	11	0	0	0	3
	Comp 1.2 Sensory Fascination	18	13	11	12	6	7	9.8
	Comp 1.3 Natural Mimics	6	3	4	0	2	0	1.8
	Comp 1.4 Cohesiveness, Novelty, & Compat.	6	6	5	2	3	1	3.4
	Total	**46**	**26**	**31**	**14**	**11**	**8**	**18**
Theme 2: Environ. Diversity	Comp 2.1 Tree Canopy	12	6	12	0	7	3	5.6
	Comp 2.2 Enclosure	12	12	9	9	8	5	8.6
	Comp 2.3 Built vs Natural	18	14	6	0	8	14	8.4
	Comp 2.4 Plant Diversity	6	6	6	3	3	2	4
	Comp 2.5 Animal Diversity	5	2	4	2	2	1	2.2
	Total	**53**	**40**	**37**	**14**	**28**	**25**	**28.8**
Theme 3: Sociality & Movement	Comp 3.1 Opportunities for Sociality	6	4	5	4	3	2	3.6
	Comp 3.2 Seating Placement	3	2	1	1	0	2	1.2
	Comp 3.3 Recreation	20	14	6	4	6	9	7.8
	Comp 3.4 Wayfinding & Signage	7	5	6	2	7	1	4.2
	Comp 3.5 Education	3	2	2	3	1	0	1.6
	Total	**39**	**27**	**20**	**14**	**17**	**14**	**18.4**
Theme 4: Mindfulness	Comp 4.1 Restorative Space	11	3	7	4	5	1	4
	Comp 4.2 Mental Health Programming	10	0	0	2	0	0	0.4
	Comp 4.3 Regulating Substance Use	4	2	4	0	3	0	1.8
	Total	**25**	**5**	**11**	**6**	**8**	**1**	**6.2**
Theme 5: Design Principles	Comp 5.1 Identity	3	3	3	1	2	0	1.8
	Comp 5.2 Safety	6	5	6	1	2	3	3.4
	Comp 5.3: Comfort + Perceived Safety	6	4	4	2	0	1	2.2
	Comp 5.4 Accessibility	3	3	1	0	0	2	1.2
	Comp 5.5 Pedestrian Connection	4	4	3	3	4	4	3.6
	Comp 5.6 Climatic Response	4	4	3	0	3	1	2.2
	Comp 5.7 Sound	6	3	2	2	0	2	1.8
	Comp 5.8 Cleanliness	5	4	5	2	0	3	2.8
	Total	**37**	**30**	**27**	**11**	**11**	**16**	**19**
	TOTAL	**200**	**128**	**126**	**59**	**75**	**64**	**90.4**

<75	75-100	101-125	126-150	151-200
Not Restorative	Somewhat Restorative	Moderately Restorative	Very Restorative	Extremely Restorative

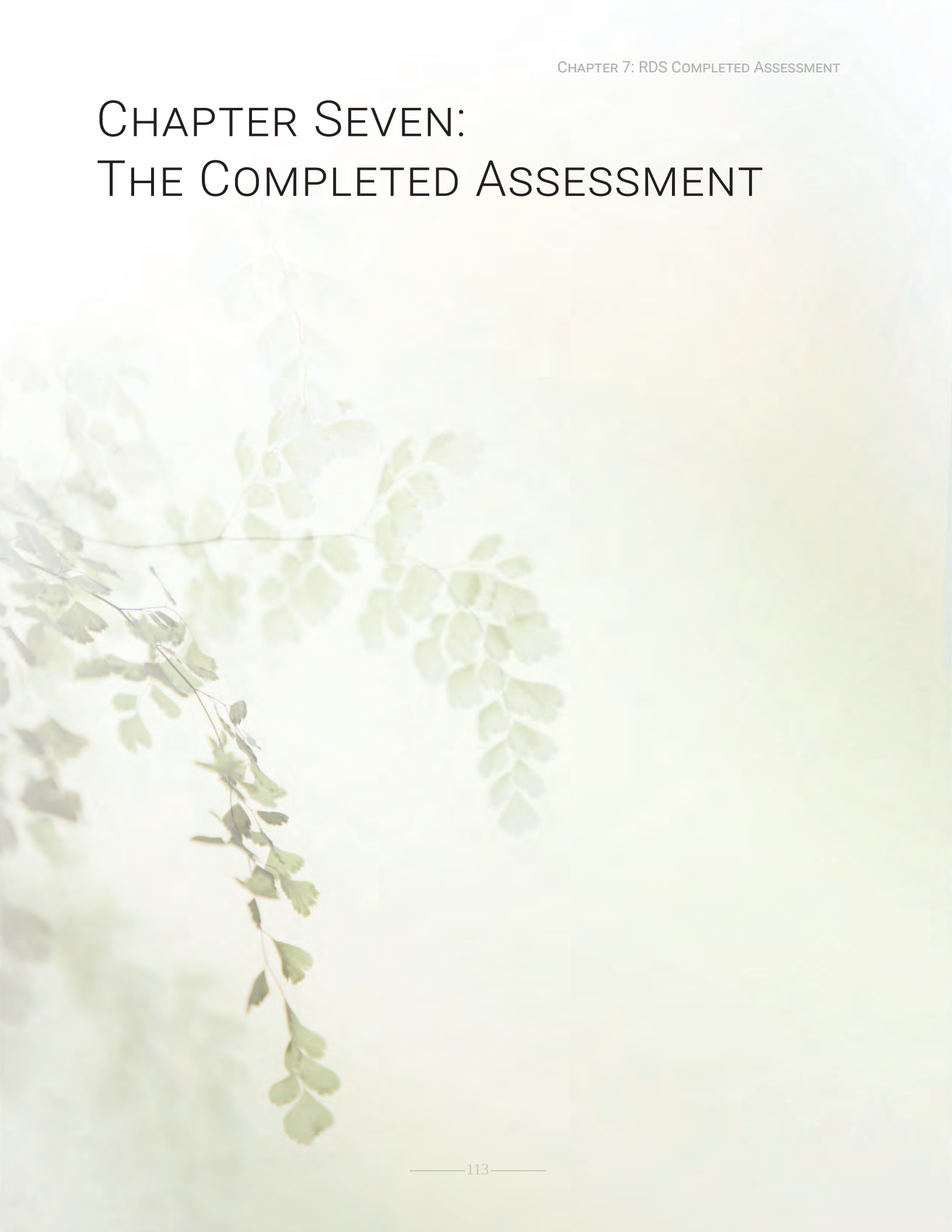
Final Review + Normalization

Following the completion of all testing phases, a re-examination of the literature was conducted to ensure consistency of point allocations. Notably, significant new literature has emerged since the inception of this project, leading to adjustments in point values for several components. Assigning precise point values to each component faced challenges in justification and would likely encounter rigorous scrutiny from the scientific community, especially given the limited studies correlating specific elements within each component. Given the dynamic nature of emerging research, maintaining specific point values would necessitate frequent updates.

To address these challenges, scores were normalized across components to a scale of 0-10, as questions with more response categories produce measures that are both more reliable and more valid. These categories allow fine grained distinctions that are essentially a continuous scale (Alwin, 1997). Points are awarded along the scale based on user discretion and the descriptions and information provided with each component. This scale allows for consistency and comparability and also allows for increased statistical analysis compared to the non-standardized numerical categories previously tested.

However, adhering strictly to this scale risks overlooking existing research indicating varying degrees of restorative potential across components. To incorporate this knowledge, recommended multipliers have been provided for each component, reflecting their relative significance based on existing literature. These multipliers are suggested rather than mandated, recognizing that they are assigned by the author, but offer users the flexibility to adopt, modify, or omit them based on project-specific objectives. This flexibility, previously requested during testing, was unattainable with fixed point allocation. These changes allow the assessment to better align with site-specific needs and project goals.

Chapter Seven: The Completed Assessment



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THE RESTORATIVE DESIGN SCALE

An Assessment Guide

MEASURING THE INFLUENCE OF GREEN SPACE ON MENTAL HEALTH

A MASTERS THESIS BY CORINNE BAHR

Acknowledgments

This journey has been unexpected and unforgettable, and I am grateful to the many wonderful people have supported and endured me throughout it.

The dedication and example of Jake Powell has guided me through this new experience. Meetings with Jake Powell, Brent Chamberlain, and Mark Brunson (my thesis committee) have pushed me through hard things to come out stronger.

My mother was my cheerleader as she mirrored my excitement and reignited mine when it was gone. She helped ground my expectations but keep my hopes soaring high. At moments she was my research assistant, my friend, and my therapist, and her contributions made it possible for me to complete this project.

My family was the inspiration for this project and they continually cheered me on. My coworkers and friends who frequently checked up on me, wanted me to succeed, and offered their skills and feedback during the review processes. My countless new professional friends and mentors who helped me through the testing and refining phases of the project.

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Written by Corinne Bahr in conjunction with Utah State University Masters Thesis
Thesis Committee: Jake Powell (MS, Chair), Brent Chamberlain (Ph.D.), and Mark Brunson (Ph.D.)

TABLE OF CONTENTS

FOREWORD

PRODUCT

The Restorative Design Scale (RDS) Assessment is the culmination of existing research and theories placed into an easy-to-use tool for landscape architects, designers, and planners that quantifies the restorative benefits of existing public green spaces on mental health.

PROCESS

The RDS synthesizes four existing scientific theories, three assessments, and extensive research to identify components of a mentally restorative green space. Each question has a weighted score based on prevalence and statistical impact as shown in the existing literature. Existing sites are to be assessed by industry professionals with a combination of quantitative and qualitative questions that measure the success of design elements in creating a restorative environment.

PURPOSE + BENEFITS

The purpose of this assessment is to combine the extensive amounts of research that show a relationship between mental health benefits and green space design elements into an easily accessible and applicable tool for design and planning professionals. This tool allows professionals to measure the mental health benefits exhibited in their existing designs and empowers them to work with clients to improve mental health by guiding upgrades to existing projects, providing benchmarks for new projects, communicating scientifically supported priorities, focusing priorities and funding, and providing a better quality of life for green space users.

THE RESTORATIVE DESIGN SCALE

An Assessment Guide

BACKGROUND

Mental health is a rapidly rising societal priority. Access to green space contributes to mental restoration and can decrease the intensity and progression of mental health disorders. Not all green spaces are created equally, though. Some green spaces are more restorative than others, more effectively mitigating effects of mental health disorders. Generally, professionals have struggled to keep up with the massive amounts of information which would allow them to more frequently prioritize mental health in design. The Restorative Design Scale (RDS) assessment synthesizes this material into a scientifically backed resource for professionals to quickly understand and apply.

RDS ASSESSMENT GUIDE

The Restorative Design Scale (RDS) synthesizes four theories, three assessments and a countless number of stand-alone research articles into five themes. Figure 1 depicts which elements contribute to the themes of the RDS. The five themes are:

1. **Novelty + Intrigue (Soft Fascination)**
2. **Environmental Diversity**
3. **Sociality + Movement**
4. **Mindfulness**
5. **Design Principles**

This tool allows professionals to assess mental health benefits exhibited in existing designs and empowers them to work with clients to improve mental health by guiding upgrades to existing projects, providing benchmarks for new projects, communicating scientifically supported priorities, focusing priorities and funding, and providing a better quality of life for green space users.

GLOSSARY OF TERMS

Mental Restoration: a state of mind where relaxation and rejuvenation can increase the ability to focus and problem-solve through the details and struggles of day-to-day life.

Restorativeness: the potential for an environment to provide relaxation and re-establish certain cognitive capacities.

Passive Attention: also known as non-voluntary attention, engaged by interesting topics that do not make excessive demands of the mind. Passive attention is restorative attention.

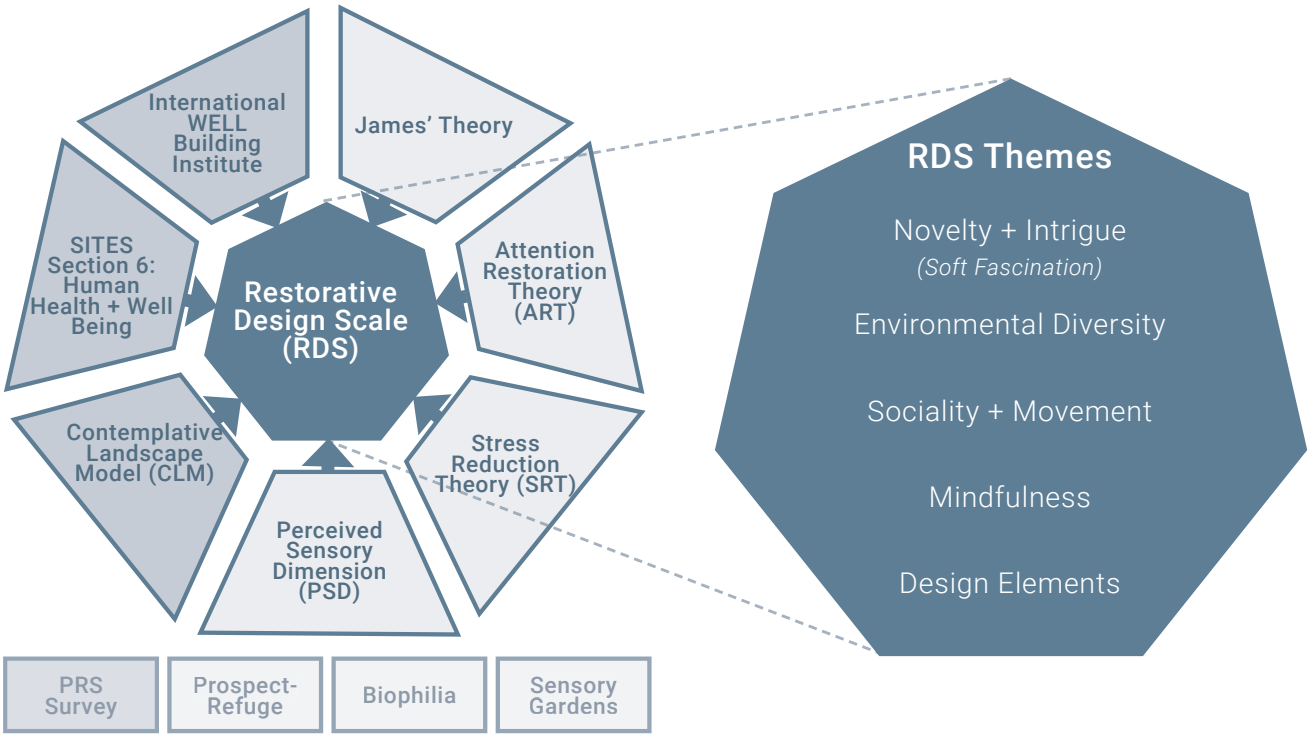
"Soft" Fascination: a form of passive attention in which elements of our surroundings are intriguing enough to be processed in our subconscious but do not demand directed attention.

Directed Attention: also known as voluntary attention, the state when we give our attention to something. Active attention can only be maintained for a few seconds at a time and is usually sustained by continuous efforts to bring back the topic to the mind.

Directed Attentional Fatigue (DAF): when directed attention is used repetitively over extended periods of time and may damage the pre-frontal cortex of the brain if not given time to recover.

THE CREATION OF THE RDS

The Restorative Design Scale (RDS) synthesizes Attention Restoration Theory (ART), Stress Reduction Theory (SRT), Perceived Sensory Dimension (PSD), James' Theory, the International WELL Building Institute, SITES Section 6, and Contemplative Landscape Model (CLM), and various independent research into five themes of what creates a mentally restorative space.



THEORIES

- **James' Theory:** established principle of passive attention as restorative attention.
- **ART:** when a site evokes emotions of extent, being away, fascination, & comparability it is restorative.
- **SRT:** when a site provides a sense of control, social support, physical movement & positive natural distractions it is restorative.
- **PSD:** when a site is natural, diverse, cohesive, open, sheltered, social, serene, & cultural, it is restorative.
- **Prospect-Refuge:** inclusion of both expansive views (prospect) and enclosed spaces (refuge).
- **Biophilia:** a genetic predisposition to the benefits of nature resulting in psychological restoration.
- **Sensory Gardens:** need sensory engagement, context, visibility, accessibility, biodiversity, privacy, seating, water, organization, and soft scape dominance.

ASSESSMENTS

- **International WELL Building Institute:** an assessment with 10 topics (air, water, nourishment, light, thermal, materials, movement, sound, mind, & community) meant to create restorative environments in buildings.
- **SITES - Section 6**: an assessment to measure sustainability of landscapes with a few elements that pertain to mental health (accessibility, way finding, historic preservation, recreation, social connection).
- **CLM:** an assessment to measure contemplation potential in landscape scenes using 7 elements- layers of landscape, landform, biodiversity, color & light, compatibility, archetypal elements, and character of peace and silence.

EXPLORING THE THEMES

The RDS is patterned after the International WELL Building Institute and SITES assessments, meant to be used by an industry professional. The RDS does not require a specific number of points to be considered restorative, rather it gives face value to the restorativeness of a site. The assessment questions are organized in five **Themes**, which contain subtopics called **Components**.

Theme 1: Novelty + Intrigue (Soft Fascination)

Novelty and intrigue create soft fascination, a form of passive attention in which elements of our surroundings are intriguing enough to be processed in our subconscious but do not demand directed attention. Naturally occurring elements are most favorable to soft fascination due to our subconscious awareness of them for our primal survival (biophilia). Encouraging exploration of natural elements creates intrigue and is easily conducive to meeting diverse mental needs and abilities. Designing a space with the included elements is the most restorative of all the themes.

Theme 2: Environmental Diversity

Environmental Diversity in the structure and availability of natural elements in a space empowers mental restoration by creating a sense of control in which the individual may choose what environment would be the most restorative to their mental state in that moment. The underlying principles of environmental diversity are thus choice and control. Creating diverse types of environments creates a sense of control and feelings of safety and engagement through soft fascination.

Theme 3: Sociality + Movement

Sociality and movement are among the most-used, non-medication methods for managing mental health. However, restorativeness is not constrained to a single degree of sociality or movement, rather, it varies by the personality and current mental condition of an individual. While the previous themes focused on passive attention, this theme emphasizes restorativeness in active attention. The following components address the diverse aspects of active attention in sociality and movement in supporting mental restoration.

Theme 4: Mindfulness

Mindfulness is a practiced therapeutic technique that can promote mental restoration by helping an individual focus their awareness and cope with mental health stressors. When education and awareness of mental health are readily available, mindfulness is increased. This theme focuses on teaching mindfulness and creating spaces where individuals can practice positive coping techniques for mental health.

Theme 5: Design Elements

Designers have developed an intuitive understanding of what makes good design. Good design creates spaces where people want to be, which are often restorative. Therefore, good design is indicative of a restorative environment. This theme highlights elements of design that are most important to restorative design.

SCORE SHEET SUMMARY

Scoring for each component may be awarded on a scale from 0-10 at the discretion of the scorer.

This sheet is for point calculations after completing the scoring described in the full document. Optional weights are provided in (#) to score for components that are more influential for mental restoration. Weights may be adjusted to meet the design goals of each site, although it's recommended to use them for more accurate restorativeness measurement.

THEME 1: NOVELTY + INTRIGUE

Component 1.1: Water Fascination*.....Score: _____/10 *(x5)*

Component 1.2: Sensory Fascination .....Score: _____/10 *(x5)*

Component 1.3: Natural Mimics.....Score: _____/10 *(x1)*

Component 1.4: Cohesiveness, Novelty, etc....Score: _____/10 *(x3)*

THEME TOTAL.....Theme: ____/40 *(140)*

THEME 2: ENVIRONMENTAL DIVERSITY

Component 2.1: Tree Canopy *.....Score: _____/10 *(x5)*

Component 2.2: Enclosure *.....Score: _____/10 *(x4)*

Component 2.3: Built vs Natural Environ.* ...Score: _____/10 *(x4)*

Component 2.4: Plant Diversity .....Score: _____/10 *(x4)*

Component 2.5: Animal Diversity.....Score: _____/10 *(x2)*

THEME TOTAL.....Theme: ____/50 *(190)*

THEME 3: SOCIALITY + MOVEMENT

Component 3.1: Degrees of Sociality ..... Score: _____/10 *(x4)*

Component 3.2: Seating Placement* ..... Score: _____/10 *(x3)*

Component 3.3: Recreation* ..... Score: _____/10 *(x3)*

Component 3.4: Pathways + Wayfinding* ..... Score: _____/10 *(x3)*

Component 3.5: Education..... Score: _____/10 *(x1)*

THEME TOTAL..... Theme: ____/50 *(140)*

THEME 4: MINDFULNESS

Component 4.1: Restorative Space..... Score: _____/10 *(x5)*

Component 4.2: Mental Health Edu.* ..... Score: _____/10 *(x2)*

Component 4.3: Regulating Substance Abuse*Score: _____/10 *(x1)*

THEME TOTAL..... Theme: ____/30 *(100)*

THEME 5: DESIGN PRINCIPLES

Component 5.1: Culture + Art ..... Score: _____ /10 *(x3)*

Component 5.2: Safety Infrastructure..... Score: _____/10 *(x4)*

Component 5.3: Perceived Safety + Comfort. Score: ____/10 *(x3)*

Component 5.4: Accessibility..... Score: _____/10 *(x2)*

Component 5.5: Pedestrian Connection*..... Score: _____/10 *(x2)*

Component 5.6: Climatic Response..... Score: _____/10 *(x2)*

Component 5.7: Sound*..... Score: _____/10 *(x2)*

Component 5.8: Cleanliness* ..... Score: _____/10 *(x3)*

THEME TOTAL..... Theme: ____/80 *(190)*

TOTAL SCORE: SITE: ____/250 *(760)*

Overcoming Limitations:

- **Limited by Size:** This assessment works best in public green spaces between 1/4 acre to ~50 acres. Any green space larger than 50 acres should be assessed in sections.
- **Variability by Time:** This assessment is likely to report different scores based on time of day, week, year (seasonal variation). The assessment notes this weakness and includes a recommendation to *visit the site at least twice* and at different times (of day, week, season, and in high visitation vs low visitation, if possible).
- **Assessor Perception:** The RDS recognizes that each assessor will score differently, based on individual perception. The assessment includes a recommendation for having teams or partnerships assess together to minimize individual variability.
- **Audience + Climate:** This assessment was written and tested by landscape professionals in the Inter-mountain region of Utah, United States. It could be adapted for types of spaces (streetscapes, private gardens, campuses,/ hospitals, etc), and specialized for different climates.

RESTORATIVE SCALE				
Not Restorative	Somewhat Restorative	Moderately Restorative	Very Restorative	Extremely Restorative

THEME 1: NOVELTY + INTRIGUE

Novelty and intrigue create soft fascination, a form of passive attention in which elements of our surroundings are intriguing enough to be processed in our subconscious but do not demand directed attention. Naturally occurring elements or mimics of naturally occurring elements are most favorable to soft fascination due to our subconscious awareness of them for our primal survival. Encouraging exploration of natural elements creates intrigue, and is easily conducive to meeting diverse mental needs and abilities. Designing a space with the following elements is the most restorative of all the themes.

COMPONENT 1.1: WATER FASCINATION

SCORE: ___/0-10 (x5)

Provide one of the following features:

Option 1: a water feature with a naturalistic appearance is visible or audible to at least 25% of the space (most restorative). OR

Option 2: a water feature with obvious human-made construction is visible or audible to at least 25% of the space (moderately restorative). OR

Option 3: a storm water garden with implied water pathway is visible for at least 25% of the space (detention/retention basins do not count for this option) (relatively restorative).

Access: safe interaction is possible with the water feature (e.g. wading area).

Quality + Condition: subject to the observer's judgment, an additional point may be awarded for good quality and condition of the water feature.

man-made water feature

appearing/natural water feature

dry water feature

COMPONENT 1.2: SENSORY FASCINATION

SCORE: ___/0-10 (x5)

Provide amenities or vegetation that enhance a multi-sensory aesthetic experience by including the elements below:

Elements:

- Art + Materials (e.g., material sculptures, murals, paving patterns, light sculptures, colored furniture)
- Scents (e.g., flowers or foliage for at least 4 months of the year)
- Tactile variation (e.g., flowers and foliage, construction materials, temperature variation)
- Natural Sound (e.g., birds chirping, wind chimes, pollinators, moving water, wind instruments)
- Taste (e.g., edible plants)

Access: an additional point may be awarded per element if safe interaction is possible.

Quality + Condition: subject to the observer's judgment, an additional point may be awarded, per element, for good condition and quality.

COMPONENT 1.3: ENVIRONMENTAL MIMICS SCORE: ___/0-10 (x1)

Provide amenities that mimic natural materials, patterns, shapes, colors, images, or sounds (0 points for no mimics and 10 points for multiple, high quality mimics).

Examples: Animal footprints in the pavement, leaf design in the back of benches, engraved animals on trash receptacles, dry riverbed in planting, naturalized play equipment, forest etched bridge or fence panels, etc.

COMPONENT 1.4: COHESIVENESS, NOVELTY, + COMPATIBILITY SCORE: ___/0-10 (x3)

Subject to the observer's judgment, 1/3 of the rating for this element may come from each element described below:

Cohesiveness: The Space feels cohesive (e.g., similar plantings, design styles, themes, etc.).

Novelty: A variety of novel (unique or diverse) soft fascination elements are strategically placed to engage interest on many levels of detail. The site is designed to facilitate exploration and creates a feeling of mystery and/or exploration without creating pressure to move through the space.

Compatibility: A variety of types of spaces and materials that can facilitate diverse preferences of users.

TOTAL THEME SCORE SCORE:___/40 (140)

THEME 2: ENVIRONMENTAL DIVERSITY

Environmental Diversity in the structure and available natural elements of a space empowers mental restoration by creating a sense of control in which the individual may choose what environment would be the most restorative to their mental state in that moment. The underlying principles of environmental diversity are thus choice and control. As demonstrated in the points of this theme, greater restorativeness is experienced when natural elements have some demonstration of human influence. For example, a trail through the woods or trees planted in a line. Creating diverse types of environments creates a sense of control and feelings of safety and engagement through soft fascination.

COMPONENT 2.1: TREE CANOPY

SCORE: ___/0-10 (x5)

Subject to the observer's judgment, 1/3 of the rating for this element may come from each element described below:

Provide Tree Canopy Coverage and Access for a minimum of 30% of the site
(Partial points may be awarded if the potential growth will reach the required coverage).

Deciduous + Conifer trees exist with at least a 4:3 (deciduous:conifer) ratio.

A Variety or Well-Executed Cohesiveness of tree planting patterns, such as formal lines or clusters, are used.

Note: It is recommended to preserve desirable existing trees, unless they are weak or invasive species.

COMPONENT 2.2: ENCLOSURE

SCORE: ___/0-10 (x4)

Provide at least 3 of the 4 states of enclosure as depicted below:

Low Enclosure (e.g., field, small planters, travel paths)

Moderate-to-Low Enclosure (e.g., raised planters, small berms, seat walls)

Moderate-to-High Enclosure (e.g., tree-lined walk, buildings, arbors)

High Enclosure (e.g., wooded trail, terraced wall, 2-3 story buildings)

Note: The most restorative enclosures are typically moderate levels, however, including a variety of types provides a sense of control for the visitor to choose what best fills their needs.

Low Enclosure

Moderate-Low Enclosure

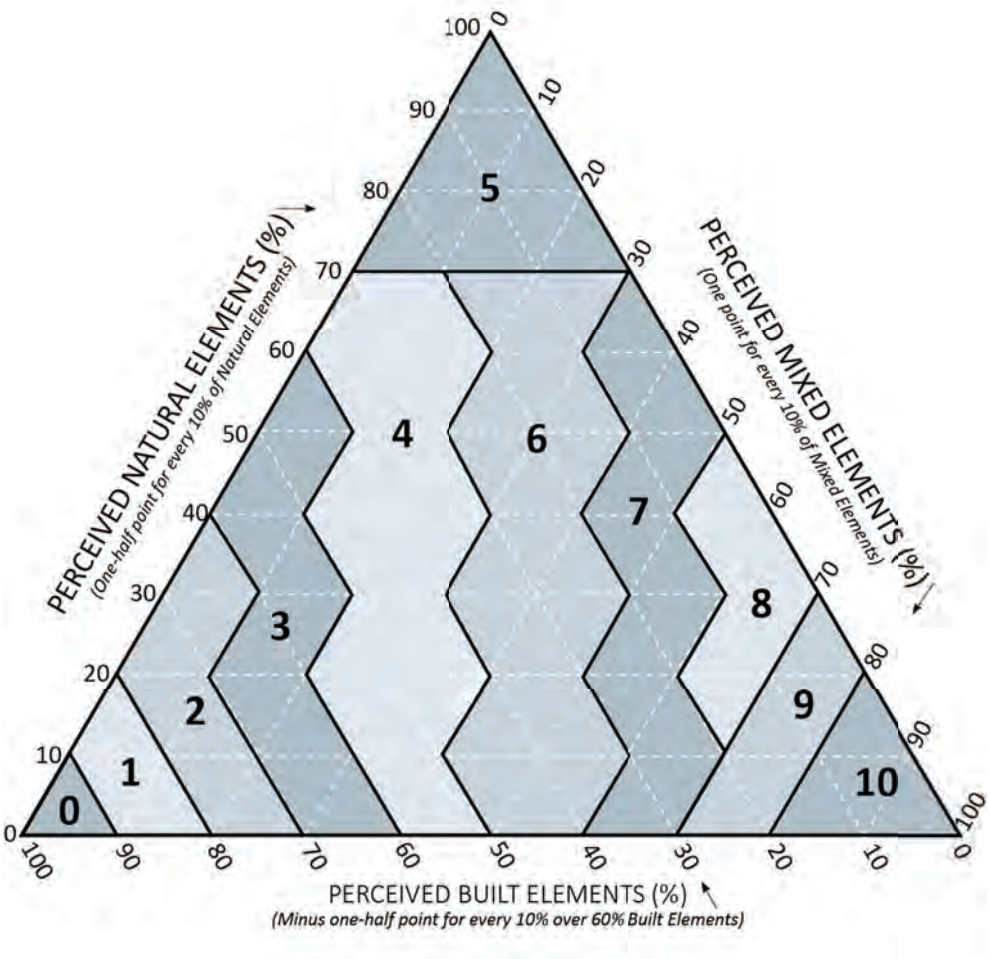
Moderate-High Enclosure

High Enclosure

Image Credit: Amelia Wilken Theobald ①

COMPONENT 2.3: BUILT VS NATURAL ENVIRONMENTS ..SCORE: ___/10 0-10 (x4)

Perception of environments is a quick, observer-based decision of the amenity's overall appearance. This encompasses the spectrum from exclusively having a natural appearance (e.g. streams and forest) to exhibiting a completely built appearance (e.g. buildings, plazas, or stairs), or a mixed appearance (e.g. trails or terraced gardens) and should account for how the observer interacts with the amenity. Use the triangle below to determine the number of points.



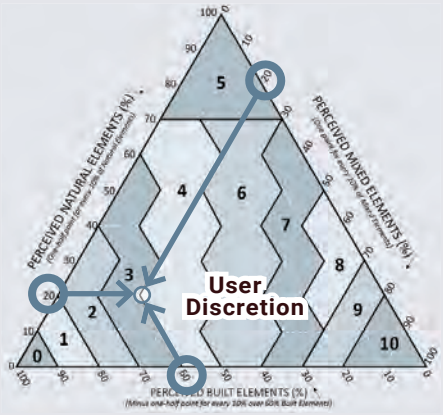
Perceived Natural
Minnehaha Creek, Minneapolis

Perceived Built
Pioneer Courthouse, Portland

Perceived Mixed
Central Park, New York

Using the Triangle:

1. **Identify** the percentage breakdown of environment types on site (should equal 100%). These percentages can be a rough estimate based on observation.
2. **Locate** the percentages for each environment type on the respective sides of the triangle.
3. **Follow** the dotted lines until they intersect. The intersection point will show how many points to award. If the intersection is between two point values (as pictured), use personal discretion to award points between the two categories.



COMPONENT 2.4: PLANT DIVERSITY SCORE: ___0-10 (x4)

Provide diverse vegetation by including the elements below:

Plant Heights (e.g., plant selections provide a variety of differing heights)

Plant Flowers (e.g., flowers appear actively blooming for at least 4-5 months of the year)

Planting Patterns (e.g., plants arranged using massing or patterns to provide variety and unity)

Plant Colors/Texture (e.g., the site uses a variety of plants that have different colors and textures)

Maintenance Condition Well-Kept (e.g., bushes are trimmed, flowers are deadheaded, mulches are within the planting bed, low-maintenance vegetation intended to have a "self-grown" look is not unkempt, etc)

All-Season Interest (e.g., the unique seasonal properties of plants are used within the site to create interest across all seasons)

COMPONENT 2.5: ANIMAL DIVERSITY SCORE: ___/0-10 (x2)

Provide amenities or vegetation that enhance the potential for animal habitation while maintaining human safety, by including at least three of the five elements below:

Presence of Non-Invasive Plants Favored by Fauna (e.g., oak trees, pollinator attractive flowers)

Wildlife Watering Places (e.g., bird/bee baths, small bubbler, small ponds)

Wildlife Food Sources (e.g., hummingbird feeders, squirrel feeders)

Living Habitat (e.g., bird boxes, dense trees, fishponds)

Existing Presence of Fauna (e.g., squirrels, birds, pollinators, fish, etc)

TOTAL THEME SCORE SCORE:___/50 (190)

THEME 3: SOCIALITY + MOVEMENT

Sociality and movement are among the most non-medication methods for managing mental health. However, restorativeness is not constrained to a single degree of sociality or movement. Rather, it varies by the personality and current mental condition of an individual. For example, different people find different restorative benefits in reflecting privately verses gathering with friends or playing basketball verses meditating. While the previous themes focus on passive attention, this theme emphasizes restorativeness in active attention. The following components address the diverse aspects of active attention in sociality and movement in supporting mental restoration.

COMPONENT 3.1: DEGREES OF SOCIALITY SCORE: ___/0-10 (x4)

Provide spaces for various levels of privacy with at least one of each space for each of the following category per every 10 acres (if the site is smaller than five acres, then only one space is required in the site):

Public/Social Space: areas that encourage social connection (restorative).

- Seating to accommodate large group sizes (e.g., amphitheater, large pavilion)
- Amenities, services, or activity spaces (e.g., access to water utilities, concessions, or dining, farmer's markets)

Semi-Private: areas where social interaction could or could not occur. These types of spaces provide the most sense of control and should be prioritized (most restorative).

- Seating to accommodate small groups or individuals (e.g., small picnic pavilions, tables or benches slightly removed from arterial circulation)

Private Space: areas for 1-3 people that are secluded or not obviously observed (e.g., bench or swing away from main activity/circulation) (very restorative).

COMPONENT 3.2: SEATING PLACEMENT SCORE: ___/0-10 (x3)

Provide a variety of seating options along pathways and near special features and active recreation areas. Consider providing comfortable, movable seating in both sun and shade. Place at least one seating option along at least 80% of the following:

Pathway Seating: at least every 200ft along the pathway (e.g., border walking path).

Special Features Seating: at least every 20ft along the perimeter or within viewing distance of the feature (e.g., water, art, viewsheds).

Active Recreation Seating: at least every 30 ft along the perimeter of the recreation area or within viewing distance for built hardscape areas (e.g., playgrounds) AND quantities to be used by at least 5% of regular occupants.

At least 50% of the seating is shaded during the hottest part of the day primarily during the summer.

At least 10% of seating options are movable.

Note: seating options may include benches, stone blocks, seat walls, etc. Berms may be counted as up to half of the required seating for recreational areas only.

COMPONENT 3.3: ACTIVE + PASSIVE RECREATION SCORE: ___/0-10 (x3)

PART A - Passive Recreation: Provide at least two of the following outdoor passive physical activity spaces on site and available at no cost and in quantities that allow use by at least 5% of regular occupants at any time:

Green space (e.g., area(s) that support yoga, meditation, photography, painting, viewsheds)

Blue space (e.g., area(s) that support wading, fishing, kayaking)

Covered shelters (e.g., area(s) that support picnicking, hammocking)

Play space geared toward children in areas built for children (e.g., sandbox, drawing wall)

AND

PART B - Active Recreation: Provide at least two of the following outdoor physical activity spaces on site and available at no cost and in quantities that allow use by at least 5% of regular occupants at any time:

Green space (e.g., area(s) that support walking/biking trail, disc golf)

Blue space (e.g., area(s) that support swimming area, splash pad)

Recreational field, court, or fitness zone that includes all-weather equipment

Play space geared toward children in areas built for children (e.g., playground)

COMPONENT 3.4: PATHWAYS + WAYFINDING SCORE: ___/0-10 (x3)

PART A - Pathways: Provide easy access pathways with the following attributes:

Paths naturally flow in a way that facilitates exploration and creates a feeling of mystery and/or exploration without creating pressure to move through the space.

Routes to and around recreation areas intersect or include loops.

Paths are wide enough for people to walk side-by-side (at least 5ft).

Surface is smooth for easy walking by all ages.

Seating is consistent and well-placed in shaded areas with high prospect.

Hierarchy in pedestrian and vehicular circulation is evident.

AND

PART B - Wayfinding: Create an environment that makes it clear and intuitive for users to orient themselves and navigate from place to place by providing at least two of the four elements below:

Clear entrances, gateways, and landmarks

Points-of-decision or nodes

Distinct areas and regions

Orientation devices and systems

COMPONENT 3.5: EDUCATION

SCORE: ___/0-10 (x1)

Provide at least one of the following options and rate based on inclusion of education services and quality of the educational elements:

Option 1: General Education Events

Hold at least four free public educational events every year. OR

Option 2: Educational Signage

Two or more educational signs are accessible for engagement that introduce or explain a principle taught in K-12 education through labels, upright signs, or embedded ground materials (e.g., plant labels and facts, historic plaques, ecological system diagrams). OR

Option 3: Educational Design Elements + Signage

One or more educational objects is accessible for engagement that introduce or explain a principle of general K-12 education on the site environment through play equipment, sculptures, paving, or other embedded ground materials (e.g., play equipment designed after a scientific concept). Supplemental signage should be included to explain the educational purpose of the element.

TOTAL THEME SCORE

SCORE:___/50 (140)

THEME 4: MINDFULNESS

Mindfulness is a practiced therapeutic technique that can promote mental restoration by helping an individual focus their awareness and cope with mental health stressors. When education and awareness of mental health are readily available, mindfulness is increased. This theme focuses on teaching mindfulness and creating spaces where individuals can practice positive mental health coping techniques.

COMPONENT 4.1: RESTORATIVE SPACE SCORE: ___/0-10 (x5)

Provide at least one space that meets significant portions of the following requirements (0 points for no elements and 10 points for well integrated elements):

The main purpose is for relaxation and restoration.

Includes signage or educational resources explaining purpose and intended use.

Provides a calming and comfortable environment by incorporating the following qualities:

- **Elements that reduce noise and mitigate negative distractions** (e.g., water, natural sounds, topography, plant barriers)
- **Elements that address microclimate and other site-specific conditions** (e.g., sun, shade, wind)
- **Seating arrangements that accommodate a range of user preferences** (e.g., movable chairs, benches, seat walls)
- **Visual and physical access to vegetation and other natural features**
- **Comfortable lighting** (e.g., little to no glare with consistent lighting)

Note: Comfortable lighting will fluctuate based on time of day. Additionally, some elements will be better measured at night or seasonally. Use your best judgment to score the typical lighting.

COMPONENT 4.2: MENTAL HEALTH PROGRAMMING SCORE: ___/0-10 (x2)

Address at least two of the following topics in signage or in educational courses (offered at least 4 times a year). If unsure, contact the local program coordinator:

Definition of mindfulness, and/or develops mentally healthy habits and self-care practices, and fosters relationships and social connections.

Common mental health conditions or concerns such as depression, anxiety, substance use, stress, burnout, loneliness, and social isolation.

Signs and symptoms of mental health distress such as how to identify emotional distress and appropriately respond.

Mindfulness courses for formal (e.g., meditation, yoga) and informal practices (e.g., mindful eating, mindful listening).

COMPONENT 4.3: REGULATING SUBSTANCE ABUSE SCORE: ___/ 0-10 (x1)

Designate substance-free zones (0 points for no elements and 10 points for well integrated elements).

Smoking areas are clearly designated and adequate waste disposal is provided

Permanent signage indicating the policy is present

TOTAL THEME SCORE SCORE:___/30 (100)

OJB Landscape Architecture | Omaha, NE | ASLA Award 2023 ①

Hoerr Schaudt | Chicago, IL | ASLA Award 2023 ②

Standford Medicine | Children's Health | Palo Alto, CA ③

Offshoots Inc. | Hood Bike Park | Charleston, MA | ASLA Award 2023 ④

THEME 5: DESIGN ELEMENTS

Designers have developed an intuitive understanding of what makes good design. Good design creates spaces where people want to be, which are often restorative. Therefore, good design is indicative of a restorative environment. This theme highlights elements of design that are most important to restorative design.

COMPONENT 5.1: CULTURE + ART — SCORE: _____/0-10 (x3)

Integrate design elements that brand the location by addressing at least one of the following (0 points for no elements and 10 points for well integrated elements):

Celebration of culture (e.g., culture of occupants, surrounding community)

Celebration of place (e.g., local architecture, materials, flora, artists)

Celebration of history (e.g., preservation of historic buildings and landscapes)

Integration of Art (e.g., statues, memorials, sculptures, etc)

COMPONENT 5.2: SAFETY INFRASTRUCTURE — SCORE: ___/0-10 (x4)

Improve safety of site users by providing some of the following (0 points for no elements and 10 points for well integrated elements):

Clear, defined spaces and access control

Easy surveillance with adequate lighting levels

Easy surveillance at entrances and walkways

Clear visibility and good sight lines from access points and crucial junctions

A variety of options for access

Site design elements that improve the effectiveness of policing and security efforts

Safety strategies that support easy access to all spaces and amenities and minimize risk of injury, confusion, or discomfort (e.g., night lighting, emergency access)

**See CPTED Safety Guidelines for more information and implementation guidelines.*

COMPONENT 5.3: PERCEIVED SAFETY + COMFORT — SCORE: ___/ 0-10 (x3)

Maintain an environment in which vulnerable populations (e.g., elderly, single women, children) would feel safe and at-ease. Based on the observer's best judgment, assign points based on level of comfort would vulnerable populations experience in this space (0 points for feeling unsafe or threatened and 10 points for feeling safe and comfortable).

Note: Comfort is crucial for experiencing restorative benefits. While this component may vary individually and by situation (e.g., time of day), incorporating it is essential.

COMPONENT 5.4: ACCESSIBILITY — SCORE: ___/0-10 (x2)

Provide site access and usability as required by local and national accessibility standards (e.g., Americans with Disabilities Act)

Provide site access and usability for developmental and intellectual health, and include sensory requirements for people who are neurodiverse (having a brain that works differently from the average person; having atypical patterns of thought and behavior, usually associated with autistic or other diverse conditions): strategies that use color, texture, images, and other multi-sensory, visually perceptible information.

COMPONENT 5.5: PEDESTRIAN-FRIENDLY SURROUNDINGS..SCORE: ___/0-10 (x2)

Provide at least one functional entrance that opens to or connects with an existing pedestrian transportation network that meets at least two of the following requirements (0 points for no elements and 10 points for well integrated elements):

Streets connect to bike/walking trails that continue for at least 1 mile outside the site boundaries

Speed limits of 25 mph or less and street has buffer protections along sidewalks (e.g., curb extension, bioswales, bike lanes, parked cars, benches, trees, planters)

Within 1/4 mile of the site boundary, 90% of the total street length has continuous sidewalks on both sides

Mass Transit is located within a 1/4 mile walking distance of an existing bus network stop, light or heavy rail stations, or commuter rail stations that provide regular weekday and weekend service

COMPONENT 5.6: CLIMATIC RESPONSE SCORE: ___/ 0-10 (x2)

Integrate design features to respond to the climate by addressing the following (0 points for no elements and 10 points for well integrated elements):

Sun (e.g., tree canopy, awnings, pavilions, shade sails)

Wind (e.g., protective wind breaks)

Heat (e.g., increased vegetation, reflective surfacing, water features)

Traffic or Unsightly Features (e.g., green walls, barriers)

COMPONENT 5.7: SOUND SCORE: ___/0-10 (x2)

Provide spaces for various levels of sound with at least one space for each zone:

Loud Zone: includes areas intended for loud equipment or activities (e.g., social spaces, music performances, sports events, etc).

Quiet Zone: includes areas intended for concentration, wellness, rest, study and/or privacy (e.g., restorative spaces). Natural sounds (such as water) may also be used in the quiet zone to mask outside noise. The presence of outside noises (e.g., traffic) does not overwhelm the purpose of these zones.

Mixed one: includes areas intended for learning and collaboration (e.g., outdoor classrooms, small pavilions/ plazas). The presence of outside noises (e.g., traffic) does not overwhelm the purpose of these zones.

Reprogramming or mitigation of sound transmission between loud zones that border quiet zones (if no need for buffer, still apply the point).

Note: These zones may correlate with the spaces used for Degrees of Sociality (Component 3.1) and such spaces may meet both requirements.

COMPONENT 5.8: CLEANLINESS SCORE: ___/ 0-10 (x3)

Maintain cleanliness of all spaces. Cleanliness includes, but is not limited to, having no litter, graffiti, or broken amenities (0 points for very dirty and 10 points for a clean and well-maintained environment).

TOTAL THEME SCORE SCORE:___/80 (190)

APPLICATION

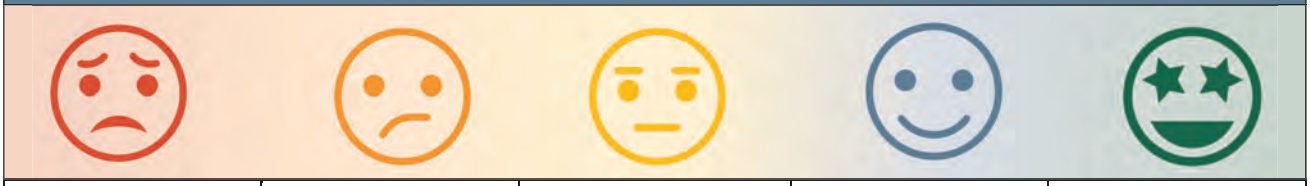
DESIGN AND PLANNING IMPLEMENTATION

Design is an iterative and expressive process. The synergistic application of creative and refining processes allows projects to be more than merely redesigned, but to be restoratively better. The RDS Assessment provides access to the knowledge that comes from significant research by creating **a shortcut to specializing** in restorative design. Regular use of the RDS Assessment helps **build the intuition** that designers and planners regularly rely on by creating an understanding of the principles it is based on. This same increased understanding of restorative design could **enable planners to update city standards or design goals and policies** to increase the application of these principles in restorative designs throughout the city.

There is remarkable potential **benefits** when using the RDS Assessment as a standard design tool and evaluative process in firms and planning teams. Marketing can be improved with an increasing awareness of restorative design and improved mental health. Visibility of projects that have incorporated restorative design can provide a unique draw for clients. **Together, the opportunity for design improvement, potential for clients, overall firm growth, and prioritizing the allocating of precious funding for essential elements of the designs is likely to increase prestige for firms and cities.**

RESTORATIVE SCALE INTERPRETED

While determining clear thresholds between what constitutes restorative and non-restorative remains elusive, the ultimate objective is to enhance the assessment such that higher points correlate with increased restorativeness.

RESTORATIVE SCALE				
				
Not Restorative	Somewhat Restorative	Moderately Restorative	Very Restorative	Extremely Restorative
The site is not restorative and needs major redesign or updates.	The site is somewhat restorative and would benefit from several updates in the areas that scored lowest.	The site is moderately restorative and could be considered good enough. Use minor updates to boost points.	Great job! The site is very restorative - be proud of your project!	Congratulations! You have created an exemplary restorative space and a model example of a restorative design!

QUICK POINTS: LOW HANGING FRUIT

Following the use of RDS Assessment, review of the themes and components can lead to the recognition of the simplest and/or most cost effective areas to improve to increase the restorativeness of each site or design. For lower scores, integrating water (1.1), engaging sensory fascination (1.2), increasing a diversity of plants (1.3), increasing tree canopy/shade options (2.1, 2.2, 2.3), and increasing enclosure diversity (2.2) could be easier and more cost-effective options to quickly and significantly improve restorativeness. Other efforts would be to create more variety of social spaces (3.1), available recreation (3.3), higher quality contemplative spaces (4.1), mental health education and programming (4.2), increase safety (5.2 and 5.3), and enhance cleanliness (5.8).

RESTORATIVENESS ON A BUDGET

Providing a restorative experience and improving mental health is still possible on a budget. Low maintenance native plants can provide species diversity and sensory fascination. Increasing benches, especially shady areas with a bench and view of the surrounding area can dramatically improve restorativeness. Pathways to access the benches can also improve restorativeness. An example of a simple improvement is the "yellow bench" project of South Salt Lake, Utah, where mental health respites that have small plaques next to them with tips for breathing, talking, meditation, meeting a new friend. Other ideas include more visually appealing power boxes, stamped concrete, recycled historic or old items to enhance identity and branding of the place. Improving cleanliness and ensuring safety are also simple but profound ways to improve restorativeness. All in all, simple cost effective changes can and will make a difference for site users, clients and communities.

STRENGTHS + VULNERABILITIES OF THE RDS	
Strengths	**Vulnerabilities**
▪ **Ease of Use**: The Restorative Design Scale Assessment improves professional knowledge and application supports the creation of a better mental health and quality of life for the people we serve. ▪ **Measuring Restorativeness:** Restorativeness is hard to measure due to individual variance based on the unique needs of users. However, the RDS uses qualitative and quantitative questions as a way to estimate green space restorativeness. ▪ **Potential Pre-Design Guide:** This assessment has been tailored to the assessment of existing public green spaces. However, with some minor adjustments, it could also be used as a guide for new design or redesign efforts, similar to LEED, SITES, and WELL. ▪ **Scientifically Backed:** The RDS combines existing theories (James', ART, SRT, PSD), assessments (WELL, SITES, CLM), and independent literature into one comprehensive tool. These established theories and assessments come together to provide a reliable foundation for the RDS. *A detailed report of the scientific backing for each component can be accessed in Utah State University's Digital Commons: https://digitalcommons.usu.edu/*	▪ **Limited by Size:** This assessment works best in public green spaces between 1/4 acre to ~50 acres. Modifications to the assessment could be tailored for various uses (athletic, natural, standard, etc) and sizes (mini, neighborhood, community, and regional). Any green space larger than 50 acres should be assessed in sections. ▪ **Variability by Time:** This assessment is likely to report different scores based on time of day, week, year (seasonal variation) and user familiarity with the site. Although no solution addresses this weakness, the assessment notes this weakness and includes a recommendation to *visit the site at least twice* and at different times (of day, week, and season, if possible). ▪ **Assessor Perception:** The RDS recognizes that each assessor will score differently, based on individual perception. The assessment includes a recommendation for having teams or partnerships assess together to minimize individual variability. ▪ **Audience + Climate:** This assessment was written and tested by landscape professionals in the Inter-mountain region of Utah, United States. It could be adapted for types of spaces (streetscapes, private gardens, campuses, hospitals, etc), specialized for different climates, and revised for laymen audiences.

CONCLUSION

This tool empowers designers and planners to work with clients to improve mental health aspects of design by guiding upgrades and new designs, communicating scientifically supported priorities, focusing funding, and providing a higher quality of life for green space users. Ultimately, providing restorative green spaces in communities will improve the mental health of the residents. Improving mental health through restorative green space design will decrease monetary medical burdens, increase productivity in employment, increase commercial revenue, increase social participation, increase community spirit, and improve the quality of life!

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A detailed report of the scientific support for the RDS can be located on Utah State University's Digital Commons.
https://digitalcommons.usu.edu/

PRINTABLE - SCORE SHEET SUMMARY

Scoring for each component may be awarded on a scale from 0-10 at the discretion of the scorer.

This sheet is for point calculations after completing the scoring described in the full document. Optional weights are provided in (#) to score for components that are more influential for mental restoration. Weights may be adjusted to meet the design goals of each site, although it's recommended to use them for more accurate restorativeness measurement..

THEME 1: NOVELTY + INTRIGUE

Component 1.1: Water Fascination*.....Score: _____/10 *(x5)*

Component 1.2: Sensory Fascination .....Score: _____/10 *(x5)*

Component 1.3: Natural Mimics.....Score: _____/10 *(x1)*

Component 1.4: Cohesiveness, Novelty, etc....Score: _____/10 *(x3)*

THEME TOTAL.....Theme: ____/40 *(140)*

THEME 2: ENVIRONMENTAL DIVERSITY

Component 2.1: Tree Canopy *.....Score: _____/10 *(x5)*

Component 2.2: Enclosure *.....Score: _____/10 *(x4)*

Component 2.3: Built vs Natural Environ.* ...Score: _____/10 *(x4)*

Component 2.4: Plant Diversity .....Score: _____/10 *(x4)*

Component 2.5: Animal Diversity.....Score: _____/10 *(x2)*

THEME TOTAL.....Theme: ____/50 *(190)*

THEME 3: SOCIALITY + MOVEMENT

Component 3.1: Degrees of Sociality ..... Score: _____/10 *(x4)*

Component 3.2: Seating Placement* ..... Score: _____/10 *(x3)*

Component 3.3: Recreation* ..... Score: _____/10 *(x3)*

Component 3.4: Pathways + Wayfinding* ..... Score: _____/10 *(x3)*

Component 3.5: Education..... Score: _____/10 *(x1)*

THEME TOTAL..... Theme: ____/50 *(140)*

THEME 4: MINDFULNESS

Component 4.1: Restorative Space..... Score: _____/10 *(x5)*

Component 4.2: Mental Health Edu.* ..... Score: _____/10 *(x2)*

Component 4.3: Regulating Substance Abuse*Score: _____/10 *(x1)*

THEME TOTAL..... Theme: ____/30 *(100)*

THEME 5: DESIGN PRINCIPLES

Component 5.1: Culture + Art ..... Score: _____ /10 *(x3)*

Component 5.2: Safety Infrastructure..... Score: _____/10 *(x4)*

Component 5.3: Perceived Safety + Comfort Score: ____/10 *(x3)*

Component 5.4: Accessibility..... Score: _____/10 *(x2)*

Component 5.5: Pedestrian Connection*..... Score: _____/10 *(x2)*

Component 5.6: Climatic Response..... Score: _____/10 *(x2)*

Component 5.7: Sound*..... Score: _____/10 *(x2)*

Component 5.8: Cleanliness* ..... Score: _____/10 *(x3)*

THEME TOTAL..... Theme: ____/80 *(190)*

TOTAL SCORE: SITE: ____/250 *(760)*

Overcoming Limitations:

- **Limited by Size:** This assessment works best in public green spaces between 1/4 acre to ~50 acres. Any green space larger than 50 acres should be assessed in sections.
- **Variability by Time:** This assessment is likely to report different scores based on time of day, week, year (seasonal variation). The assessment notes this weakness and includes a recommendation to *visit the site at least twice* and at different times (of day, week, season, and in high visitation vs low visitation, if possible).
- **Assessor Perception:** The RDS recognizes that each assessor will score differently, based on individual perception. The assessment includes a recommendation for having teams or partnerships assess together to minimize individual variability.
- **Audience + Climate:** This assessment was written and tested by landscape professionals in the Inter-mountain region of Utah, United States. It could be adapted for types of spaces (streetscapes, private gardens, campuses,/ hospitals, etc), and specialized for different climates.

RESTORATIVE SCALE				
Not Restorative	Somewhat Restorative	Moderately Restorative	Very Restorative	Extremely Restorative

Chapter Eight: Discussion

Significance

The integration of various restorative frameworks into a cohesive language accessible to those designing urban green spaces represents a new approach in the realm of landscape architecture and city planning. Traditionally, research in this field has been fragmented with different frameworks focusing on specific aspects of restorativeness. However, this effort has aimed to bridge these gaps by synthesizing diverse theories and findings into a unified framework that practitioners can easily comprehend and apply. This holistic perspective not only enhances the understanding of how different elements contribute to restorative experiences but also provides practical guidance for creating environments that promote mental well-being. By translating complex research into actionable insights, this new approach empowers designers to make informed decisions that optimize the restorative potential of urban green spaces and ultimately benefits communities' health and well-being.

The extensive literature review involved in this project reveals patterns for identifying the mediators of mental health challenges. The diversity in approaches, perspectives, needs, preferences, and benefits reinforces the intricacy of this challenge, driven by unique needs of individuals and even variations throughout the lifespan influenced by experience, time, and life stages. Despite these challenges, recognizing patterns and trends has become essential in identifying the necessity, realism, and worthiness of attempting to find characteristics applicable to improving mental health within planned green spaces. The challenges posed by diversity in needs, preferences, and experiences underscored the societal importance of addressing mental health needs through green spaces. The RDS represents the beginning of a continual process of refinement and learning to better support mental health through green spaces and to evolve with new findings and research.

Recognizing the RDS as more than a mere assessment tool with a restorativeness ranking, but also a tool for evaluating areas of potential change and preparing for future improvements, is crucial. The tool's design streamlines the identification of weaknesses and enables planners, designers, and funders to prioritize improvements that can significantly enhance restorative potential in green spaces.

The RDS, a product of cutting-edge research, not only addresses conflicting and diverse research challenges but also navigates the complexity of terminology in collaboration with planners and landscape designers. The tool's potential, not only as an evaluative and design tool but also as an educational resource, presents exciting prospects. The insight into the value of paired or team evaluations echoes the studio culture in landscape architecture by offering a holistic approach to assessments.

The RDS is positioned as a new tool to address the ongoing challenges related to mental health, helping professionals prioritize respite and mental restoration. Intentional design guided by RDS principles has the potential to significantly improve designers' ability to recognize and create spaces that enhance citizens' mental health. This can lead to various benefits such as reduced medical burdens, increased productivity, commercial revenue, social participation, community spirit, and enhanced overall quality of life. This study contributes to the body of knowledge on restorative design by providing a simple and accessible application tool. The RDS empowers landscape designers and city planners to design and prioritize funding for public green spaces aligned with scientifically backed principles that improve users' mental health. As municipalities embrace mental health awareness, the transformation of green spaces guided by the RDS is poised to benefit communities and societies at large. The RDS, with its foundation in research-based restorative design and usability by professionals, stands as an assessment that holds promise for shaping the future of public green spaces.

Strengths

The RDS combines existing theories, literature, and assessments into an easy to use option for professionals. The RDS was created by analyzing existing theories (ART, SRT, PSD), wellness measures already existing in other assessments (WELL, SITES, CLM), and other independent research, and then condensing commonalities into themes. Bringing these established theories and assessments together provides a reliable foundation for the RDS.

Measuring Restorativeness: One of the greatest challenges in this process was accurately measuring restorativeness. Restorativeness is hard to measure because, while there are well documented scientific elements that affect it, there is also some subjectivity which varies based on the unique needs and perceptions of individuals. However, both qualitative and quantitative components exist (e.g., Component 5.2 measures the design technicalities that create safe environments and Component 5.3 accounts for how safe vulnerable populations would feel in the space), therefore mixing assessment methods as a way to reduce potential for cognitive dissonance and triangulate the actual value of restorativeness that is exhibited in the existing public green space. The resulting assessment creates a comprehensive, cohesive method for current research to be uniformly and easily applied to professional practice. The Restorative Design Scale Assessment gives way to better professional accessibility and applicability of knowledge and thus allows for the creation of a better mental health and quality of life for the people we serve.

Ease of Use: Repeated rounds of professional testing followed by careful editing molded the RDS until it became intuitive for professional users. Verbiage and phrasing, order of components and theme, examples, and document layout were adjusted during the testing phase to meet the criteria and recommendations of professionals within the framework of established research.

Certification: The RDS does not require fees or certification. This is both a strength and a weakness because professionals do not have to pay for the assessment and therefore more professionals and clients could be inclined to use the assessment sooner and more frequently. However, it can also be a weakness because, without a certification, recognition of and prestige of pursuing certification will not be as highly sought after, potentially limiting its use.

Limitations + Potential for Future Research

Size: As discovered in the testing rounds, this assessment works best with public green spaces smaller than 80 acres. Modifications to the assessment could be tailored for various uses (athletic, natural, standard, etc.), types (mini, neighborhood, community, and regional), and sizes of parks. Potential options for addressing size limitations could include assessing portions of large parks or combining the strengths of the RDS and CLM (Olszewska-Guizzo et al., 2022) into a new measuring tool.

Time: Also discussed in the testing rounds, this assessment is likely to report different scores based on time of day, week, year (seasonal variation) and user familiarity with the site. Although no answer has been found to address this weakness, a note is included in the assessment that states this weakness and includes a recommendation to visit the site at least twice at different times.

Audience & Climate: This assessment was written and tested by professionals in the Intermountain region of Utah, United States. While not only useful in the Intermountain Region, future iterations of this assessment could include adaptations for other areas, larger park sizes, and specialized for different climates.

Complexity of Compounding Effects: Another challenge lies in the intricate interplay between the themes and components of the RDS assessment and the potential for their compounding effects. Although numerous studies have measured individual elements of restorative environments, there is limited understanding of how these elements interact within the context of whole, complex landscapes. The human experience is multidimensional and multisensory across time and space, making it exceedingly difficult, if not impossible, to assess the impacts comprehensively. As a result, the RDS tool only scratches the surface of this complex issue and highlights the need for further research and refinement to capture the full spectrum of restorative experiences in urban green spaces.

Validation: Critical to the RDS's evolution is empirical validation. Research should explore validating the assessment by comparing scores with survey reports on restorativeness or neurologic responses within the evaluated locations. Comparative studies with existing models

like the Contemplative Landscape Model (CLM) (Olszewska-Guizzo et al., 2022) and Perceived Restorativeness Scale (PRS) (Hartig et al., 1997) could offer insights into consistency and divergence and ultimately contribute to refining restorative design assessments. It is important to note that the RDS is a pioneering assessment tool constructed using sites from a single city and evaluated by a limited pool of assessors. Despite validation of the tool being beyond the scope of this project, it is a crucial next step for the improvement of the RDS.

Future Evolution of the Assessment: Future research on the RDS presents diverse opportunities. Customized versions could be developed for pre-design guides, private gardens, streetscapes, and tailored for specific mental disorders. Tailoring versions for different audiences, including laymen, biomes, sizes, and park uses could enhance accessibility and understanding, which would expand the applicability of the RDS. However, a universal version, integrated to an existing certification such as SITES (2015), could also promote accessibility and understanding of green space restorativeness.

Conclusion

This project has been a fulfilling and enriching journey, synthesizing existing theories, assessments, and literature into the Restorative Design Scale (RDS) for objectively measuring the restorativeness of public urban green spaces. The personal connection to the project, rooted in firsthand experiences of the benefits of green spaces for mental health, has added a profound layer of significance. Witnessing the growing enthusiasm and support within the professional community as they engage with, critique, and implement the assessment has been one of the most rewarding aspects and underscores its potential impact on the well-being of urban residents.

The RDS assessment is emerging as a pivotal tool in advancing the science and application of restorative design principles within urban green spaces. By providing a comprehensive evaluation framework, the RDS bridges the gap between theoretical concepts and practical implementation and offers a nuanced understanding of the restorative potential of diverse environments.

The RDS not only fills a critical void in current evaluation methodologies but also sets a benchmark for future research and development in the field. As urban green spaces play an increasingly vital role in promoting mental well-being, the RDS stands as a key element in the progression of designing, implementing, and assessing restorative landscapes. Its holistic approach, informed by iterative testing and refinement, positions the RDS as an invaluable asset for researchers, designers, and urban planners committed to enhancing the mental health benefits of urban green spaces.

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Appendix

Glossary

- **Urban Green Space (UGS):** open areas reserved for parks and other green spaces (e.g., cemeteries, plazas, schoolyards, some streetscapes, etc.), that include plants, water (also known as blue space) and other kinds of natural environment.
- **Restorativeness:** the ability of a place or space to empower mental restoration.
- **Mental Restoration:** a state of mind where relaxation and rejuvenation can increase the ability to focus and problem-solve through the details and struggles of day-to-day life.
- **"Soft" Fascination:** a form of passive attention in which elements of our surroundings are intriguing enough to be processed in our subconscious but do not demand directed attention.
- **Directed Attention:** also known as voluntary attention, is the state when we give our attention to something. Active attention can only be maintained for a few seconds at a time and is usually sustained by continuous efforts to bring back the topic to the mind.
- **Passive Attention:** or non-voluntary attention, is engaged by interesting topics that do not make excessive demands of the mind. Passive attention is restorative attention.
- **Directed Attentional Fatigue (DAF):** when directed attention is used repetitively over extended periods of time and may damage the prefrontal cortex of the brain if not given time to recover.
- **Biophilia:** the idea that humans possess an innate tendency to seek connections with nature and other forms of life, most commonly believed to originate through evolution.
- **Prospect-Refuge Theory:** the theory that feelings of safety and peace come from being in environments that offer both views and a sense of enclosure, developed by Jay Appleton in 1975.

FIGURES OF OTHER THEORIES

PRS SURVEY QUESTIONS (HARTIG ET AL., 1997)

Please indicate on the 7-point scale the extent to which the given statement describes your experience in the setting (0 = Not at all; 6 = Completely).

0. 1. 2. 3. 4. 5. 6.	
☐☐☐☐☐☐☐	Being here is an escape experience.
☐☐☐☐☐☐☐	Spending time here gives me a break from my day-to-day routine.
☐☐☐☐☐☐☐	It is a place to get away from it all.
☐☐☐☐☐☐☐	Being here helps me to relax my focus on getting things done.
☐☐☐☐☐☐☐	Coming here helps me to get relief from unwanted demands on my attention.
☐☐☐☐☐☐☐	This place has fascinating qualities.
☐☐☐☐☐☐☐	My attention is drawn to many interesting things.
☐☐☐☐☐☐☐	I want to get to know this place better.
☐☐☐☐☐☐☐	There is much to explore and discover here.
☐☐☐☐☐☐☐	I want to spend more time looking at the surroundings.
☐☐☐☐☐☐☐	This place is boring.
☐☐☐☐☐☐☐	The setting is fascinating.
☐☐☐☐☐☐☐	There is nothing worth looking at here.
☐☐☐☐☐☐☐	There is too much going on.
☐☐☐☐☐☐☐	It is a confusing place.
☐☐☐☐☐☐☐	There is a great deal of distraction.
☐☐☐☐☐☐☐	It is chaotic here.
☐☐☐☐☐☐☐	Being here suits my personality.
☐☐☐☐☐☐☐	I can do things I like here.
☐☐☐☐☐☐☐	I have a sense that I belong here.
☐☐☐☐☐☐☐	I can find ways to enjoy myself here.
☐☐☐☐☐☐☐	I have a sense of oneness with this setting.
☐☐☐☐☐☐☐	There are landmarks to help me get around.
☐☐☐☐☐☐☐	I could easily form a mental map of this place.
☐☐☐☐☐☐☐	It is easy to find my way around here.
☐☐☐☐☐☐☐	It is easy to see how things are organized.

The current version of the Perceived Restorativeness Scale (PRS) is comprised of the 26 items below. Participants make their responses using a 7-point scale to indicate the extent to which the given statement describes their experience in the given setting (0 = Not at all; 6 = Completely).

The items are grouped by subscale membership (Being Away, Fascination, Coherence, and Compatibility, respectively):

1. Being here is an escape experience. *
2. Spending time here gives me a break from my day-to-day routine. †
3. It is a place to get away from it all.
4. Being here helps me to relax my focus on getting things done.
5. Coming here helps me to get relief from unwanted demands on my attention.

6. This place has fascinating qualities. *
7. My attention is drawn to many interesting things. *
8. I want to get to know this place better. †
9. There is much to explore and discover here. *
10. I want to spend more time looking at the surroundings. †
11. This place is boring. (-)
12. The setting is fascinating.
13. There is nothing worth looking at here. (-)

14. There is too much going on. (-) *
15. It is a confusing place. (-) *
16. There is a great deal of distraction. (-) *
17. It is chaotic here. (-) *

18. Being here suits my personality. *
19. I can do things I like here. *
20. I have a sense that I belong here. *
21. I can find ways to enjoy myself here. †
22. I have a sense of oneness with this setting. *
23. There are landmarks to help me get around. ‡
24. I could easily form a mental map of this place. ‡
25. It is easy to find my way around here. ‡
26. It is easy to see how things are organized. ‡

Notes: (-) - an item for which the value must be reversed in coding; * - the item is from the earlier PRS and is in its original form; † - the item is from the earlier PRS but is in a revised form; ‡ - the item was designed to represent legibility.

PSD - THE VARIABLES AND FACTOR LOADINGS FOR EACH FACTOR (STIGSDOTTER ET AL., 2020)

Table 1: The variables and factor loadings for each factor/Perceived Sensory Dimension. The term 'green space' is used here (Source: Grahn & Stigsdotter, 2010)

Factor 1 – Nature	
Variables	**Factor loading**
The green space has a nature quality.	0.71
The green space has a wild and untouched quality.	0.63
There are free growing lawns.	0.54
It is possible to light a fire in the green space.	0.50
It feels safe spending time in the green space.	0.49
One is able to spend time in the green space without coming into contact with too many people.	0.47
The green space contains hilly areas.	0.44
Factor 2 – Culture	
Variables	**Factor loading**
The green space is decorated with fountains.	0.73
The green space is decorated with statues.	0.65
The green space contains a wide range of foreign plants, ornamental plants, and kitchen plants.	0.65
The green space has the characteristic of a city park.	0.57
The green space has different water features, such as ponds, canals.	0.52
The green space is ornamented with flowers.	0.50
The green space has a wooded pasture quality.	0.46
Factor 3 – Prospect	
Variables	**Factor loading**
The green space contains lawns and well-cut grass surfaces.	0.87
It is possible to gain an overview, with vistas over the surroundings.	0.78
The lawns are cut.	0.76
The green space has grass football pitches.	0.68
The green space has gravel football pitches.	0.50
The football pitches are lit up.	0.48
That green space has small ball grounds on asphalt.	0.47
Showers and changing rooms are available.	0.43
Factor 4 – Social	
Variables	**Factor loading**
It is possible to observe entertainment, like a park concert.	0.94
It is possible to observe exhibitions.	0.92
It is possible to visit a restaurant or a simple open-air restaurant in the green space.	0.89
It is possible to shop at market stalls, kiosks, etc.	0.78
There are plenty of people and movement in the green space.	0.74
The green space contains roads and gravel paths.	0.72
The green space holds special park animals, like swans, ducks and deer.	0.66
The green space has generally good lighting.	0.64
The roads are well lit.	0.63
There is access to washrooms.	0.60
There are places in the green space sheltered from the wind.	0.59

There are sunny places.	0.54
There are shady places.	0.52
The green space contains several seats and benches.	0.50
It feels safe spending time in the green space.	0.44
There are tables and benches.	0.38
The green space contains roads and paths with hard surfaces, such as asphalt, and concrete bricks.	0.33
Factor 5 – Space	
Variables	**Factor loading**
The green space is experienced as spacious and free.	0.89
It is possible to find areas not crossed by roads and paths.	0.87
The green space has numerous trees.	0.58
It is possible to find places where a group of several people can gather.	0.52
There are places in the green space sheltered from the wind.	0.49
There are sunny places.	0.44
There are shady places.	0.42
Factor 6 – Rich in species	
Variables	**Factor loading**
One can detect several animals, such as birds and insects.	0.97
The green space consists of natural plant and animal populations.	0.96
There are many native plants to study.	0.87
Factor 7 – Refuge	
Variables	**Factor loading**
The green space contains many bushes.	0.93
The green space holds animals that children and adults may feed and pet.	0.87
There are sand boxes.	0.77
There is play equipment, such as swings, slides, etc.	0.73
It is possible to watch other people being active, playing, engaging in sports, etc.	0.58
It feels safe spending time in the green space.	0.57
There are tables and benches.	0.36
Factor 8 – Serene	
Variables	**Factor loading**
The green space is silent and calm.	0.94
There are no bikes in the green space.	0.89
One is able to spend time in the green space without coming into contact with too many people.	0.84
There are plenty of people and movements in the green space.	−0.78
There are no mopeds.	0.74
It is possible to watch other people being active, playing, practicing sports, etc.	−0.69
The area is clean and well maintained.	0.60
There is no traffic noise from the surroundings.	0.57
It feels safe spending time in the green space.	0.50

IRB Documents

Recruitment Email

Hello _____,

My name is Corinne Bahr, and I am a graduate student at Utah State University studying Landscape Architecture. I am emailing to request your help for a part of my thesis and have reached out to you as someone I have interacted with in the past, someone who has shown interest in my research in previous discussions, or as someone who has been recommended by my professors. Thank you for having created these connections throughout our profession!

PROJECT ABSTRACT

The purpose of my project is to unify existing research on greenspace characteristics with beneficial mental health attributes and bridge the gap from research to professional application regarding green space design and mental health benefits. I proposed to evaluate existing research and establish a research-based design guidebook for landscape designers regarding best practices for mentally restorative public spaces. This guidebook and the accompanying assessment guide aggregates and translates restorative environmental psychology principles into design best practices.

In this phase of my project, I am developing a scoring system, similar to LEED or SITES. However, unlike these systems that assess sustainability, my project focuses on quantifying and guiding the design of mentally restorative green spaces. This assessment guide is called the Restorative Design Scale (RDS). A working draft of the RDS Assessment is now complete and needs to be tested, reviewed, and improved.

INCLUSION CRITERIA

I am reaching out to Landscape Designers and Landscape Architects who have practiced in Utah and would be willing to test, review, and offer suggestions on how to improve the applicability of the RDS Assessment to professional practice.

TIME AND TASK COMMITMENTS

Should you be willing to help, I would email you a PDF document that contained a brief background of environmental psychology relative to the project and the current draft of the Restorative Design Scale (RDS) Assessment Guide.

Your task would be to:

1) visit the assigned site that will be stated in the document (all sites will be in the Salt Lake area),

2) use the assessment guide to score the site (anticipated time on site is less than an hour), and

3) meet with me for a 30-minute virtual discussion of possible improvements to the

assessment's usability and applicability (ex., Would you use this in your office, are the questions and scoring methods easy to understand, do you find the topics relevant, what changes would you suggest, etc.)

The total time demand is approximately 2 hours, at your convenience, over the course of 2 weeks, from when I send you the document (anticipated _____) and when we meet to discuss its strengths and weaknesses (anticipated to be before _____). You will receive emails from me at the beginning of the process, when scheduling our meeting time, following up with any questions you may have, and as a thank you at the end of the process. I may follow up twice by email and once by phone if communication lapses, however, as a respect to your privacy and work, I would like to inform you that you are not signing up for any communication beyond these boundaries. You may also withdraw from participation at any time by contacting me with this information.

Thank you for taking the time to review this information. If you are willing to help, please read the Letter of Information that has been attached in this email and return a signed, digital copy via email. If you have any questions, please feel free to reach out to me or Jake Powell.

Best,

Corinne Bahr

Principal Investigator: Jake Powell (jake.powell@usu.edu)

Student Researcher: Corinne Bahr (corinne.bahr@usu.edu)

IRB Protocol number: #13741

Follow-Up Email

Hello,

Thank you for being willing to participate!

Just as a reminder, the purpose of my project is to unify existing research on greenspace characteristics with beneficial mental health attributes and bridge the gap from research to professional application regarding green space design and mental health benefits. Thank you for being willing to review the current draft and help me to bridge this gap!

Attached is the working draft of the Restorative Design Scale (RDS) Assessment that is now complete and needs to be tested, reviewed, and improved! This assessment focuses on quantifying and guiding the design of mentally restorative green spaces. The included document contains the assessment and a basic introduction to restorative design and the previous theories

that contributed to the construction of the RDS Assessment.

TIME AND TASKS

The total time demand is approximately 2 hours, at your convenience, over the course of 2 weeks, from when I send you the document (Monday August 14th) and when we meet to discuss its strengths and weaknesses (before Saturday August 26th).

1) At your convenience, visit City Creek Park at 350 State St, Salt Lake City, UT 84103,

2) use the attached assessment guide to score the site (anticipated time on site is less than an hour), and

3) meet with me for a 30-minute virtual discussion of possible improvements to the assessment's usability and applicability.

INTERVIEW TIMES

Please respond to this email ASAP with the time that you would like to schedule our follow-up discussion. I am available any time between 8am-7pm on Friday August 25th and Saturday August 26th. Once you have told me what time works best for you, I will send you an email with the link for the 30-minute virtual meeting. The questions I will ask in that interview are strictly for the improvement of the Restorative Design Scale Assessment and can be reviewed prior to our meeting in the document attached to this email.

Thank you again for being willing to help! I look forward to hearing about your experience with the RDS Assessment at our follow-up meeting!

Best,

Corinne Bahr

Protocol #13741
IRB Exemption Date: August 6, 2023
Consent Document Expires: March 7, 2024

Research
UtahStateUniversity

Letter of Information

Prioritizing Mental Health in Urban Green Spaces:

An Assessment for Measuring the Mental Restorativeness of Urban Green Spaces

You are invited to participate in a research study by Corinne Bahr, a graduate student in the Landscape Architecture and Environmental Planning Department at Utah State University.

The purpose of this research is to create an assessment guide, like LEED or SITES, that evaluates the mental restorativeness of a site. Specifically, we are interested in learning how we can make the assessment more professionally friendly and feasible for your in-office use. You are being asked to participate in this research because of your experience in planning and design in the state of Utah.

Your participation in this study is voluntary and you may withdraw your participation at any time, for any reason by telling me via email or phone. If you take part in this study, you will be asked to **1) visit an assigned site with your partner** (site and partner assignments will be made by Tom Millar), **2) use the assessment guide to score the site** (anticipated time on site is less than one hour), and **3) meet with the planning team and research team for a 90-minute discussion** of what you learned, how it applies to your projects, and possible improvements to the assessment's usability and applicability (ex., would you use this in your office, are the questions and scoring methods easy to understand, do you find the topics relevant, what changes would you suggest, etc.) The overall time asked of you will be approximately two hours, at your convenience, over the course of two weeks, from when I email you the assessment to when we meet to discuss the assessment's strengths and weaknesses.

The possible risks of participating in this study include sharing your opinions about the assessment that may be shared in the editing process. While we cannot guarantee that you will directly benefit from this study, we hope that the assessment and affiliated guidebook for restorative design for mental health will be useful to landscape architects and city planners in improving mental health throughout Utah.

We will make every effort to ensure that the information you provide remains confidential. We will not reveal your identity in any publications, presentations, or reports resulting from this research study. However, it may be possible for someone to recognize the specifics you share with us. You may choose to withdraw at any time by informing a member of the research team.

We will collect your information through email, interview (no audio or visual recordings will be made, notes will be taken by the research team), and any electronic documents with your detailed feedback. Since this is a city team, your email will be accessible to the members of your team. Online activities always carry a risk of a data breach, but we will use systems and processes that minimize breach opportunities. This feedback will be securely stored only on the main computer used for this project and will be coded, removing any identifiers, at the end of the project in March of 2024.

You can decline to participate in any part of this study for any reason and can end your participation at any time. If you have any questions about this study, you can contact Corinne Bahr at corinne.bahr@usu.edu or Jake Powell at jake.powell@usu.edu. Thank you again for your time and consideration. If you have any concerns about this study, please contact Utah State University's Human Research Protection Office at (435) 797-0567 or irb@usu.edu.

By signing below, you agree to participate in this study. You indicate that you understand the risks and benefits of participation, and that you know what you will be asked to do. You also agree that you have asked any questions you might have, and are clear on how to stop your participation in the study if you choose to do so. Please be sure to retain a copy of this form for your records.

_____	_____	_____
Participant's Signature	Participant's Name, Printed	Date

INTERVIEW QUESTIONS – IMPROVING THE ASSESSMENT GUIDE

1) What worked well in the assessment? Why?

2) What did not work well in the assessment? Why?

3) Do you find the themes, components, and elements relevant? If not, what suggestions would you make?

4) Did the themes, components, and elements fit together comprehensively? If not, what suggestions would you make?

5) Were you able to understand the scoring system and point distribution? If not, what suggestions would you make?

6) Is this assessment intuitive? If not, what suggestions would you make?

7) What changes would you suggest to make it more intuitive?

8) What changes would you suggest to make it more accurate?

9) Does the scoring provide an accurate representation of your observations of the park's restorativeness?

10) Do you have any other suggested changes?

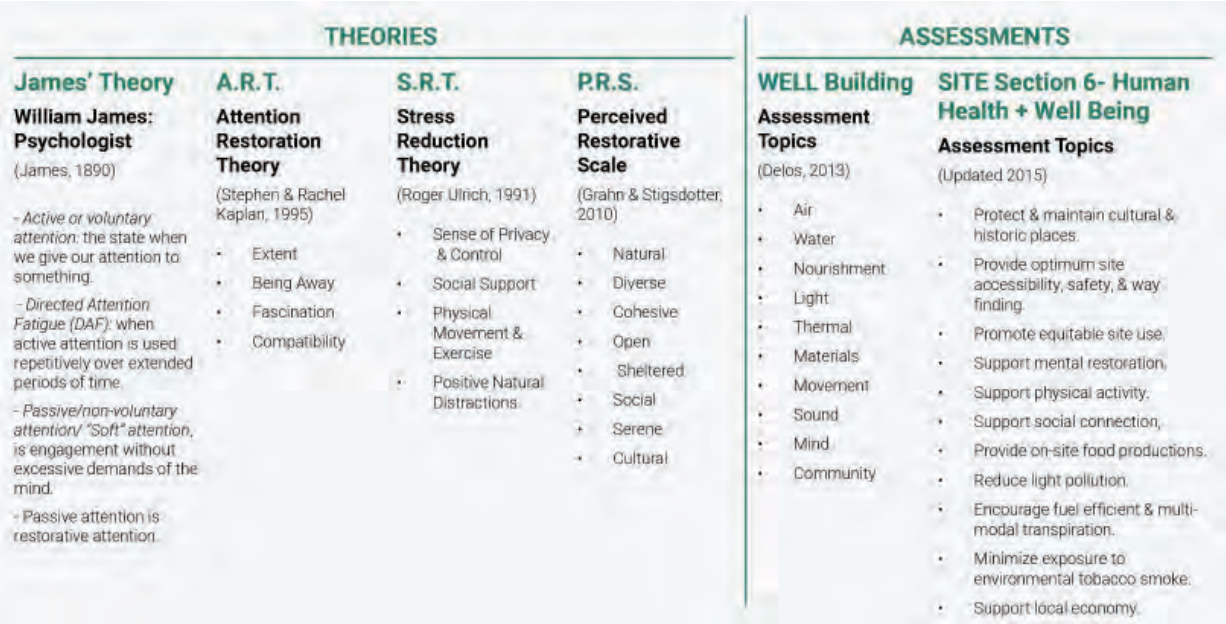
11) Would you use this in your office? Why or why not? If so, how frequently would it be used?

12) Any final thoughts you would like to add?

QUICK FACTS SHEET

Background

The Restorative Design Scale combines the common themes of four previously developed theories and two previously defined assessments to identify what creates a mentally restorative green space. The image below depicts the elements from each previously created theory and assessment.



**Design Intent: please note that almost any park will inherently be restorative to some degree because greenspace is inherently restorative. People tend to find special spaces that are individually restorative, but if the space prioritizes restorability, then it will be more restorative.

Glossary:

- ***Mental Restoration****:* a state of mind where relaxation and rejuvenation can increase the ability to focus and problem-solve through the details and struggles of day-to-day life.
- ***Restorativeness:*** the ability of a place or space to empower mental restoration.
- ***"Soft" Fascination:*** a form of passive attention in which elements of our surroundings are intriguing enough to be processed in our subconscious but do not demand directed attention.
- ***Directed Attention:*** also known as voluntary attention, is the state when we give our attention to something. Active attention can only be maintained for a few seconds at a time and is usually sustained by continuous efforts to bring back the topic to the mind.
- ***Passive Attention:*** or non-voluntary attention, is engaged by interesting topics that do not make excessive demands of the mind. Passive attention is restorative attention.
- ***Directed Attentional Fatigue (DAF):*** when directed attention is used repetitively over extended periods of time and may damage the prefrontal cortex of the brain if not given time to recover.

RDS Point Evolution

RDS POINT EVOLUTION	ROUND 1	ROUND 2	ROUND 3	ROUND 4	FINAL REVIEW	NORMALIZE + WEIGHT (10 X __)
Theme 1: Novelty & Intrigue (Soft Fascination)						**40 Points**
Component 1.1: Water Fascination	15 points	15 points	16 points	16 points	16 points	x5
Component 1.2: Sensory Fascination	18 points	18 points	18 points	18 points	15 points	x5
Component 1.3: Natural Mimics	6 points	6 points	6 points	6 points	3 points	x1
Component 1.4: Cohesiveness, Novelty, & Mystery	6 points	6 points	6 points	6 points	9 points	x3
	45 Points	**45 Points**	**46 Points**	**46 Points**	**43 Points**	**140 Points**
Theme 2: Environmental Diversity						**50 Points**
Component 2.1: Tree Canopy	12 points	12 points	12 points	12 points	12 points	x5
Component 2.2: Enclosure	12 points	12 points	12 points	12 points	10 points	x4
Component 2.3: Built vs Natural Space	19 points	19 points	18 points	18 points	10 point	x4
Component 2.4: Plant Diversity	6 points	6 points	6 points	6 points	10 points	x4
Component 2.5: Animal Diversity	4 points	4 points	4 points	5 points	6 points	x2
	53 Points	**53 Points**	**52 Points**	**53 Points**	**48 Points**	**190 Points**
Theme 3: Sociality & Movement						**50 Points**
Component 3.1: Degrees for Sociality	9 points	9 points	9 points	6 points	10 points	x4
Component 3.2: Seating Placement	3 points	3 points	3 points	3 points	8 points	x3
Component 3.3: Recreation	18 points	18 points	20 points	20 points	8 points	x3
Component 3.4: Pathways & Wayfinding	5 points	5 points	5 points	7 points	8 points	x3
Component 3.5: Education	3 points	3 points	3 points	3 points	3 points	x1
	38 Points	**38 Points**	**40 Points**	**39 Points**	**37 Points**	**140 Points**
Theme 4: Mindfulness						**30 points**
Component 4.1: Restorative Space	12 points	12 points	11 points	11 points	16 points	x5
Component 4.2: Mental Health Programming	8 points	10 points	10 points	10 points	4 points	x2
Component 4.3: Regulating Substance Use	6 points	4 points	4 points	4 points	4 points	x1
	26 Points	**26 Points**	**25 Points**	**25 Points**	**24 Points**	**100 Points**
Theme 5: Design Principles						**80 Points**
Component 5.1: Culture & Art	3 points	3 points	3 points	3 points	8 points	x3
Component 5.2: Safety Infrastructure	6 points	6 points	12 points	6 points	8 points	x4
Component 5.3: Perceived Safety + Comfort	--	--	--	6 points	6 points	x3
Component 5.4: Accessibility	3 points	3 points	3 points	3 points	4 points	x2
Component 5.5: Pedestrian Connection	4 points	4 points	4 points	4 points	4 points	x2
Component 5.6: Climatic Response	3 points	3 points	4 points	4 points	4 points	x2
Component 5.7: Sound	4 points	4 points	6 points	6 points	6 points	x2
Component 5.8: Cleanliness	--	3 points	5 points	5 points	8 points	x3
		26 Points	**37 Points**	**37 Points**	**48 Points**	**190 Points**
TOTAL SCORE		**188 Points**	**200 Points**		**200 Points**	**760 Points**