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Growing with the Roots: Re-Connecting Youth with Nature through Nature-Based Learning and Play

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MASTER OF LANDSCAPE ARCHITECTURE

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GROWING WITH THE ROOTS: RE-CONNECTING YOUTH WITH NATURE THROUGH
NATURE-BASED LEARNING AND PLAY

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ABSTRACT

Children today are becoming increasingly disconnected from the natural world. This is directly related to the increased amount of time spent indoors which is likely caused by limited access to natural green spaces, time spent on screens and parental safety concerns. Too much time spent indoors leads to reduced physical activity, lower physiological well-being, increased social-emotional vulnerabilities and a lack of care for the environment. While these trends are detrimental to the child, they are also detrimental to the environment. In a time where pro-environmental advocates are needed more than ever, our next generation of environmental stewards are disconnected from the natural world. This begs the question; how can we better connect the next generation of youth to nature? Growing with the Roots is a design solution intended to provide children with the opportunity to connect with nature by being highly accessible to the surrounding communities in West Fargo, ND. A lack of accessibility to naturalized spaces in this area of the city calls for an ecological community park, centered around nature-based play and learning, to help children form a bond with nature, while also enhancing their learning, development, and environmental stewardship.

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DEDICATION

I would like to dedicate this thesis project to the Green Schoolyards America initiative. This organization inspired me to approach this thesis project and provided valuable information on the benefits nature has on youth, while inspiring me to have a positive impact on the environment and future generations.

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1. INTRODUCTION

1.1. Problem Statement

In a world where environmental awareness is becoming more important than ever, children and youth are continuing to lose contact with nature (Kuo et al., 2019). Both in and out of school, children and teens spend most of their time indoors. The excessive use of technology, limited access to green spaces, and heightened concerns regarding safety have collectively led to a generation of children spending an excessive amount of time indoors (Barrette et al., 2022).

The excessive amount of time spent indoors has led children and youth to spend a vast majority of time on screens (Barrette et al., 2022). Screen-time has been associated with reduced physical activity and lower physiological well-being (Barrette et al., 2022). Statistics show that “less than 25% of children and youth in the US are physically active enough for healthy development” (Barrette et al., 2022). In addition to that, more time spent indoors has led to increased social-emotional vulnerabilities such as depression, anxiety, hyperactivity, inattention, and aggression (Barrette et al., 2022).

Limited access to green space can be associated with urbanization, likely due to the economic benefits and job opportunities associated with living in an urban setting (Barrette et al., 2022). Over half of the global population resides in urban areas, facing a shortage of green spaces (Barrette et al., 2022). Youth who live in areas with less access to green space are more likely to develop emotional problems as well as worsened mental health in adulthood (Barrette et al., 2022). This disconnection from children to nature has led to a loss of interest in nearby naturalized areas, which results in the lack of understanding about biodiversity, which ultimately leads to a smaller population of environmental experts in the future (Barrette et al., 2022).

Without greater efforts than shown today in terms of mitigating climate change, by the end of the 21st century, the rising temperatures are expected to result in a substantial and potentially severe risk of widespread and irreversible impacts on a global scale (Chawla, 2018). As much as it is an environmental crisis, it is also just as much a social justice issue (Chawla, 2018). A positive take away from the fact that we as humans are partially responsible for the climate change crisis, is that we are also capable of reversing our course of action that is deteriorating the environment (Chawla, 2018). Meaning, we can reverse the course of climate change, and one way we can accomplish that is by re-connecting the next generation of youth to nature.

Nature-based learning agenda has become a popular topic as of late due to these arising problems. Studies have shown that nature enhances learning, personal development, and environmental stewardship among youth (Kuo et al., 2019). Being in nature also enhances physical and mental well-being, promotes social connection, aids in impulse control, increases attention, and boosts self-esteem among youth (Barrette et al., 2022). All these factors play an important role in the healthy development of children, by boosting their learning capabilities, problem solving skills, mental health, and appreciation for the environment (Kuo et al., 2019).

This study aims to explore the benefits of nature-based learning environments, emphasizing the importance of connecting youth to nature. By doing so, it seeks to understand the benefits nature has on students' learning, development, and overall well-being, inevitably contributing to a more inclusive and adaptive educational environment for a diverse range of students.

1.2. Research Objectives

The objective of this thesis is to evaluate the benefits nature has on students' learning, personal development, overall-wellbeing, and stewardship towards the environment. The study will break down each of these objectives into more detail, citing how and why each objective becomes enhanced through the context of nature. Once a knowledgeable understanding has been obtained through the benefits of nature on children and youth, the study will investigate the design principles of nature-based learning and play environments. The goal of the study is to continue to push the nature-based learning and play agenda to reach wider audiences across the Midwest. This objective will be reached by further research, inventory, analysis, and a final design of a green schoolyard.

2. NATURE-BASED LEARNING

2.1. Definition

Nature-Based Learning is described as an “educational approach that uses the natural environment as the context for learning” (Chawla, 2018). It explores the acquisition of knowledge about the natural world through direct interaction with the environment, incorporates outdoor learning in nature across various curriculum areas, and examines the influence of natural surroundings on learning (Chawla, 2018). What is consistent across various aspects of nature-based learning is the accessibility of nature to children. At the very least, they can observe it, and in other instances, they can engage with it using all their senses (Chawla, 2018). It is the last point that is driving this study, that nature should ultimately become a necessity in curriculums across all school districts.

2.2. Impact on Children and Youth

There is a growing amount of evidence suggesting that the natural environment is an asset in learning and development among youth (Kuo et al., 2019). Nature both directly and indirectly benefits students by increasing attention, reducing stress, enhancing self-discipline, engagement, motivation, and physical activity (Kuo et al., 2019). Evidence also suggests that students become more persevering, better problem solvers, better leaders, collaborators, critical thinkers and more resilient (Kuo et al., 2019). From preschool to high school students, nature has demonstrated improvements in cognitive functions as well as social relationships (Barrette et al., 2022). These factors ultimately boost academic learning, personal development and overall well-being among children and youth (Kuo et al., 2019).

2.2.1. Learning and Development

There are both direct and indirect ways nature benefits learners. Directly, it benefits students by making them more attentive, more engaged, more self-disciplined, and better able to socially connect with one another (Kuo et al., 2019). It also benefits students in an indirect way, by being a more calm, quiet, safer, and more cooperative context for learning, as well as providing developmentally beneficial forms of play (Kuo et al., 2019). There is increasingly strong evidence that suggests nature-based learning outperforms traditional instruction and is especially beneficial for students who have difficulties learning in a traditional classroom setting (Kuo et al., 2019).

2.2.1.1. Impacts on Attention

Students who had views of greenery outside of a classroom window performed better on attentive tests than those with no views of the outside environment (Kuo et al., 2019). There was a study conducted in the Michigan Public Schools system that takes this approach further

(Chawla, 2018). It states that schools with more greenery planted near classrooms and cafeterias resulted in students with higher standardized test scores, graduation rates, and even a higher college enrollment (Chawla, 2018). Improved grades, test scores, and college enrollment, just from nature being visibly present, further concludes the benefit nature has on children's ability to learn and develop as students.

2.2.1.2. Improved Self-Discipline

There has been a positive correlation with nature contact and improved self-discipline among adults and children (Kuo et al., 2019). It improves self-discipline because of reports of delayed gratification and reduced hyperactivity (Kuo et al., 2019). These interactions and improvements prove that interactions with nature have beneficial effects on aspects of cognitive and behavioral control. Connecting children to natural environments appears to contribute positively to individuals' ability to regulate their behaviors and engage cognitive control.

2.2.1.3. Student Engagement and Motivation

Because of nature's positive effect on mood, students become more engaged, motivated and enjoy the process of learning when they are present in nature settings (Kuo et al., 2019). During curriculum required nature-based activities within schools, teachers reported higher levels of engagement and motivation towards learning among students (Kuo et al., 2019). These outcomes are especially positive within students who have difficulties learning in traditional settings (Kuo et al., 2019). Nature-Based learning has been proven to enhance intrinsic motivation, student engagement and educational experience (Kuo et al., 2019). These benefits go beyond just learning in the nature setting, by contributing to improved student attitudes during subsequent lessons, their view of the curriculum, and their overall view of school (Kuo et al., 2019).

2.2.1.4. Social Connectiveness

Bullying and negative social interactions have become a widespread problem in schools across the nation, and evidence suggests that green schoolyards are able to reverse this trend by supporting positive social relationships (Stevenson et al., 2020). Evidence shows that the presence of nature bridges the gap in socio-cultural differences and interpersonal barriers, which ultimately lead to better social connections and group function in the classroom (Kuo et al., 2019). Building positive social relationships with classmates leads to better cooperation among the classroom, which ultimately leads to better academic performance (Kuo et al., 2019).

2.2.2. Physical and Emotional Well-Being

2.2.2.1. Improved Physical Health

Time spent outdoors is tied to higher levels of physical activity and fitness among youth (Kuo et al., 2019). The more time children spend outdoors, the better their physical activity and health, which ultimately leads to lessened sedentary behavior and improved cardiorespiratory fitness (Kuo et al., 2019). More importantly, academic performance is most directly linked to cardiorespiratory fitness among the various components of physical fitness (Kuo et al., 2019). Ultimately, being in nature directly benefits the health and fitness among youth while also indirectly benefiting their ability to learn through better fitness levels.

2.2.2.2. Reduced Stress

Exposure to natural elements in urban settings helps people recover more quickly from stress compared to similar spaces with no natural elements (Stevenson et al., 2020). Students who participated in outdoor learning in a forest setting once a week showed more favorable diurnal cortisol rhythms compared to a group of students who attended indoor classes (Kuo et al.,

2019). Specifically, cortisol levels decreased throughout the school day during lessons held in the forest, but this pattern was not observed when classes took place indoors (Kuo et al., 2019).

2.2.3. Environmental Stewardship

Evidence suggests that nature-based learning programs create a greater connection to the natural world, and promote ecological stewards among children (Barrette et al., 2022). For this reason, it is crucial for schools not just to provide students with access to the natural world for their well-being but also to equip them with the knowledge and values necessary to live on this planet in wiser and more compassionate ways than previous generations (Chawla, 2018). By connecting students to nature through different learning environments, we not only help them grow as individuals, but also nurture a generation that cares about and takes care of our planet for the long term.

Free play and exploration in nature has been argued as the most important aspect of the curriculum in terms of the youth developing pro-environmental behaviors (Chawla, 2018). Research suggests that contact with nature at a young age is also correlated to higher intellectual curiosity and creative imagination in adulthood (Barrette et al., 2022). Experiences with nature create a greater connection to the natural world, which ultimately leads to responsible behaviors towards the environment from youth into adulthood (Barrette et al., 2022).

2.3. Green Schoolyards

2.3.1. Definition

Green schoolyards are essentially the context for which nature-based learning activities take place. They can be defined as “school grounds where natural elements are present and abundant” (Stevenson et al., 2020). A green schoolyard consists of, but not limited to, playground equipment, sports facilities, community gathering spaces, accessible pathways,

outdoor classrooms, storage, storm water capture elements, nature play settings, trails, etc. (Stevenson et al., 2020). Most importantly, “they include native vegetation (trees, shrubs, grassland, flowers, etc.), pollinator and/or edible fruit and vegetable gardens, associated animal life, and other natural features such as boulders connected to the greater biome surrounding the school” (Stevenson et al., 2020).

2.3.2. A Trend Towards Green Schoolyards

Due to arising problems over the last two decades, green schoolyards have become more popular than ever. The certain resources green schoolyards provide help aide in these issues and create benefits for children, teachers, surrounding communities, wildlife, and the environment.

These resources include:

- Edible gardens have become popular as educational tools for healthy eating habits, due to the rising obesity rates in the United States (Danks, 16).
- Loss of habitat continues to rise throughout the nation due to urbanization, industrialization, and agricultural conversion. Because of this, national organizations have encouraged schools to grow native plants and nurture local wildlife species (Danks, 16).
- Natural water treatment methods and stormwater capture elements are increasingly becoming popular due to polluted waterways. These elements are included to filter pollutants, treat stormwater, and store the water for future use (Danks, 16).
- “An educational shift toward hands-on lessons, project-based learning, and teaching to “multiple intelligences” has made the school ground an appealing location for academic studies” (Danks, 16).

- The “nature play” movement has started to trend due to children spending too much time indoors (Danks, 16). Instead of spending time in front of a screen, children are gaining experiential experiences with hands-on learning opportunities with nature (Danks, 16).

2.3.3. Benefits of Green Schoolyards

2.3.3.1. Re-Connect Students with Nature

Due to the rise in urbanization and housing developments, because of a growing population, we are continually becoming disconnected with nature, and how natural processes that take place every day occur. These processes haven’t necessarily been wiped out or eliminated, but rather, have become invisible to us (Danks, 18). “Our immediate environment is filled with artificial materials and vast amounts of pavement that separate us from natural processes that occur all around us” (Danks, 18). An example of an artificial material used to manage a natural process would include stormwater drainage pipes found underground (Danks, 18). Since they are underground, we don’t see how stormwater can be captured and cleansed in a natural way such as a raingarden or bioswale.

Green schoolyards provide opportunities for students to become aware of the local ecology in their communities (Danks, 18). They become more aware of their surroundings because they can witness rainwater moving through a bioswale, a butterfly pollinating a flower, and the leaves changing colors due to seasonal changes (Danks, 18). These hands on, experiential experiences, are a low-cost way for students to learn and become better connected to nature and the environment (Danks, 18).

2.3.3.2. Enhanced Educational Value

Green schoolyards provide beneficial educational opportunities for teachers and students. “Teachers gain high quality teaching resources and report increased job satisfaction when using green schoolyards” (Danks, 15). Accessibility to these resources and gaining hands-on experience with these materials as opposed to reading in a textbook may benefit students who have difficulties learning in a traditional classroom. As opposed to traditional classrooms, green schoolyards are often more inviting and physically comfortable because they offer a variety of different microclimates to interact with including sunny knolls, shady pockets, sheltered retreats, etc. (Danks, 15).

Research also suggests that natural settings provide a calmer, quieter and safer context for learning for students (Kuo et al., 2019). In the presence of nature, students are better able to remove themselves from conflicts and demonstrate better self-control, especially those who have difficulties in traditional school settings (Kuo et al., 2019). The calmness of nature leads to better student engagement which leads to better academic success (Kuo et al., 2019).

2.3.3.3. Community Enrichment

Access to green space for nearby communities has been linked to increased community cohesion and lower crime rates (Stevenson et al., 2020). Research shows that lower income communities have less access to nature than higher income communities, which suggests that access to nature has become a privilege (Stevenson et al., 2020). In relation to this evidence, children from lower income communities may benefit more from access to nature than those who have greater access to nature (Stevenson et al., 2020). Incorporating nature into school environments would guarantee that each child has exposure to the natural world while spending a substantial part of their daily routine in these spaces (Stevenson et al., 2020). Green schoolyards

allow for equal access for all children to nature which in turn will shorten the gap in learning and development between different socio-economic groups.

2.3.3.4. Health and Wellbeing

Although traditional schoolyards are great for promoting physical health and wellness, they lack tree canopies which help protect students from ultraviolet rays (Danks, 21). Green schoolyards provide tree canopies and shade structures which help protect students from excess exposure to sunlight (Danks, 21). Traditional schoolyards also pose a higher risk of injury due to asphalt surfaces, which can lead to “knock and bump” injuries from falling on the ground (Danks, 21). Whereas a green schoolyard tends to use softer surface materials such as mulch, grass, and sand, which help prevent those injuries otherwise seen on an asphalt surface (Danks, 21).

2.3.3.5. Environmental Sustainability

Green schoolyards are essentially an ecological oasis which includes “rich wildlife habitat, rainwater purification and storage capacity, the ability to treat greywater and blackwater flows from school buildings, and energy conservation and production capacity” (Danks, 20). They can show students how all these processes work by producing food for on-site consumption and treating waste as a resource (Danks, 20). Experiences with these processes allow students to become aware of their potential impact on their surroundings and encourage them to become stewards towards the environment.

2.3.3.6. Microcosms of Ecologically Healthy Cities

According to Sharon Danks, founder of Green Schoolyards America, school grounds offer a great opportunity for greening cities because school districts are among the largest landowners in every city throughout the United States (Oder, 2020) Danks adds, they are a great

opportunity because children visit them every day and schools are typically located in the center of neighborhoods and communities (Oder, 2020) On top of being an important asset in the development and well-being of children, they are also a vital aspect in improving the environment. Danks states that green schoolyards “provide habitat patches and corridors for wildlife; help foster healthy urban watersheds that prevent neighborhood flooding; recharge aquifers under cities; and increase tree canopies to cool communities, thus improving climate and air quality” (Oder, 2020).

2.3.4. Green Schoolyards America

Green Schoolyards America is a non-profit organization founded in 2013 by Sharon Danks. This organization has essentially become a blueprint for green schoolyard design and initiative throughout the state of California and has started to become popular in other states throughout the United States. Their mission is to “transform asphalt-covered school grounds into living schoolyards that improve children’s well-being, learning, and play, while strengthening their communities’ ecological health and climate resilience” (Green Schoolyards America). The vision of Green Schoolyards America involves a “future in which public school grounds are used strategically to improve the well-being of all children, the environment, and communities” (Green Schoolyards America).

2.3.5. Ecological Principles

2.3.5.1. Wildlife Habitat

When designing a green schoolyard, it is crucial to use native plantings to support diverse, local wildlife species (Danks, 36). It is essential to include the four components necessary for species survival including “food, water, cover, and nesting places” (Danks, 36).

2.3.5.2. Stormwater Management Systems

It is important to include stormwater management systems throughout the schoolyard such as raingardens, bioswales wetlands, etc., to allow students to “monitor and evaluate the school’s water supply, drainage and purification systems” (Danks, 36). These systems function to purify and retain water, while also supporting biodiverse habitats and educating students on the importance of these natural water management systems.

2.3.5.3. Energy Systems

Using renewable energy resources and conserving as much energy as possible is an important aspect of designing green schoolyards (Danks, 36). An example would include planting “deciduous trees and vines to demonstrate passive solar cooling of classrooms and outdoor areas (Danks, 36).

2.3.5.4. Edible Gardens

It is important to allow students to “select the edible plants, maintain the garden, harvest the crops, prepare the food, and eat it at school (Danks, 36). When planting an edible garden, it is crucial to plant enough to share with local wildlife and maintain the garden in an organic matter, to keep children and wildlife safe, and protect the quality of water on site (Danks, 36). Include amenities such as picnic tables around the area for people to sit and enjoy the food (Danks, 36).

2.3.6. Design Principles

2.3.6.1. Design Outdoor Environments that Support Learning

According to the Oakland Unified School District (Barros et al., 2022), “living schoolyards should be vibrant places where teachers can easily immerse students in curriculum outdoors for more diverse learning opportunities that support different learning modalities”

(Barros et al., 2022). These outdoor learning environments should include one or more of the following:

- A supplemental space to the indoor classroom meant solely for students and teachers (Barros et al., 2022).
- A space that is specific to distinct learning opportunities such as an outdoor art space (Barros et al., 2022).
- Environmental interpretive areas that mesh well with the curriculum and can be used for daily exploration such as a pollinator garden (Barros et al., 2022).
- A flexible space that can host larger school events such as an amphitheater (Barros et al., 2022).
- A flexible space with infrastructure that allows for seasonal usage (Barros et al., 2022).

All these outdoor environments should include permanent or flexible seating for larger groups and breakout areas for multiple smaller groups (Barros et al., 2022).

2.3.6.2. Design Spaces that Support Child Development

The design of each space at the green schoolyard should support the social, emotional, physical, and cognitive development of each student (Barros et al., 2022). The following objectives should be kept in mind when designing spaces for child development:

- The specific age group you are designing for and the needs of that group (Barros et al., 2022).
- Provide opportunities for each child's specific interests such as ball play or quiet contemplation (Barros et al., 2022).

- Since children develop through the senses, it is important to implement materials that activate these senses such as hearing, touching, seeing, tasting, etc. (Barros et al., 2022).
- Don't design spaces to be as safe as possible, but as safe as necessary (Barros et al., 2022). This allows children to challenge themselves and develop motor skills (Barros et al., 2022).

2.3.6.3. Design for Equity

According to California Schoolyard Forest System, living schoolyards should “meaningfully engage, empower, and give agency to students and stakeholders of all ages, genders, cultural backgrounds, and abilities, including differing cognitive, sensory, and physical abilities” (Green Schoolyards America). When designing for equity, it is important to keep in mind accessibility, open space access, and learning differences (Barros et al., 2022).

2.3.6.4. Design for Play

2.3.6.4.1. Inclusive Play

Traditional schoolyards lack the balance of play options needed to accommodate all user types of the space. Green schoolyards are designed to include “open-ended play opportunities and imaginative play options” (Danks, 37). It is essential to keep a balance of “energetic creative play, relaxing quiet zones, and inspiring art options” (Danks, 37).

2.3.6.4.2. Loose Parts

Based off teachers and principles' opinions, evidence suggests that children's play becomes more social, creative, and physically active in the presence of loose parts (Kuo et al., 2019). “Loose parts” play enhances creativity because it is self-directed by the student engaging

with the materials (Kuo et al., 2019). “Loose parts” may include, but not limited to, pinecones, seedpods, and moveable groundcovers such as mulch (Danks, 37).

2.3.6.4.3. Create Challenges

Implementing challenges and risks in playground helps children develop both physically and mentally by improving their motor skills. A lot of times, restrictions on play equipment are a direct result of liability concerns, and not safety concerns (Danks, 37). Introducing challenges also adds mystery and curiosity to the student, which helps hold their interest in the playground for years to come (Danks, 37).

2.3.6.5. Design for a Better Environment

The current climate crisis continues to get worse, and schoolyards are a great opportunity to design environmental resilience. Some factors to include when designing for environmental resilience include:

- Carefully selecting trees that create habitat, provide shade, create buffers, better the air quality, and adapt to the changing climate (Barros et al., 2022).
- Consider using permeable surfaces when designing to reduce air temperature and allow for water infiltration and retention on site (Barros et al., 2022).
- Implement stormwater elements that relate to the rest of the site as well as the nearby watersheds (Barros et al., 2022).

2.3.7. Design Components

2.3.7.1. Types of Spaces in Schoolyard

2.3.7.1.1. Active Play Spaces

Active play areas include both soft and hard play areas in the schoolyard (Austin Unified School District, 2023). Soft play areas consist of nature-based materials and elements which

include logs, grassy mounds, and rock climbs (AISD, 2023). These areas typically consist of a softer play surface and are primarily designed to “encourage gross motor skill, proprioceptive, and vestibular development activities such as climbing, balancing, jumping, swinging and sliding” (Barros et al., 2022). Whereas hard play areas consist of poured-in-place rubber or asphalt that function as “a play slab supporting the PE curriculum” (AISD, 2023). These areas typically support ball play activities such as basketball, four square, tether ball, etc., and “encourage team building and mind-body coordination” (AISD, 2023).

2.3.7.1.2. Gardens

Produce gardens and habitat gardens are the two different types of gardens to be considered on school grounds (AISD, 2023). Produce gardens can consist of raised planters, an orchard, etc., which teaches students hands-on learning and can be incorporated into food and health lessons within the curriculum (AISD, 2023). Habitat gardens provide opportunities for students to observe wildlife and understand the different types of local wildlife (AISD, 2023). These areas must support wildlife by providing food, shelter, and water (AISD, 2023). Habitat gardens provide an excellent opportunity for educational signage to be implemented to help students and teachers interpret the different types of native species, plants, trees, etc.

2.3.7.1.3. Outdoor Studios

Outdoor studios have similar functionalities to what is seen in an indoor classroom (AISD, 2023). These spaces are meant for active learning opportunities, and they support both “project- and presentation-based learning activities (AISD, 2023). There should be fixed or flexible seating in this area for students and a presentation space for teachers and/or students (AISD, 2023). Like the indoor classroom, these spaces are meant to serve a variety of activities

including presentations, project-based learning, hands-on learning, and group projects (AISD, 2023).

2.3.7.1.4. Community Gathering Areas

A school is essentially a mix of different communities, from students, to faculty, to families, and the surrounding community (Barros et al., 2022). Gathering areas allow for these different communities to come together for special events, presentations, or award ceremonies and create special relationships with one another (Barros et al., 2022). These spaces are meant primarily for social relationship opportunities and may consist of an amphitheater or a cluster of tables and chairs (Barros et al., 2022).

2.3.7.1.5. Pathways and Trails

Pathways can function to separate different spaces while also allowing for connection between them (Barros et al., 2022). Pathways may serve as aspects of informal play, as they may create a curiosity for students who are adventuring along the path (Barros et al., 2022). They also support creativity, social interaction, recreation, and health (Barros et al., 2022; AISD, 2023). Trails and pathways should be accessible to all and should include both hardscape and softscape elements (AISD, 2023). Trails and pathways are flexible when it relates to the curriculum, as they may support “sensory and experiential learning, social emotional learning, self-regulation, and humanities education” (AISD, 2023).

3. METHODS OF RESEARCH

3.1. Case Studies

To further research in the realm of nature-based learning and play in the context of green schoolyard design, case studies were examined to understand the context of nature and its

benefits on students. These case studies were chosen because of their relationship with the goals and objectives of the proposed thesis project.

3.1.1. Brent Elementary School, Washington, D.C.

3.1.1.1. Context

Brent Elementary School is in Washington, D.C. in the Capitol Hill neighborhood (Ellis et al., 2012). Between 2006 and 2010, it went through multiple phases to improve the schoolyard (Ellis et al., 2012). The overall community consisting of teachers, parents, and students were involved in the design process (Ellis et al., 2012).

3.1.1.2. Goals

The goal of this project was to design an outdoor learning environment that promotes meaningful environmental education for students, fostering a school community committed to nurturing children in healthy outdoor spaces (Ellis et al., 2012).

3.1.1.3. Challenges

A limited budget forced teachers and families to look to outside sources for funding (Ellis et al., 2012). Considering the project's reliance on volunteers, the redesign needed to be both cost-effective and low maintenance (Ellis et al., 2012). Additionally, enhancements to the campus had to be introduced gradually in separate phases (Ellis et al., 2012).

3.1.1.4. Solution

The school community was able to raise \$264,000 by reaching out to local and national organizations and holding fundraising events (Ellis et al., 2012). To save money on maintenance costs, the community rallied together to form a “Green Team”, which maintained the school grounds. The project became a success due to the hard work and collaboration of the school community (Ellis et al., 2012).

3.1.1.5. Benefits

3.1.1.5.1. Environmental

- Decreased surface temperatures by 23 degrees Fahrenheit and air temperature by 9 degrees Fahrenheit by converting asphalt surfaces into a rain garden (Ellis et al., 2012).
- The rain garden holds an estimated 720 gallons of water and the additional trees in the garden hold around 1,600 gallons per year (Ellis et al., 2012).
- By substituting the 6,200 sq ft of lawn with an outdoor classroom that eliminates the need for mowing, the project effectively reduces hydrocarbon emissions. (Ellis et al., 2012).

3.1.1.5.2. Social

- Increased outdoor classes for a range of grades that included subjects such as art, music, and English (Ellis et al., 2012).
- The improvements of the school grounds led to a 191% increase in enrollment (Ellis et al., 2012).
- “Helped increase student attendance, reading test scores, parent engagement, and parent and staff satisfaction with the school” (Ellis et al., 2012).

3.1.1.6. Achievements

- SITES Certified
- ASLA Stormwater Management Award
- Landscape Architecture Foundation – Performance Series
- 2nd Annual Livable Walkable Community Award

3.1.1.7. Application to Thesis

The Brent Elementary School project demonstrates the importance of collaboration and teamwork in reaching a common goal that benefits the students, school staff, and surrounding community. By greening the schoolyard, it not only benefited the lives of students and the community, but the environment. Like the aspirations for the proposed thesis project, Brent Elementary School used nature as a tool for student learning, development, wellbeing, combined with teachers and surrounding community members' satisfaction, with an overall goal of improving the environment and making the world a better place.

3.1.2. Teardrop Park

3.1.2.1. Context

Teardrop Park is a 1.8-acre park located in Lower Manhattan that has become a vibrant part of a mid-block community (Valkenburgh Associates). The project is located between four apartment buildings, which emphasizes the access for nearby residents and communities to access the park (Valkenburgh Associates). The park consists of “bold topography, imaginative water features, dramatic material choices, and lush plantings contribute to a world that embraces both active play and quiet contemplation amid intricately choreographed views” (Valkenburgh Associates).

3.1.2.2. Goals

Sustainability was the focus in the development and organization of the project (Teardrop Park). Due to thorough environmental research over the years, the design implements “fully organic soils and maintenance regimes that do not rely on toxic pesticides, herbicides, or fungicides (Teardrop Park). The main target group for the project is children, since the park is designed to address the limited access to nature among urban children (Teardrop Park). The park

offers different types of play, both sanctuary and adventurous, that are meant for the child to engage both the body and mind (Teardrop Park).

3.1.2.3. A Strong Relationship with Native Ecology

The park has a strong connection to the native ecology of the region, where much of it is designed to mimic the forested environment of the northeastern United States, including rolling hills, lush vegetation, and rock outcrops (Webb, 2012). One of the most distinguished parts of the park is the bluestone wall, which is meant to mimic the natural rock strata of the area (Webb, 2012). “All 3,000 tons of stone was obtained within 160 miles from the site,” and about 88% of the 16,870 plants and trees are native to the state of New York (Hill & Geffel, 2011). By creating this strong connection to the native ecology of the region, it allows children to grow, appreciate, and become stewards of the natural environment around them.

3.1.2.4. Benefits

3.1.2.4.1. Environmental

- A full-scale simulation of the Ice-Water wall was done at the quarry where the stone originated from, which ensured that no extra materials would be delivered to the job (Hill & Geffel, 2011).
- A variety of factors played into the manufactured soils throughout the park, such as water retention, drainage, and nutrient levels, which led to a 99.5% establishment for the woody trees and vegetation (Hill & Geffel, 2011).
- Biological soil tests are regularly done to ensure that nitrogen levels are maintained at a healthy rate (Hill & Geffel, 2011).

- The park saves an estimated 900,000 gallons of water by recycling stormwater from the nearby Solaire Building, which eliminates the use of potable water for irrigation management (Hill & Geffel, 2011).

3.1.2.4.2. Social

- “Counters nature-deficit disorder by providing open-ended nature play for an estimated 200,000 children a year, with 72% of those observed engaged in physical activity and 69% enjoying constructive, dramatic, and functional play” (Hill & Geffel, 2011).

3.1.2.5. Application to Thesis

The strong use of sustainable and native materials to the region in Teardrop Park is a similar aspiration for the proposed thesis project. It allows children to gain an understanding and become connected with the native roots of which they are a part of, ultimately gaining stewardship towards the native environment. Teardrop Park also thrives in the management of stormwater on the site, where all water is captured on site and used in the different planting areas (Hill & Geffel, 2011). By implementing these methods into the thesis project, it will help children gain an appreciation for nearby ecology, while understanding the importance of keeping waterways clean.

4. RESULTS

4.1. Discussion

Nature is proven to have profound impacts on the health and development of youth. While doing so, it also helps children gain an appreciation and greater connection to the natural world around them. The disconnection from nature among youth, paired with the rising environmental issues happening today, are the main issues that are driving this trend of creating

accessible access to nature for children. Schoolgrounds are at the forefront of this movement because:

- Children attend school daily, meaning every child will have equal access to nature everyday (Oder, 2020).
- School districts are among the highest landowners in every city across the United States, which means there is a lot of land of opportunity in providing nature-rich experiences among youth, while also serving as the forefront of sustainable communities (Oder, 2020).
- They are mostly located in the heart of residential neighborhoods, which allows for easy access to nature for surrounding communities (Oder, 2020).

Transitioning from traditional schoolyards into naturalized areas will have an astounding benefit on the environment and the health and well-being of the next generation. Increased community awareness around this topic is important to continue this trend of greening schoolgrounds throughout the United States.

4.2. Limitations

One of the primary limitations in this research study is the lack of case studies or research done in the same geographical area of the proposed thesis project, which takes place in West Fargo, North Dakota. The long and harsh cold winters may pose a threat for accessibility and use throughout the entire year. The lack of projects in this part of the region makes it difficult to follow any sort of guidelines for combatting the harsh winter months. It is important to consider designing to suit the different seasons throughout the year, to allow for year-round activation.

Another limitation to this research and thesis project is community engagement. This type of project requires the support of certain stakeholders, including students, parents, teachers,

and surrounding communities. Especially since the nature-based schoolyard initiative is uncommon around this part of the United States, it may be difficult to create any excitement or enthusiasm around the project. It is important to get involved with stakeholders early in the process and educate them about the benefits of nature-based learning and play, and how children's learning and development becomes enriched through these experiences.

5. CONCLUSION

It is evident that children are becoming more disconnected from nature. This is likely due to the increased amount of time spent indoors and on screens, due to technological advancement (Barrette et al., 2022). Children are also spending more time indoors because there is simply very little access to any naturalized areas, likely due to urbanization (Barrette et al., 2022). While children are becoming more disconnected from nature, they are also more prone to social-emotional vulnerabilities, reduced physical activity, and lower physiological well-being (Barrette et al., 2022). The disconnect from nature is also leading to a world with fewer environmental stewards, in a time when the environment needs them more than ever.

Nature exposure among youth has many benefits, including enhanced learning, personal development, and stewardship towards the environment (Kuo et al., 2019). It also improves physical and mental health, enhances social interaction, and boosts self-esteem (Barrette et al., 2022). While children are present in nature, they are also gaining a greater connection to the natural world and increased environmental awareness. It is important to provide opportunities for youth to re-connect with the natural world, and one way to do that is by simply making nature accessible to them.

5.1. Application to Thesis

Transforming schoolgrounds into ecological parks has become a trending topic due to the benefits it has on youth and the environment (Oder, 2020). Schoolgrounds present a great opportunity because they are highly accessible, they consist of large amounts of land, and they are usually located within communities (Oder, 2020). Sharon Danks, the founder of Green Schoolyards America, has been one of the primary pioneers behind the green schoolyard movement. Danks, along with Green Schoolyards America, has provided valuable insight and research into the benefits, as well as the different design principles that help make these projects successful. These design principles, along with different design precedents, will help guide the design for the proposed thesis project.

6. PROJECT TYPE

The typologies of this project include playgrounds and schoolyards, community planning, ecological design, and public gardens. The main purpose of the project is to meet the needs of the diverse range of students at the Lodoen Community Center and West Fargo Early Childhood Center, as well as the surrounding community, in the context of an ecological park designed for children, to enhance learning, development, well-being, and environmental stewardship.

6.1. Site Selection

The site selection process was focused on the specific characteristics and typologies that an existing site presents, that meets the vision for the proposed project. Based on research on this specific topic, it was decided that the schoolgrounds would be the best fit for a site location. This is because schoolgrounds are the forefront of sustainable communities, they provide equity, and they are most commonly located in the heart of residential communities (Oder, 2020). Schoolgrounds provide equity because all children attend school daily and will have equal access

to nature, meaning nobody is at a disadvantage. They are the forefront of sustainable communities because school districts are among the highest landowners in every town and city across the United States (Oder, 2020). With so much land and opportunity, schoolgrounds could ultimately be the forefront of a trend towards greener cities throughout the United States. By primarily being located in the heart of residential communities, they provide easy access for surrounding communities to access nature.

6.2. Site Context

The project site (Figure 1) is located adjacent to the Lodoen Community Center and West Fargo Early Childhood Center in West Fargo, North Dakota, between 1st Ave E and 3rd Ave E; 3rd St E and 5th St E. Built in 1941, the Lodoen Community Center is the oldest school within the West Fargo Public Schools district. It was initially built as West Fargo High School before transitioning into a middle school, and now currently sits as the Lodoen Community Center. The site is in the heart of a diverse West Fargo community, consisting mostly of multi-family, one and two family and single-family residential homes. This community is in one of the earlier developments of the city and has been around for a long time.

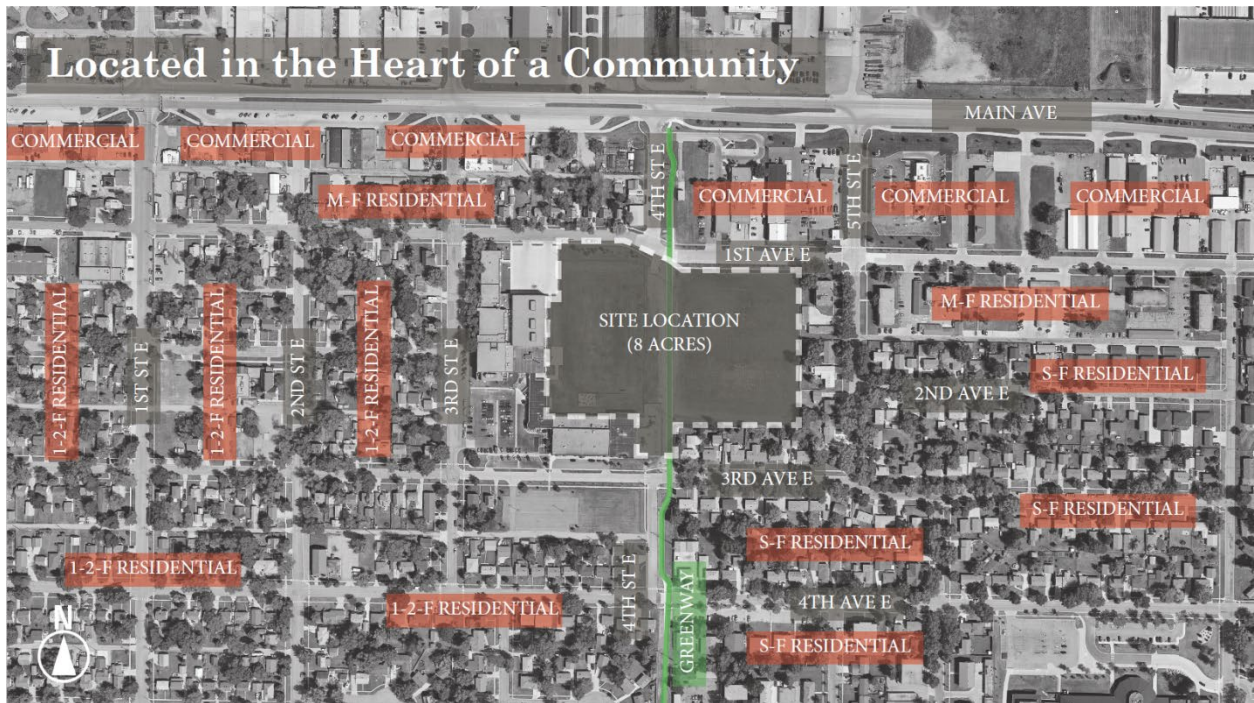


Figure 1: Site Context.

6.3. Site Inventory

The existing land for the proposed site (Figure 2) consists of roughly 8 acres and is owned by the West Fargo School District. Located adjacent to the site are two highly functional buildings, the Lodoen Community Center, and West Fargo Early Learning Center. Running directly through the site is a community greenway, which allows for easy access from surrounding communities into the site.

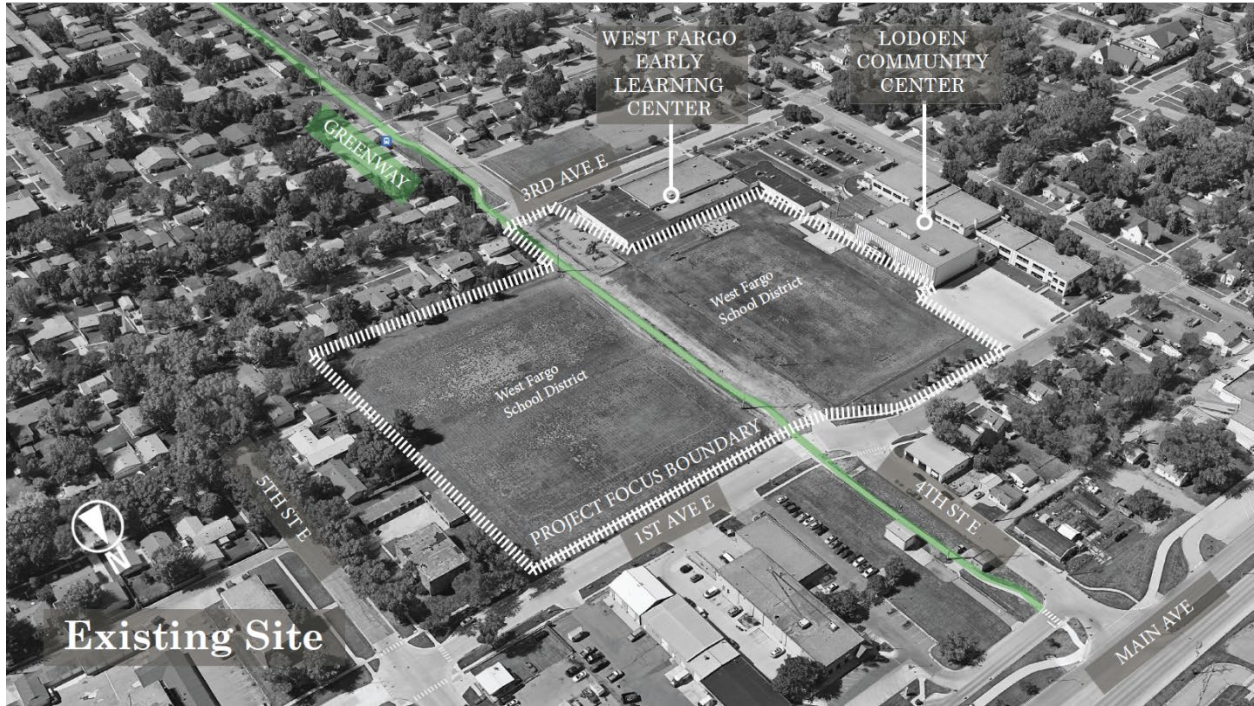


Figure 2: Existing Site Conditions.

6.4. Site Analysis

A SWOT analysis was conducted to determine the strengths, weaknesses, opportunities, and threats for the existing site. This process was determined to be the best method of analysis by building off the current strengths of the project, finding solutions to the weaknesses, taking advantage of the opportunities present, and mitigating current and future threats to the project.

6.4.1. A Highly Programmatic Building

The most present strength of the site is the two highly functional buildings located adjacent to it (Figure 3), the West Fargo Early Learning Center, and Lodoen Community Center. They consist of a variety of programs that relate well to the aspirations of the project, which include the Head Start program, Early Childhood Education, Early Childhood Special Education, West Fargo Public Library, YMCA Early Learning program, Transition Academy, Alternate

Middle School, and the Community High School. Most of these programs present the primary target groups of the proposed thesis project.



Figure 3: Lodoen Community Center and West Fargo Early Childhood Center.

6.4.2. Under Utilized and Not Maintained

The primary weakness of the existing site is underutilization and low upkeep and maintenance. The existing 8 acres was once a former soccer complex (Figure 4), that has been out of use for the past few years due to the uprise in athletic complexes being built throughout the area. Since it is no longer in use, the site has not been well maintained and has started to degrade over time (Figure 5).



Figure 4: Underutilized Green Space.

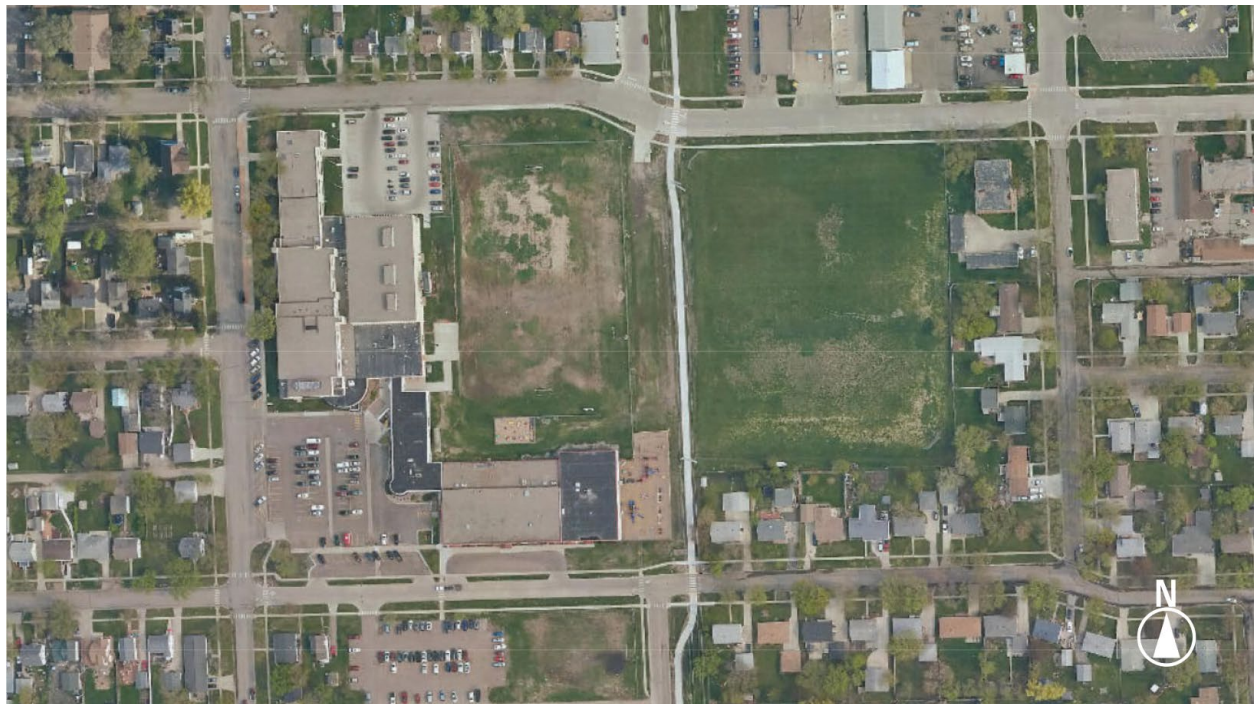


Figure 5: Existing Site has become Degraded.

6.4.3. A Great Opportunity for Accessibility

A community greenway (Figure 6) runs directly through the site which presents a great opportunity for accessibility. The community greenway runs north and south, starting from Main Avenue and going just past 13th Ave East. It is roughly 1.5 miles in length and connects to a variety of communities throughout West Fargo, while also providing a safe and accessible transit to the site. Raised crosswalks are implemented at the major crossing points along the greenway, which provide safe and effective transit for children and youth who are utilizing the greenway.



Figure 6: A 1.5-mile Community Greenway.

6.4.4. Limited Access to Natural Areas for Nearby Communities

Most parks and schoolgrounds (Figure 8) within the general area lack ecological features. They are all repetitive in their design and appearance, mainly consisting of concrete pad play areas, large open areas of turf grass, and traditional playground equipment. While these

areas are still most certainly beneficial to youth, they lack any opportunity for children to engage and explore the natural world around them.

The most ecologically significant feature in this area of the city is the Sheyenne River. However, because most of the land located along the river is privately owned (Figure 7), it limits access for nearby communities to access the most ecological part of the city.

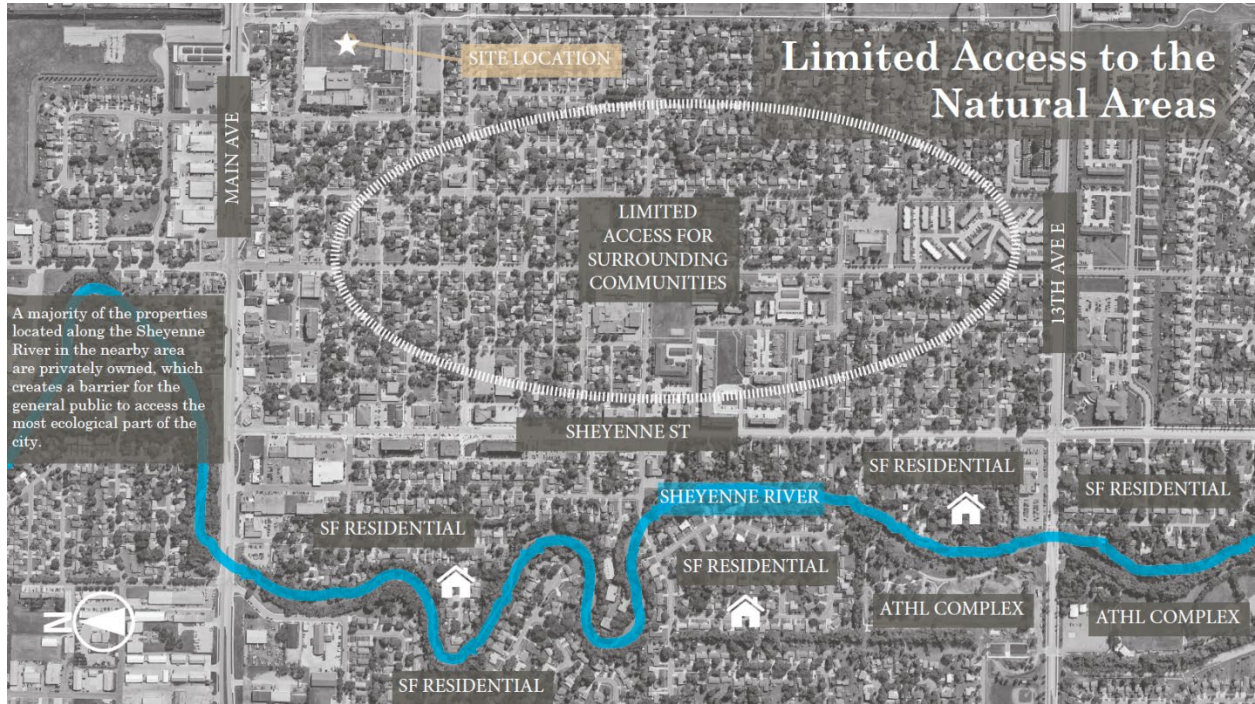


Figure 7: Limited Access to the Sheyenne River for Surrounding Communities.

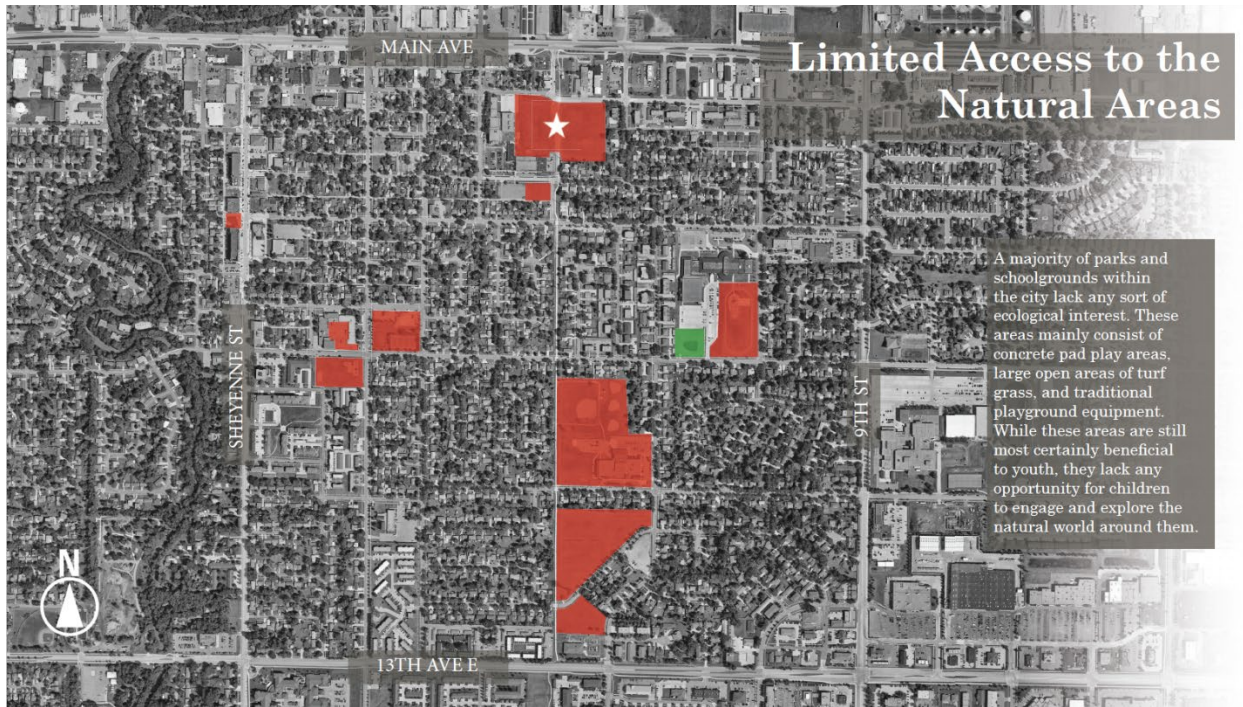


Figure 8: Surrounding Schoolgrounds and Parks.

6.4.5. Analysis Summary

6.4.5.1. *Building off existing assets*

A big advantage to the site is the two existing buildings located adjacent to the site, the Lodoen Community Center and West Fargo Early Learning Center, which consist of a variety of diverse programs, many of them being the primary target groups for this project. It is important to implement different design strategies and programming elements that fit the needs of these different programs.

6.4.5.2. *Creating equitable access to nature*

It is important to address the surrounding communities in the area who have limited access to natural areas. The parks and schools in the area that are seemingly accessible to the public lack ecological significance, while the ecologically significant areas of the city are seemingly inaccessible. The primary vision for this project is to create an ecological oasis that is

rich in play and learning opportunities, while also being the staple point for building a sustainable community. This vision, paired with a great opportunity to access the site using the existing greenway, allows for equitable access for nearby communities.

7. PRE-DESIGN OBJECTIVES AND PROGRAMMING

The typologies of this project include playgrounds and schoolyards, community planning, ecological design, and public gardens. The main purpose of the project is to meet the needs of the diverse range of students at the Lodoen Community Center, as well as the surrounding community, in the context of an ecological park designed for children, to enhance learning, development, well-being, and environmental stewardship.

7.1. Project Objectives

7.1.1. Nature Play and Exploration

The first, and probably most significant objective of the project was to provide opportunities for youth to explore nature while creating ecological connections. Exploration is the key word here, emphasizing children to explore the natural world around them, through different forms of play, while enhancing their learning, development, and environmental stewardship. Nature exploration also allows children to discover and learn something new daily, whereas traditional playgrounds are mainly structural and provide repetitive play and learning opportunities.

7.1.2. Restore Native Ecology

The second objective was to restore native vegetation that has dominated this region for thousands of years, while attracting native wildlife into the site. This includes the restoration of the primary native ecosystems that are located throughout the region, including grasslands, wetlands, forests, and oak savannas. While these ecosystems once dominated the region, that is

no longer the case. Agricultural and commercial development are the primary reason many of these native ecosystems have been destroyed throughout the region. By restoring these ecosystems, it is not only beneficial to the environment and native habitats, but also as an educational resource for youth to connect and grow, with the roots that make up the biome of the region.

7.1.3. Seasonal Opportunities

Seasonal opportunities allow youth to understand the concept of time and educate them on weather, vegetation, and wildlife patterns, while also providing a variety of play opportunities. It relates well with the restoring of the native ecology because the transformation of native vegetation throughout the year provides rich sensory experiences and educational experiences.

7.2. Programming Elements

7.2.1. Outdoor Classrooms

7.2.1.1. Boulder and Log Council

- Circular boulder and log seating areas that allow for flexible use related to the different programs within the Lodoen Community Center and West Fargo Early Learning Center.
- Can be used for large groups, small groups, or individual activities.

7.2.1.2. Reading Circle

- Natural areas meant for both large and small group reading activities.

7.2.2. Active Lawn

7.2.2.1. *The Great Lawn*

- Main lawn in the park that can be used for a variety of activities throughout the different seasons.
- Can be used for both passive and active recreational activities.

7.2.2.2. *Children's Play Lawn*

- Smaller, active lawn secluded to the early childhood students at the Lodoen Community Center and West Fargo Early Learning Center.
- Flexible for a variety of activities throughout the year and includes both passive and active play opportunities.

7.2.2.3. *The Glade*

- An active and open lawn that can be discovered within the dense forested area of the park.
- Provides a sensory rich experience and can be used for a variety of activities and play opportunities.

7.2.3. The Great Hill

- Provides opportunities for a variety of activities and can be used both passively and actively.
- Provides winter recreational opportunities for sledding and snowboarding.

7.2.4. Canyon Cove

- Most active and busiest play area in the park.
- A variety of challenging and risk-taking play opportunities are meant to benefit child development.

7.2.5. Early Childhood Garden

- Secluded play and explorative area meant for the early childhood students at the Lodoen Community Center and West Fargo Early Learning Center.
- A variety of play and learning opportunities that are both explorative and relate to the school's curricula.

7.2.6. Children's Nursery

- Produce gardens and tree nurseries where children learn to plant, grow, and nurture nature while also learning about healthy eating habits.

7.2.7. Storybook Trail Loop

- Provide seasonal reading opportunities that allow children to enhance literacy while forming a bond with nature.

7.2.8. Green Stormwater Infrastructure

7.2.8.1. Dry Swale ("Sheyenne River")

- Looping swale through the proposed site that collects a majority of the stormwater run-off.

7.2.8.2. Dry Creek

- Stormwater collection system designed to collect stormwater in the Early Childhood Garden and provide educational opportunities.

7.2.8.3. Raingarden

- Stormwater drainage area in the Early Childhood Garden meant to hold and filtrate water, while providing educational opportunities.

7.2.9. Native Ecosystems

7.2.9.1. Grasslands

- The primarily dominant ecosystem found throughout the proposed project, including Tall-Grass Prairie, Mixed-Grass Prairie, and Short-Grass Prairie.

7.2.9.2. Wetlands

- Primary pooling areas for stormwater run-off were found at the existing drainage areas on the site, consisting of native aquatic vegetation to the region.

7.2.9.3. Forest

- Dense forest area meant for more explorative opportunities that consists of tree and shrub vegetation native to the area.

7.2.9.4. Oak Savanna

- Consists of scattered Bur Oak trees found atop native grasslands.

8. SCHEMATIC DESIGN

Following a comprehensive inventory and analysis of the existing site, and the organization of proposed programming elements, the project kicked off with an overall visionary layout of the masterplan. This visionary concept plan was formed by locating different zones consisting of the proposed programming elements, and where they would best fit throughout the site. Once the zones were established, they were taken further with conceptualization. This conceptual phase consisted of plans, sections, and perspective drawings of the different elements proposed within each zone.

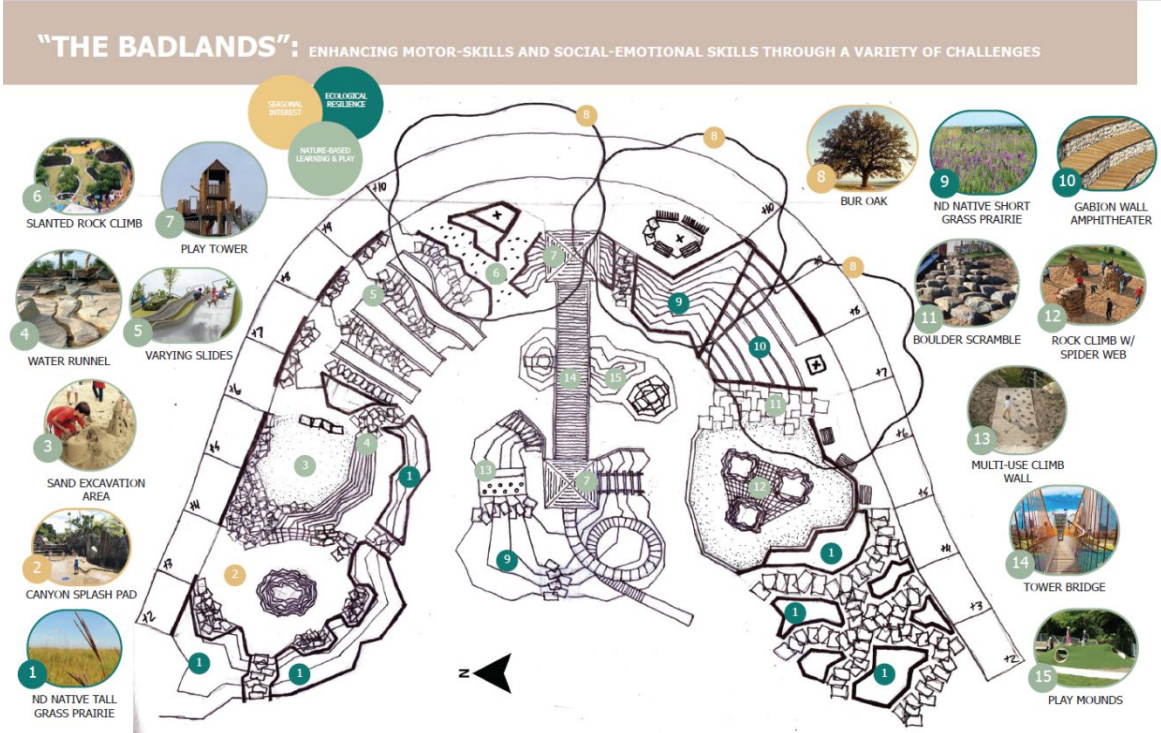


Figure 9: Early Concept of Canyon Cove.

One of the focus areas of the park is Canyon Cove. This area of the park is meant to provide a variety of challenges and risk-taking activities, meant to help primarily with motor-skill and social-emotional development in children. Canyon Cove is inspired by the rigid topography and terrain of the Painted Canyons in western North Dakota.

THE BADLANDS SECTION

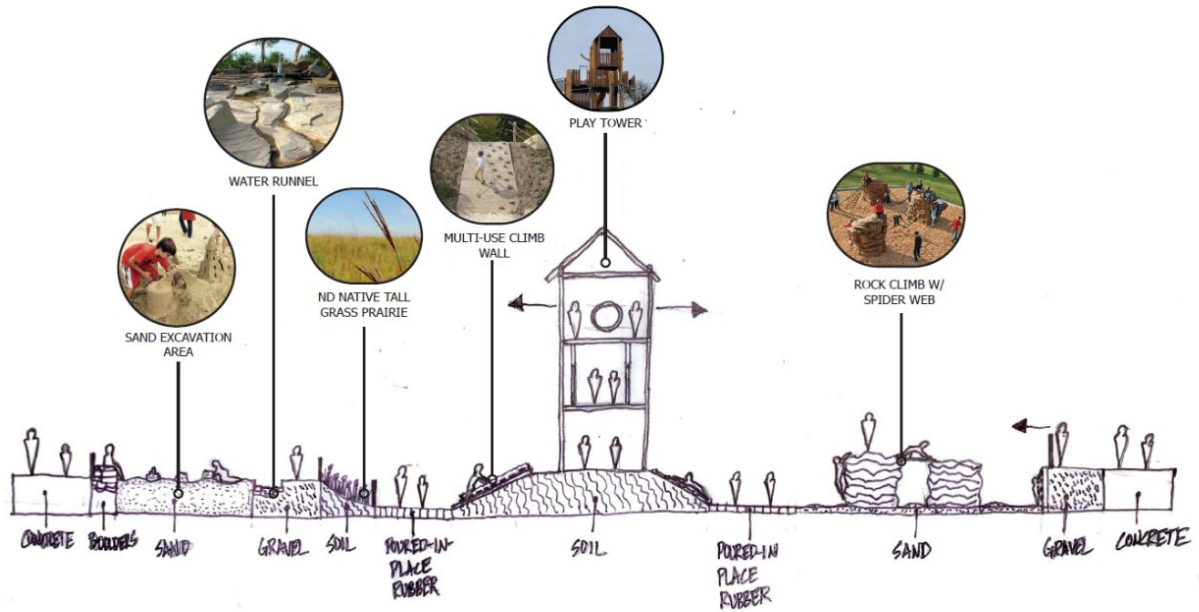


Figure 10: Canyon Cove Section.

A section showing the topographical change and various activities taking place within Canyon Cove. It captures the variety of play opportunities throughout this part of the park, including sand and water play, for more sensory rich and imaginative play opportunities, as well as more active play, such as the rock climb and spider web.

THE BADLANDS PERSPECTIVE

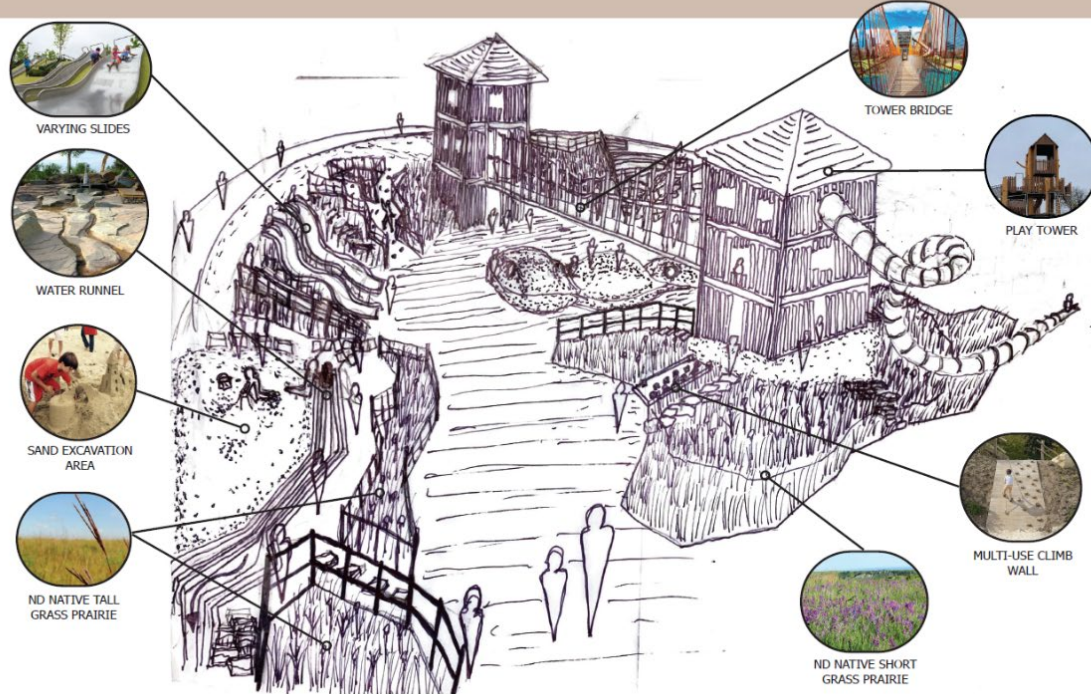


Figure 11: Perspective of Canyon Cove.

An aerial perspective capturing the early concept for Canyon Cove. A variety of play opportunities serve this area as the most popular and busy part of the park. Two play towers and a bridge serve as the focal point of this site and allow children to play while also capturing excellent views throughout the site.

EARLY CHILDHOOD SCHOOLYARD: PLAY AND LEARNING OPPORTUNITIES FOR ECC STUDENTS

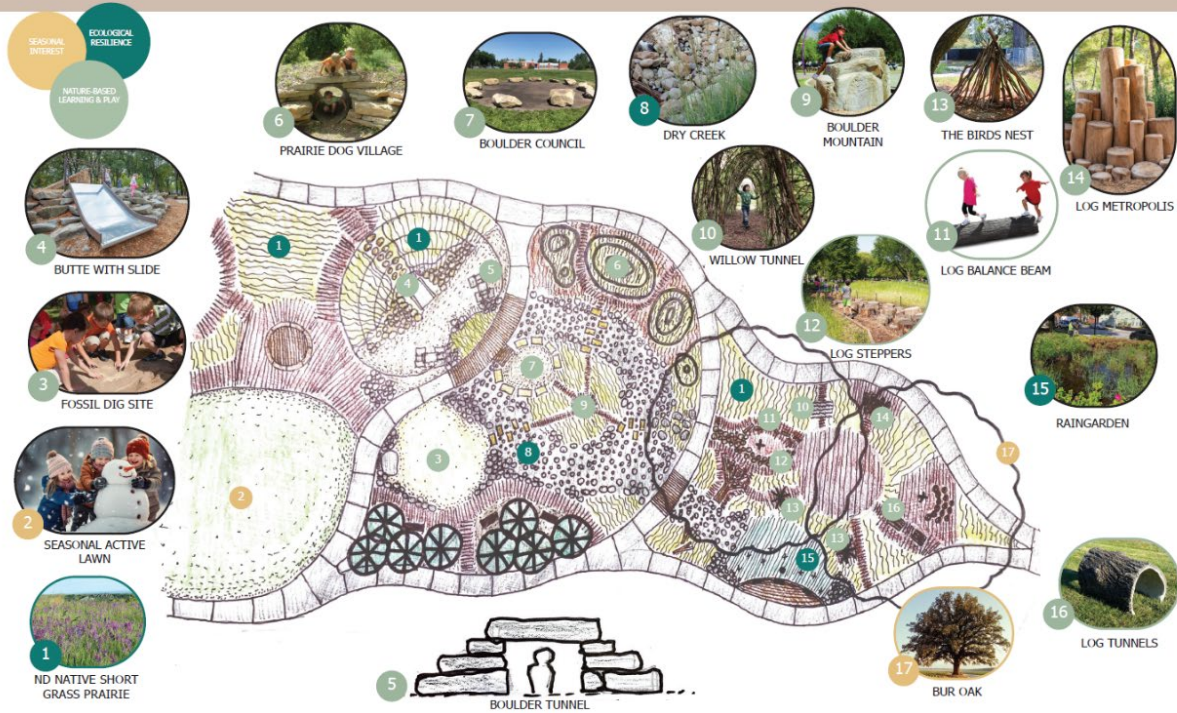


Figure 12: Early Concept of Early Childhood Garden.

The other primary focus area is the Early Childhood Garden. It is secluded to the early childhood students at the Lodoen Community Center and West Fargo Early Childhood Center. This area is meant for more explorative and non-structural play, allowing children to explore, learn, and discover something new each day.

DRY CREEK BED

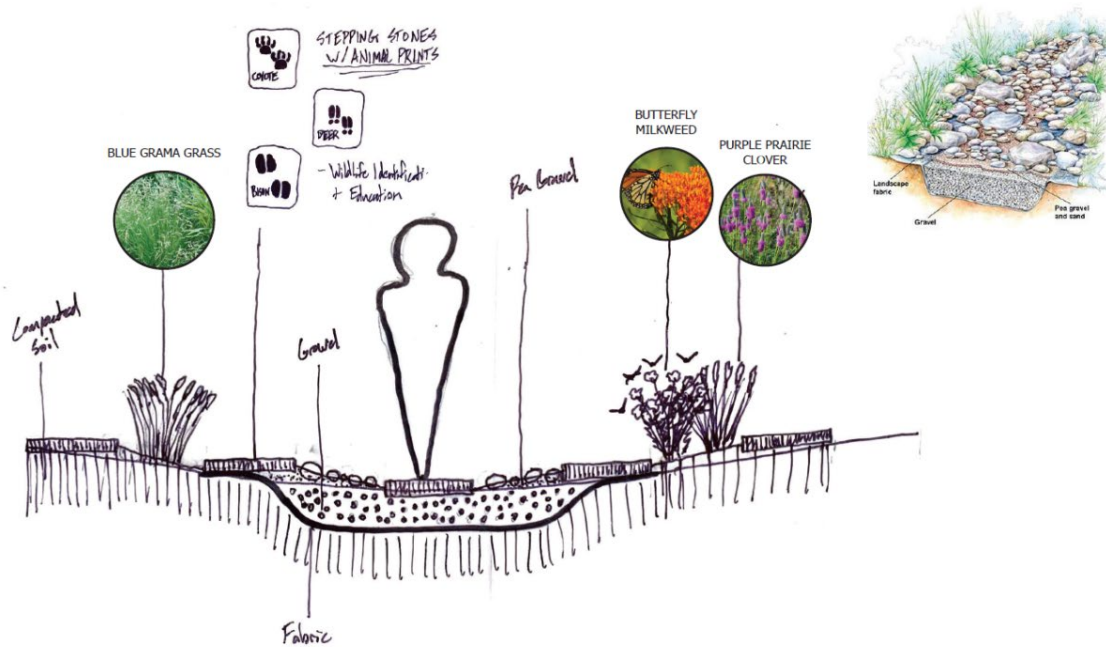


Figure 13: Dry Creek Bed.

A dry creek bed is meant to mimic a river and serve as green stormwater infrastructure in the Early Childhood Garden. While children are exploring and playing in the dry creek bed, they are also provided with learning opportunities. Steppingstones with native animal footprints allow children to learn while playing and create a connection with the native wildlife in the region.

RAINGARDEN

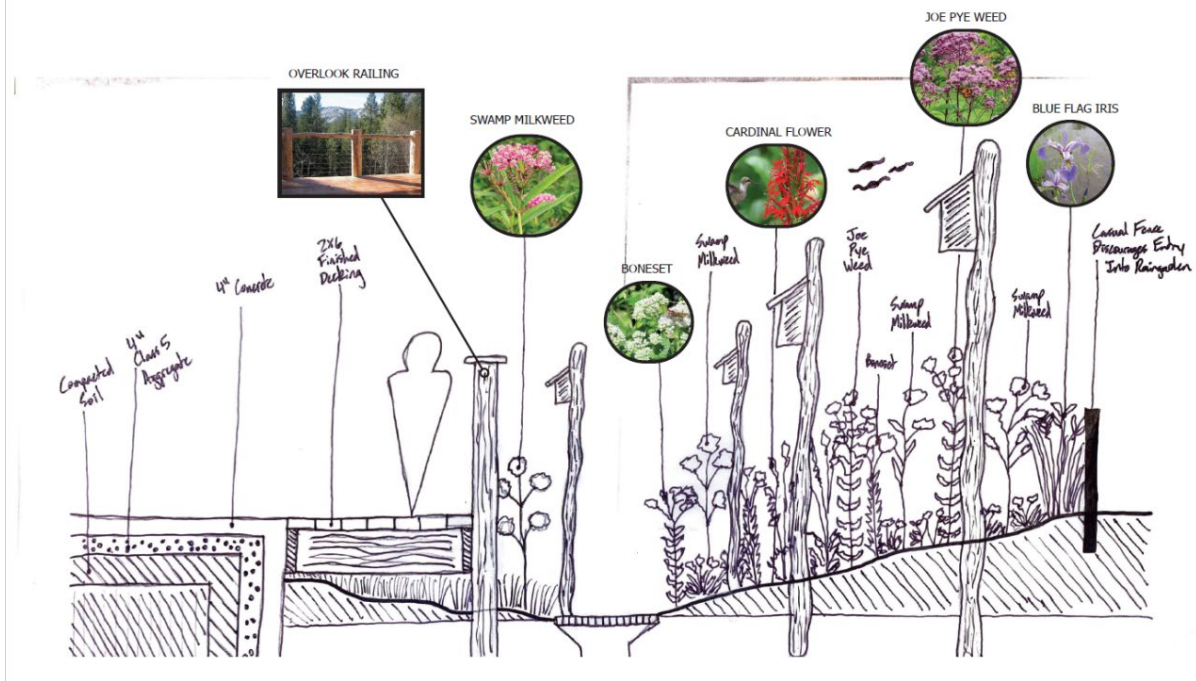


Figure 14: Rain garden Detail.

The Rain garden serves as the primary drainage area in the Early Childhood Garden, while also providing sensory rich experiences. The rain garden is meant to make stormwater management visible, while also attracting native wildlife and habitat to the area. An overlook area allows children to create a bond and connection with the native ecology of the region.

"THE STORYBOOK TRAIL": ENHANCING LITERACY, SENSORY DEVELOPMENT, AND APPRECIATION FOR NATURE

A WALK THROUGH THE OAK GROVE

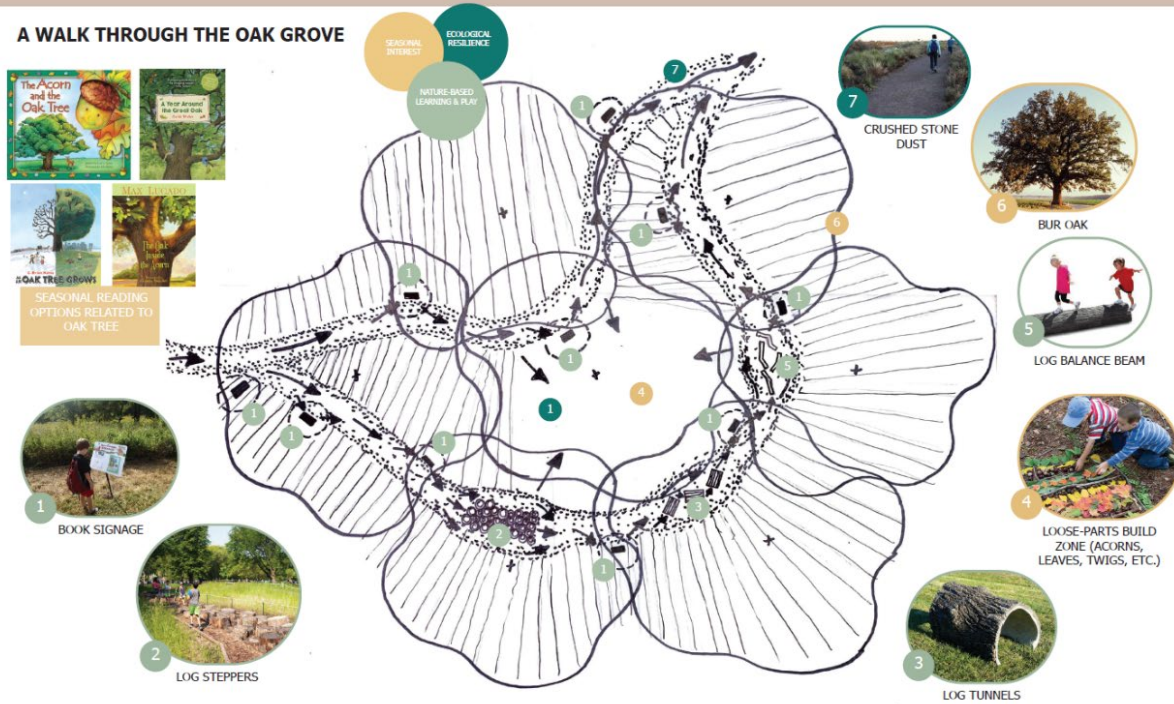


Figure 15: Storybook Trails.

Storybook Trails are meant to provide seasonal reading experiences while enhancing literacy and allowing children to create a direct connection to the native vegetation and wildlife around them. They also provide passive and seasonal play opportunities.

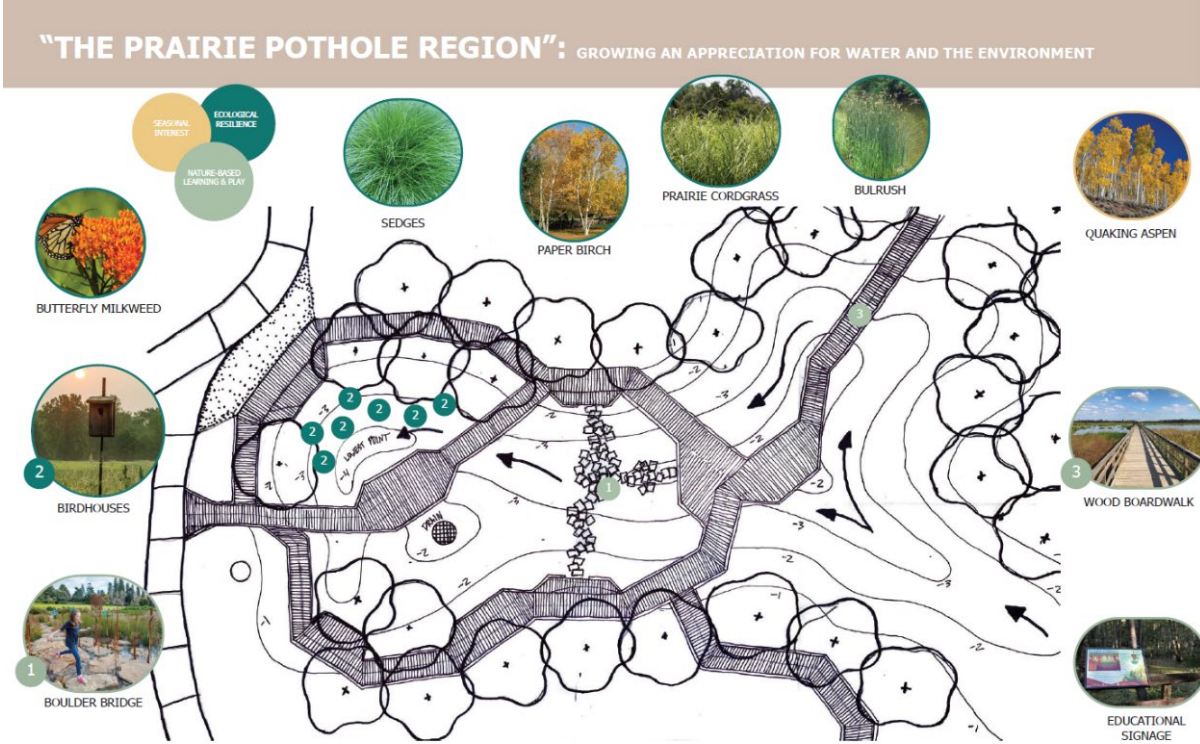


Figure 16: The Prairie Pothole. The Prairie Pothole is one of the two main wetland areas in the park, both located near existing drainage areas on the site. The wetland is meant to mimic the Prairie Potholes found throughout the Midwest and serve as a learning area where children can connect with the native ecology of the region.

9. DESIGN DEVELOPMENT

Following the schematic phase, the concepts were further developed into a digital model. Most of the concepts developed in the schematic phase remained the same throughout the rest of the design. This was mainly due to the emphasis on developing each concept as far as possible, before entering the digitization phase. The organization and spatial layout of these programs in the masterplan, however, drastically changed. The organization of these elements was determined by their relationship with the building, the greenway, and the street.

There are two primary areas of the masterplan that were taken into further detail, which include Canyon Cove (Figure 18) and the Early Childhood Garden (Figure 22). It was determined these areas would likely be the most popular and most used areas throughout the masterplan. Two secondary areas of the masterplan were also highlighted, which include the Storybook Trail Loop (Figure 26) and the Prairie Pothole (Figure 27).



Figure 17: Masterplan.

The site design was inspired by the native biome of the region, primarily the grasslands that had dominated this region for a long time. Other features include a natural dry swale, mimicking the flow of the Sheyenne River, that captures stormwater on site and drains into the two Prairie Pothole wetlands on the site. The dunes, forest, and Oak Savannas were all inspired by areas along the Sheyenne watershed, including the Sheyenne National Grasslands and the Sheyenne River Forest. These native features present a great opportunity to provide learning and play opportunities to youth, with the hopes of inspiring the next generation of environmental stewards, while also helping children grow and develop.

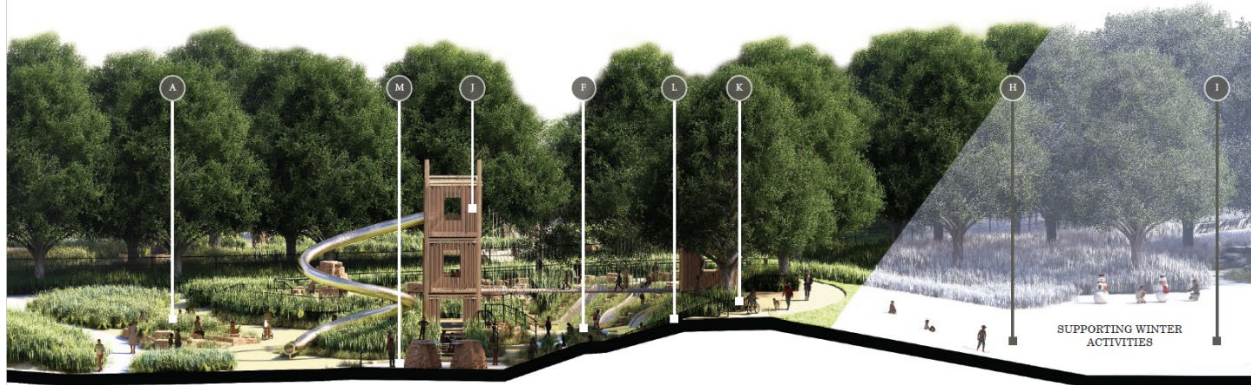


Figure 18: Canyon Cove Site Plan.

Canyon Cove is inspired by the Painted Canyons of western North Dakota. This area is meant to be the most active and busiest area of the park, because it presents risk taking obstacles and challenges that children are prone to engage in. Similarly, to overcome challenges when hiking the Painted Canyons, this area presents an opportunity for achievement and fulfillment, to further develop both emotionally, socially, and physically.

Play Opportunities Enriched through the Seasons

Site Key	
A BOULDER LOUNGE	H THE GREAT HILL
B THE CAVE	I THE GREAT LAWN
C WATER RUNNEL	J PLAY TOWER
D SAND COVE	K BIKE STATION
E SLIDE MOUNTAIN	L AMPHITHEATER
F PRAIRIE DOG VILLAGE	M CLIMBING ZONE
G SLANTED CLIMB	N BOULDER SCRAMBLE



S01: Canyon Cove

Figure 19: Play Opportunities Enriched through the Seasons. A section showing another perspective of the varied play opportunities throughout Canyon Cove, as well as the change in topography. The backside of Canyon Cove includes the Great Hill and Great Lawn, which provide seasonally rich play opportunities, especially in the winter months, for sledding and snowboarding as well as snow building.



Figure 20: Loose-Parts and Imaginative Play Opportunities.

Canyon Cove also provides opportunities for more sensory rich play experiences such as loose parts play with sand and water, as well as imaginative play experiences like The Cave, mimicking the caves found in western North Dakota. These opportunities encourage children to use their imagination to enhance their creativity and problem-solving skills. Non-structural seating opportunities are found all throughout the area, which enrich one's feeling of being part of the natural world around them.



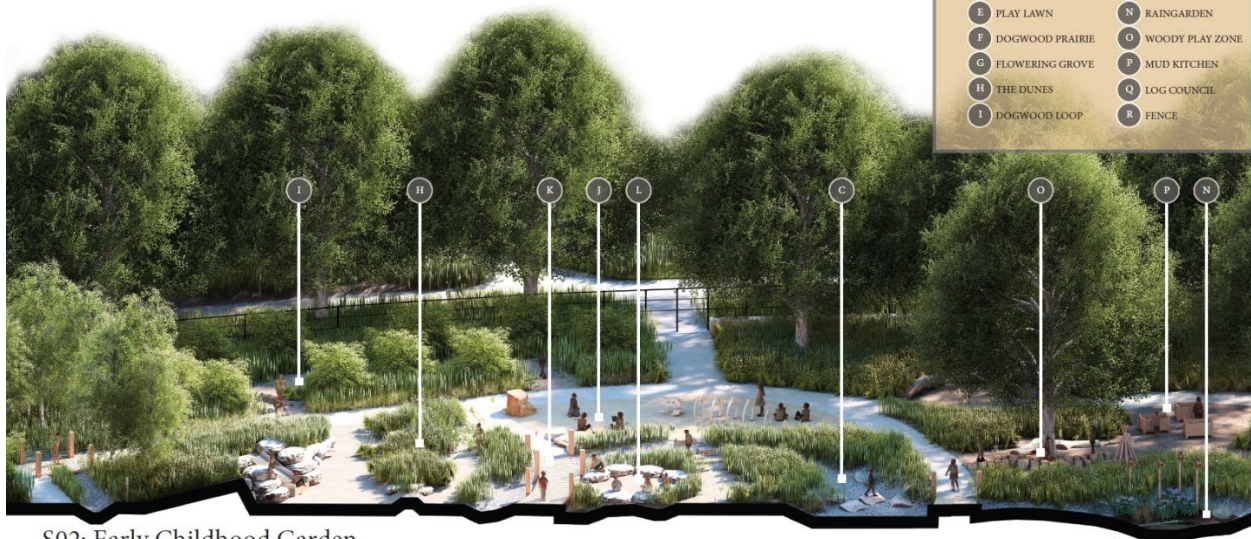
Figure 21: Overcoming Challenges and Developing Motor-Skills. Active play opportunities such as the Climb Zone and Prairie Dog Village present challenges and risk-taking experiences that help children further develop their motor-skills and social-emotional skills. By overcoming these challenges, children gain confidence and can celebrate and socialize with others who are overcoming the same challenges.



Figure 22: Early Childhood Garden Site Plan.

The Early Childhood Garden is meant to serve the early childhood students at the Lodeon Community Center and West Fargo Early Childhood Center. This area is filled with explorative play opportunities and sensory rich experiences, which are meant to allow children to explore and engage in the natural world around them. An explorative natural playground gives children the chance to discover and learn something new each day, which is much different than a traditional playground, where play and learning experiences are often repeated daily.

Explorative Play for ECC Students



A GATE ENTRY	J FOSSIL DIG SITE
B WATER CAPTURE ZONE	K BRIDGE
C DRY CREEK	L BOULDER COUNCIL
D READING CIRCLE	M CONIFER GROVE
E PLAY LAWN	N RAINGARDEN
F DOGWOOD PRAIRIE	O WOODY PLAY ZONE
G FLOWERING GROVE	P MUD KITCHEN
H THE DUNES	Q LOG COUNCIL
I DOGWOOD LOOP	R FENCE

S02: Early Childhood Garden

Figure 23: Explorative Play for ECC Students.

A section showing the various play and learning opportunities happening throughout the Early Childhood Garden. A few of the key spaces to highlight are The Dunes, which are active play mounds and tunnels, that mimic the sand dunes found in the Sheyenne Grasslands. A Fossil Dig Site allows children to discover the hidden fossils of the dinosaurs found in this region. The Boulder Council serves as an outdoor breakout room where children can socially engage with one another. The Woody Play Zone is filled with woody play elements such as log steppers, balance beams, log tunnels, as well as a mud kitchen, which encourages children to mix different elements of nature such as twigs, leaves, acorns, etc.

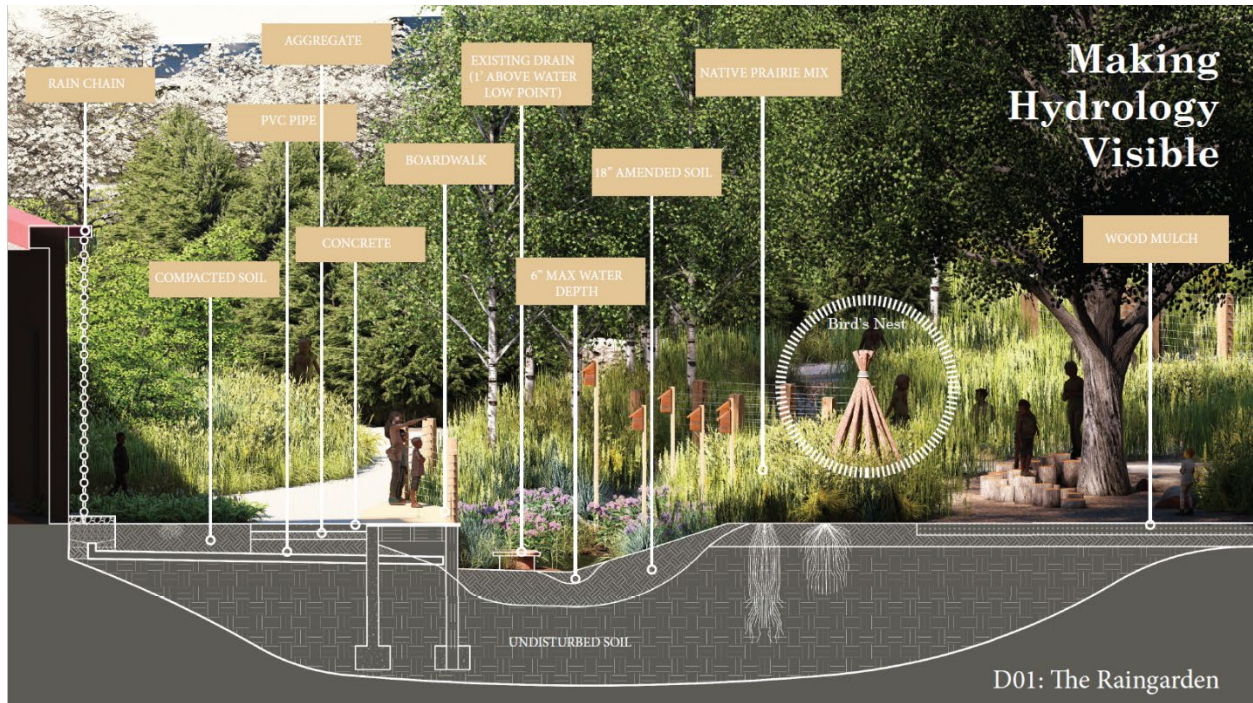


Figure 24: Making Hydrology Visible.

The natural process of hydrology often goes unnoticed within a city, essentially becoming invisible. Most city hydrology systems are underground, making it difficult for people to comprehend the general process of stormwater and the appreciation for it. Over the last decade, there has been a growing trend in green stormwater infrastructure systems. It is important to continue that trend, as it allows for the next generation of youth to become educated and engaged in the importance of keeping our waterways clean. By making ecology visible through such features, children can develop a deeper understanding and appreciation of nature and hydrology, encouraging a sense of responsibility and stewardship towards the environment. The rain chain presents a visual appeal that draws curiosity from users. It brings the process stormwater takes off the roof and presents it in an aesthetic way, one that can be interpolated. It eventually reaches the rock pad, where it infiltrates into the PVC pipe, where it is finally transferred to the rain garden. The rain garden offers unique sensory experiences with its vibrant colors, fragrancy, and the local pollinators it attracts. Once the water settles in the rain garden, it infiltrates into the soil within 48 hours. During heavy storms, the existing drain in the rain garden may be activated if water levels exceed 1 foot.



Figure 26: Storybook Trails offer Seasonal Experiences. The Storybook Trails offer seasonal reading opportunities that help children enhance their literacy, while creating a direct connection to the native vegetation and wildlife around them. The experience along the trail is also enriched through passive play and seasonal play opportunities, such as the falling leaves in the fall.



Figure 27: Connecting to Native Ecology.

The Prairie Potholes are restored wetlands that serve as the primary pooling or drainage areas on the site. They mimic the Prairie Potholes that had once dominated a majority of the Midwest, that have become more threatened over time due to agricultural and commercial expansion. These wetlands are meant to attract native wildlife into the area and allow for children to form a connection with the native ecology of the region.

10. DESIGN CONCLUSION AND REFLECTION

The achievement of completing this thesis project is felt thoroughly through the time and effort that went into each phase of the project. The research and analysis portion of the project were crucial in understanding and mastering the topic, which ultimately led to more conclusive design solutions.

The research portion played a big role in understanding the topic, and how nature has a major impact on child learning, development, well-being, and environmental stewardship. It is important to understand these benefits in a time where children seem to be more disconnected from nature than ever, and the environment is continuing to decline.

Once it was understood how nature benefits children, it was important to see how these elements could be implemented contextually. Case studies were examined to understand the different programs and elements that were integrated in these projects, and how they have a positive impact on children and the environment. It was determined that a large majority of nature-based play and learning projects take place on schoolgrounds, learning institutions, residential zones, or natural areas.

By zoning in on these different typologies for the potential site of the project, it made the selection process more efficient. The proposed project site was selected because it was located adjacent to two highly programmatic buildings and a 1.5-mile community greenway, while the existing 8-acre site was being highly underutilized and unmaintained. There is also a lack of access to natural areas in this part of the city, and this project would give surrounding communities easy access to nature.

Based off design principles for nature-based play and learning, as well as case studies, a programming list was developed that would best fit the needs of the students and surrounding communities. Due to surrounding communities lack of access to the most ecological part of the city, the Sheyenne River, these natural programming elements were themed around the different native ecosystems that take place along the Sheyenne Watershed. This allows youth to create a connection and appreciate the native ecology of the region, all while enhancing their learning, development, and well-being.

Playing and learning in the natural environment is special because nature is constantly changing. It provides youth with different play and learning experiences daily, all throughout the year. Nature is non-structural, allowing children to make up their own types of play and enhance

their imagination and creativity. Re-building the natural environment, and allowing the next generation with easy access, will help make the world a better place.

I was inspired by this project and research because of my dedication to improving the environment, while leaving the world a better place for the next generation. I was fortunate to grow up near and have easy access to natural areas, and these experiences made me truly grateful for nature and the native ecology of the region. This project was a great learning experience, and hopefully, can serve as a foundational piece of continued research around this topic in this part of the region. Re-growing the native environment while supporting children's developmental growth, essentially reflects the idea of "growing with the roots" as we nurture not just the natural environment but also the next generation of youth.

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