ABSTRACT

Title of Thesis:	CONFLUENCE COMMUNITY PARK: A FRAMEWORK FOR SENSORY LANDSCAPE DESIGN
	Alison Kimber Jones Master of Landscape Architecture, 2021
Thesis Directed By:	Assistant Professor Naomi A. Sachs, PhD Plant Science and Landscape Architecture

The human mind and body evolved in a sensory world steeped in light, sound, odor, wind, weather, water, vegetation, animals, and landscapes. In an increasingly urbanized and digitized world, it is critical that human beings sustain this close association with nature. Developments in the biological sciences over the past-half century have demonstrated our interdependence with the environment. Landscape architects can apply research in sensory perception to create an immersive experience of environmental attributes that fosters well-being, community, and stewardship.

This thesis was developed in three phases: first, to understand what research in environmental psychology and cognitive neuroscience reveals about how we perceive the environment through our senses; second, to derive from this research a framework for sensory landscape design; and third, to apply this framework to the design of a community park that connects the Green Meadows and Chillum neighborhoods at the confluence of Sligo Creek and the Northwest Branch of the Anacostia River in Chillum, Maryland.

CONFLUENCE COMMUNITY PARK:
A FRAMEWORK FOR SENSORY LANDSCAPE DESIGN

by

Alison Kimber Jones

Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
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Advisory Committee:
Assistant Professor Naomi A. Sachs, PhD, Chair
Professor Byoung-Suk Kweon, PhD
Professor Jack Sullivan

Preface

The circumstances brought on by the COVID-19 pandemic had a profound impact on the direction of my research. Instead of touring the country to study the health benefits of urban parks as I had planned, I began walking every evening from my home in Takoma Park, Maryland, to clear my head after a day of dire news and Zoom (Figure 1). Living in the Atlantic Seaboard fall zone, I could follow Sligo Creek or Long Branch trails north toward the hilly terrain of the Piedmont or south toward the flatter expanse of the Coastal Plain (Figure 2). The walking, combined with reading in environmental psychology, cognitive neuroscience, and biophilia, became a moving laboratory where I could test abstract theories against my own experiences, which I recorded in voice memos, written narrative, sketches, and paintings. This process of walking, reading, and observing led me to focus on sensory perception as a research topic, and on a site within two miles of my house as a place to apply that research.

Figure 1: Sligo Creek trail, New Hampshire Ave.

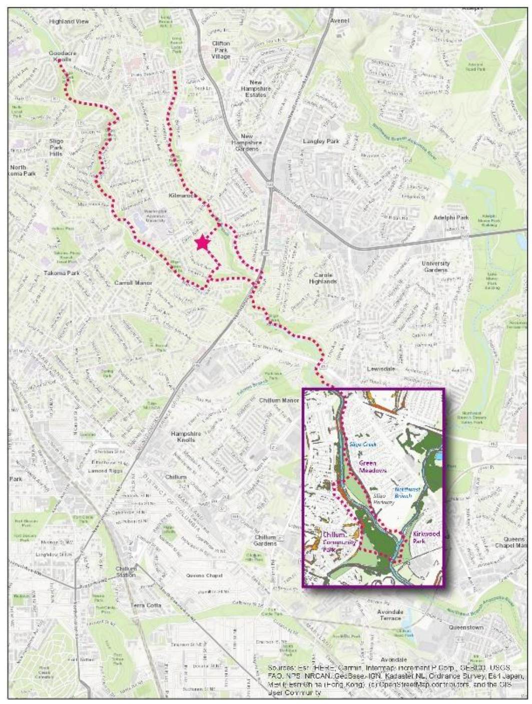

Figure 2: Walking routes

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Chapter 1: Introduction

The human mind and body evolved in a sensory world steeped in light, sound, odor, wind, weather, water, vegetation, animals, and landscapes (Kellert, 2008). The industrial production and modern technology that has emerged over the past 5,000 years represents only a small fraction of human history and has not replaced the benefits of adaptively responding to a largely natural environment. According to professor of social ecology Stephen Kellert, most of our emotional, cognitive, and physical abilities reflect “skills and aptitudes learned in close association with natural systems and processes that remain critical in human health, maturation, and productivity” (2008, p. 4).

Developments in the biological sciences over the past-half century have demonstrated our interdependence with our environment. The discovery that two neurons that fire together strengthen the synaptic bond between them has led to our present understanding of learning and the neuroplasticity of the brain (Hebb, 1949). Neuroimaging technologies such as positron emission tomography (PET scans) and function magnetic resonance imaging (fMRI) have allowed us to scan regions of the human brain as it responds to environmental cues, refining our understanding of how we perceive buildings and landscapes, and their spatial properties (Mallgrave, 2017). As professor of architecture Henry Francis Mallgrave notes, “We are developmental organisms raised within environmental fields, and the quality of these environmental fields has a powerful impact on our cognitive and organic development over a relatively short time” (2017, p. 18).

In an increasingly urbanized and digitized world, where once biodiverse ecosystems have been paved over with asphalt and turf, and we experience (or at least visualize) much of the world second-hand through images, it is critical that we sustain our close association with nature. Landscape architects can foster this essential relationship by designing landscapes that restore natural systems and processes while connecting them to human bodily experience.

This thesis was developed in three phases: the first phase was to understand what research in environmental psychology and cognitive neuroscience reveals about how we perceive the environment through our senses; the second phase was to derive from this research a framework for sensory landscape design; and the third and final phase was to apply this framework to the design of a community park that connects the Green Meadows and Chillum neighborhoods at the confluence of Sligo Creek and the Northwest Branch of the Anacostia River in Chillum, Maryland.

Chapter 2: Literature Review and Precedent Study

By observing human behavior, environmental psychologists have been able to document and draw conclusions about how our environment impacts the way we think, feel, and behave. By studying neural connections in the brain involved in mental processes, cognitive neuroscientists have been able to explain how our brains have evolved to respond to the environment in particular ways. My review of scientific literature and design precedents explores two interrelated questions: what can research in environmental psychology and cognitive neuroscience show us about how humans engage with the environment through their senses, and how can this engagement be facilitated through landscape design? From this review I derive a framework for sensory landscape design which I then apply to the design of a community park.

Embodied Cognition

The past two decades of scientific research into human cognition reveal that the "mind" and "body" are integrated, and that the way people interact with their environment depends on the nature of the bodies we have (Goldhagen, 2017). We know that landscape features should accommodate our physical dimensions and abilities. But we also need to consider that how we experience the world (egocentrically) differs from how we exist as objects in the world (allocentrically). A significant portion of our brains is dedicated to the parts of our bodies with the greatest concentration of nerve endings - hands, lips, tongue, eyes, nose, and ears (Figure 3) (Goldhagen, 2017). These organs deliver far more information to our minds about the world than larger but less sensitive areas such as the torso, arms, and legs. Figure 3 is a sculptural depiction of the relative amount of area the brain allocates to responding to sensory stimuli from each body part.

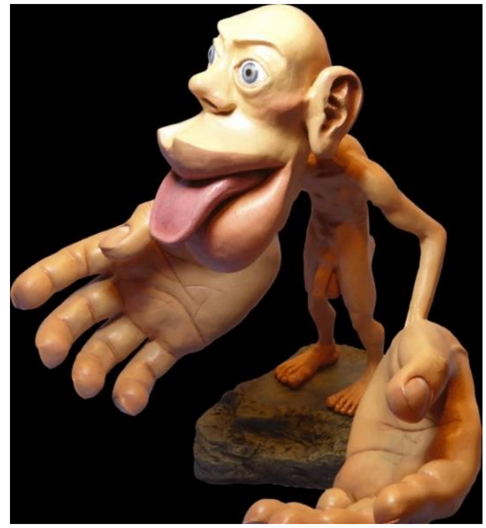

Figure 3: Sensory homunculus

The information we receive through those sensitive nerve endings not only triggers our instinctive responses, but colors our emotions, shapes our thoughts, and even forms the basis of language (Lakoff & Johnson, 1999). The theory of "embodied cognition," introduced by neuroscientist Francisco Varela, holds that cognition depends upon having a body with various sensorimotor capacities, and that these capacities are themselves embedded in a more encompassing biological, psychological and cultural context (1991, p. 147). The concept of embodied cognition is grounded in romantic philosophy, which affirms the reciprocity of inner and outer realms of human experience (Perez-Gomez, 2017). This philosophy emerged at the end of the 18th century as a reaction to a dualistic scientific worldview in which nature was regarded as a machine rather than an organism, and quantitative measures were valued over qualitative experience. Renouncing abstract reason, romantic philosophers considered emotions and sensations to be the seat of awareness and "attunement" with the world (Perez-Gomez, 2017, p. 221).

The "enactive approach", which grew out of the theory of embodied cognition, emphasizes the active role of the individual in generating and maintaining their cognitive domain through the continuous and reciprocal interaction of brain, body, and world (Varela et al., 1991, p. 205). Recent studies in cognitive linguistics indicate that human reason is shaped by the specific nature of our bodies and by bodily experience (Capra & Luisi, 2014). As Lakoff and Johnson illustrate, our understanding of "inside" and "outside" is grounded in the experience of the body as a container (1999). Indeed, our highly malleable brains are continually being reshaped by our interaction with the world (Goldhagen, 2017).

Perceptual Systems

Psychologist James Jerome (J.J.) Gibson (1904-1979) sought to understand human behavior in its ecological context, at an intermediate range and duration nested between the atomic and cosmic range of modern physics. He wrote, "We are concerned here with things at the ecological level, with the habit of animals and men, because we all behave with respect to things we can look at and feel, or smell and taste, and events we can listen to" (Gibson, 1986, p. 9). Gibson was concerned with the direct perception of the sense organs; how we human observers apprehend the same things that our human ancestors did before they were able to indirectly perceive atoms and galaxies through microscopes and telescopes (Gibson, 1986).

J.J. Gibson was strongly though indirectly influenced by the work of William James (1842-1910) who introduced an evolutionary perspective to psychological theory. James asserted that it was the *relationship* between humans and the environment that provided the structure to our experience. His radical empiricism provided an analysis of psychological experience that was grounded in the concreteness of everyday life and paved the way for phenomenology, the study of direct experience from a first-person point-of-view (Heft, 2001). Edwin Holt (1873-1946), a student of James and colleague of Gibson, extended James' pragmatic approach by proposing that individuals purposefully interact with environmental opportunities and constraints to learn more about the environment (Heft, 2001).

Gibson conceived of the senses as active perceptual systems made up of energy receptors and muscular organs that purposefully and continuously "pick up" information around them to determine what the environment "affords" or allows us to do (Gibson, 1966, p. 52). The perceptual systems include five modes of externally oriented attention: the basic orienting system, the auditory system, the haptic system, the visual system, and the taste-smell system. The orienting of these systems is governed by the brain "so that the whole system of input and output *resonates* [emphasis added] with the external information" (Gibson, 1966, p. 5). Gibson's theory of sense perception, developed over 40 years ago, remains a useful lens through which to look at how our bodies and minds engage with the world around us.

Gibson used the term "affordance" to signify the opportunities for perception and action that the environment offers the unique individual, either for good or ill (Gibson, 1986, p. 127). Which affordances an individual perceives depends on that person's size as well as on their physical and cognitive abilities and goals. Our terrestrial environment includes a medium (air), substances (various forms of matter, including water), and the surfaces that separate them. For us, the earth's surface is where most of the action is. It is what we touch and what touches us, where light is reflected or absorbed, where vibrations are transmitted, and where chemical reaction mostly takes place. The level surface of the ground affords support for locomotion, while perpendicular surfaces afford enclosure. The concept of affordance has powerful implications for landscape architecture.

Gibson's *Table of Perceptual Systems* (Table 1) provides a concise summary of his research on sensory perception. For each perceptual system, the table identifies the mode of attention, the receptive units and organs involved, the stimuli available, and the external information that each system picks up or resonates with. This external information refers to the forces, events, substances, and surfaces of the terrestrial environment that are the purview of the landscape architect. I have used this table as the basis for my design framework, linking the external information obtained by each perceptual system to specific environmental attributes. These site-specific attributes can be accentuated through certain design strategies to resonate more fully with the perceptual systems, as illustrated by the following examples from landscape architecture, architecture, and art.

Table 1. Gibson's Table of Perceptual Systems

TABLE 1: THE PERCEPTUAL SYSTEMS

Name	Mode of Attention	Receptive Units	Anatomy of the Organ	Activity of the Organ	Stimuli Available	External Information Obtained
The Basic Orienting System	General orientation	Mechano-receptors	Vestibular organs	Body equilibrium	Forces of gravity and acceleration	Direction of gravity, being pushed
The Auditory System	Listening	Mechano-receptors	Cochlear organs with middle ear and auricle	Orienting to sounds	Vibration in the air	Nature and location of vibratory events
The Haptic System	Touching	Mechano-receptors and possibly Thermo-receptors	Skin (including attachments and openings) Joints (including ligaments) Muscles (including tendons)	Exploration of many kinds	Deformations of tissues Configuration of joints Stretching of muscle fibers	Contact with the earth Mechanical encounters Object shapes Material states Solidity or viscosity
The Taste-Smell System	Smelling	Chemo-receptors	Nasal cavity (nose)	Sniffing	Composition of the medium	Nature of volatile sources
	Tasting	Chemo- and mechano-receptors	Oral cavity (mouth)	Savoring	Composition of ingested objects	Nutritive and biochemical values
The Visual System	Looking	Photo-receptors	Ocular mechanism (eyes, with intrinsic and extrinsic eye muscles, as related to the vestibular organs, the head and the whole body)	Accommodation, Pupillary adjustment, Fixation, convergence Exploration	The variables of structure in ambient light	Everything that can be specified by the variables of optical structure (information about objects, animals, motions, events, and places)

Basic Orienting System

Our basic orienting system organizes auditory, visual, and proprioceptive experience into horizontal and vertical planes so that we can maintain equilibrium and propel our bodies forward (Gibson, 1966). Through the basic orienting system, the body responds to forces of gravity and acceleration, picking up information about variations in topography (Figure 4). Topography and landscape features can be molded to

Figure 4: Sligo Creek trail, Green Meadows

Figure 5: Wave Fields, Maya Lin, New Windsor, NY

gently challenge our sense of direction and balance, inducing us to defy gravity as we push uphill (Figure 5) or leap through the air (Figure 6). Paths can be shaped to follow the contours of the land and graded to offer varying degrees of resistance. Climbing structures with multiple and varied routes of access and egress provide options for different abilities, risk-tolerances, and play styles (Zakharova, 2020).

Figure 6: Promenade de L'Aire, G. Descombes, Confignon, Switzerland

Auditory System

The auditory system which orients us to the nature and location of vibratory events, picks up mechanical disturbances such as waterfalls, which broadcast continuously; wind, which is more intermittent; and the rolling, rubbing, colliding, or breaking of solids which can be more abrupt (Gibson, 1966) (Figure 7). It alerts us to interacting forces, indicates life, and feels immersive. We listen to the behavioral and vocal acts of animals and the speech and musical performances of humans. Natural sounds

Figure 7: Step pools in Sligo Creek, Wayne Ave.

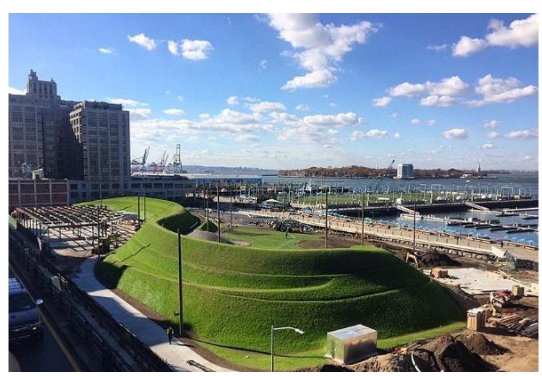

Figure 8: Grass berm, MVVA, Brooklyn Bridge Park, Brooklyn, NY

tend to be more modulated, whereas industrial sounds are more uniform and monotonous. Volume and sound quality can be manipulated through surface form, texture, and contour in the way that the berm at Brooklyn Bridge Park buffers the sound of traffic on the Brooklyn-Queens Expressway (Figure 8). As with Lawrence Halprin's cascading fountains, the sound of water can be amplified to screen out the sounds of the city, captivate attention, and provide an immersive experience (Figure 9).

Figure 9: Keller Fountain, Lawrence Halprin, Portland, OR

Haptic System

The haptic system, which detects tactile sensations received through the skin and tissues, and kinesthetic sensations felt in the joints and muscles, responds to the texture, temperature and resistance of surfaces, materials, and media, such as air and water (Gibson, 1966) (Figure 10). Hands, feet, and other members of the body are active organs of perception, picking up information about the mechanics of tools or machines and the size and shape of objects. It is the haptic system through which animals and humans are literally "in touch" with the environment (Gibson, 1966, p. 97). Understanding how we experience the environmental medium kinesthetically is key to structuring and

Figure 10: Wading spot in Sligo Creek, Maple Ave.

shaping landscapes that resonate with the entire body (Pashman, 2013). Japanese garden designers often exaggerate kinesthetic movements by building multiple muscular sensations into the experience of walking. Unevenly spaced stepping-stones set into a pool compel visitors to continuously adjust their balance while looking down to place a foot and up to see where they are going (Hall, 1982).

The shape and texture of objects that the body comes into contact with, such as paving, railings, and benches, can be used to stimulate or soothe the nervous system. The grooves in the sidewalk at Allegheny Riverfront Park made from reeds pressed into wet concrete by Ann Hamilton can be felt through the soles of the feet (Figure 11). Thermoception, sensitivity to temperature, can be modulated through shading by trees and overhead structures, cooling by water and wind, and the materials used. Because stone and metal conduct heat and cold more readily than wood, concern for comfort in all seasons has led to the universal choice of wood as a desirable material for outdoor seating (Figure 12) (Olin, 2017).

Figure 11: Reed paving, Ann Hamilton, Allegheny Riverfront Park, Pittsburgh, PA

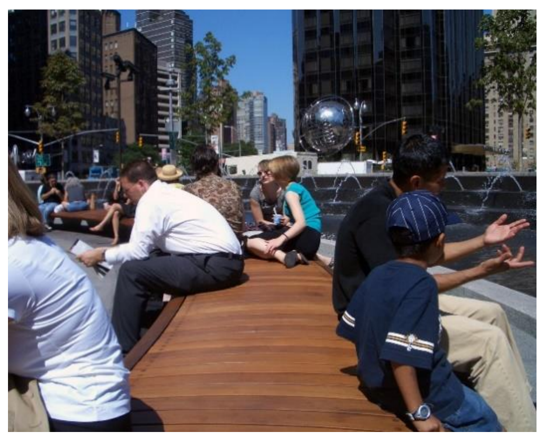

Figure 12: Wood bench, OLIN, Columbus Circle, New York, NY

Taste-Smell System

Gibson groups taste and smell into one integrated system (1966). Our olfactory sense identifies the source and nature of volatile chemical compounds carried along by air currents (Figure 13). The olfactory system provides information about the state of natural materials such as wet stone, baked earth, or burning wood, and what the material affords such as whether it is safe or dangerous and whether to draw closer or move away (Gibson, 1966). Smell can evoke memories of an event or location that we associate with a particular emotion (Malnar & Vodvarka, 2004). The changing seasons can be detected through the smell of plants as they flower and decompose (Figure 14). Memory and imagination can be stirred by fragrant plants, or by materials such as wood or stone which exude scent when touched by sun, wind, or rain (Figure 15). Pleasant odors also increase alertness, facilitate the recall of pleasant memories, and have a salutary effect on mood (Malnar & Vovarka,

Figure 13: Sun-warmed grasses, PEPCO Corridor

Figure 14: Naval Cemetery, Nelson Byrd Woltz, Brooklyn, NY

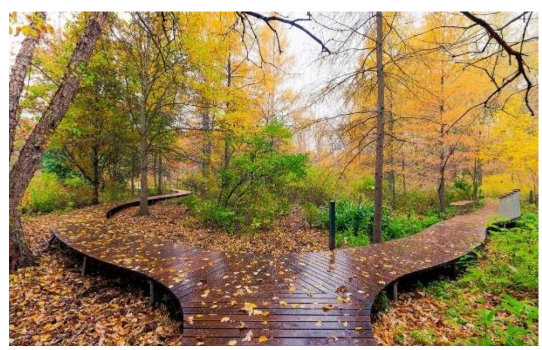

Figure 15: Eloise Butler Wildflower Garden, Cuningham, Minneapolis, MN

2004). Certain volatile organic compounds can also boost the immune system. Dr. Qing Li, founder of the Forest Therapy Study Group, has discovered that breathing in phytoncides, the natural oils in a plant that protect it from bacteria, insects, and fungi, can increase the number and activity of "natural killer" cells which attack and kill unwanted cells such as cancer (2018). Conifers are the largest producers of phytoncides. The cool, astringent smell we inhale in a pine forest is of terpenes, the main components of phytoncides (Li, 2018).

Our tasting system works in concert with the olfactory system to regulate the digestive system by selecting certain substances and rejecting others based on their chemical and physical properties such as solubility and volatility, temperature, texture, shape, and size (Gibson, 1966). Edible plants can be incorporated into the design of a landscape to stimulate the taste buds and nourish the body. Communal food production or meals can contribute to social cohesion.

Visual System

Figure 16: Bridge over Sligo Creek, New Hampshire Ave.

The visual system registers variations in ambient light and depends on our ability to look around and move around. The eye, the brain, and the body function inseparably (Gibson, 1966). As we move, sunlight reflecting off surfaces flows past us in what Gibson called "an ambient optic array" (1986, p. 65). The features of the array that persist specify the layout of our environment, while the features of the array that change specify our movement. The gradual transition of light to shade indicates the movement of the earth relative to the sun (Figure 16). The moving observer and the moving sun are conditions under which terrestrial vision has evolved over millennia. As Gibson notes, “We know that whatever goes out of sight will come back into sight, and whatever is lighted will be shaded” (1986, p. 92). The play of light over surfaces and through substances can provide information, attract attention, and be a rich source of fascination.

Findings in environmental psychology and cognitive neuroscience show that the visual system has evolved with nature to favor forms that aid human survival. Because our brains have evolved to quickly evaluate the safety of our surroundings, we are predisposed to prefer forms and patterns that are easy to perceive. Based on research into how people react to different aspects of the environment, Rachel and Stephen Kaplan (1998) developed a preference matrix that suits our information-seeking visual systems. They determined that the “coherence” and “legibility” of a landscape allow us to rapidly scan our surroundings for opportunities or constraints, while “complexity” and “mystery” allow us to infer further details and discoveries (Kaplan, Kaplan & Ryan, 1998). Symmetry, hierarchy, complexity, and clear sequencing also suggest an organization and intentionality that we can easily and intuitively grasp (Sussman & Hollander, 2015).

We are more accustomed to searching for both positive and negative physical cues located below eye level than those located above it. This trait may also have evolved from our need to identify predators and track prey by their tracks (Gazzaniga, 1998). Most obstacles, including trip hazards, are located on the ground. Wayfinding cues below eye level are more likely to be noticed.

Figure 17: Thorncrown Chapel, Fay Jones, Eureka Springs, AR

Mid-range fractal patterns that repeat at different scales appeal to us because they are familiar and resonate with our eye trajectories, which trace a fractal pattern as they scan for information (Taylor et al., 2011). As with our lungs, capillaries and neurons, our visual systems are branched into fractals. Repeating lines in co-linear, curvilinear, parallel, and radial patterns are easily perceived because they correspond to the organization of our visual systems (Albright, 2017). Our preference for these natural forms comes from fluent visual processing. We can incorporate these forms into our landscapes to make them more accessible and comfortable. Architect Fay Jones employs closely repeating lines in many of his works to both abstract the built form from its natural surroundings and express a kinship with it (Figure 17).

Figure 18: Red Ribbon Park, Turenscape, Qinhuangdao City, Hebei Province, China

Humans have an innate preference for curved contours over hard, sharp edges and acute angles which may suggest teeth, claws, and sudden drops or changes in direction (Ellard, 2015). Fluid curves are easy for the eyes to follow. Color is also associated with primal experiences and can be used to energize or calm the nervous system (Molnar & Vodvarka, 2004). The curving red ribbon bench in Qinhuangdao City, Hebei Province, China, by Turenscape, which evokes the meandering form of the Tanghe River, stands out against the dense woodland, arouses our attention, and leads us effortlessly forward (Figure 18).

To ensure our ability to continually scan our environments, we gravitate to the edges of public spaces and avoid the middle. This instinct is called thigmotaxis or "wall-hugging" (Sussman & Hollander, 2015, p. 10). We are most comfortable with our backs to a wall and facing out, and we feel more at ease in a place with visible borders and exits. This neurological finding supports Jay Appleton's prospect-refuge theory which describes our preference for places that offer both views and a sense of enclosure (1996). Well-defined edges allow us to relax, sense the extent of a space, internally map our location, suggest a way forward, and conserve energy (Sussman & Hollander, 2015). In addition, orderly frames around ecologically rich and seemingly messy ecosystems indicate human intention and care (Nassauer, 1995).

Sensory Space

The extent to which each perceptual system is able to pick up information is an important design consideration. Anthropologist Edward T. Hall noted that intimate, personal, social, and public distances and the activities and spaces associated with them vary between cultures. He coined the term "proxemics" for the study of "man's use of space as a specialized elaboration of culture" (Hall, 1966, p. 1). Hall distinguished between distance receptors (eyes, ears, and nose) and immediate receptors (skin, membranes, and muscles) in terms of how they help regulate interpersonal distance (1966). The specific distance chosen also depends on the nature of the activity, the relationship of the interacting individuals, how they feel, and what they are doing. The extent to which we are able to recognize a human body or another person's face has an impact on our behavior. Close proximity amplifies our responses to others, both positive and negative (Ahs et al., 2015). Providing for these zones of involvement with a range of activity areas, seating configurations and access points offers choice, flexibility, and a sense of agency for diverse groups.

One way to think about experiential space is as concentric circles or nested units, with tactile and thermal space at the center, surrounded by olfactory, auditory, and visual space (Figure 19). Hall notes that skin and muscles, the immediate receptors, pick up information within reach of our limbs (1966). The nose detects volatile chemicals diffused through the air. Up close the nose identifies concentrated odors like the ripeness of a piece of fruit. It can differentiate individuals and detect emotional changes in another person's endocrine system. Further away the nose picks up more widely dispersed chemicals carried along by the wind. The ear easily detects sounds within 20 feet. At 100 feet one-way vocal communication is possible, although two-way communication is strained. Beyond 100 feet auditory cues break down rapidly. The eye, on the other hand, sweeps up an extraordinary amount of detail within a hundred-yard radius and is still efficient at a mile (Hall,

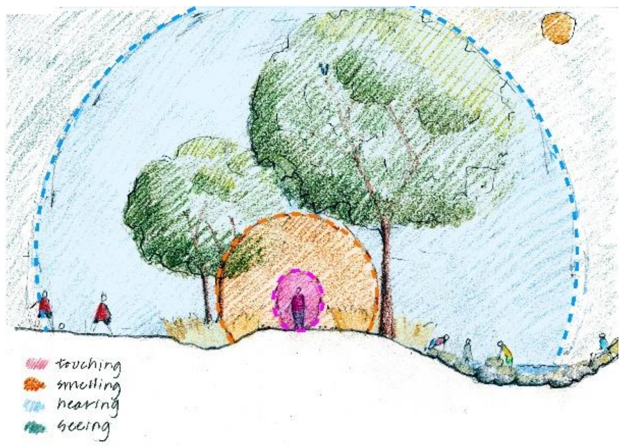

Figure 19: Sensory space

1966). The speed and frequency of light waves are faster than sound waves. Although the difference is almost imperceptible, one sees a distant event before hearing it.

Mirror Neurons

Over five decades of neuroscientific research has shown that motor neurons, cells that transmit nerve impulses from the brain or spinal cord to a muscle or gland, respond to auditory, haptic, and visual stimuli. In the early 1990s, neuroscientist Giacomo Rizzolatti and his team found that a class of motor neurons in the auditory, haptic, and visual systems responded not only when a subject performed a given action, but also when the subject observed someone else performing that same action (2008). These “mirror neurons” enable us to make sense of others’ experiences by unconsciously simulating their actions.

Figure 20: Ice Water Wall, Ann Hamilton, Teardrop Park, New York, NY

This is also true for the way we respond to both representational and abstract art and to artistic gestures (Rizzolatti & Sinigaglia, 2008). We respond viscerally to the orientation of external objects and to their perceived weight. Horizontal, vertical, and heavy elements convey a sense of stability and permanence, while diagonal and lightweight elements evoke transience or movement. In classical Japanese garden design, the geological and biological growth forces encapsulated in the shape and grain of rocks and trees are placed up and down to express stored tension, or side to side to express repose (Slawson, 1987). Diagonal arrangements express the dynamism of human activity, the slanting lines of legs and arms as we walk or run. In the geologic section of *Ice Water Wall* by Ann Hamilton at Teardrop Park (Figure 20), the scale, heft, and gradual tilt of the bluestone slabs convey massive forces at work, while the meandering *Wood Line* by Andy Goldsworthy feels more ephemeral (Figure 21). With elements arranged on a diagonal, both works express a powerful sense of movement. The inclusion of artistic form and handmade objects in our landscapes can impart human warmth, intention, emotion, and meaning, and arouse empathy for and even awe of the natural world.

Figure 21: Wood Line, Andy Goldsworthy, the Presidio, San Francisco, CA

<u>*Atmosphere*</u>

Swiss architect Peter Zumthor is renowned for his explicit emphasis on the atmosphere of his buildings. A former cabinetmaker, Zumthor carefully calibrates or "tempers" the qualities of the materials he employs: their texture, their temperature, the sound they produce, how they reflect or absorb light, and how they play off of one another to create a "surrounding object" that evokes a particular mood (2006, p.34). At the thermal baths in Vals, Switzerland, the firm embrace of the mountain is conveyed through a rigorous use of geometry, subtly textured materials, and the interplay of water and light (Figure 22). Zumthor observes that we sense the

Figure 22: Thermal baths, Peter Zumthor, Vals Switzerland

overall character of a space before we discern its component parts, noting “I enter a building, see a room, and - in a fraction of a second - have a feeling about it” (2006, p. 13). He believes that this atmospheric sense is heightened when a body fully engages with a building that has “[become] part of its surroundings” (Zumthor 2006, p. 63). This experiential continuity between body, building, and environment embodies Gibson’s idea of nested units (Gibson, 1986).

Zumthor likens interiors to large musical instruments that collect, amplify, and transmit sound. In a one-room chapel in rural Sumvitg, Switzerland, he specified spruce planks laid over a wooden subfloor that flex and creak underfoot, registering the visitor’s presence (2006). The exposed support beams meet the trusses overhead, diminishing in size to a point over the altar. This focal point pulls the eye forward and up as light spills in from the clerestory windows (Figure 23).

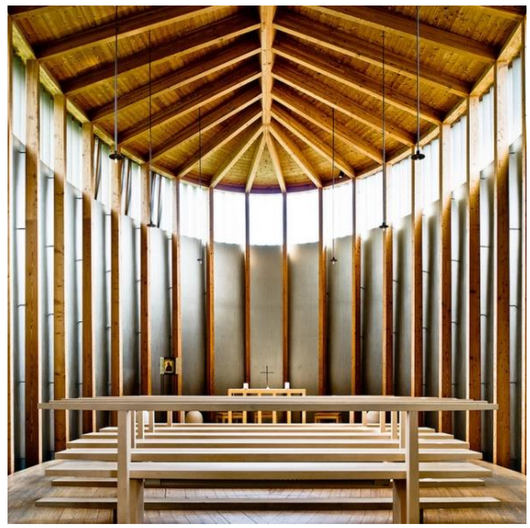

Figure 23: St. Benedict Chapel, Peter Zumthor, Sumvitg, Switzerland

Finnish architect and theorist Juhani Pallasmaa writes that “the judgement of environmental character is a complex fusion of countless factors that are immediately and synthetically grasped as an overall atmosphere, feeling, mood or ambience” (2014, p. 19). He notes that we absorb information about a place in a diffuse, peripheral, and polyphonic manner, with all our senses at once, in order to quickly differentiate a setting of potential danger from one of safety and nourishment (Pallasmaa, 2014).

Neural and Walking Pathways

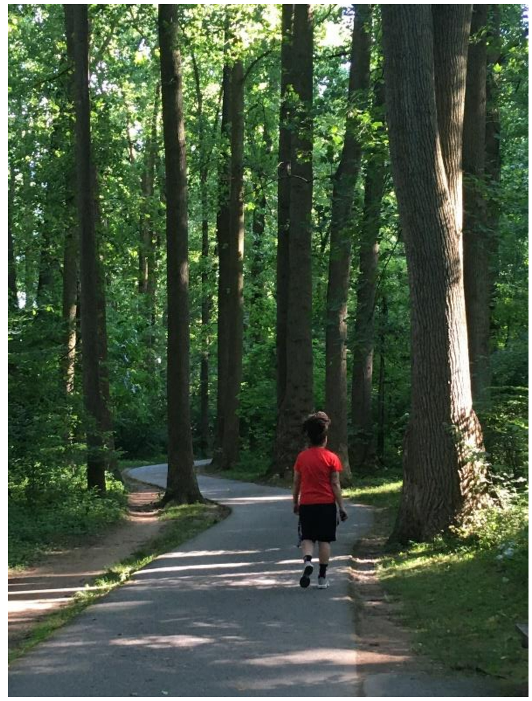
Figure 24. Sligo Creek trail, Dennis Ave.

Francisco Varela's description of enaction as "laying down a path in walking" captures the dynamic relationship between brain, body, and world (Varela et al., 1991, p. 235). Propelling ourselves, either by foot or on wheels, along a route that takes us away from familiar tasks and surroundings allows us to shift our perspective for a time, release our concentrated focus, and take in new information (Figure 24). Movement stimulates creative thought as ideas flow at a steady pace. Taking in the surrounding environment or recalling a conversation, awareness ranges in and out, allowing thoughts to form freely.

As we walk, the touch receptors on the soles of the feet trigger our basic orienting system, sending messages to the brain about the texture, stability, and angle of the walking surface. Each footfall sparks an electromagnetic charge that spreads throughout the body, eventually reaching the brain. Tires on a bicycle or wheelchair transmit vibrations to touch receptors in the hands and posterior as they roll over terrain. This rhythmic cycle of compression, tension, and release patterns our thoughts.

Brain researchers speculate that because human cognition developed along with our ability to walk, the complex brain structures needed for walking led to the development of sophisticated modes of thinking (Leisman et al., 2006). Nikola Tesla took long daily walks and Steve Jobs held “walking meetings” to work out ideas (Dean, 2020). Authors from Ernest Hemingway to J.K. Rowling have claimed that walking is the only cure for writer’s block.

Creativity may be stimulated by walking because coordinating movement while maintaining balance is so complicated, involving multiple regions of the brain. As each hemisphere directs the opposite side of the body, shifting from left foot to right with each step may improve communication between the hemispheres. The dynamic interplay between the logical left hemisphere of the brain and the intuitive right may also explain the inspiration that comes from walking (Dean, 2020). Walking gently releases tension in the muscles. Footfalls on pavement, wooden bridges, gravel, and dirt beat out a steady rhythm, entraining our brain waves into a meditative state conducive to creative thought.

Rachel and Stephen Kaplan recognized that our ability to sustain directed attention is limited (1998). They suggested that activities and settings that provide a sense of “being away” and that offer effortless “quiet fascination” allow us to recover from mental fatigue (1998, p. 69). Observing clouds moving across the sky, trees swaying in the breeze, or water flowing beneath a bridge, we can find this soft fascination while taking a walk.

Urban designer Jan Gehl observes that meeting our fellow citizens face-to-face in common areas can allay fear and alienation (2010). During a time of limited mobility and social distancing, walking can enhance our creativity, restore the attention we direct at our screens and enlarge our sense of community and belonging. A continuous pathway that links neighborhoods to recreational and natural areas, as well as to one another, can provide myriad mental, physical, and social benefits.

Resonant Landscapes

Gibson described the organs of perception as "resonating" with the environment as they seek, extract, and adjust to external information in a continuous loop of input and output (Gibson, 1966, p. 5). E.O. Wilson explains that we seek out and thrive in the sensory-rich context we evolved in, replete with plants, water, and sunlight (1984). To apply Gibson's term specifically to landscape design, resonant landscapes provide a wealth of stimuli that can prompt imagination and action, providing an enriching and restorative experience (Figure 25).

Figure 25: Sligo Creek, Park Valley Road

When Ed Blake designed the network of paths for the Crosby Arboretum in Picayune, Mississippi in the 1980s, he intended for them to be immersive and experiential; unfolding pathway "journeys" that revealed the forms, textures and light patterns of the woodland, savannah, and wetland (Brzuszek, 2014, p. 53). He sought to express the unique qualities of the site: "form expressive of structure, structural form expressive of phenomena, structural integrity expressive of fitness, fitness expressive of beauty, health and well-being" (Blake, 2006, as cited in Brzuszek, 2014, p. 50). Blake was influenced by landscape architect Lawrence Halprin's RSVP Cycles and the idea of scoring movement sequences to affect the sensual experience of a place (Brzuszek, 2014). According to Halprin, scores for the environment are symbolizations of a process that extends over time and space (1969). Halprin used scoring to design public spaces in which the constructed elements encourage physical and emotional participation. Blake choreographed the gradually curving pathways and seating areas to provide a rhythm to how visitors would experience the site. Direct contact with the environment was of the utmost importance to Blake. He wrote of the synthesis of "the smell of a thunder shower, the sight of a bog orchid, the soft textured feel of club moss, the taste of a blueberry and the sound of the wind through the crowns of the longleaf pine" (Blake, 2009, as cited in Brzuszek, 2014, p. 54).

Architect Fay Jones worked closely with Blake on Pinecote Pavilion and other site furnishings at the Crosby Arboretum that were deeply in tune with the character of the site and "each part to the whole" (Jones, 1988, as cited in Brzusek, 2014, p. 64). Constructed of notched pine posts with branching cross braces that support a roof with exposed edges, Pinecote Pavilion merges with the surrounding forest (Figure 26). Jones observed, "Time of day and seasonal changes will modify the shadows that frame the

Figure 26: Pinecote Pavilion, Fay Jones, Crosby Arboretum, Picayune, MS

light and will keep the spaces in and around Pinecote vital and alive, enhancing the poetics of revealed construction” (Jones, 1986, as cited in Brzuszek, 2014, p. 63). Jones’s design of the entry gates, a pond weir, bridges, benches, information kiosks, and even trash cans carry his theme of organic unity through to the smallest detail.

Figure 27: Lurie Garden, GGN, Millenium Park, Chicago, IL

The myriad qualities of the objects, substances, and surfaces at the designer’s disposal – plants, wood, stone, soil, water, and light – can be shaped, directed, and “tempered” to provide an enveloping, immersive environment that engages all the senses. Landscape architects can design landscapes for the movements, actions, and gestures they afford. How these landscape elements *look* can arise from what they *do*, rather than from an abstract or esthetic ideal (Robinson, 2019). Affordances, such as steps, bridges, railings, rocks, logs, and paths, channel movement and invite engagement with the environment, adding to a “kinesthetic repertoire of spatial experiences” (Hall, 1982, p. 62). The gently sloping paths of the Lurie Garden in Chicago’s Millennium Park by Guthrie, Gustafson and Nichol frame the visual, tactile, and aromatic complexity of Piet Oudolf’s plantings as the elongated boardwalk steps and sound of running water invite the visitor to dip her toes into the cool, shaded channel (Figure 27).

Environmental psychology and cognitive neuroscience provide a wealth of research on how the brain and body respond to the environment. This knowledge can be used to design landscapes that encourage interaction with nature through elements tailored to the many facets of human cognition. Creating a Sensory Design Framework allowed me to connect the literature and precedent review to site specific design interventions.

Chapter 3: Sensory Design

Sensory Design Strategies

Key design strategies gleaned from my literature review and precedent studies include framing unique features; amplifying sounds, smells and textures; abstracting natural forms at various scales; emphasizing the sensory qualities of natural materials and processes; affording access to natural elements; and expanding the quantity and variety of native plant species to increase biodiversity and information richness.

Sensory Design Framework

To create a design framework based on my literature review I first linked each of Gibson's (1966) perceptual systems to specific *environmental attributes* (Table 2, column 4). For example, the basic orienting system detects variations in topography. I then identified the environmental attributes unique to my study area through a physical, biological, and cultural site inventory, and mapped my own auditory, haptic, and visual perceptions of these attributes through a *sensory site inventory* (Table 2, column 5). As I walked through the study area, for example, I used proprioception to detect changes in terrain, noting where I felt myself straining forward and shortening my steps to walk uphill, and where I felt myself leaning backward and bending my knees to walk downhill.

Table 2. Sensory Design Framework

Perceptual System	Mode of Attention	External Information Obtained	Environmental Attributes	Sensory Site Inventory	Sensory Design Features
Basic Orienting	General orientation	• Organizes auditory, visual, and proprioceptive experience into horizontal and vertical planes so that we can maintain equilibrium and propel our bodies forward, responds to forces of gravity and acceleration	• Topographical variation • Stability, continuity, and direction of supporting surface	• Steep ridge along west side • Flat floodplain • Mounded levee • Firm asphalt, dirt, wood and boulders; loose mulch, pebbles and sand	• Arches provide entry passage • Boardwalk descends 10 feet from escarpment to flood plain at 3% slope • Realigned hiker-biker path descends from levee to floodplain at 3% slope • Stone terrace steps down to Sligo Creek • Gravel, stone, wood, pebble, sand, and grass walking surfaces offer varying levels of resistance and traction • Log steppers and stone weirs require balance and coordination • Moving current engages muscles and joints
Auditory	Listening	• Orients us to the nature and location of vibratory events	• Variation in pitch, loudness, and tone • Mechanical disturbances which are continuous (water), intermittent (wind) or abrupt (snapping twig) • Behavioral and vocal acts of animals and humans	• Received sounds of stream flowing over riffles, wind in trees, rustle of leaves, birdsong, voices in playgrounds and playing fields • Imposed sounds of footfalls on leaves, ice and snow, gravel path levee, wooden bridges, splash of puddles and stream, own voice in greeting • Birdsong, rustle of small mammals	• Stone weirs in stream and swales broadcast sound of cascading water • Rain pavilion roof sends rainwater splashing into recirculating fountain • Improved habitat increases insects, bird, and animal activity, vocalization • Denser canopy amplifies sound of wind • Decks and terrace provide places to congregate, talk, exercise, and play • Wood and gravel walking surfaces amplify the sound of footfalls
Haptic	Touching	• Detects tactile sensations received through skin and tissues as well as kinesthetic sensations felt in the joints and muscles • Hands, feet, and other members of the body are active organs of perception	• Texture, temperature, and resistance of surfaces (earth), materials (soil), and mediums (air and water) • Mechanics of tools or machines • Size and shape of objects the body must conform to	• Texture of asphalt, wood, boulders, pebbles, grass, dirt, sand, puddled walking surfaces • Wood bleachers on playing field and composite benches on playground • Metal playground equipment • Warmth of sun in open floodplain • Coolness of shade, earth, breeze, stream • Slight pressure of wind in floodplain, water currents in stream • Texture of bark, branches, leaves, blossoms	• Smooth curved wood benches and railings invite touch • Boulders near stream terrace invite climbing and sitting • Denser canopy increases shade and lowers temperature • New plantings produce tactile bark, stems, leaves and seed pods • Rain pavilion and stream terrace provide contact with water
Taste-Smell	Smelling	• Detects things and events at a distance through odors carried by air currents	• Smell of chemicals released by natural processes such as pollination (flowers), decay (leaves), burning (wood), precipitation (stone)	• Smell of tree products: bark after rain, leaves in fall, blossoms in spring • Smell of freshly mown grass • Smell of grilled food	• New plantings provide variety of scent • Wood and stone features release resin and mineral scents when warmed by the sun or washed by the rain
Visual	Looking	• Registers variations in ambient light and depends on our ability to look around and move around. • The eye, the brain, and the body function inseparably	• Variations in ambient light, including contour, texture, color, reflectivity and luminosity, and semi-transparency • Location of objects, people and animals moving in and out of view • Wayfinding and safety	• View obscured by woods, ridge and levee; open in floodplain • Views more open in winter with loss of vegetation • Moving shadows cast by waving branches, and fluttering leaves • Shadows of solid objects move with transit of sun across the sky • Light reflected by different states of water; still pool, dancing riffle • Flecks of reflective mica in sand and rock • Color and density of vegetation at different times of year – shades of green, yellow, and brown	• Curving boardwalk leads eye through dense woodland, offers unfolding views • Semicircular decks provide sweeping views • Bridge offers panoramic view of stream and park with clear sightlines to entrances • Arches mark entry points • Light and motion activated footlights illuminate the boardwalk at night • Realigned hiker-biker path offers views to neighborhood and park • Water flowing over stone refracts light • Diverse, layered plantings provide visual texture, information richness • Massed plantings and tree allees provide structure, legibility
J.J. Gibson, 1966			A. Jones, 2021		

My sensory impressions, coupled with the design strategies I derived from the precedents in my literature review, informed the design of site-specific features or affordances that resonate with the perceptual systems (Table 2, column 6). For example, the experience of climbing the escarpment on the west side of Sligo Creek inspired the design of a gradually ascending boardwalk which frames views of the stream and woodland and, much like Red Ribbon Park, evokes the meandering form of Sligo Creek before it was channelized. The boardwalk provides access to an immersive visual, auditory, and haptic experience of the stream and the meadow, wetland, and woodland ecotypes that make up the riparian buffer, environmental features that are unique to the site. The relationship of my research to the design follows the research *through* design (RTD) model in which spatial design is viewed as an exploratory activity that produces knowledge which meets a research goal or answers a set of research questions (Van den Brink, 2016).

The results of my design inquiry address a particular set of questions, a place, and a moment in time. The process of site inventory and analysis enabled me to identify a study area for the application of my research, and to ultimately select a site for the design of a community park.

Chapter 4: Site Inventory and Analysis

To analyze the environmental attributes unique to my study area, I conducted a physical, biological, and cultural site inventory based on the method outlined by James LaGro (2008), including a sensory inventory of my own auditory, haptic, and visual impressions. I created a separate map for each attribute with ArcGIS mapping software to understand the patterns and processes occurring within my study area. I confirmed and supplemented this data with my own observations. I then layered the geospatial data to determine where the constraints and opportunities were for a community park that could engage visitors with natural elements.

Study Area

The study area which drew my attention sits at the confluence of Sligo Creek and the Northwest Branch of the Anacostia River in Chillum, Maryland. It includes three community parks: Chillum Community Park, Green Meadows, and Kirkwood

Neighborhood Park, which are part of two contiguous corridors of Maryland-National Capital Park and Planning Commission (M-NCPPC) parkland (Figure 28). The stream valleys and hiker-biker trails of Sligo Creek and the Northwest Branch join in Kirkland Park.

The parkland is surrounded by residential neighborhoods which are bordered by four major roads. This inner beltway region of Prince George's County is close to the Montgomery County and Washington, DC border, and lies in the fall zone between the Piedmont and the Coastal Plain. The two waterways, along with a steep embankment on the west side of Sligo Creek, a levee along Sligo Creek Parkway, and a large tract of woods, separate the parks and the neighborhoods. I saw an opportunity here to connect the communities to the parkland and to each other.

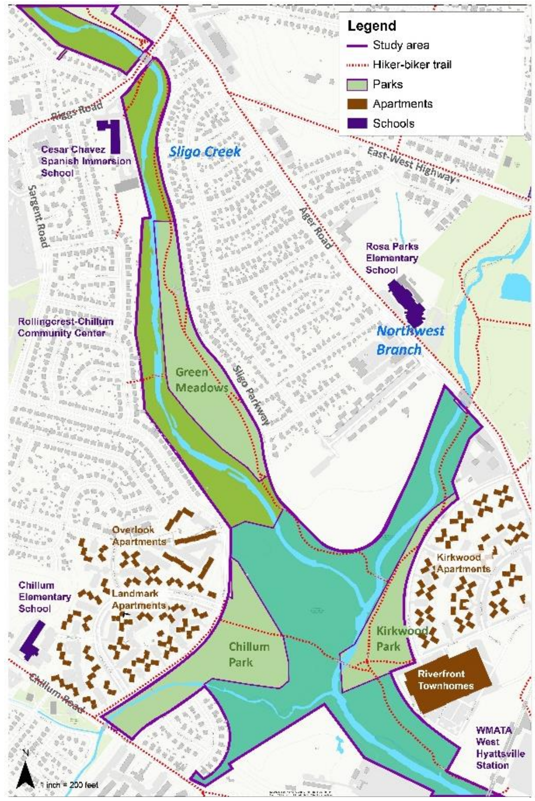

Figure 28: Green Meadows, Chillum and Kirkwood Parks

The three parks currently serve the apartment complexes and single-family homes in their immediate vicinity. A row of parking spots along Sligo Parkway serves local sports groups who reserve the Green Meadows soccer fields for practice and competition. The West Hyattsville Metro provides access from further afield. Each of the parks has a playground, pavilion, and playing fields, though they vary in size and quality (Table 3). Green Meadows, the most heavily used of the three parks, has two softball diamonds and a large soccer field as well as basketball and tennis courts and a small community center. In the spring and summer, activity in the parks picks up in the late afternoon when the sun starts to sink behind the tree line, casting shade on the playing field (Figure 29). Individuals, couples, and families stroll, run, bike, scoot, skateboard, and walk their dogs on the asphalt paths through Green Meadows and along the Northwest Branch in Kirkwood Park. The asphalt path through Chillum Park is less used, although five eight-tier bleachers bordering a large cricket field connote large pre-pandemic crowds. In all three parks, younger kids climb, slide, and swing in the playgrounds while older kids and adults play competitive and pick-up soccer on the fields. During my study, a new playground was installed at Kirkwood Park to serve the new Riverfront development near the West Hyattsville Metro (Figure 30). On weekend evenings, the Kirkwood and Chillum pavilions are often decorated with balloons and streamers for birthday parties and graduation celebrations (Figure 31). Wedged between the community

Table 3: Park Facilities

Park	Acres	Facilities	Qty
Green Meadows	16.31	Playground	2
		Community Center	1
		Pavilion	1
		Grill	1
		Basketball court	1
		Tennis court	2
		Softball field	2
		Multipurpose field	2
		Hard surface trail	.55 mi
Kirkwood Neighborhood Park	9.44	Playground	1
		Pavilion	1
		Grill	1
		Basketball court	1
		Volleyball court	1
		Soccer field	1
		Hard surface trail	.48 mi
Chillum Community Park	16.85	Playground	1
		Pavilion	1
		Grill	1
		Fountain	1
		Cricket field	1
		Hard surface trail	.15 mi

Figure 29: Green Meadows soccer field

center and playground, the Green Meadows pavilion is used infrequently for small gatherings.

Both Sligo Creek and the Northwest Branch attract fishers and waders, some with hammocks and portable grills. A step pool just beyond the Green Meadows tennis courts is a popular swimming spot (Figure 32). Along the edges of the playing fields, people sit in their folding chairs or picnic and exercise on blankets. Stripped of their nets in March to discourage close contact during Covid-19, the basketball courts at Green Meadows and Kirkwood Parks were used for aerobics, yoga, or learning to ride a bike. Longer distance hikers and bikers following the Sligo Creek trail ride through Green Meadows Park to reach the Northwest Branch trail which leads northeast to Silver Spring and southwest to Washington, DC.

Figure 30: New playground at Kirkwood Park

Figure 31: Chillum Park pavilion and playground

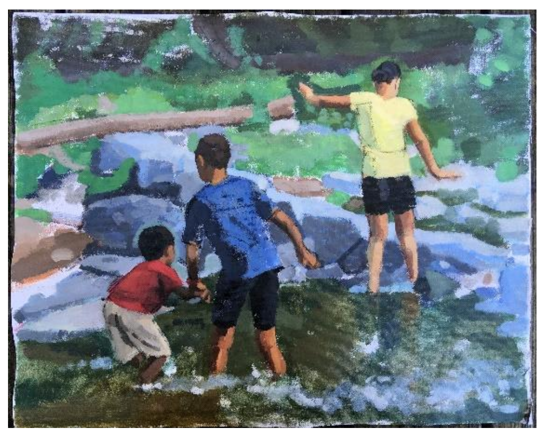

Figure 32. Study of siblings wading in step pool

Physical Attributes

Topography

The topography of the study area slopes northwest to southeast from a high point of 80 feet above sea level to a low point of 28 feet above sea level (Figure 33). As I follow Sligo Creek southward from the Piedmont to the Coastal Plain, the terrain flattens out and boulders in the stream decompose into pebbles and sand (Figure 34). An escarpment along the west side of Sligo Creek drops steeply toward the woodland, stream, and flat floodplain. A berm at the top of the escarpment along Ray Road isolates the woodland from the neighborhood. Discarded furniture, mattresses, and building materials litter the woodland side of the berm. Along the east side of Green Meadows, a six-foot-high levee built in 1968 by the US Army Corps of Engineers (USACE) to protect the neighborhood from flooding, creates a visual barrier and noise buffer. It is difficult to discern the original form of this highly engineered landscape.

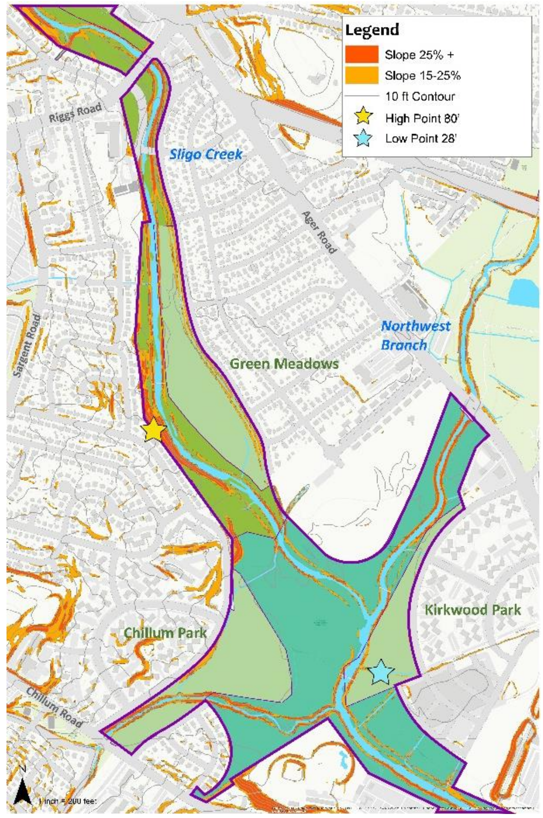

Figure 33. Topography map

Figure 34. Sligo Creek, Green Meadows

Hydrology

Green Meadows, Kirkwood Park, and a good portion of Chillum Park lie in the 100-year floodplain of the lower mainstem of the Sligo Creek stream valley (Figure 35). In addition to the levee, flood control measures from the 1960s to the present have involved straightening and hardening the edges of Sligo Creek with a concrete embankment just south of Riggs Road and concrete and steel grade control structures within the stream to move stormwater quickly and efficiently downstream. An 1878 map of the area shows how dramatically the free-flowing meander of the stream was altered to protect new development (Figure 36). The clearing and construction for this system resulted in a substantial loss of wetland. Only a thin band of riverine wetland and two areas of palustrine forested wetland remain. Stormwater runoff coming from impervious roofs, driveways, sidewalks,

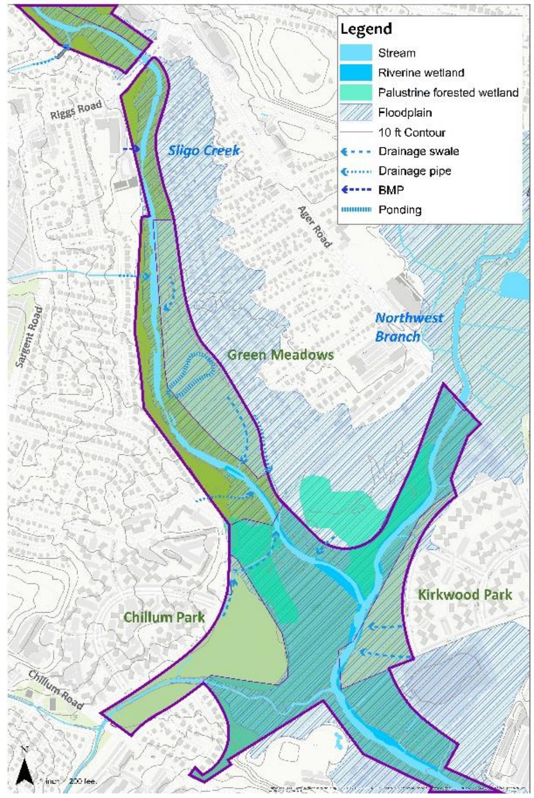

Figure 35. Hydrology map

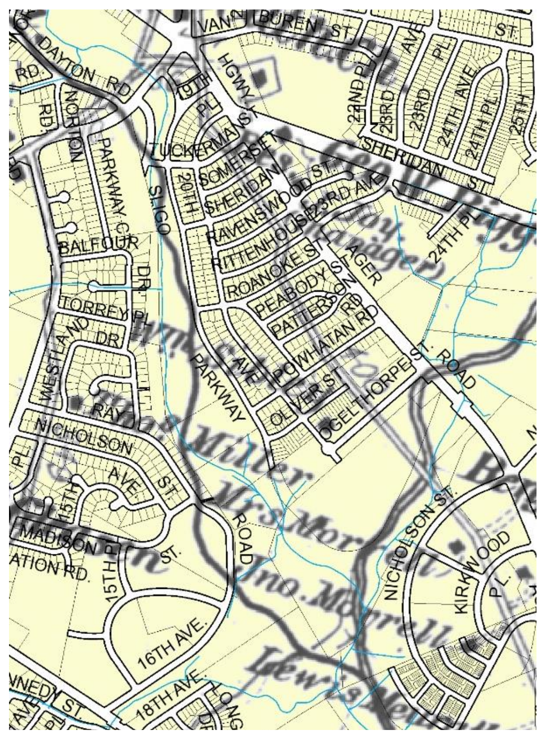

Figure 36. 1878 Hopkins Atlas

and roads is collected through storm drains and piped directly into the stream. In the parks, concrete or grass swales direct runoff to the stream. Some are broken or blocked by vegetation and debris (Figure 37). Green Meadows and Kirkwood Parks often have standing water more than 24 hours after a rain event (Figure 38). According to the Prince George's County floodplain ordinance, any new structure should be built at least one foot above the Flood Protection Elevation (FPE) and must be designed to minimize floodplain disturbance and resist the 100-year flood (PGC, 2021).

Figure 37. Broken concrete drainage swale

Figure 38. Flooded Green Meadows playground

Channelization and armoring reduce the sinuosity of the stream and the acreage of spongy wetlands that naturally regulate the hydrological cycle. Destroying the habitats in these overflow areas has been detrimental to aquatic biodiversity. To improve fish habitat and allow passage, the USACE will be replacing some of the remnants of this system with riparian vegetation and cross vanes that raise the streambed behind the structure to form pools (USACE, 2018).

Sligo Creek and the Northwest Branch are designated as Use Class 1 by the Maryland Department of the Environment (MDE), which means that they should be clean enough to support aquatic life and water contact sports. I have observed people fishing, wading, and swimming in these streams (Figure 39). Unfortunately, the streams still receive stormwater runoff that brings nutrients, sediments, PCBs, fecal coliform bacteria, trash, and microplastics. The volume and speed of the stormwater also causes erosion, incision, and sedimentation. In 2014, the MDE issued Prince George’s County a new Municipal Separate Storm Sewer System (MS4) permit that required the County to meet total maximum daily load limits set by the EPA. Recommendations in the 2015 Restoration Plan for the Anacostia River Watershed also include Environmental Site Design bioretention systems such as bioswales, riparian buffers, reforestation, stream restoration, and wetland restoration (Tetra Tech, 2018). In 2017, a submerged gravel wetland was installed by the USACE at the Cesar Chavez Spanish Immersion School overlooking Sligo Creek to treat runoff from the parking lot. The work that the USACE will begin in the fall of 2022 along Sligo Creek and the Northwest Branch will include floodplain reconnection, invasive species removal, and a one-time planting of native species adjacent to the stream (USACE, 2018).

Figure 39. Waterplay in Sligo Creek, Green Meadows

Soils

The frequently flooded soils on the site are combinations of Codorus, Hatboro, and Issue-Urban land complex; Codorus-Hatboro-Urban land complex (CH) in the area of Green Meadows regraded for flood control; Codorus and Hatboro (CF) in the wooded section where the streams converge, and Issue-Urban land complex (Iu) in the Chillum Park area where more development has taken place (Figure 40). Loamy Codorus is found in the floodplain and belongs to hydrologic soil group C. It is moderately well-drained with a depth to water table of 20-40”. Hatboro is a silt loam found in floodplain channels. It belongs to hydrologic soil group B/D and, with a depth to water table of 0-10”, drains poorly and ponds frequently. Issue-urban land complex is a silt loam found in the drainageways on the floodplain. It belongs to hydrologic group B/D and is somewhat poorly drained with a depth to water table of 10”-20” (USDA/NRCS, 2020). Areas of the B/D soils might drain poorly during the wet season (D soils) but drain better than the C soils group during the dry season (B soils). With the variation in depth to water table among the different soil types a perc test would be needed to determine where bioretention and new construction are appropriate.

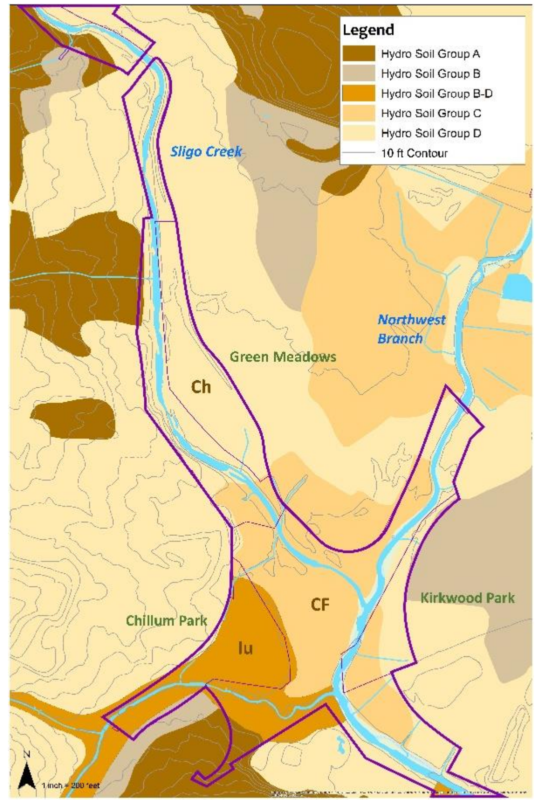

Figure 40. Soil map

Circulation

The Sligo Creek and Northwest Branch hiker-bike trails that connect at Kirkwood Park were designed primarily for through traffic, with a few awkward turns at bridge intersections. Neighborhood access, clear sight lines through wooded areas, smooth and safe transitions from bridge to trail, and environmental features and conditions seem to have been less of a consideration when the trails were built (Figure 41). On the west side of Green Meadows, the only connection to the park is an unmarked path between houses that leads down a steep and secluded set of concrete steps to a sunken path and a bridge over Sligo Creek (Figure 42). An MS-13 tag is scrawled across the trunk of a beech tree, indicating gang activity. Beer cans litter the bridge abutment. On the other side of the bridge a steep asphalt ramp leads down to the playing fields where walkers and

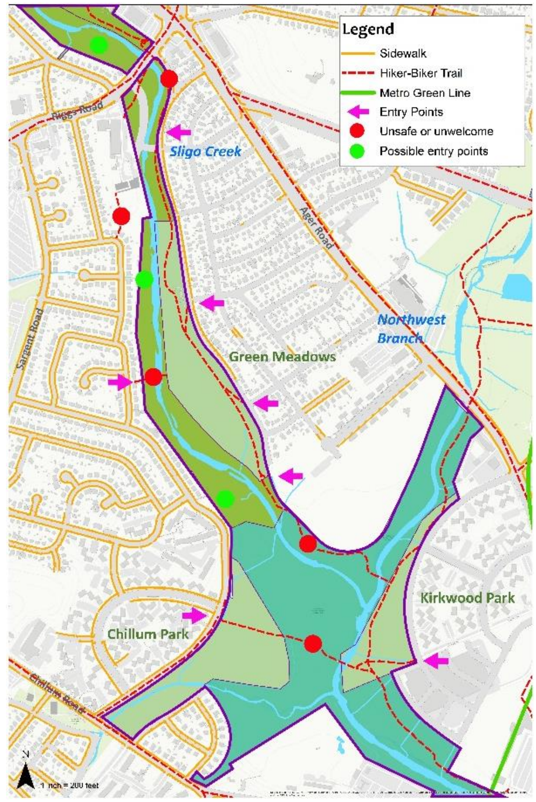

Figure 41. Circulation map

Figure 42. Secluded entry, Green Meadows

bikers must find their way across the fields to the Sligo Creek trail. This path feels unsafe, unwelcoming, and disconnected from the main trail. On the east side, three spurs over the flood control levee provide access from the Green Meadows neighborhood to the Sligo Creek trail. I identified three parcels of parkland that could serve as entry points on the west side of Sligo Creek. A privately owned but undeveloped lot at the terminus of Sligo Parkway could provide greater access on the east side.

Figure 43. Intersection of Sligo Creek and Northwest Branch trails

Between Green Meadows and Kirkwood Park, the trail dips and turns sharply left over a bridge above Sligo Creek, winds through a glade, and then sweeps right over the bridge above the Northwest Branch, ending abruptly at a T-intersection (Figure 43). Angling away from the bridges at either end, this section of trail is not visible from the adjacent parkland. Soon after I began my site inventory, a colleague was held up at gunpoint in this area during an early morning bicycle commute. The police told him that muggings sometimes occur early and late in the day when fewer people are around. The same lack of visibility holds true for a trail spur that loops back over the Northwest Branch toward Chillum Park and provides pedestrian access to the West Hyattsville Metro. These blind spots make the trails feel unsafe and discourage use. In addition to limiting visibility, the sharp turns and abrupt intersections make the trails difficult to navigate on a bike. Realigning these trails to have greater turning radii, and to be visible from access points and activity areas where there are likely to be a greater concentration of people, would increase the safety and comfort-level of trail users.

I identified numerous dirt paths down to the stream that suggest a desire for access, notably where boulders or riffle structures provide a place to observe, chat, fish, or swim. Arching over the stream, the weathered Cor-ten Steel and wood plank bridges provide a vantage point for experiencing the stillness of reflective pools or the power of the rapids.

<u>Biological Attributes</u>

Ecological Communities

An aerial photo of this area taken in 1938 shows the land between the streams completely cleared for agricultural use (Figure 44). The surrounding neighborhoods were built soon after, and a successional tulip poplar forest grew in around the fields. In ideal conditions, this plant community would also include redbud and spicebush (Harrison, 2016). What remains (Figure 45) has been badly degraded by the disturbance of frequent flooding, deer grazing, sewer and gas line maintenance, invasive plant species, and trash. A very thin riparian buffer on the

Figure 44. Aerial photo, 1938

east side of Sligo Creek is being taken over by invasive porcelain berry, autumn clematis, and wineberry. The interior woods are predominantly tulip poplar covered in English ivy, which matures and bears fruit when it grows vertically. There is very little understory.

The turf areas that are used for field sports in the warmer months extend well beyond the playing fields. Methods to improve sustainability and increase biodiversity on the site could include

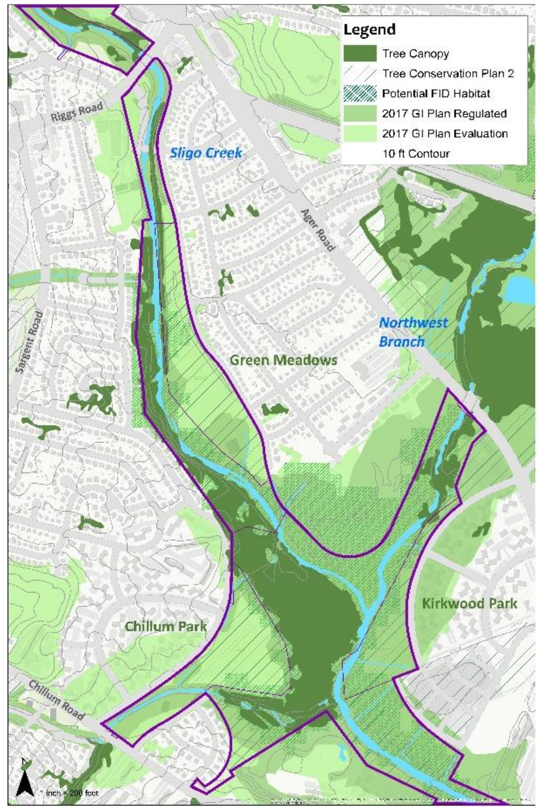

Figure 45. Vegetation map

planting a buffer of native trees, shrubs, forbs, and grasses along the edges of the fields and streams. The Maryland Department of the Environment and Prince George's County consider 35 feet of riparian buffer on either side of a stream to be the minimum width to provide shading, water quality, and other environmental benefits (MWCOG, 2005). Where possible, 100 feet is recommended, and 200 feet is preferred for sediment and nitrate removal. A continuous patch of riparian forest at least 50 acres in size has the potential to provide habitat to forest interior dwelling species such as hawks, owls, and warblers. In 2005, the Metropolitan Washington Council of Governments set a goal and provided strategies for establishing 12 additional miles (45 acres) of forested riparian buffer in the Anacostia Watershed by 2010 (MWCOG, 2005).

Cultural Attributes

Demographics

According to the M-NCPPC (2015), African Americans and immigrants from Central America and West Africa with low-to-moderate incomes make up a large portion of the community surrounding the parkland. Median household income is $62,733 which is 75% of the median income for Maryland. There has been a 30% growth in the Latinx population since 2010 and 11.3% projected growth for 2025.

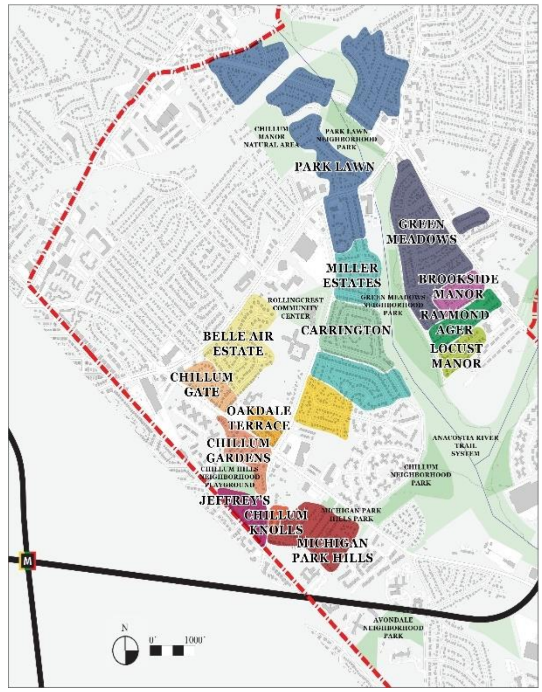

Figure 46. Chillum communities

Projections indicate that the overall immigrant population will increase. As it does, the African American population is likely to decline. Larger, multigenerational families and immigrants seeking affordable living situations will expand the size of households. The community is also relatively young, with a median age of 33.8. Sixty-nine percent of residents have received a high school degree or higher.

Green Meadows, on the east side of the park, is the oldest neighborhood in Chillum (Figure 46). The single-family frame houses in simplified Cape Cod and Colonial Revival styles were built at the end of WWII as an automobile suburb (Figure 47). The neighborhoods of Brookside Manor and Raymond Ager were built within the next 10 years. The duplexes and garden apartments in Locust Manor followed in the 1960s. This section qualifies for the low-income housing tax credit.

The Chillum neighborhoods along Ray Road on the west side of the park (Parklawn, Miller Estates, and Carrington) were built in the 1960s in simplified masonry or frame Cape Cod styles (Figure 48). Two large garden-style apartment complexes, the Overlook and Landmark Apartments, look over Chillum Park (Figure 49). The two-story brick Kirkwood Apartments border Kirkwood Park. Currently under construction, the Riverfront at the West Hyattsville Metro will add 300-400 apartment units, 183 townhouses, 10,000 square feet of commercial space, a park, an amphitheater, and improvements to the Northwest Branch Trail.

Figure 47. Green Meadows single-family homes

Figure 48. Miller Estates single-family homes

Figure 49. Overlook Apartments

Land Use

Three elementary schools and a community recreation center lie within a quarter mile of the park, although access currently depends on crossing busy streets and walking along some roads where there are no sidewalks (Figure 50). Cesar Chavez Spanish Immersion School overlooks Sligo Creek but is cut off from the park by a chain link fence. Religious institutions, including a Catholic Seminary, 7th Day Adventist and Ethiopian Orthodox Churches, and a

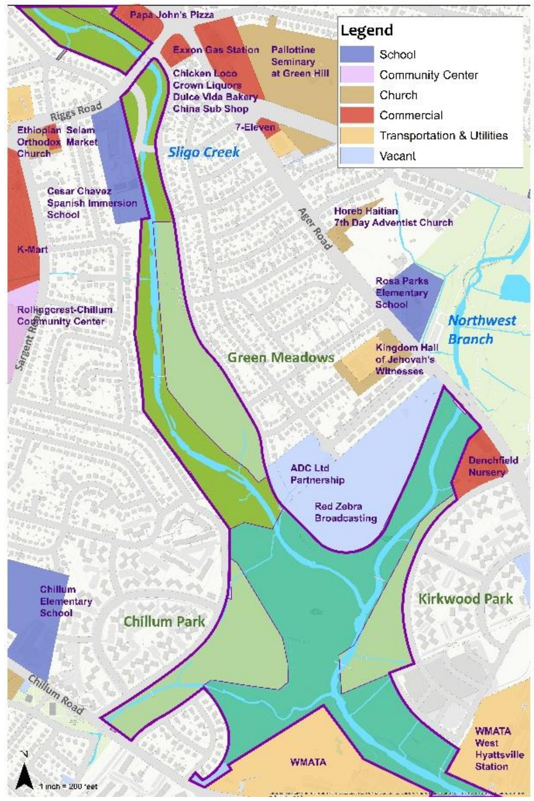

Figure 50. Land use map

Jehovah's Witness Kingdom Hall exemplify the religious diversity of the area. To the east, three radio towers rise out of an 18-acre lot on Ager Road where bioretention swales for the Riverfront are being constructed. Between this land and the park is a 3-acre vacant parcel owned by a real estate developer. With a traffic light and sidewalk on Ager Road, an access route through this parcel could safely connect the Rosa Parks Elementary School to the park.

<u>Sensory Attributes</u>

In addition to walking the Sligo Creek and Northwest Branch trails at different times of day in all seasons and types of weather, I explored the neighborhoods, fields, woods, and streams, taking note of my sensory impressions. In an early journal entry, I wrote:

> After passing the ball fields at Kirkwood Park I cross back over the rapids of on a high bridge. My footfalls get lost in the sound of water rushing over rocks. A man leaning on the bridge railing looks over crossed forearms at the stream below. On the other side of the bridge, I skid down a sandy path to a pebble beach. Mid-stream, the current flows around a large boulder where a man sits talking on his cell phone while his kids play in the rapids.

To spatially locate these impressions, I created maps for the auditory, haptic, and visual perceptual systems, pegging a unique symbol for each stimulus to the place I experienced it and scaling it to approximately the range it covered. Using my body as an instrument, this sensory inventory helped me to understand which sounds, sensations, and sights attracted my notice, held my attention, and drew me in for further investigation. I found that these impressions aroused a range of physical and emotional responses: inspired (trees swaying in the breeze), becalmed (flowing water, dappled light, warm stone), cheered (birdsong), energized (footfalls on wooden bridge, bare feet on grass), irritated (motorized bicycles), defensive (traffic), or disgusted (stagnant filmy water, trash). By accentuating the stimuli I found uplifting, calming, and energizing, and by minimizing the stimuli I found irritating, stressful and repellent I hope to create a positive and engaging experience for park users.

Auditory Perceptions

In my inventory of sounds, I distinguished between those that I *received* such as the stream, birdsong, and the wind, and sounds I *imposed* through my own actions, such as footfalls on dry leaves or a wooden bridge (Figure 51). The sight and sound of the stream where it cascaded over a riffle structure, eddied around boulders, or flowed beneath a bridge was captivating to me and to many passers-by whom I saw pausing to look and listen.

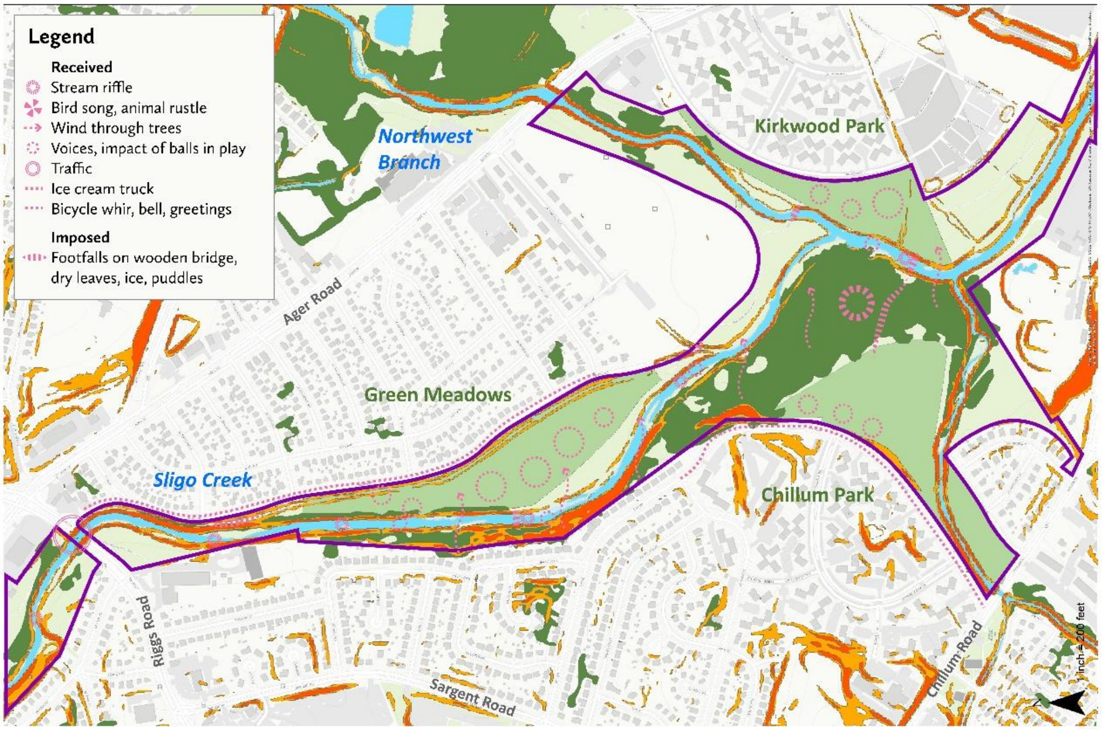

Figure 51. Auditory map

Haptic Perceptions

As I walked through the study area, my feet fell on a variety of surfaces: the smooth, hard asphalt of the trail and basketball courts; springy wood bridges; spongy grass playing fields; packed dirt or shifting sand and pine needles along the riverbank; hard uneven boulders, stones, or pebbles in the stream; springy mulch in the playground; or the crunch and snap of leaves and brush on the forest floor (Figure 52). Weather and seasonality influenced my haptic (as well as other sensory) experiences. Where overhung with trees, the paths are strewn with leaves in the fall, crackling underfoot and occasionally causing me to slip. After rain or snowmelt, I splashed through puddles of water in depressions in the paths and fields. My boots crunched over the ice and snow blanketing the bridges.

When I climbed to a road or bridge and then descended on the other side, I was aware of different muscle groups working against gravity to push me forward or hold me upright. I imagined if I were playing soccer, tennis, or basketball, my limbs, feet, and hands would feel the impact of a ball or of other bodies. On the playground, my entire body would be engaged in climbing, swinging, or sliding.

The heat of the summer sun is intense in the open fields. In the afternoons, people sit with their coolers at the woods edge to watch the soccer games while kids and adults splash in the stream.

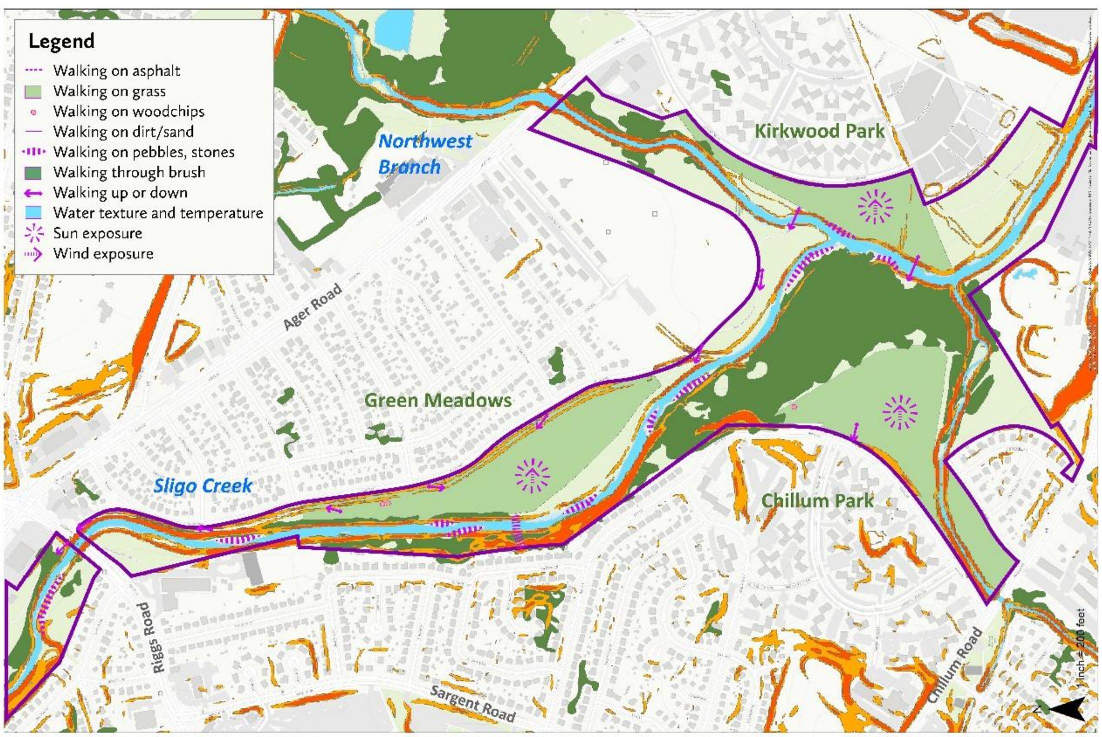

Figure 52. Haptic map

Visual Perceptions

As I followed the trail, I noticed where my view was open and where it was obstructed. At Green Meadows, my view was circumscribed by the woods to the west and the levee to the east, directing my focus to activity on the open fields (Figure 53). In the wooded areas between Green Meadows and Kirkwood Park and between Kirkwood Park and Chillum Park, I could not see beyond the next bend. Visibility changed dramatically with the seasons as foliage came and went. In the winter, I was able to see through the woods to parkland and neighborhoods on the other side (Figure 54). The loss of vegetative cover revealed the shape of the land, the structure of the woods, and where things were in relation to one other, suggesting possibilities for connection. I also noted landmarks that were visible from multiple vantage points such as the three radio towers. Although not recorded on my visual inventory map, I studied light patterns, landforms, plant structures, and surface colors and textures through sketching and painting (Figure 56). The visual map indicates where points of interest could lead visitors through the parks and where path realignment could improve visibility (Figure 56).

Figure 53. Levee between park and neighborhood

Figure 54. Profile of Overlook Apartments through the trees in winter

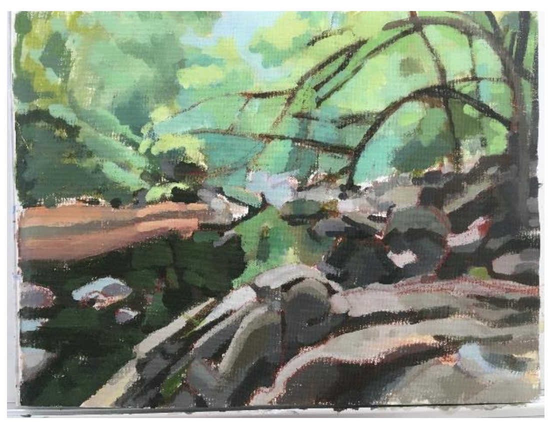

Figure 55. Study of Sligo Creek

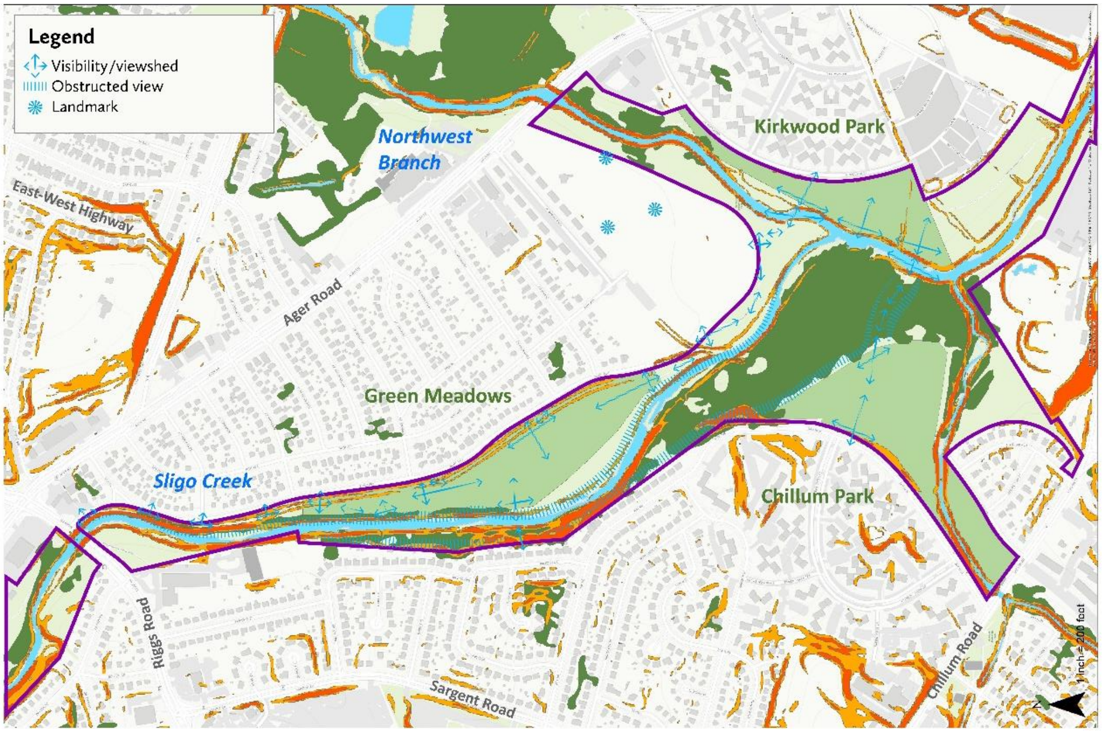

Figure 56. Visual map

Site Selection

The sound of water and voices first drew my attention to a section of Sligo Creek where a step pool has become a popular swimming spot (Figure 57). This rare instance of people interacting directly with nature became the inspiration and location for my design concept. Several stormwater inlets empty into Sligo Creek here: a concrete pipe that directs runoff collected from storm drains along Sligo Parkway into a tributary of Sligo Creek; a grass swale that collects runoff from the Green Meadows playing fields; and a broken concrete swale that directs runoff collected from storm drains along Ray Road (Figure

Figure 57. Step pool, Green Meadows

58). The woodland has been disturbed by repeated flooding, invasive species, and trash.

A small area of parkland on Ray Road to the west of Sligo Creek where the steep topography levels out, the Sligo Creek Trail and the dead end of Sligo Parkway, and an undeveloped lot on 20th Avenue to the east could serve as access points (Figure 59). Cesar Chavez Spanish Immersion School, Rosa L. Parks Elementary School, Chillum Elementary School, and the Rollingcrest-Chillum Community Center lie within a quarter mile of the site. This leftover, in-between space could be transformed into a lively confluence of woodland, wetland, stream, and community.


Figure 58. SWM facilities and access points

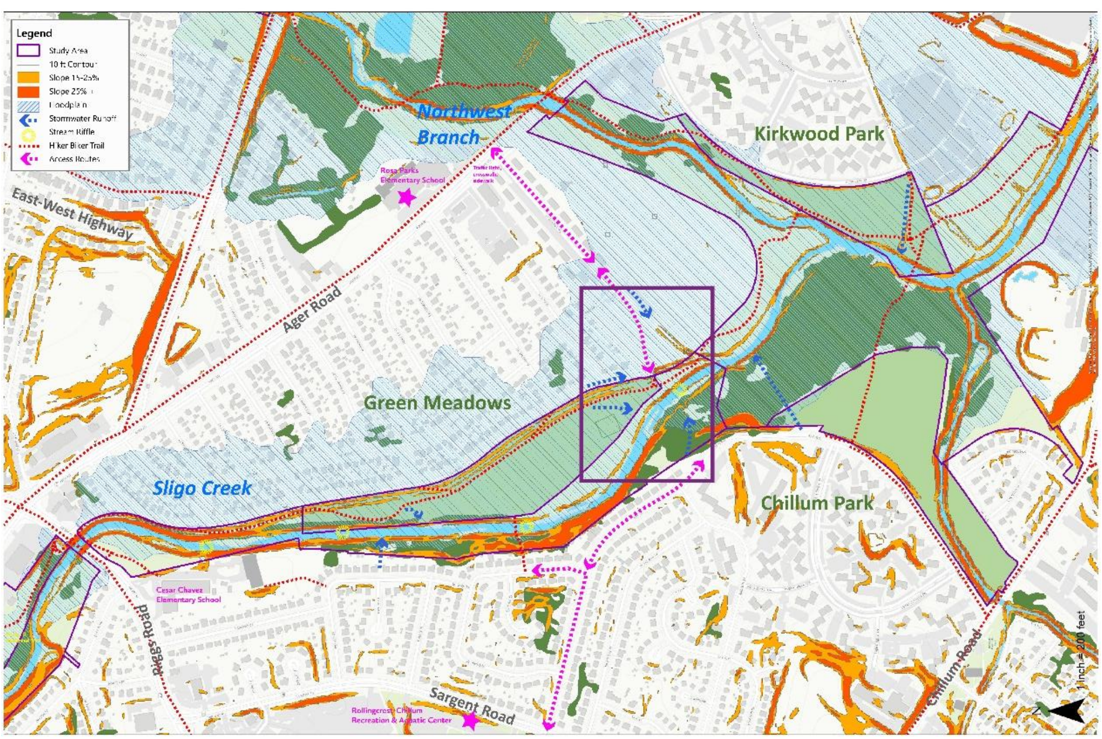

Figure 59. Site location map

Chapter 5: Confluence Community Park

Design Concept

I propose to apply my Sensory Design Framework, adapted from Gibson's *Table of Perceptual Systems* on page 7, by designing affordances or *sensory design features* that accentuate the environmental attributes detected on the site through the sensory site inventory. As shown in Table 2 on page 26, each of these sensory design features will resonate with one or more of the perceptual systems: basic orienting, auditory, haptic, taste-smell, or visual. The site design will demonstrate the richness and coherence of the Sensory Design Framework as applied to a particular context.

Design Program

A central pavilion set into a cul-de-sac at the end of Sligo Parkway and a stream terrace that overlooks a series of shallow steps pools in Sligo Creek draw visitors into the park from the surrounding neighborhoods and the Sligo Creek Trail. (Figure 60). A winding quarter-mile long wood boardwalk forms the spine of the park, hovering at least 30 inches over the floodplain as it gradually drops ten feet from the western entry at Ray Road to the central entry at Sligo Creek Trail and Sligo Parkway. The eastern section of the boardwalk stretches between Sligo Parkway and 20th Avenue. A series of five semi-circular observation decks overlook the various ecotypes that make up the newly planted riparian buffer, including wetland, woodland, stream, meadow, and floodplain. Aging stormwater infrastructure is replaced by five vegetated bioswales.

A circle motif repeats at various scales and configurations throughout the park, both in structure and detail: in the round pavilion and the ruffled edge of its roof; in the curve of the boardwalk around the meadow and its rounded railing; in the semicircular decks; and in the three copper arches that frame the west and east entries to the park. This motif serves as an embodied metaphor: a form that represents the cyclical and dynamic relationship between human beings and the natural world, while also affording the physical experience of being circumscribed or encompassed.

Figure 60. Site plan

If you imagine the boardwalk stretched out like a beaded necklace, this centerline profile (Figure 61) illustrates the journey that a visitor would take from the west end of the boardwalk at Ray Road to the east end at 20th Avenue, and the sequence of focal points and activity areas they would encounter along the way.

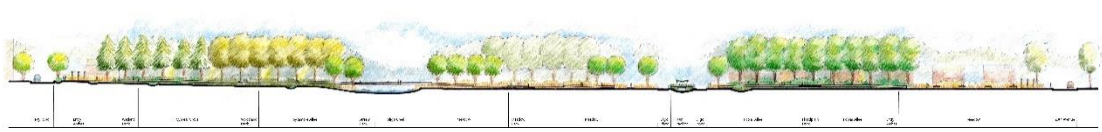

Figure 61. Centerline profile of boardwalk journey

Sensory Design Features

Confluence Arches

Three rounded copper arches frame the west (Figure 62) and east (Figure 63) entrances to the park. The entry arches turn the circle motif on its side, with sides that gradually overlap overhead as the visitor passes through them, representing the confluence of waterways as they also delineate the sweep and embrace of outstretched limbs. The telescoping forms direct the gaze down the length of the boardwalk and instill a sense of forward motion, as visitors become aware of the

Figure 62. Confluence arches at west entry on Ray Road

Figure 63. Confluence arches at east entry on 20th Avenue

relative size, shape, weight, and orientation of their bodies. The hammered copper surface and welded seams reveal the hand of the maker. The copper will eventually oxidize, displaying the effects of weather and time.

Paths

As visitors approach Confluence Community Park from the north, the Sligo Creek hiker-biker trail has been elevated out of the floodplain and onto the levee to strengthen the visual connection between the Green Meadows neighborhood and the park (Figures 64 & 65). Street trees provide cooling and a bioswale treats runoff from the playing fields.

Figure 64. Existing levee and trail

Figure 65. Elevated Sligo Creek trail

A crushed granite path intersects the Sligo Creek trail, leading east to a pavilion and west to a boardwalk (Figure 66). The crunch of the gravel stimulates feet and ears, signaling a shift in terrain.

Figure 66. Sligo Creek trail and path intersection

Rain Pavilion

At the dead-end of Sligo Parkway, a permeably paved cul-de-sac provides a turnaround point and nexus between the Green Meadows neighborhood and the park (Figures 67 & 68). A new five-foot wide sidewalk encircles the cul-de-sac, then follows the east side of Sligo Parkway to an existing sidewalk that leads to Ager

Figure 67. Dead end of Sligo Creek Parkway

Figure 68. Permeable cul-de-sac

Road and Rosa Parks Elementary School. The permeable pavers collect runoff from the lower end of Sligo Parkway. A bioswale at the center of the cul-de-sac treats the runoff before it is channeled through a stone runnel to Sligo Creek.

Figure 69. Rain pavilion

During a rain event, the sound of cascading water draws visitors to the pavilion at the center of the bioswale (Figure 69). The inverted copper roof directs rainwater to a central aperture where it falls to an underground cistern to be treated with ultraviolet rays and recirculated in a fountain. Visitors passing from one side of the park to the other can sit on the circular bench or dip feet and hands in the fountain.

A section of the rain pavilion (Figure 70) illustrates two overlapping

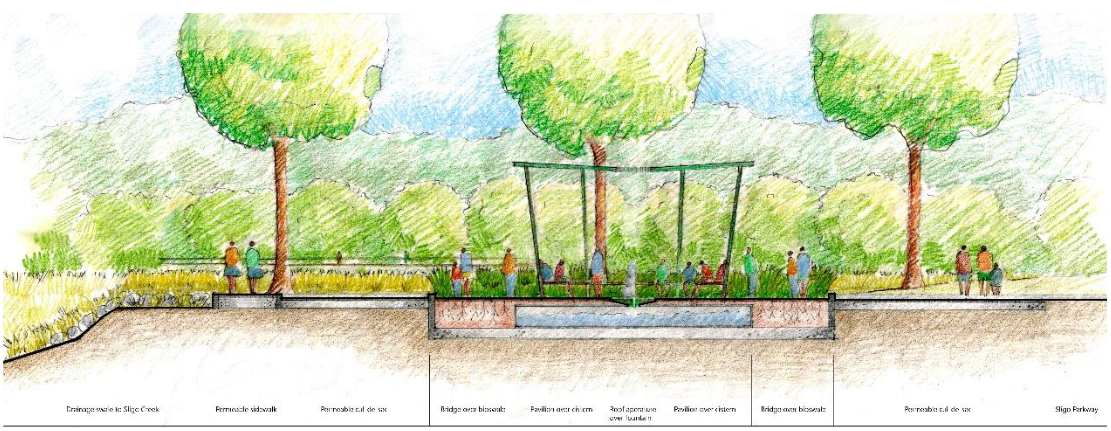

Figure 70. Section of pavilion and cul-de-sac stormwater treatment trains

stormwater treatment trains: the reuse of rainwater for human contact as it falls through the central aperture in the roof and the treatment of stormwater runoff as it is filtered through permeable pavers and into the bioswale before entering Sligo Creek.

Boardwalk

The spine of the park is a winding quarter mile long wooden boardwalk that gradually ascends from east to west over the floodplain, intersecting Sligo Parkway, the Sligo Creek trail, and the creek itself and intertwining with bioswales that slow and treat stormwater runoff (Figure 71). Its curving form simulates the meander of a free-flowing stream. The boardwalk hovers 30” over the ground plane, meeting the grade at both ends and at the center where it intersects the parkway and trail. Overall, the boardwalk rises 8’ from the floodplain which lies at an elevation of 43’ above sea level to Ray Road which lies at an elevation of 51’ above sea level.

Figure 71. Boardwalk

From the central entry at Sligo Creek Parkway and the Sligo Creek Trail, the western section of the eight-foot-wide boardwalk rises at a gentle 3% slope from the floodplain and then levels off, rises, and then levels off again, until it meets the sidewalk on Ray Road (Figure 72). This subtle horizontal and vertical undulation causes visitors to adjust the angle and direction of their bodies as the wooden boards resound with each footfall.

Figure 72. Entry to boardwalk from Sligo Parkway and trail

The wood railing that guides visitors along the boardwalk has a smooth rounded surface that invites touch. Views gradually unfold as the eye follows the

Figure 73. Curved railing

curve of the boardwalk and railing along the stream banks and over the stream (Figure 73).

From the bridge one can survey the stream, a series of step pools, a terrace and steps leading down to the stream, and both entrances to the boardwalk as the sounds of voices and cascading water float up from below (Figure 74).

Figure 74. Stream crossing

Observation Decks

The boardwalk features five semi-circular observation decks that overlook the various ecotypes: stream, wetland, meadow, and woodland, that make up the riparian buffer (Figure 75). Each ecotype includes native plants selected for their seasonal color, texture, scent, resilience, and wildlife appeal.

A two-foot-deep bench follows the curve of each deck, offering flexible seating options. Visitors can choose which direction to face and whether to sit alone or with others. As landscape architect Laurie Olin notes, “Benches that are concave toward adjacent circulation and open space are conducive to sociability because each person seated there is … turned toward the others seated there” (Olin, 2017, pp. 141-142). The rounded railing provides a comfortable backrest.

Figure 75. Observation decks

Within view of the west entry on Ray Road, the Wetland Deck (1) passes through a grove of bald cypress trees, which thrive in swampy conditions (Figure 76). The finely textured needles dampen sound, filter light, and provide a soft landing underfoot. The pale green seedpods display a fractal pattern that fascinates the eye.

Figure 76. Wetland Deck

An allée of sycamore trees leads to the Woodland Deck (2), which is lit up in the fall by large yellow leaves and striking white and tan peeling bark. The curved bench sweeps over the woodland bioswale as it broadcasts the sound of cascading water after a rain event (Figure 77).

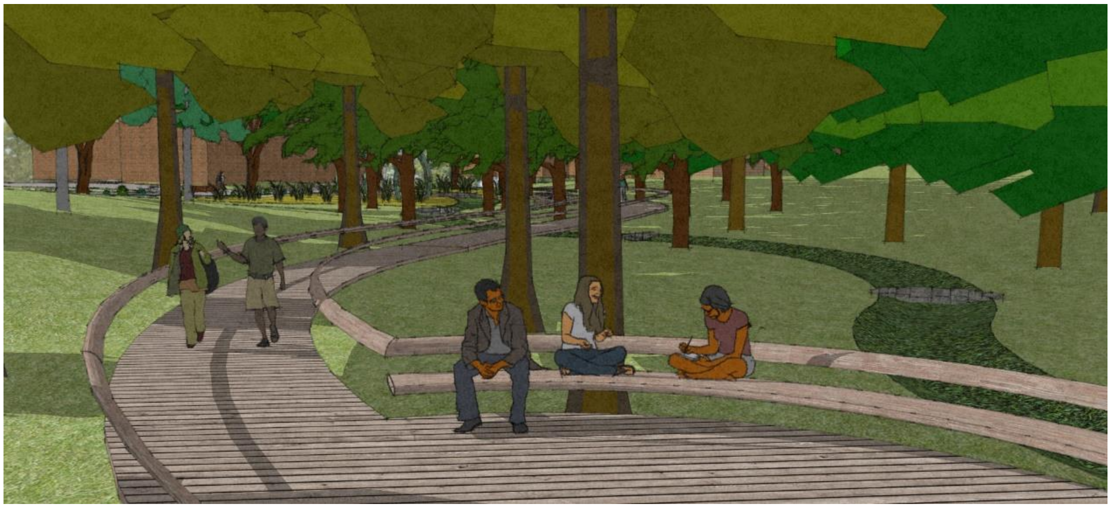

Figure 77. Woodland Deck

Surrounded by river birches and the sound of the stream, the Stream Deck (3) adjoins the bridge (Figure 78). Here at the edge of Sligo Creek where the canopy opens up, the semi-circular deck provides a firm support for exercise and play and a canvas for shifting patterns of dappled light.

Figure 78. Stream Deck

On the east side of the creek, the Meadow Deck (4) overlooks a tapestry of short grasses, such as prairie dropseed and little bluestem, and pollinators such as bee balm, coneflower, and aromatic aster (Figure 79) as the boardwalk descends to the floodplain. Log steppers of various sizes harvested from a dead sycamore tree invite adventurous visitors to step, leap, jump, and climb through the meadow.

Figure 79. Meadow Deck

Beneath the sheltering canopy of tulip poplars, the Floodplain Deck (5) overlooks a flat expanse of densely planted grasses and perennials punctuated with scented shrubs such as Carolina allspice and chokeberry (Figure 80).

Figure 80. Floodplain Deck

Stream Terrace

On the east bank of Sligo Creek, an elliptical stone terrace with a curved wooden bench and wide, shallow steps flanked by boulders provides access to the stream and a variety of places to sit. Within the stream, three C-shaped stone cross vanes or weirs form a sequence of shallow step pools and serve as step stones when the stream is low. The weirs broadcast the sound of cascading water as they attenuate the velocity of the stream and improve fish passage (Figures 81 & 82). The moving current and uneven surface of the stream bed engage muscles and joints in keeping the body upright.

Figure 81. Step pool and east bank

Figure 82. Step pool and terrace

A meandering mosaic embedded in the terrace mimics the stream and stimulates bare feet. The arrangement of large stones and small pebbles reflects the changing composition of the streambed as it travels from the Piedmont to the Coastal

Plain. A section illustrates how the terrace sits on the stream bank in relation to the stream, the riparian buffer, the boardwalk, and the Sligo Creek trail (Figure 83).

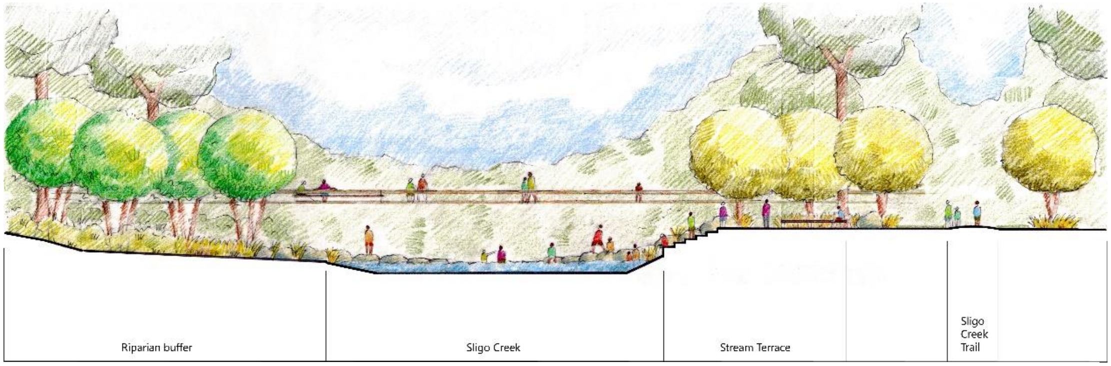

Figure 83. Section of stream terrace

Bioretention

The aging stormwater infrastructure is replaced by five vegetated bioswales. Bioswales 1, 2, and 3 reduce the velocity of runoff by directing it along longer, more sinuous flow paths (Figure 84). Bioswale 4 surrounds the rain pavilion at the center of

Figure 84. Bioswale locations

the cul-de-sac, filtering runoff from Sligo Parkway. Bioswale 5 collects runoff from a parking lot on 20th Avenue. Leaves, branches, and trunk surfaces intercept and absorb rainfall, reducing the amount of water that reaches the ground, and delaying the onset and reducing the volume of peak flows. Tree canopies reduce soil erosion by diminishing the volume and velocity of rainfall as it falls through the canopy, lessening the impact of raindrops on barren surfaces. Perennials and grasses send their roots deep into the earth while their foliage dies back every year, returning organic matter to the soil and increasing water-holding capacity. Plants taking up the stormwater filter out pollutants and return moisture to the air through transpiration (USEPA, 2013). Within the bioswales, moisture-loving trees such as sweetbay magnolia and serviceberry, shrubs such as summersweet and inkberry, and a ground layer of turtlehead, New York fern, and Pennsylvania sedge form a multi-layered sponge that also serves as a corridor for wildlife.

The seven-foot wide bioswale between the sidewalk and the curb (1) collects runoff from Ray Road, directing it under the boardwalk to the ten-foot wide bioswale (2) that winds through the woodland below the boardwalk (Figures 85 & 86). C-shaped stone weirs along both bioswales slow the flow of stormwater and broadcast the sound of cascading water when it rains.

Figure 85. Existing parkland on Ray Road

Figure 86. Ray Road bioswale emptying into woodland bioswale

An existing grass swale that collects runoff from the tennis court and playing fields on the east side of the creek (3) is widened and made more sinuous to increase capacity and lengthen the time it takes for runoff to reach the creek (Figure 87). A medley of trees, shrubs, perennials, and grasses introduces the plant palette to park visitors. A circular bioswale in the center of the cul-de-sac (4) collects runoff from Sligo Parkway and serves as a showcase for the wetland plants that occur throughout the park. A bioswale planted with trees, ferns, and sedges (5) captures runoff from the parking lot on 20th Avenue before it enters a tributary of the creek.

Figure 87. Sligo Parkway bioswale

Plant Palette

The plants for Confluence Community Park were selected for their form, color, texture, and scent as well as for their ecological functions, such as absorbing runoff and preventing erosion; improving air, water, and soil quality; providing food and habitat for wildlife; and increasing biodiversity (Table 4). The plants have been arranged to mimic the essential patterns and dynamics of each ecotype: woodland, meadow, and wetland, while maintaining clear sight lines.

Table 4. Sample of selected plants and their sensory attributes

Sycamore	Bald Cypress	River Birch	Spicebush	Baptisia	Echinacea	Prairie Dropseed
Yellow leaves in fall Coarse textured Peeling bark Large, fluffy seeds Rustle of dry leaves, crunch underfoot Food and habitat for wildlife	Rust leaves in fall Fine textured Fractal-pattern seeds Peeling bark Aromatic leaves, bark Food and habitat for wildlife	Yellow leaves in fall Dappled shade Catkins in spring Peeling bark Food and habitat for wildlife	Yellow leaves in fall Red berries in fall Yellow flowers spring Food for wildlife in spring and fall	Blue-green leaves Purple panicles spring Rattle of black pods Larval host plant for variety of butterflies	Long-lasting orange-deep pink flowers in summer Seedheads provide texture in winter Seeds & nectar for wildlife	Orange-tan fall color Soft, wispy texture Aromatic Seeds & cover for wildlife

Woodland

Woodlands contain different qualities of space. Tangled, dense thickets seem menacing while open groves feel welcoming. The essential layers of a forest include a closed tree canopy, a patchy understory, and a dense herbaceous ground cover (Figure 88). We prefer wooded areas that allow us to see into them, with a low understory, wide spacing between tree trunks and a broad sheltering canopy (Rainer & West, 2015). Like the proposed sycamore allée, trees can be used structurally to define a space. As Hungarian landscape designer Imre Ormos notes, “Allées have very strong architectural effects, like colonnades or the vaults of buildings. They have intense drift compelling us to pass on, to move on or to look along the line as far as the terminus” (1955, p. 315). Grouped together, the qualities of a singular species can be amplified to create an overall atmosphere. The grooved tapering trunks, soft texture, and filtered light of a bald cypress grove engenders a sense of quiet, enduring strength. In addition to animating the ground plane, a dense ground layer of ferns, sedges, and spring ephemerals with scattered shrubs will provide habitat for small creatures, retain moisture, reduce erosion, and crowd out invasive plant species.

Figure 88. Woodland plants

Meadow

From a distance, meadows read as a monolithic green background with seasonal displays of color and texture. Accent forbs rise out of the matrix of grasses in response to a change in moisture or elevation (Figure 89). We can see over meadows, taking them in with a sweeping gaze. This legibility and openness is soothing (Rainer & West, 2015). Up close, meadows are intricate and densely layered, drawing our fascination with the details of a leaf or flower or the activities of the insects and birds they attract. Vertically layering species to “inhabit different niches in space and time” provides a rich mosaic of compatible forms and a “green mulch” that protects and enriches the soil (Rainer & West, 2015, p. 52).

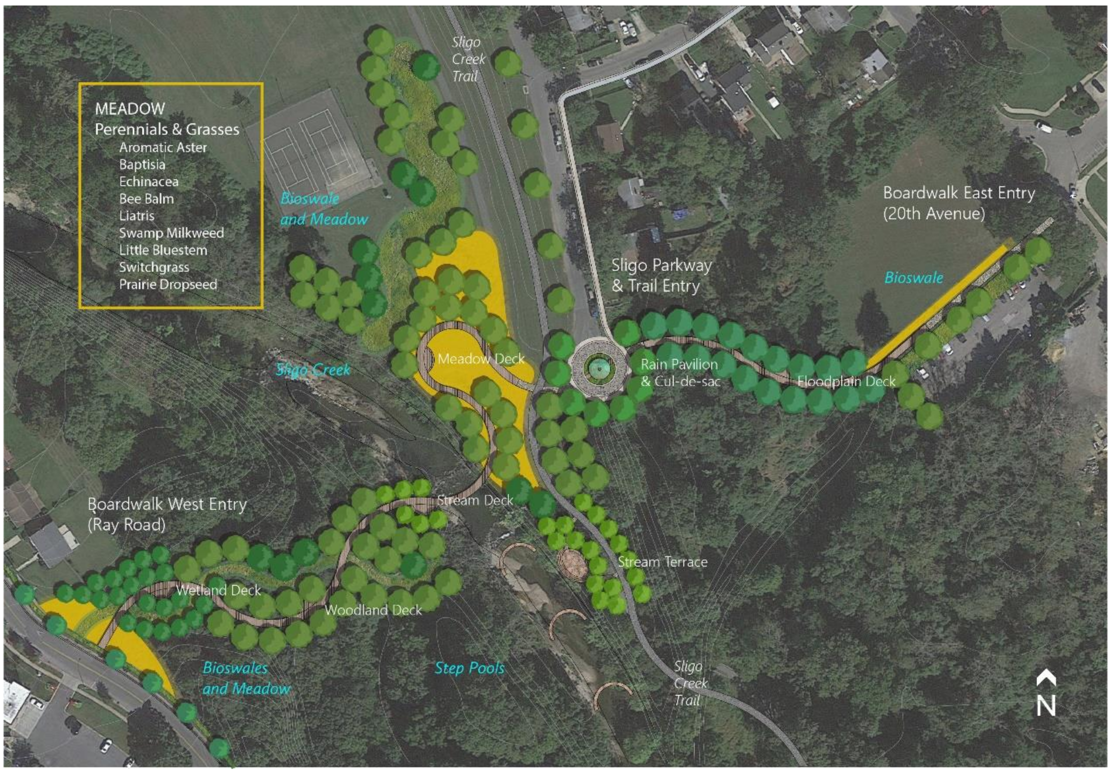

Figure 89. Meadow plants

Wetland

A contrasting composition of sedges, ferns, and taller perennials, shrubs, and trees expresses the change of depth and moisture in the bioswales (Figure 90). Each layer is visually distinct with a canopy of individual specimens or clumps of small trees or shrubs rising out of the herbaceous ground cover. The repetition of a handful of signature trees, such as sweetbay magnolia or serviceberry, among lower shrubs such as summersweet and inkberry, serves as a visual reference for the wetland ecotype throughout the site.

Figure 90. Wetland plants

Chapter 6: Discussion

For Confluence Community Park, the proposed sensory design features shown in column 6 of the Sensory Design Framework (and excerpted in Table 5) accentuate the environmental attributes of the site by resonating with one or more of the perceptual systems. For example, the boardwalk emphasizes the topography of the site by gently encouraging the visitor to push against gravity and change direction through its gradually rising and undulating form (basic-orienting system); water cascading over the stone weirs produces a continuous burbling sound that beckons the visitor to the stream (auditory system); the smooth rounded wood railings and benches invite touch, bringing visitors to the edge of the boardwalk to look over the surrounding landscape (haptic system); scented plants cause the visitor to inhale more deeply or move closer to inspect the source (taste-smell system); and the rounded arches at the west and east entrances to the park direct the gaze down the length of the boardwalk while the curving form of the boardwalk leads the eye through the woodland, inviting the visitor to enter and explore (visual system).

Table 5. Sensory Design Features

Perceptual System	Sensory Design Features
Basic Orienting	• Arches provide entry passage • Boardwalk descends 10 feet from escarpment to flood plain at 3% slope • Realigned hiker-biker path descends from levee to floodplain at 3% slope • Stone terrace steps down to Sligo Creek • Gravel, stone, wood, pebble, sand, and grass walking surfaces offer varying levels of resistance and traction • Log steppers and stone weirs require balance and coordination • Moving current engages muscles and joints
Auditory	• Stone weirs in stream and swales broadcast sound of cascading water • Rain pavilion roof sends rainwater splashing into recirculating fountain • Improved habitat increases insects, bird, and animal activity, vocalization • Denser canopy amplifies sound of wind • Decks and terrace provide places to congregate, talk, exercise, and play • Wood and gravel walking surfaces amplify the sound of footfalls
Haptic	• Smooth curved wood benches and railings invite touch • Boulders near stream terrace invite climbing and sitting • Denser canopy increases shade and lowers temperature • New plantings produce tactile bark, stems, leaves and seed pods • Rain pavilion and stream terrace provide contact with water
Taste-Smell	• New plantings provide variety of scent • Wood and stone features release resin and mineral scents when warmed by the sun or washed by the rain
Visual	• Curving boardwalk leads eye through dense woodland, offers unfolding views • Semicircular decks provide sweeping views • Bridge offers panoramic view of stream and park with clear sightlines to entrances • Arches mark entry points • Light and motion activated footlights illuminate the boardwalk at night • Realigned hiker-biker path offers views to neighborhood and park • Water flowing over stone refracts light • Diverse, layered plantings provide visual texture, information richness • Massed plantings and tree allees provide structure, legibility
J.J. Gibson, 1966	A. Jones, 2021

To create an immersive sensory experience, I've located walkways and gathering places in close proximity to environmental features, well within range of human perception. A range of activity areas, seating configurations, and access points offers visitors flexibility and choice in terms of where and how to interact with environmental features or other visitors. For example, a curious child can wade in the stream or observe others wading from a boulder in the stream, the streambank, or a terrace or deck overlooking the stream (Figure 91). The central pavilion, stream terrace, and five boardwalk decks provide a variety of viewpoints, sensory experiences, and levels of privacy.

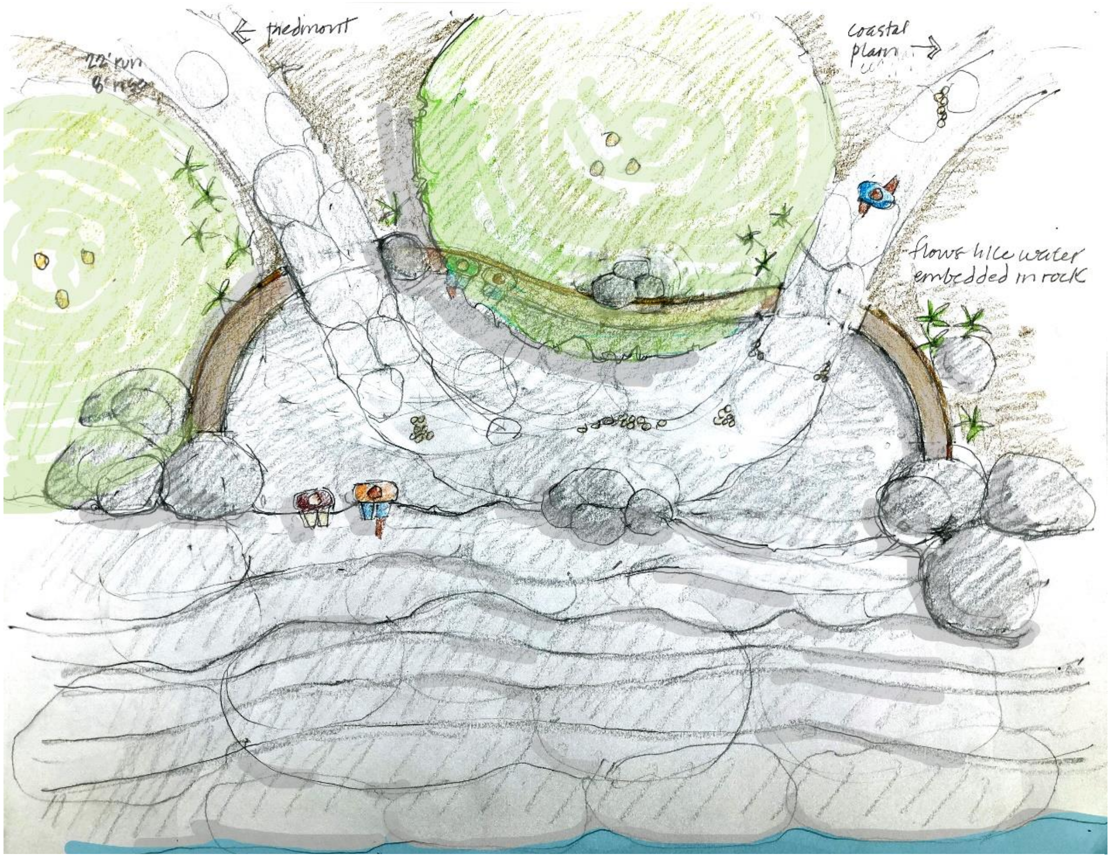

Figure 91. Concept sketch for stream terrace

As our experience of the world is centered in our bodies, circumscribed by the limits of our perception, the encircling forms center human experience and perception within a natural setting. As Gibson notes, human behavior exists within an ecological context of intermediate range and duration nested between the atomic and cosmic range of modern physics (1986). The openness of the structures encourages interaction while also providing shelter, safety, and comfort – a sense of being held or nested within a world that is both smaller and larger than we can comprehend. The inward sloping roof of the pavilion provides shelter from the elements, yet is open to the sky at the center, channeling rain, and sunlight. The low perimeter bench provides a permeable edge between the social space of the pavilion and the natural processes occurring within the bioswale.

The semi-circular decks along the boardwalk offer a sense of safety (rail), comfort (benches), and enclosure (encircling form, overarching trees) while extending over and opening out to the sights, sound, and smells of meadow, stream, and woods.

The round entry arches exhibit a controlled tension between the strength or resistance of copper and the downward pull of gravity. Through their mirror neurons, visitors relate the force of this exertion, as well as the embrace of the overlapping sides, to their own bodily experience. As Juhani Pallasmaa notes, “We feel pleasure and protection when the body discovers its resonance in space. When experiencing a structure, we unconsciously mimic its configuration with our bones and muscles. Unknowingly, we perform the task of the column or of the vault with our body” (2012, pp. 71-72).

At the level of detail, the ridges and grooves of the pavilion roof channel rainwater to the central aperture while the wavy edge mimics the movement of water and light or other forms of energy. The rounded edges of the benches and boardwalk rail present a convex surface that the body easily conforms to.

Design components such as the simple palette of wood, stone, and oxidized copper; plantings massed to accentuate their unique characteristics and repeated at regular intervals to instill a sense of order; and the continuous through line of the boardwalk have all been carefully calibrated to create an overall atmosphere of clarity, continuity, abundance, and beauty.

By appealing to the senses, the quarter mile boardwalk invites visitors to return to their bodies, to loosen the attention they've been directing at screens, to-do lists, or events beyond their control and to briefly immerse themselves in another way of being. The winding boardwalk leads visitors from a suburban setting of asphalt streets lined with cars, lawns, and houses through a hushed glade that opens onto a burbling stream. The trees and vegetation filter light and buffer sound while offering a profusion of forms, colors, textures, soft sounds, and subtle scents for quiet fascination. The curved boardwalk and decks offer a congenial place to stroll or pause and reflect, instilling a sense of "being away."

Limitations

Due to social distancing requirements, there were initially no group activities such as soccer and rugby in the parks for me to observe. For the same reason, I was unable to formally solicit any community input on present and future uses of the park or the sensory site inventory.

The sensory site inventory was based on my own direct experience as a walker and demonstrates how environmental attributes and sensory perception can inform sensory design. Other perspectives and methods of data collection would produce a wider range of responses and a different design solution. Design is ultimately an act of synthesis and imagination, so no matter the source of the data, the Sensory Design Framework encourages the landscape designer to be alert to and curious about the sensations a particular place brings forth, and to connect those sensations to specific environmental attributes which can be amplified through design features.

Future Direction

Having thought deeply about this in-between site tucked between low-to-moderate income neighborhoods in the floodplain of a degraded stream, a condition that is commonly found throughout the Anacostia watershed, I would love to receive feedback on the Sensory Design Framework and site plan from the communities that the park would serve and from the M-NCPPC.

With modifications to transportation and stormwater infrastructure and stream and floodplain ecology, implementation of the proposed design would require the collaboration of multiple agencies, an undoing of the siloed approach that has led to the fragmentation of the site. A modest though complex project like Confluence Community Park could be a model not only for sensory design but for the multidisciplinary collaboration needed for sustainable development.

Chapter 7: Conclusion

Although the Covid-19 pandemic thwarted my original thesis travel plans, the lockdown enabled me to discover the beauty and potential in my own neighborhood and gave me the time to explore it. Walking in the park quickly became a solace, not only for me but for countless neighbors. I became curious about people and places that I would ordinarily have sped by during my daily car commute. The flexibility of working from home allowed me to walk in the park whenever I felt the need and to observe activity at different times of the day. Every excursion revealed a new aspect of the landscape: the stream muddy and sluggish in the summer heat or bursting its banks after a heavy spring rain; or the sky over Green Meadows radiating sunshine or gusting with clouds. Layering my sense memories of things that move and change, such as the effects of daylight, the weather, and the seasons, onto things that persist, such as mature vegetation and landforms, has instilled in me a deeper sense of place.

Sensory design is in some respects a humanizing response to the speed and efficiency of modern technology. For example, the speed and insularity of cars and airplanes which separate us from the telling details, sounds, smells, and textures of the places we travel through, and the efficiency of hardened stormwater pipes and swales that disrupt stream ecology and remove it from our daily experience. We turn to our digital devices for information about the world, sounds and images of events occurring around the globe, and lose touch with the tangible and verifiable knowledge we receive from our bodies about our immediate environment. Sensory design is an argument for landscape features that soften the edges, bringing us into direct contact with natural forms, materials and processes and expanding our experience of the natural world.

The Sensory Design Framework is based on a review of research in environmental psychology and cognitive neuroscience and design precedents in landscape architecture, architecture, and art, the close study and observation of the parkland at the confluence of Sligo Creek and the Northwest Branch of the Anacostia River and my own visual, auditory, and haptic perceptions. Confluence Community Park is a site-specific interpretation of the Sensory Design Framework that can inspire others to incorporate sensory perception into the design of public and private landscapes.

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