

Creating Healing Environments Through Virtual Augmented Reality: How Technology Can Help Nature Deficit Disorder in Children

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Many children growing up in urban environments today have never formed a relationship with nature. To them, it is inaccessible. Even though sustainability and the “green” movement are at the forefront of popular trends, will this really last if the youngest of us does not have any deep rooted values? The strongest beliefs are fostered with a personal experience. On the other hand, we have had a rapid boom in smart technology. People everywhere are “connected.” It has dramatically changed many aspects of our culture. However, the segment of the population that has been the most receptive to these rapid changes are children. They have more access to computers, iphones, and tablets than parks. These devices have replaced parks, playgrounds, and backyards as traditional places for recreation and leisure. Although, technology does not have to be at odds with nature. It can be used as a stepping stone to reconnect children to the environment. This thesis aims to create a small oasis in an urban environment, aided by computer gaming technology, it uses the principles of Attention Restoration Therapy to create an accessible and welcoming environment where kids can experience a piece of nature and start building appreciation for nature and ecology.

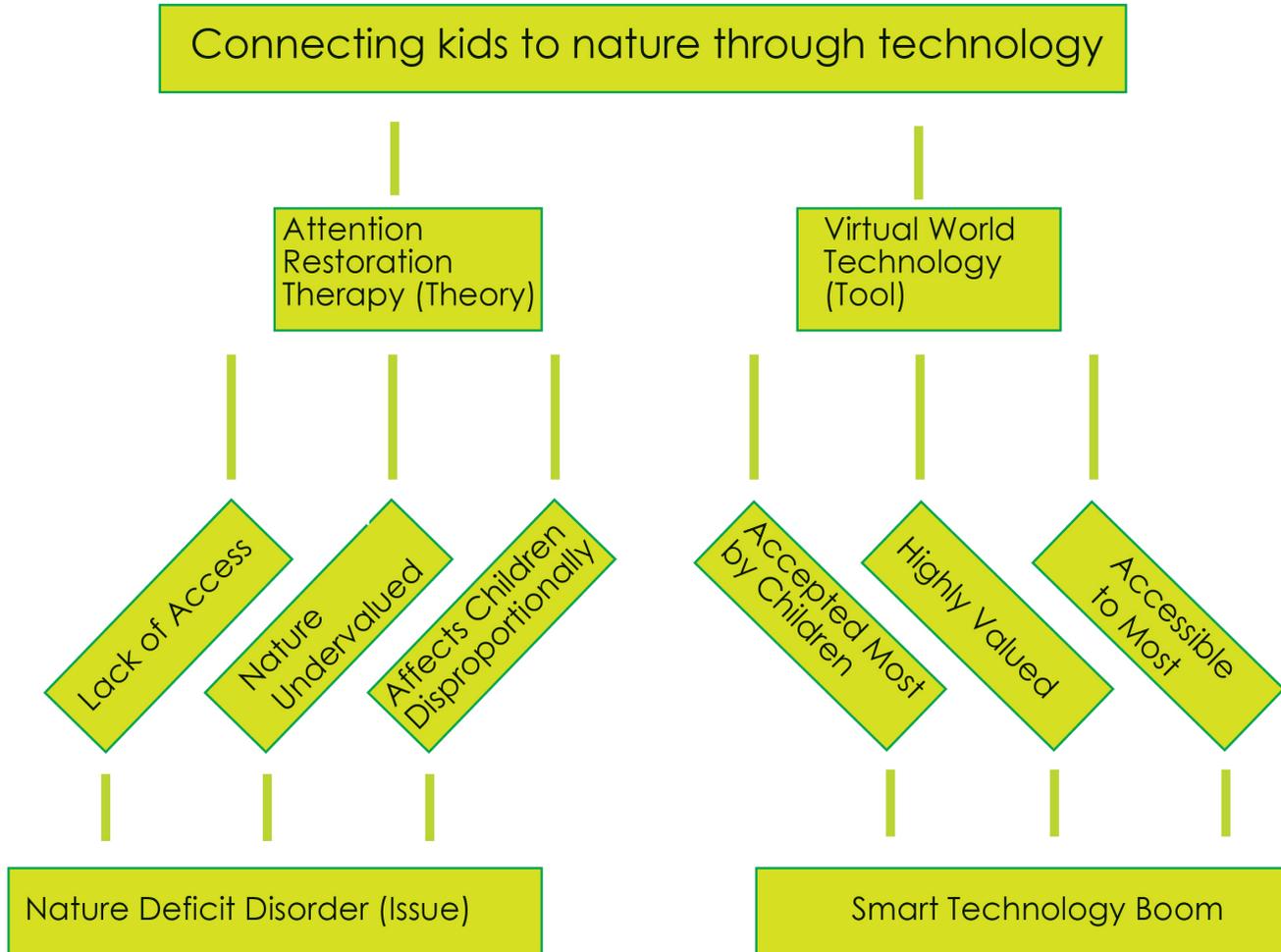
The urban environment can be a physically hostile place. City designers have tried for years to mitigate these effects through streetscape design, planning, and brown-site redevelopment. However, not as much attention or research has been given to the devastating effects the urban environment can have on the mind and soul. (Olmstead 1870) Frederick Law Olmstead began this search in the United States when he realized the need for green space to soothe and reform the minds of factory workers living in sub standard living conditions. He believed much of the hostility between city residents was from their disconnection with the grounding forces of nature. (Olmstead 1870) For Manhattan, New York, Central Park was his answer.

Since that time New York City has grown exponentially. Are the same ideas that were applied then still relevant today? The areas surrounding Central Park have become prime real estate and now has a belt of expensive high rise apartments and office buildings. It is not accessible daily to those living in other, less expensive areas of Manhattan. Today's realities are that land is disappearing and transportation is expensive. Furthermore, this disconnection with nature that Olmstead feared has disproportionately affected the younger generations. They grow up in an era without memories of farms or wilderness, while only hearing about it in history books. The handheld personal technology boom has also taken off. Now kids are six times more likely to play a video game than ride a bike. (Cauchon, 2005) Many urban and suburban kids and adults cannot say the last time they went to a national park, but have spent the entire day on their iPhone. This represents a clear shift that has taken place in recent years. Much of our business and personal interaction takes place through the internet and various devices. Does nature and technology have to struggle against each other?

This thesis aims to take a different approach in reconciling the two. What if digital media technology can be the tool that builds relationships between people and nature? This thesis explores the intersection of digital media technology as a learning tool for the youth within urban centers, with the development of an appreciation for nature and local ecology. Through this, we can create the first step back towards harmony between nature and humans.

research

RESEARCH PROCESS



Nature → City → New Nature Awareness!

The Decline of Nature (D.O.N)

Since humans have existed, we have steadily made the climb to more urban environments. From what we know of known human history, we have been mostly hunter-gatherers up until about 10,000 years ago. (Bulliet 2011) At this moment, much of the world turned towards subsistence agriculture and began to settle down. Roughly, another 5,000 years after that, agricultural innovations allowed for a surplus of food and for people to make their livelihood through non-agricultural activities. These people moved off farms and into the first cities. (Bulliet 2011) However, since these changes happened gradually over thousands of years, people had time to change and adapt to their environment and new ways of living. Once the industrial revolution hit in the 18th-19th centuries, urbanization began to pick up pace. Agriculture became mechanized and drove more people out of work. These displaced people found work in city factories. (Bulliet 2011) The rapid rate of industrialization and change created

fast, poorly designed housing. In New York City, between 1800 and 1880 tenements were built at a rapid rate to accommodate the influx of poor factory workers. ("Tenements" 2013) These tenements were meant to be single family apartments, but were even subdivided to fit more people. These apartments were built back to back with sometimes only a bit of backyard greenspace that housed the outdoor community toilet. (saberchill.com) Much of these were built in the Lower East Side. ("Tenements" 2013) As a result of these poor living conditions, the City Beautiful movement emerged in response. Frederick Law Olmstead, a leader of this movement, saw the need for a public, natural refuge for these families in tenement conditions. (loc.gov) He helped to design Central Park as a refuge for these people. (loc.gov) He wanted the "greatest possible contrast with the restraining and confining conditions of the town, which compel us to walk circumspectly, watchfully, jealously, which compel us to look closely upon others without sympathy." (Olmstead 1870) Society was starting to wake up to the effects of tight living

quarters and lack of greenspace.

By the first world war, dense cities contained residents in multi-family houses that were built next to work. (Auch 2004) Beginning in the 1920s, aided by the rising popularity of automobiles, suburban living started to appear around the older cities. These suburbs emerged due to the automobile and middle and upper classes leaving cities that faced economic hard times and rising crime. (Dickinson Jr. 1960) These suburbs continued to grow until some began to develop some of the problems of the city such as pollution and crime. During this time, beginning in 1949 with Title One of the Housing Act of 1949, which provided government funding to redevelop slums, the urban revitalization era began in the U.S.. (Hyra 2012) This movement recognizes the diminishing natural and agricultural landscapes and aims to reinvent these historical cities. These cities are making an effort to create socially, economically, and environmentally sustainable living conditions.

Nature Deficit Disorder (N.D.D.)

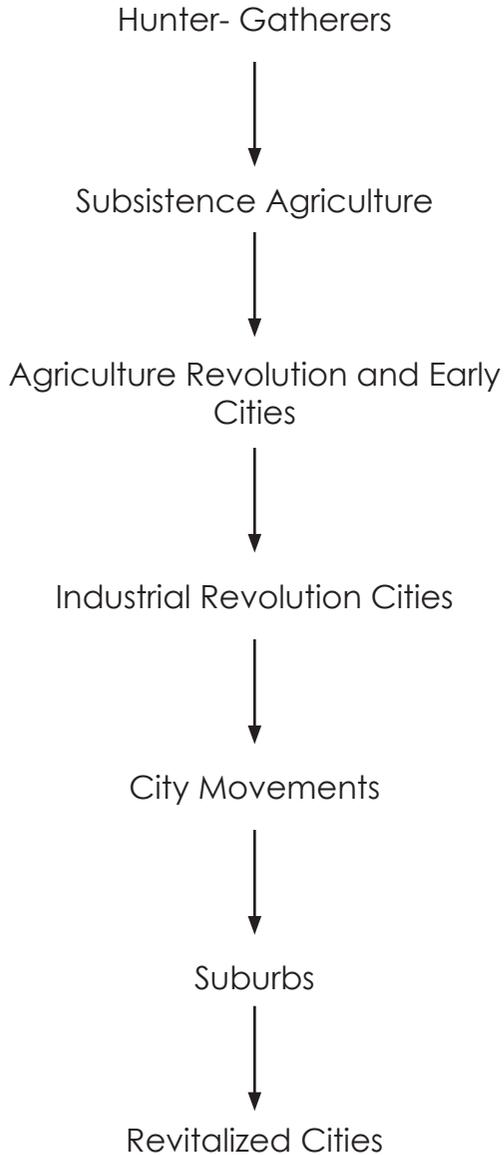
Nature deficit disorder is a term by Richard Louv (2006) used to describe the increasing divide between humans and nature. From pre-colonial America until now, each generation has grown up with a slightly different relationship to nature. It began as nature, the wilderness to be conquered. It progressed into small farms where families grew up and children roamed the woods. When early cities appeared parks were available to roam as well as undeveloped natural areas nearby. Children, in search of fun and driven by their imagination, could spend the entire day outside playing, if given the chance. At the advent of suburban living, stretches of neighbors' lawns and yards in neighborhoods, were the childhood stomping grounds. Recently, according to Louv, many children and adults from the past 2-3 decades have experienced the beginning of the division between nature and play. These children and young adults have not had the experiences of past generations of kids where nature was easily accessible.

Basic Cognitive Functioning (B.C.F.)

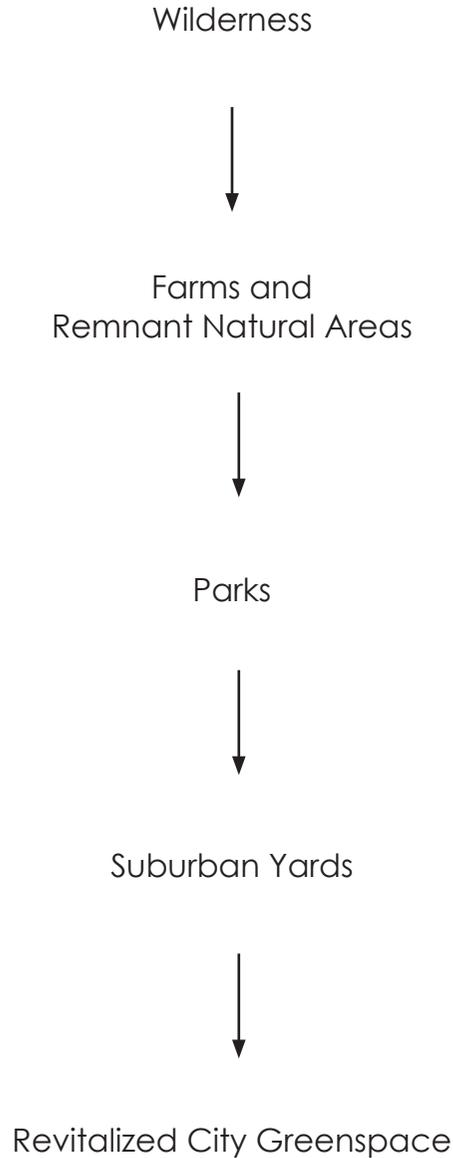
The absence of nature or the under exposure of nature also has physical effects. Recently, scientists have

researched how city environments affect our brain. They have found evidence that just being in an urban environment has immediate, detrimental effects. After a few minutes of being immersed on a crowded city street, "the brain is less able to hold things in memory, and suffers from reduced self-control." (Lehrer 2009) In a cityscape, there is so much stimuli vying for our attention. We have to find our way dodging traffic, while redirecting our attention away from conversations, beeping horns, restaurant smells, etc. In 1892 William James distinguished between our two types of attention: 1) involuntary attention, where attention is captured by fascinating stimuli and 2) directed attention, where attention is focused on a mentally directed task. (James 1892) Our involuntary attention is our innate reaction to the stimuli and cannot be completely controlled. Our directed attention has to override our involuntary attention in order to complete the task we are focused on, such as walking to our favorite pastry shop downtown. It has been proven that not only after taking a stroll in the city, but even just looking at a picture of the city, our directed attention suffers and we are not able to perform tasks related to this type of attention as well. (Berman 2008)

D.O.N.



N.D.D.



B.C.F.

2 Types of Attention:

Involuntary Attention - Attention is captured fascinating stimuli, our innate response

Directed Attention - Attention that is focused on a mentally directed task

Cognitive Effects of:

A Few Minutes on Urban Street
-Reduced Memory Capacity
-Reduced Self Control

Looking at Picture of Urban Env.
-Directed attention suffers, not as able to perform mental tasks

Creativity and Higher Mental Tasks

Many of the attention experiments have focused on the effect urban environments have on directional attention and have measured basic tasks that require this type of attention. (Berman 2008) If the effect is so dramatic on these simple tasks, what then becomes of higher level cognitive tasks such as problem solving and creativity? It is an interesting coincidence that generations ago the average person could build their own house and most of what they needed while all around them was wilderness. In addition it was commonplace for children to build their own toys from whatever their imagination spewed out and what materials they could find. Now, in a time when the average urbanized American has more disposable resources and income, instead of children building to their hearts content, the creativity is limited to a few toy manufacturers. Few adults have the impetus (or ability) to imagine something new and bring it into the physical, even if it is as simple as a better idea for their paper towel dispenser.

Every day, most adults commute through the city to then work at a job that demands directed attention. These people are making decisions that will change the course of history and direct peoples' lives. How can we foster an environment that is

conducive to creativity.

Spiritual

Richard Louv (2006) recalls that in a meeting in his living room with religious leaders, they stressed that to be spiritual is to always be in awe. Nature brings this constant sense of amazement. It is not coincidental that most of the well known places on earth are natural features: the sand dunes of the Sahara, the Great Barrier Reef, the Swiss Alps, the Grand Canyon, Niagara Falls, the savannahs of Africa. All these features strike awe in the hearts of the visitor and humble the viewer. Young Native Americans would immerse themselves in the wilderness on vision quests in search of God. Buddha gained enlightenment underneath a bodhi tree. The experience of nature transcends human communication and is understood at a deeper level. Edward Hoffman, a psychologist who specializes in childhood psychology, interviewed many adults and children to gain insight into their childhood transcendental experiences of "great meaning, beauty, or inspiration." He found that most of these experiences happened in nature. (Hoffman 1992) If children cannot access some form of nature, what will inspire wonder and amazement in them? Where will they begin to understand that there are things that cannot be described with language? This is one of their first introductions to God,

before a face or religion is attached to this understanding. It is from this deep understanding that ethics and values are born. These spiritual convictions shape beliefs and inform the sincerest environmental stewardship.

The Generation That Nature Abandoned

“...I was encouraged to find that many people now of college age – those who belong to the first generation largely to grow up in a de-natured environment – have tasted just enough nature to intuitively understand what they have missed. This yearning is a source of power.....They do not intend to be the last children in the woods.”
–Richard Louv

I completely identify with Louv's sentiments and this was in part, the inspiration for my research. My particular age group being at the front end that experienced a little piece of nature in my small suburban backyard while listening to my parent's stories of how they would get lost in the acres and acres of tropical forest that surrounded their homes in Jamaica. At the same time, my sister and I were always told we could not dig mudholes in our backyard because there was not enough space; but then had to endure stories of how our mom used to dig holes and climb trees because there was enough space for her to wander out of sight of the house. My dad spoke of digging up cannon balls in the land around his house left over from Jamaica's buccaneer days. In another childhood memory I recall looking into a school's parking

lot through the chain link fence at the back of my yard, while my dad described how he used to hike up the Blue Mountains with his cub scouts through the mist and exchange the hot Jamaican air for the cool mountain breeze. I recall wanting to do the same. I wanted to wander far enough that I could make mud pies to my heart's content. I imagined my sister and I could extend our game of pretending to be Native Americans to a further place that was uninterrupted by car engines and police sirens. My grandfather and father built us a swing set in the backyard and my mom bought us outdoor toys, but what I really wanted was their stories.

This thesis will focus on the younger school children since they are part of this first generation that will be growing up in this 'de-natured environment.' They are also young enough that if given the right situation, they can begin a relationship with nature and grow up with ecological understanding and experience.

Lost Values

Unfortunately, I think that those younger than myself whose parents are not from exotic places, would not have been exposed to those stories, or even the little access to nature that I had. Nature is a foreign entity to these kids because they do not realize that people can live next to and in

nature. There does not have to be a division between the two. It is only recently that we have drawn this harsh line. It is imperative that these children and young adults are reached out to. How will they protect forests and wetlands if they do not have an appreciation or tie to them? It cannot be taken for granted that without experiencing it, this generation will grow to endear it. A renewed environmental ethic is starting to grow with the sustainability and green movement, but who will bring it to fruition?

A.R.T.

Attention Restoration Theory (A.R.T.) is an idea proposed by Steven Kaplan (1983) where exhausted directed attention could be restored if the individual was put into the right environment. The most conducive environment for this is wild nature. Undisturbed nature has these inherent qualities. However, these qualities can be extracted from natural examples and infused into urban environments that lack these restorative qualities. Kaplan (1983) Kaplan has 4 major criteria for a restorative environment:

Compatibility – The environment must support a person's goals and inclinations. It does not coerce but allows room for reflection. Enough information is given in the environment that wayfinding and comprehension are obvious. There are not too many distractions (excessive noise, visual clutter, physical obstacles).



Fig. 1

This picture shows that this park provides many ways to relate to the environment. Users have flexible options.

Escapism – in order to achieve restoration, the stimuli and pressure that first created the depleted directed attention must be removed. The person must feel as if they were away from it.



Fig. 2

This wilderness picture shows that this environment has depth and is a world of its own.

Fascination – The environment has to hold the person's attention and interest without becoming a distraction.



Fig. 3

A rushing stream creates fascination through motion.

Coherence – This largely ties into fascination. The environment has to be easily discernible and organized. It has to have some form of organizing principle so it does not become a loose connection of distracting parts.



Fig. 4

This rest stop has areas that are easy to identify both physically and functionally.

In order to understand the different forms Attention Restoration Therapy can take, three case studies were examined to find out which elements created an environment that was conducive to the 4 principles of ART. The case studies were picked to show the range of physical possibility. Various forms of nature can provide restorative benefits. The first type is the classic immersion in nature or in a park. (Berman 2008) The first case study, the Toyota Children's Learning garden, features a small park that exhibits the natural biodiversity of its region. The second form nature can take is an abstracted, symbolic reference to nature, such as a photograph. (Berman 2008) The next case study, The Nest, is located inside an office building and uses referential forms to imitate nature and calm the minds of its users. On the extreme end of the spectrum, even the color green has therapeutic benefits. (Lichtenfeld 2012) The third case study, Urban Green, uses this color to evoke the idea of nature.

A.R.T. CASE STUDIES



Fig. 1



Fig. 2



Fig. 3

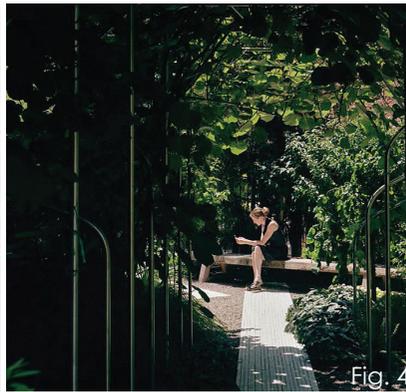


Fig. 4



Fig. 5

Toyota Children's Learning Garden
Michael Van Valkenburg Associates (LA Firm)
New York, NY USA

The Learning Garden shows a more traditional experience of urban nature presented in a small park format. The garden was created so kids could learn different environmental habitats in an intimate setting.



Compatibility: The site has medium compatibility. For the most part there is a path to follow through the park that winds back and forth and determines how most visitors traverse the park. However, there are some areas that diverge off the path that have seating for moments of reflection. These areas are great for adults, but are not as expansive for kids. When younger kids are playing, they tend to run wherever their imaginations take them and find inventive uses for park furniture. Some areas of this garden do not look like they could accommodate this type of play. Furthermore, the large black metal gates do not seem very welcoming to children.



Escapism: This site has a high level of escapism because once you are in the middle, the garden envelops you and you lose sight of the road and urban streetscape. The use of plants that occupy various spacial levels helps to block the outside context, whether the user is walking or seated.



Fascination: The different textures of green allow the eye to wander without demanding sole attention. The textures offer layers of interest. Larger textures capture attention from afar, while finer textures hold interest upon closer contact.



Coherence: This small park is easily navigable. The walkway forms diagonals that bounce back and forth on the site. While on the pathway, it is possible to view further destinations and seating. This grabs the users attention, but also reassures them that there is space for rest. The garden is also organized into beds that are surrounded by the same gravel that is used between the concrete walkway slabs. This lets the visitor know that it is also ok to walk off the path and around these beds.



Fig. 1



Fig. 2

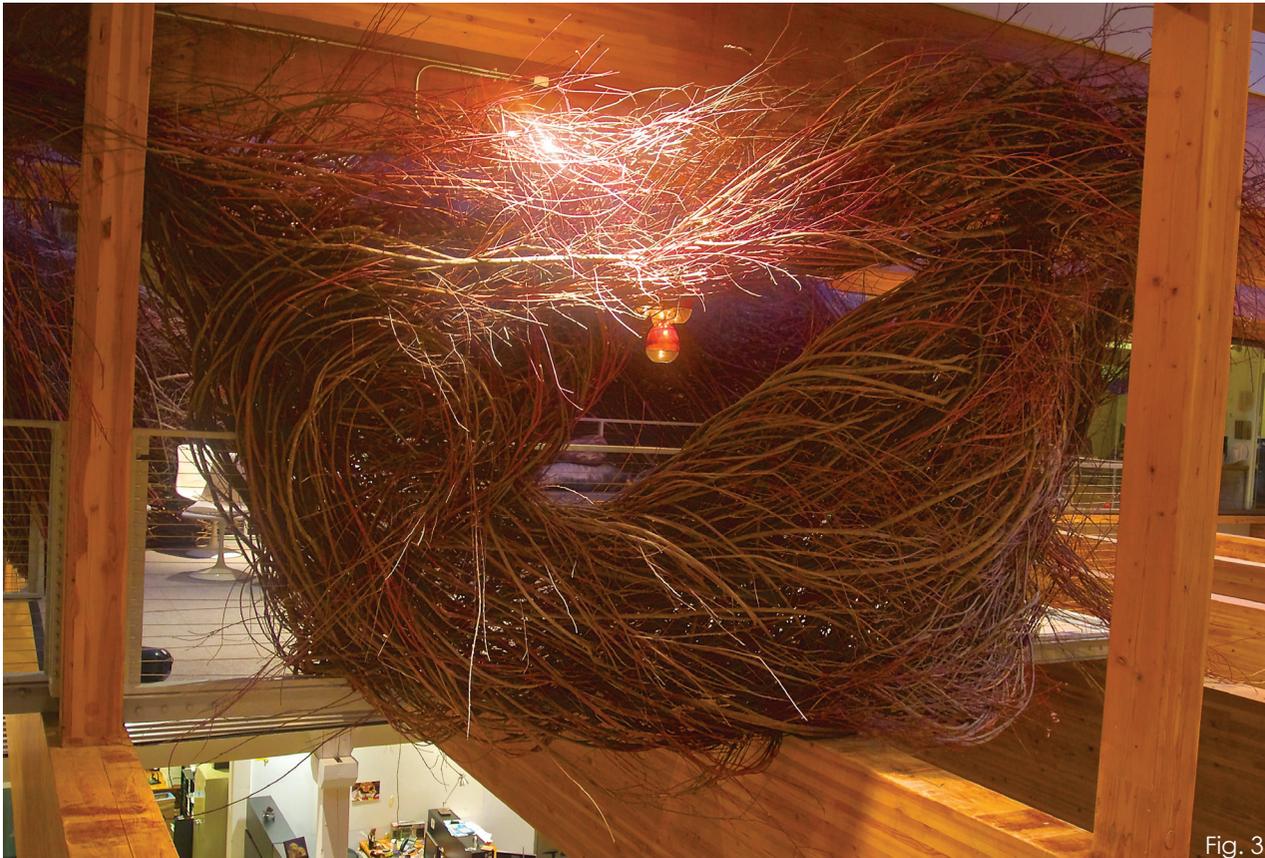


Fig. 3

The Nest

Patrick Dougherty (Willow Sculpture Artist)
Portland Oregon

The founders of the international ad agency, Wieden + Kennedy, believe that in order for creativity and innovation to flourish, the mind has to feel comfortable so it has space to imagine. The Nest was created to provide this meaningful space.



Compatibility: The Nest provides a high level of compatibility. It allows its users to escape and unwind from the creatively demanding workplace. The room has large pillows that resemble natural rock and couches to relax upon. This room is also host to a small coffee and tea station that adds additional comfort.



Escapism: 'The Nest,' as the name suggests, has a form reminiscent of a blank bird's cocoon-shaped nest. This cozy space has walls of willow saplings and alder branches contrasts against the rigid, modern architecture inside the office building. These organic shapes create soft walls that successfully block out most views of the building it is in.



Fascination: This curvilinear egg form environment draws wonder with its odd placement in an office. Its interior The tables and furniture are made out of raw materials like found driftwood and coarsely woven fibers.



Coherence: The organic shape of the room signals to the user that this space is different from the rectilinear design of the surrounding offices. The arched doorway invites the user while the large, curving couch emphasizes that this is a place of relaxation.



Fig. 1



Fig. 2

Urban Green Ljusarkitektur (Lighting Design Company) Stockholm, Sweden

Urban Green is an art installation that showcases how lighting, color, and sound can imitate nature. The concept for this piece was an “eco-duct” that funnels and connects plants and animals from one point to another.



Compatibility: The Urban Green installation enhances the function of the pedestrian underpass. It is however, limited to the tunnel like structure that funnels car traffic through. Without the installation, the underpass would have little compatibility. The installation does increase its compatibility and even allows for small moments of reflection through its limited seating.



Escapism: This abstract installation achieves quite a bit of escapism even with its simplicity. It draws the attention upwards and away from the traffic. The installation includes sounds of birds chirping and a scent component. Since the underpass is dark both day and night, the neon colors of the lights, mesh and glowing graffiti present an alternate reality underneath.



Fascination: This piece captures the user's attention with the undulating, green forms. The lighting randomly appears on different parts of this form and adds interest. Combined with the sounds of birds, the installation seems to have been inspired by a tree canopy, with limbs swaying in the wind to obscure the sunlight.



Coherence: While Urban Green is eye-catching, it actually is easily discernible because its elongated shape mirrors the pedestrian path underneath. The linear configuration of the seating reinforces that this is a through way. The lighting and use of bright green actually enhances the way-finding ability of the site. It lets the user know that the underpass is not only for cars.

Case Study Summary

After analyzing these three case studies for their strength in attention restoration according to Kaplan's four guidelines, I realized they shared three physical traits. These traits are: the use of levels, the use of texture, and a cocoon-like environment.

Levels

The first trait, the use of levels, was utilized in the Toyota Children's Learning Garden (TCLG) by providing plant material that covered the low, medium and high spaces. Ground [plants and gravel occupied the lowest levels. Bushes and smaller trees inhabited the mid-level while an arbor is at the top level. The Nest in the Wieden + Kennedy office has low rough, wooden tables with couches that mimic natural rock in the mid range. The sides of the woven wood installation towers over the heads of its users. Lastly, even though Urban Green is far from 'natural' it also follows these three levels. The bottom level has lit up artificial turf. The middle level has both seating and glow in the dark graffiti. The top level has the lit green installation.

Texture

The TCLG contains texture in its plant biodiversity. The types of plants with

their varying size, leaf shapes, and colors, provide an abundance of textures. The Nest contains many textures too. The woven branches are an abstract texture. The couch that mimics a boulder provides a contrast against the wood. Then there are the small smooth light shades that seem to look like some type of insect egg. Lastly, Urban Green shows that texture can still be present without having to be natural. The long organic shape with its depressions and lumps coupled with lighting that flickers on and off randomly create a moving texture that highly contrasts against its rectilinear environment.

Cocoon-Like Environment

The planted arbor that surrounds the user as they walk through, in the TCLG, adds a sense of enclosure. The Nest effectively does this with high walls surrounding it to provide visual relief from the workplace and create a sense of safety. Urban Green surrounds the user with color and light beneath them and above them to encapsulate them in an area that is distinct from the busy traffic close by.

Kaplan's four components that create a restorative environment, compatibility, escapism, fascination, and coherence, will provide the assessable guidelines to shape the creation

of the site. However, the starting point in creating the physical form will be the three traits discussed above. At a minimum, for the site to be successful, it should contain these three aspects.

How to Bring Nature Back..... Through Technology?

We know that we need to infuse nature back into cities where it is lacking. However, we also need to generate interest and participation for those who nature has left behind. We need to reach out to the generations who nature has abandoned and technology has embraced. The youngest of these nature-deprived souls are far more comfortable downloading the latest app on their smartphone than distinguishing the different trees in their backyard. According to the American Environmental Values Survey, 92% of participants thought that most kids do not spend enough time outdoors while 91% also agree that kids now "care more about video games and portable music players than about wildlife and clean air." (EcoAmerica 2006) To reach this more techno-urban generation in a language they understand and feel at home with, computer gaming technology is the bridge. This technology provides the opportunity to shape the youth's opinions and experiences with nature in a way that is realistic and understands the needs of the current generation. Digital simulation can create new "green" spaces without the physical necessities of water and sunlight. These new spaces provide the interface where transcendental experiences can be manifested and

deep feelings evoked.

Mass Accessible

"Video games were the first computer technology to be truly accessible by the masses." (Hutchby 2001) Video games today, combine the visual cinematography of movies and computer technology to create a visually interactive experience. In 1992, video games made up 10% of the audio visual market. (Hutchby 2001) In 2009 the video game industry surpassed the music, movie, DVD/Blu-Ray industries in revenues domestically and worldwide. (Murph 2009) In 2011 video game sales (hardware, software, and accessories) were \$16.998 billion. (Savitz 2013) This technology has quickly become the most lucrative form of entertainment. Kids 8 to 18 spend an average of 6.5 hours a day with electronic media, about 45 hours a week. (Rideout & Hamel, 2006; Roberts, et al., 2005). If video games have become one of the most popular forms of entertainment amongst the younger generations, then how many of these 45 hours using electronic media are actually spent video gaming? Probably at least half.

To ignore the widespread popularity of this genre of entertainment would do a disservice to any field, including landscape architecture, intending to keep up with the times. How long was it after the first movies when cin-

ematography was adapted to the field of landscape architecture? It is only recently that the cinema media has gone from project presentation to integration into urban landscapes (i.e. Crown Fountain at Chicago's Millennium Park). This fountain changed the way this space functioned, and connected people in new ways. The industry of video gaming is just beginning to be recognized as mainstream as the first generation of kid gamers reaches 30. How can the integration of this media and landscapes change the field of landscape architecture? Furthermore, pure console and computer video games do not take into account the smartphone and tablet revolution. These may be the next leap, with video games serving as one of the main forefathers of interactive multimedia. (Hutchby 2001)

The Increasing Acceptance of Video Games

In recent years, the access to personal digital media has exploded. The general public is now acquainted with smartphone and tablet apps and digital interfaces. Games on smartphones and tablets have grown into its own industry. Many of these apps are modeled off of the video game experience. In the past video games were limited to computers and video game consoles and these games were usually thought of as a pastime. However, now their power is

being harnessed in other fields to provide a new depth of understanding and facilitation. The simulation concept that video games use is unique in that the user can interact and manipulate the subject of the interface to produce a certain result. The path to a result is dynamic and depends upon the user's inputs within a given set of rules. This is different from past media such as film and literature in that they can only show a representation of an object and describe through words and images how something works. (Frasca 2001) This simulation has the ability to advocate through experience.

The Digital Value

Recent digital media technology provides services that have not been possible until this technology development. Currently, smartphones and tablets have the ability to locate places and people through GPS (Global Positioning System). Games on these devices have taken advantage of the geo-location technology to create an augmented, parallel reality that is accessed and interacted with the device.

Current Technology

The stargazing accompaniment on the iPad, known as Star Walk, allows the user to hold up their smartphone or tablet to the sky and overlays an

image of the constellation in that direction. So in real life, the viewer only sees the stars, but through the screen the viewer sees the stars with the overlaid image so they can easily identify where the constellation is, and what stars make it up. Right now there is not a synthesis between the actual sky and the virtual overlay.



Technology in Prototype Phase

The **Google Glass** is just about to start its testing phase with the first release of these glasses coming soon. The Google Glass has many of the capabilities of a smartphone except it is housed in barely there eye glasses. Instead of looking at a smartphone screen, these high tech eye glasses put the screen right next to your eye so the image overlays on top of your regular vision. (google.com/glass) So far, this technology seems to be limited to basic pictures and videos.

Google Glass Eyewear



View Through Google Glass Eyewear



The **Oculus Rift** headset is made exclusively for 3D video gaming where once the headset is on, you can view the virtual world in the same way you would view the real world, in 360 degrees. You just have to turn your head. Unlike the transparency of the Google Glass, this headset aims to fully immerse the gamer in the virtual world, without interference of the real world. This headset is still in the early stage of hardware and software development. This is the closest technology has come so far to full visual immersion.

Oculus Rift Headset

Oculus RIFT

Truly Immersive Virtual Reality



Fig. 1

where landscape architecture is not limited to the physical world but will also take place in the virtual world whether or not real landscape architects have a hand in its design. Right now architects and landscape architects are being hired to recreate believable worlds in video games. This future presents a vital opportunity. Who do we want designing our virtual spaces that are experienced equally with the physical? Landscape architects with training in environmental and social awareness can reach out to a large captive audience and educate through virtual experience.

Future Technology Possibilities

In the near future, just as how telephones merged with computer gaming to create smartphone technology, the wearable internet based Google Glass cellphone and the virtual reality Oculus Rift headset will very soon spawn technology where the real and virtual world become part of each other. It is at that point

Summary of Findings

The media of digital gaming has the opportunity to be used as a tool for environmental advocacy. A conflict does not need to exist between nature and new technology. The technology is only a tool that can be shaped to do our will, whether it is reuniting children with nature or severing the connection. To foster this rekindling, we must take an active part in the integration of interactive digital media with environmental values, just as how oral histories and film documentaries were used to pass on values and ideas. While the video game and smartphone markets have exploded, visits to national parks have steadily declined. (sciencedaily.com) Even though a Science Daily article cites economic hardship despite relatively cheap admissions for the decline in national park visitation, video game sales have increased in these tough economic times, despite the \$60 price tag for new games. In addition, smart phones and tablets that have become popular require expensive data plans. An increasingly substantial amount of money is being spent on leisure electronic media. Does this represent a shift in values?

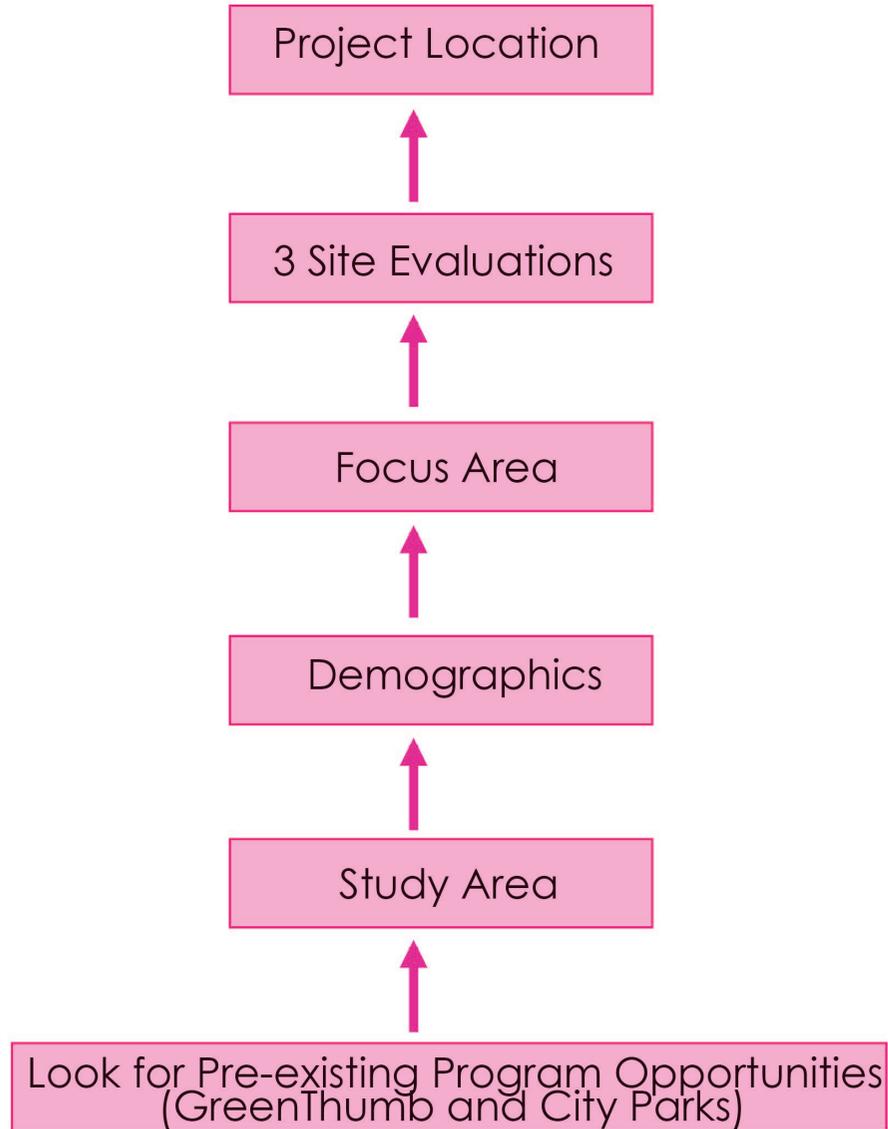
This thesis will explore how computer gaming technology can help reverse the trend of Nature Deficit Disorder in children. Using the A.R.T. principles as a guide, this combination will allow kids to step outside of their physical perspective and inhabit the view of

someone else, or in this case, view another possibility of their own reality. Flanagan (2009) describes this as "critical play" but I believe this is more of a "reflectional play." The kids will be able to step into this make believe reality that questions or brings to attention certain aspects of urban life. While immersive, it is reflective play in the way the alternate reality is designed. This digital re-creation used as a tool, blurs the lines between reality and fantasy. The virtual version borrows the features of the geographical site and remixes and adds to the content to create a re-imagined space. This new space can only be experienced at the real site through looking through a digital device to experience this parallel reality. The goal is to inspire kids to look at this virtual reality and hold it up to the real one to be compared and improved. It presents an environmental possibility that is physically absent. Then eventually through inspiring stewardship and values, the virtual becomes physical when digital ideas are constructed in physical space.

site

selection

CONTEXT ANALYSIS + SITE SELECTION



SITE LOCATION



Study Area in Manhattan New York, New York

Fig. 1

Historical Map Showing City Grid Imposed on Original Water Courses of Manhattan



Fig. 2

CONTEXT



This project's study area is made up of the East Village and Lower East Side. Before development, these areas were primarily made up of marsh land and pasture land. (Viele Map 1865) These areas were mostly made up of tenements during the Industrial Revolution and both neighborhoods were actually part of the Lower east Side. ("Tenements" 2013) In the 1960s the northern half of the neighborhood became known as East Village as artists and poets moved in and created a different culture. (McKinley 1995) The past 100 years have seen many cultural movements spring from East Village and the Lower East Side. These movements include hip-hop, punk music, and folk music. The neighborhood was home to clubs like CGBG and many bands and singers such as Blondie, the Ramones, and Madonna, started their career here. (McCormick 2006) East Village (Alphabet City) was the setting for the musical Rent. (Perez 2005) In recent times the art scene has declined and gentrification has taken over. (Salkin 2007)

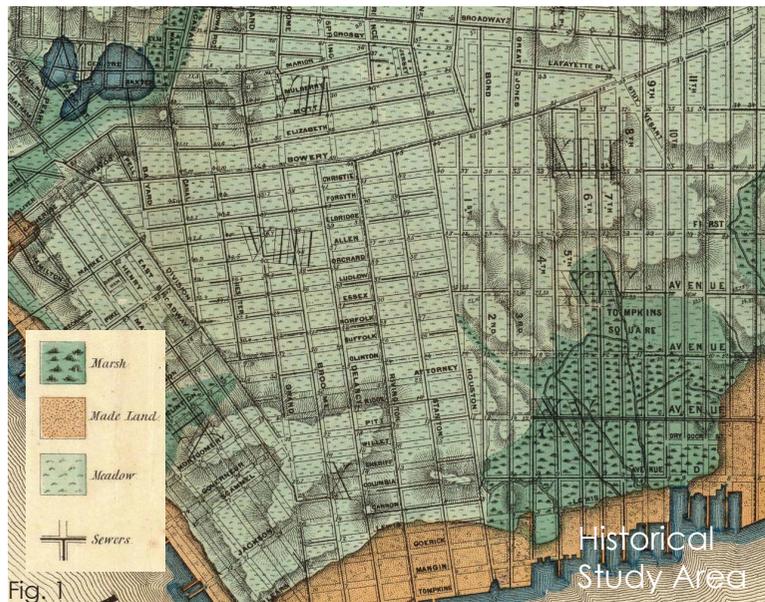


Fig. 1



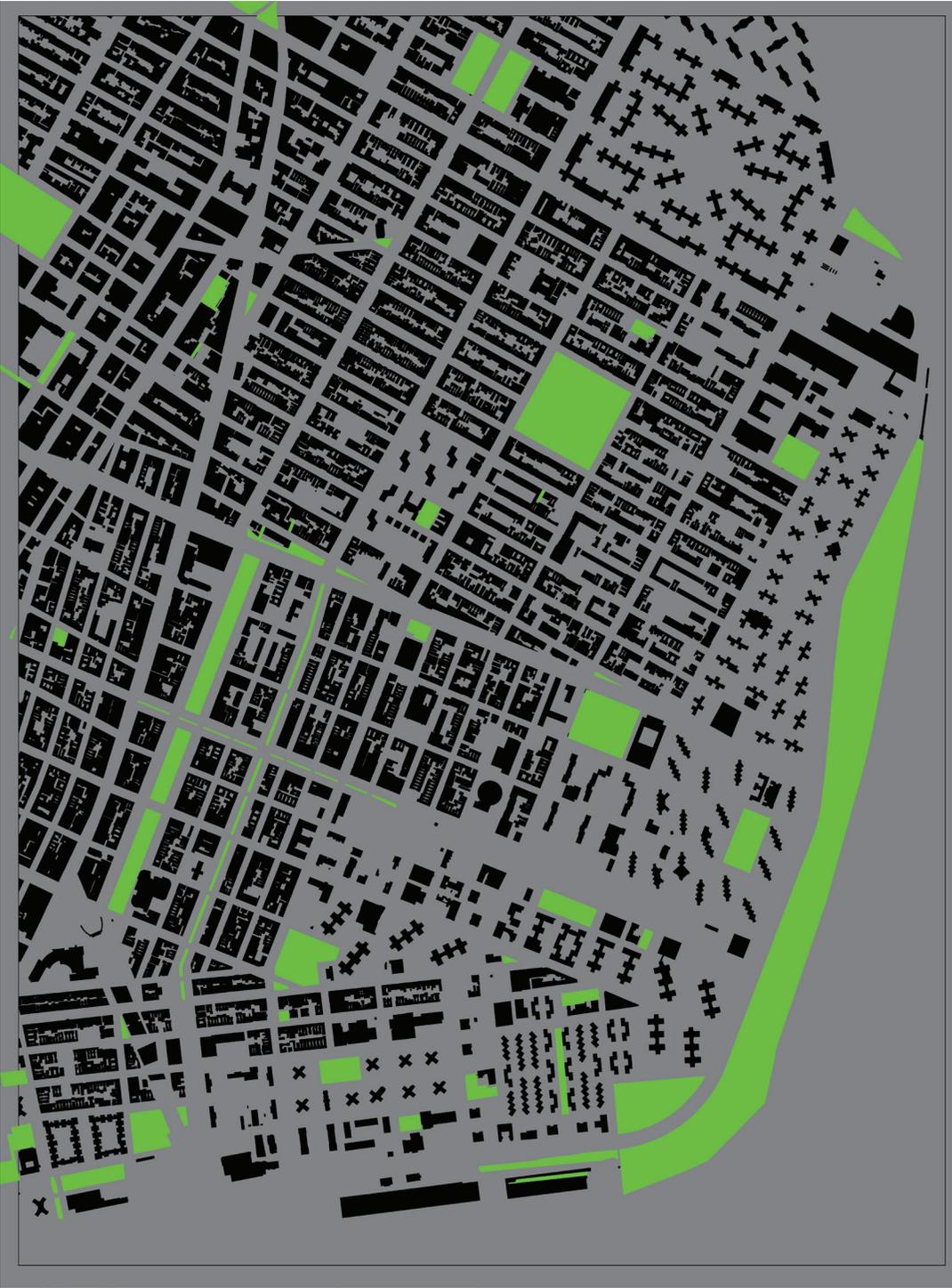
Fig. 2

GREENTHUMB

The GreenThumb community gardens are sponsored by the city. The program includes education and supplies to assist a community in creating their own garden. The program was founded in the 70s when many public and private lands were abandoned due to a financial crisis. These vacant lands were turned into greenspace that ranges from edible gardens to gathering spaces.



PARKS



This maps shows all city owned parks on or near the study site.

DEMOGRAPHICS

To understand the appropriate location for the park, it was integral to find where the children were concentrated and where the population was most vulnerable. These maps show that there is an overlap between the higher concentrations of children and socio-economically stressed populations. This means that the greatest opportunities would be in the nearby blocks.

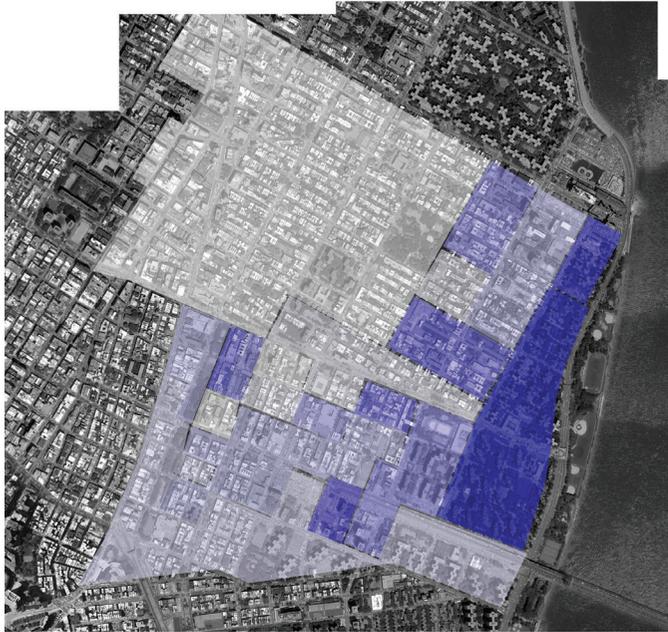


% of family households



% of population that is under 18 years old





% of single moms



% of population under poverty level



SCHOOLS

Public Schools

- Kindergarten - 6th Grade
- Kindergarten - 8th Grade
- Kindergarten - 12th Grade
- 6th Grade - 8th Grade
- 6th Grade - 12th Grade
- 9th Grade - 12th Grade

Private Schools

- Kindergarten - 5th Grade
- Kindergarten - 8th Grade
- Kindergarten - 12th Grade
- 6th Grade - 8th Grade

The grades of the public and private schools, kindergarten through twelfth grade were investigated to understand where the target demograph (kindergarten through eighth grade) was located.

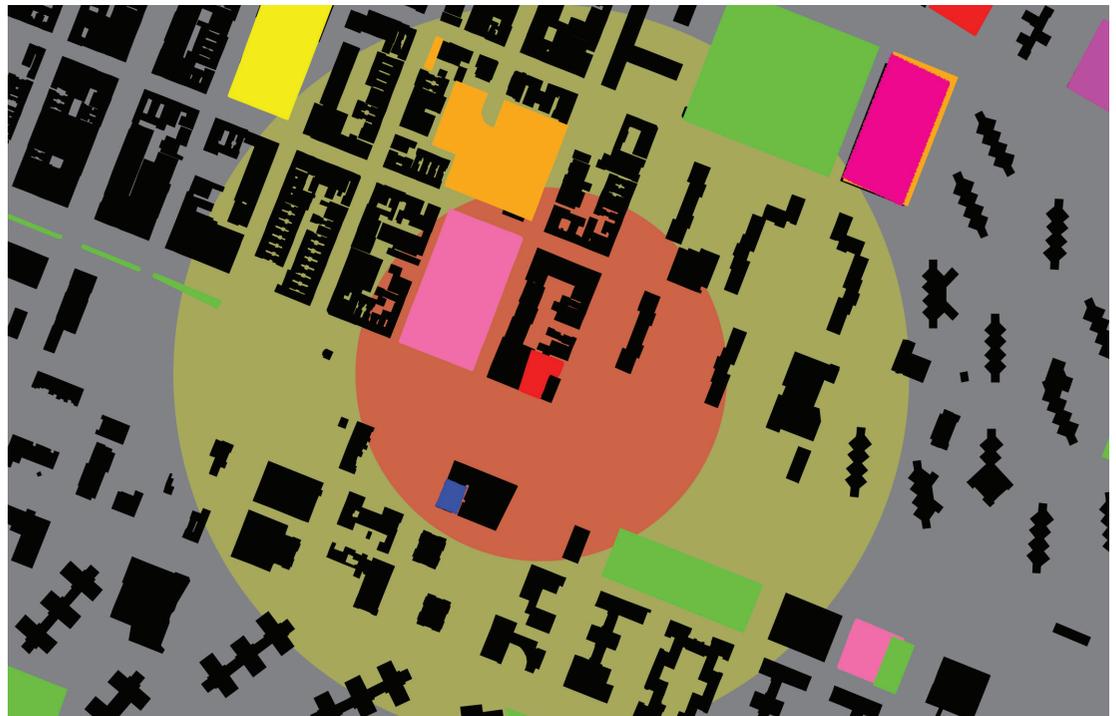


VACANT LOTS



These lots were identified as vacant through google earth. The area of focus was centered around the blocks identified in the demograph diagrams.

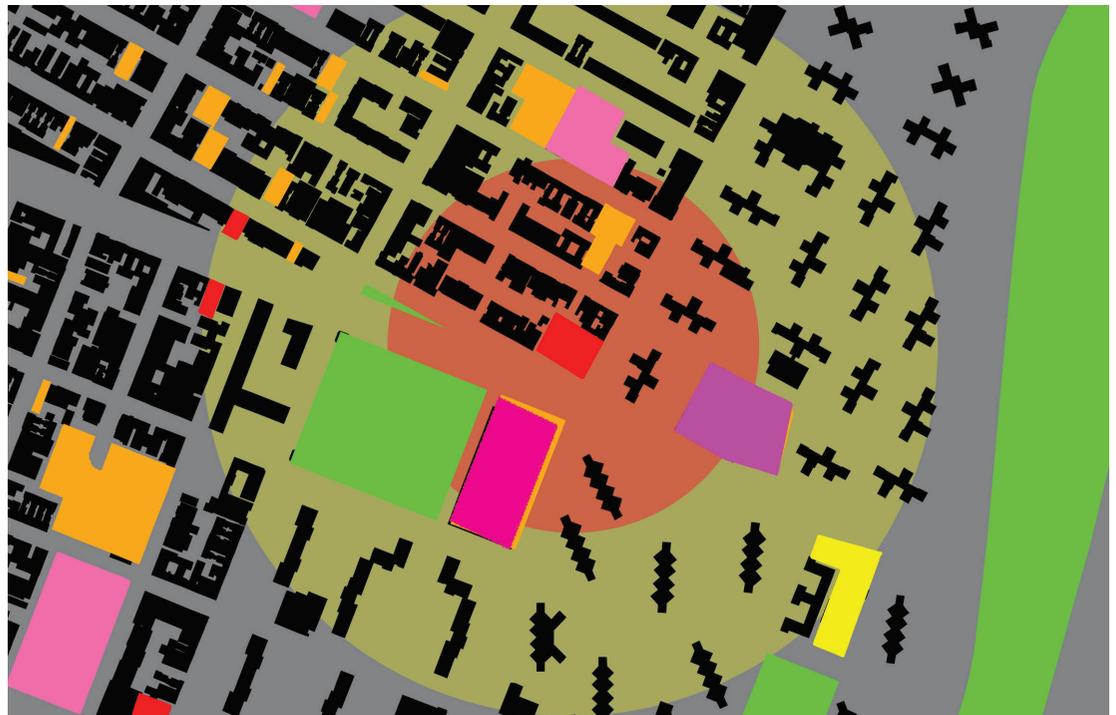
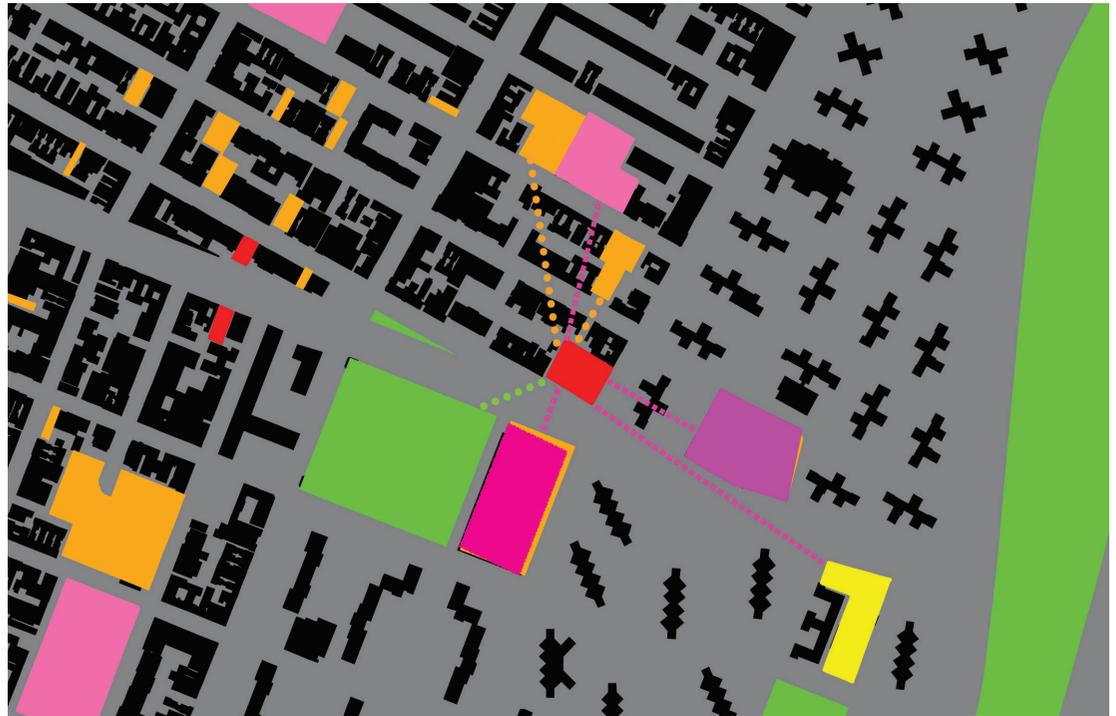
SITE 1



-  Park Connection
-  GreenThumb Connection
-  School Connection
-  10 Minute Walk Diameter
-  5 Minute Walk Diameter



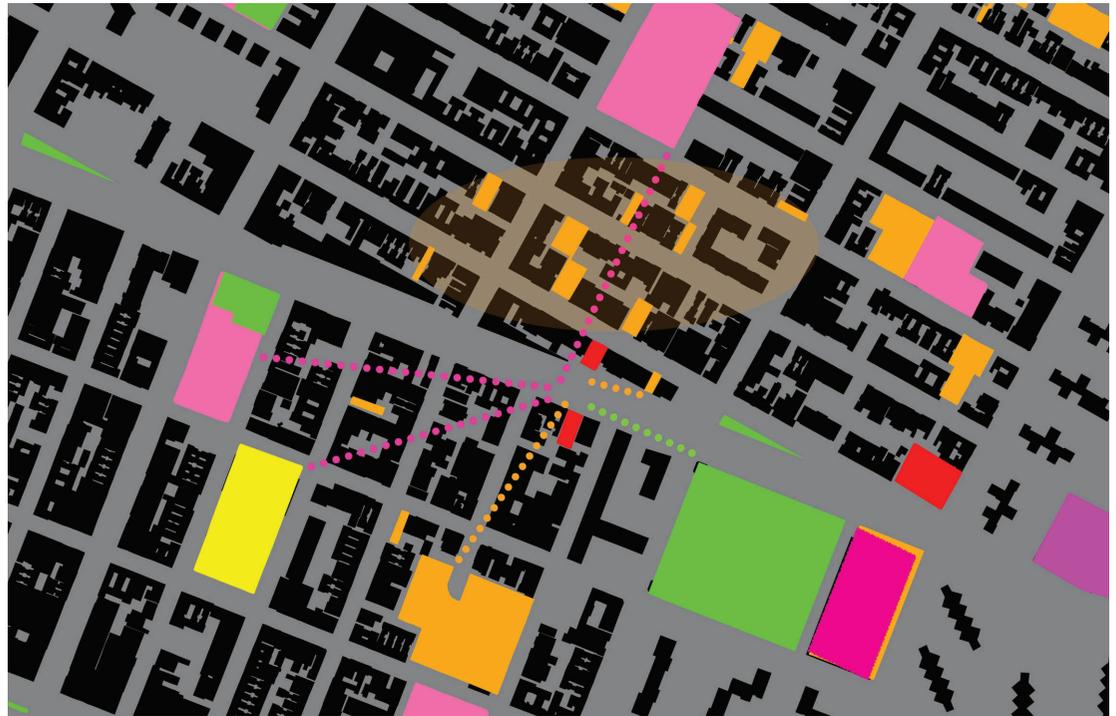
SITE 2



-  Park Connection
-  GreenThumb Connection
-  School Connection
-  10 Minute Walk Diameter
-  5 Minute Walk Diameter

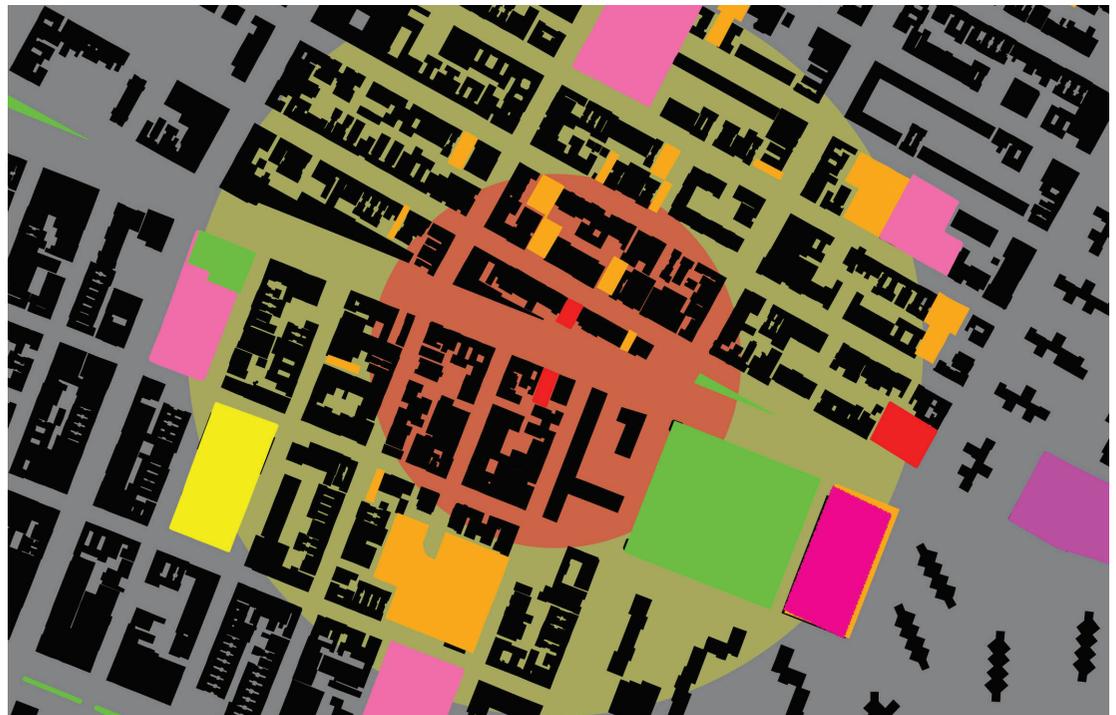


SITE 3



This site was chosen as the project location because of its many opportunistic connections, its artful character, and it did not have a current construction project on the site.

-  Park Connection
-  GreenThumb Connection
-  School Connection
-  10 Minute Walk Diameter
-  5 Minute Walk Diameter



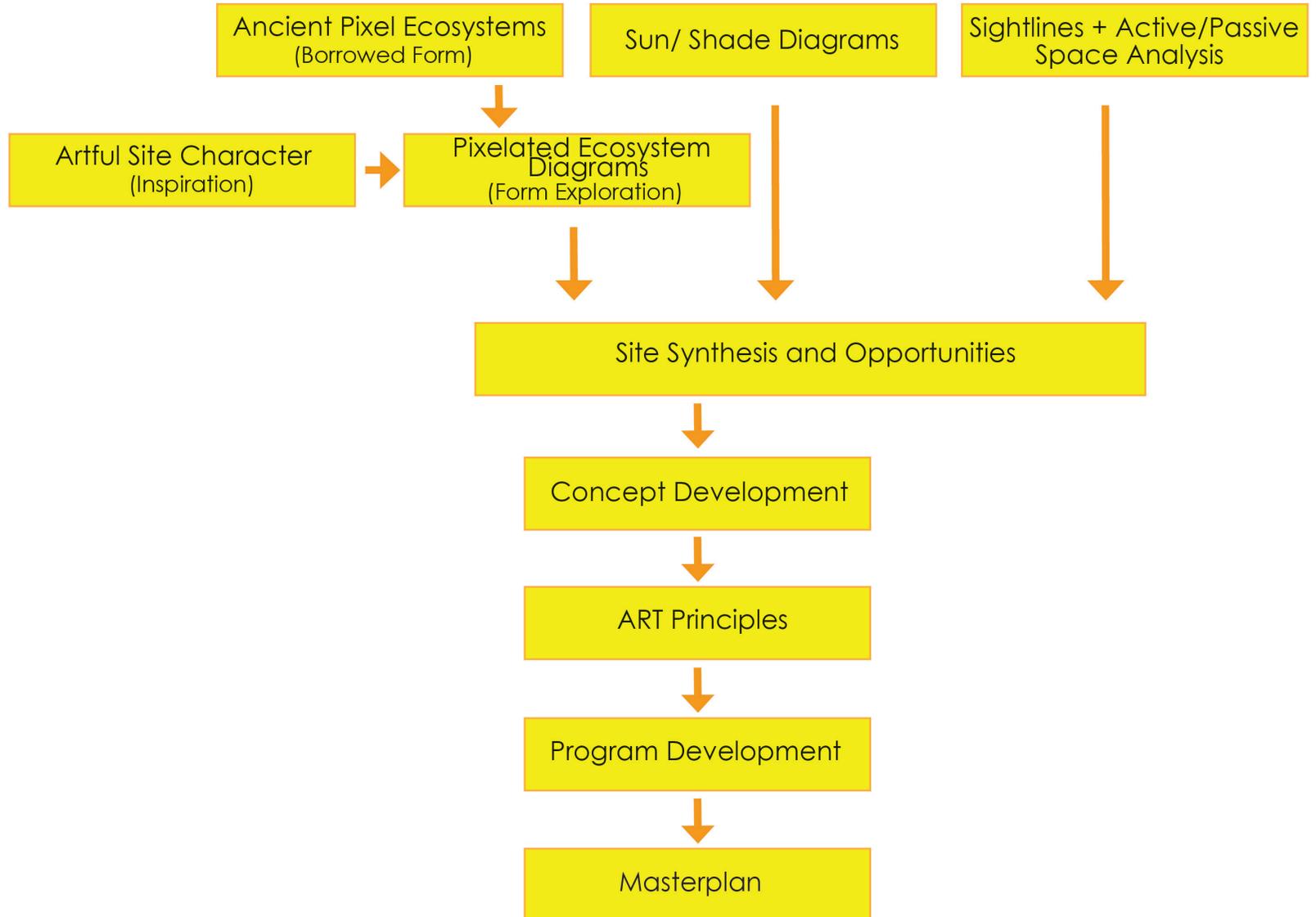


The name for this project, **RIZE**, was taken from graffiti that was found onsite. The definition of the correct spelling from dictionary. reference.com:
rise \ˈrīz\
7. to spring up or grow, as plants
9. to come into existence, appear
26. to increase in price or value



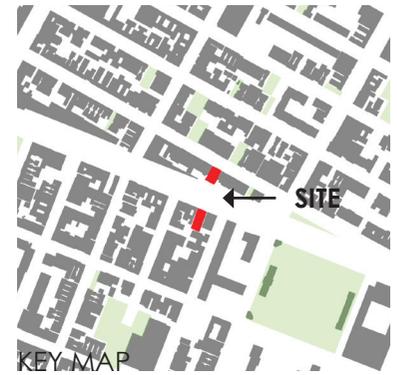
design
process

CONCEPTUALIZATION + DESIGN PROCESS

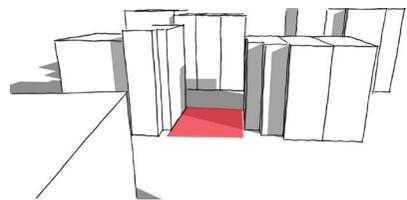
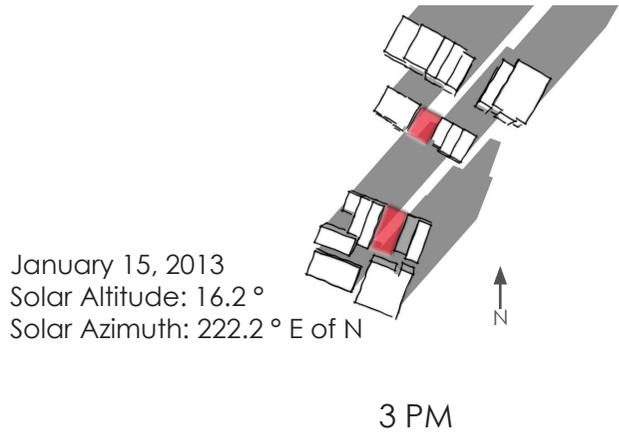
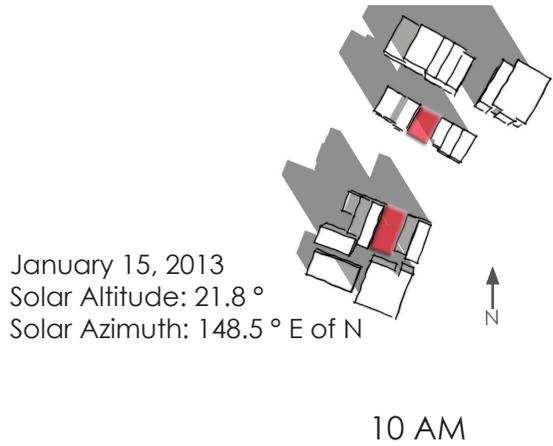


SUN - SHADE DIAGRAMS

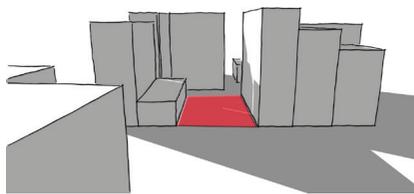
These solar/ sun studies provide information for site planning purposes and the potential location for plants and program elements. Microclimates help to inform optimal spatial arrangement of program elements for user comfort.



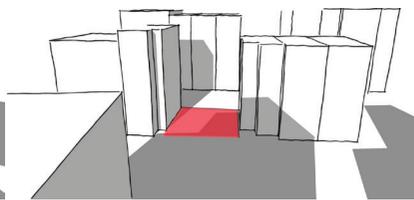
January



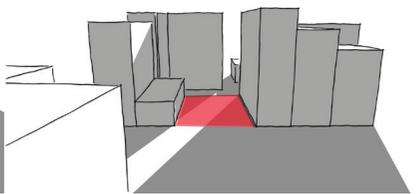
North Site



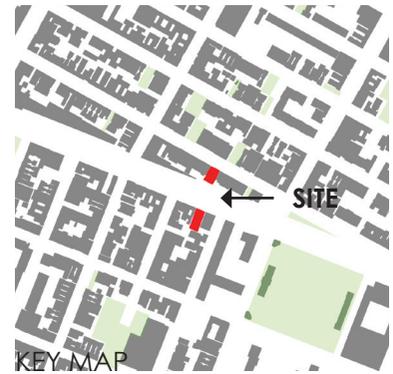
South Site



North Site

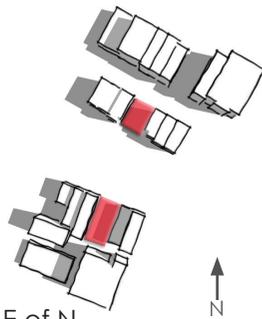


South Site



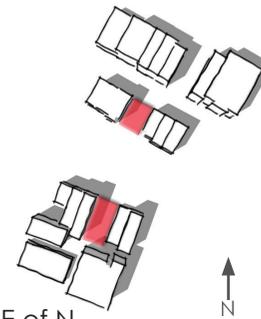
July

July 15, 2013
 Solar Altitude: 66.7 °
 Solar Azimuth: 141.3 ° E of N

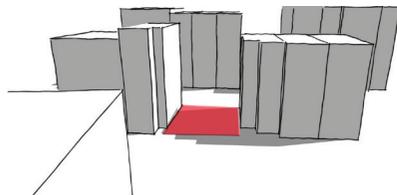


10 AM

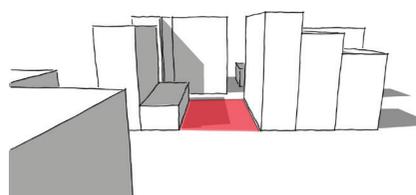
July 15, 2013
 Solar Altitude: 36.6 °
 Solar Azimuth: 267.8 ° E of N



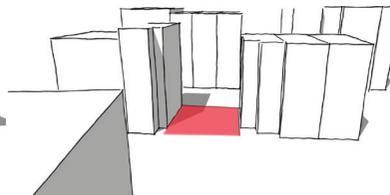
3 PM



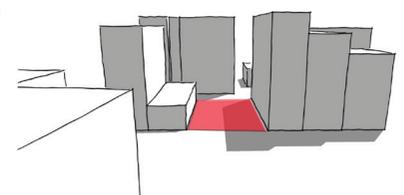
North Site



South Site

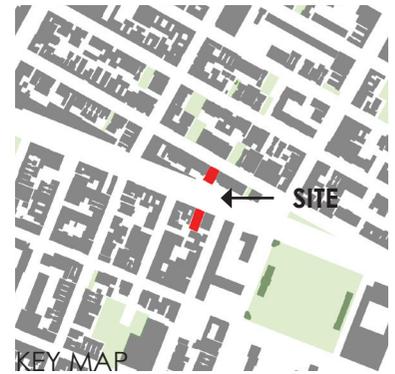


North Site



South Site

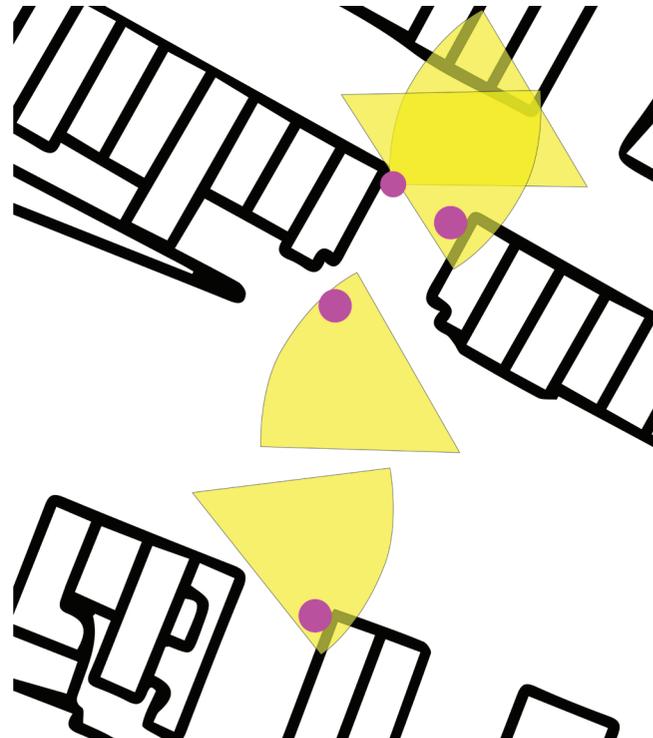
SIGHTLINES/ POINTS OF INTEREST



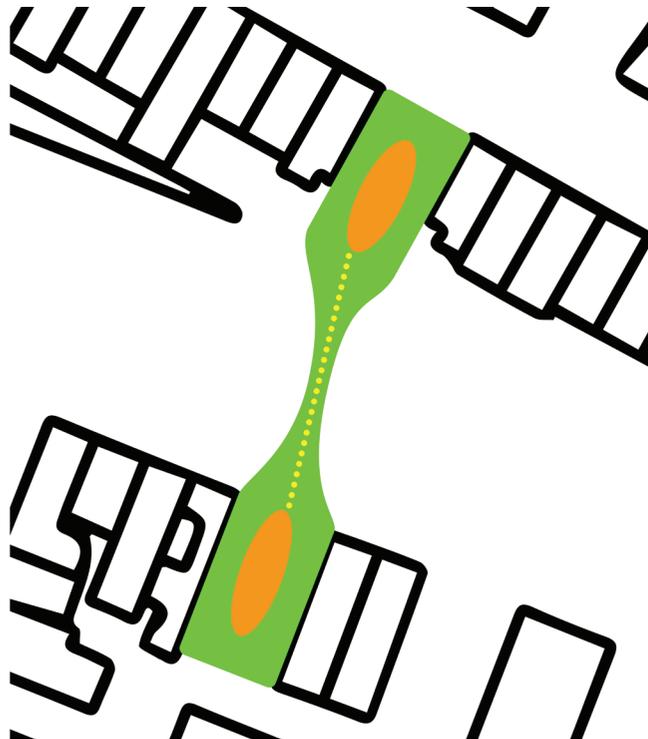
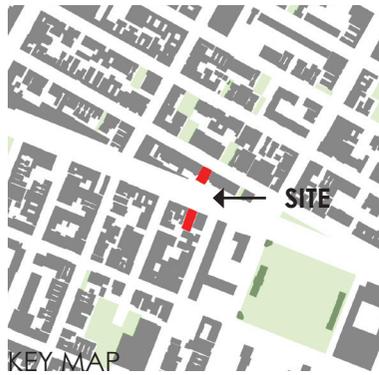
● Point of Interest



This diagram shows 60 degree sight cones into the site from cars and pedestrians. These sight cones highlight important views of the site that will entice kids and passersby to explore the site. It is important that these areas attract attention and stand out from the surrounding context. These areas should let the viewer know what this site is about. This can include signage or memorable design features that help with way finding.



ACTIVE/ PASSIVE DIAGRAM



Active



Passive



Connection

The design of the active and passive spaces take its form from remnant habitat patterns in which a corridor connects the two patches. Each patch contains an interior space with unique species and a surrounding ring that houses generalist species. In this adapted urban remnant corridor, the interior is home to more active and playful activities, while the exterior ring allows for reflection, observation, and viewing.

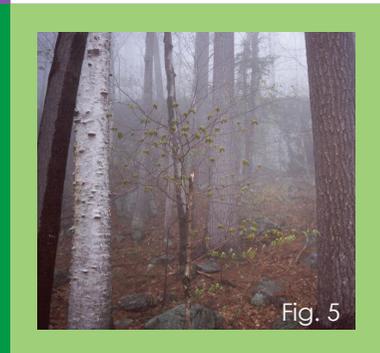
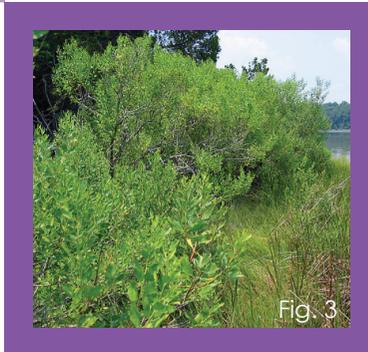
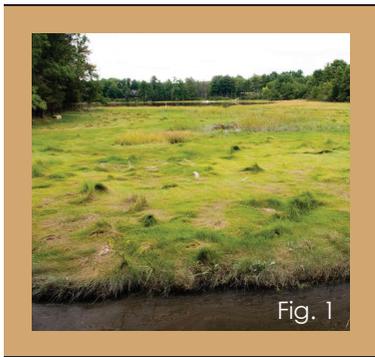
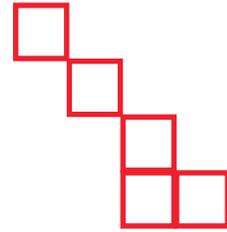
HISTORIC ECOSYSTEMS



- Low Salt Marsh
- High Salt Marsh
- Salt Shrub Community
- Oak Tulip Forest
- Appalachian Oak Pine Forest

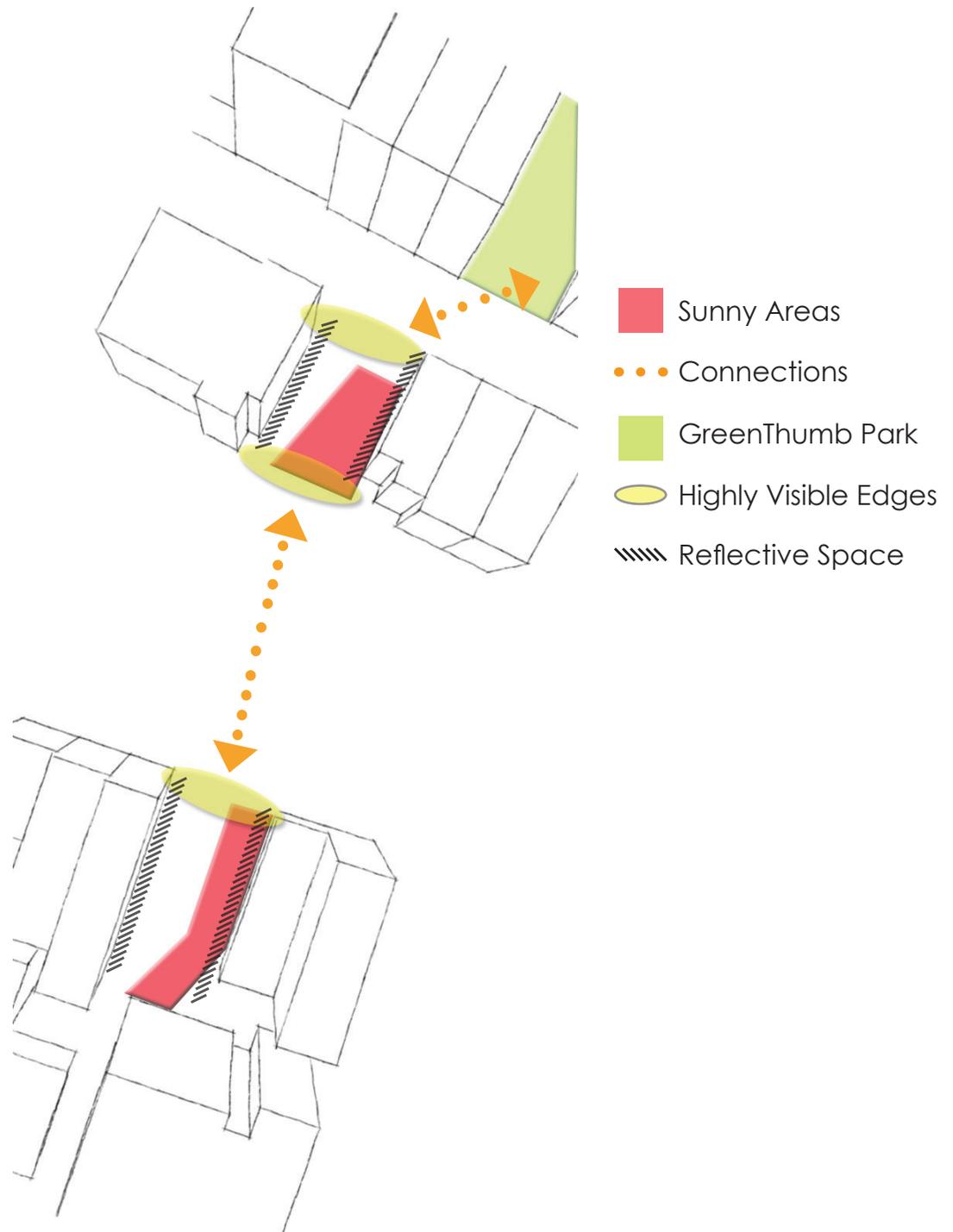
This map from New York City's Open Accessible Space Information System (OASIS) reconstructs which ecosystems were most likely present on the site in 1609. The site is rich in ecosystem diversity and was even home to a riverine system.

ANCIENT HABITATS ONSITE

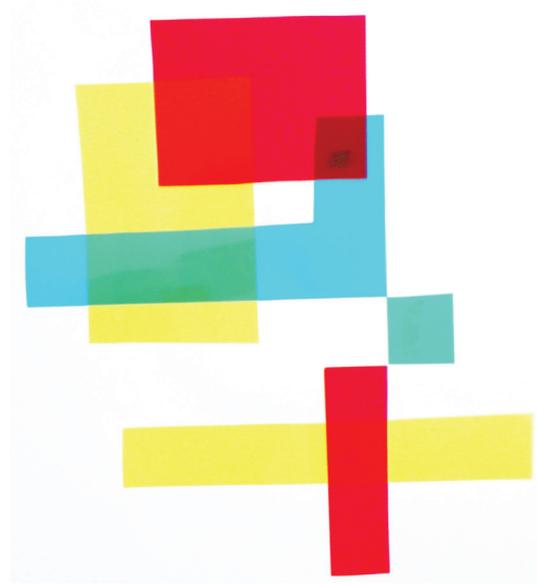
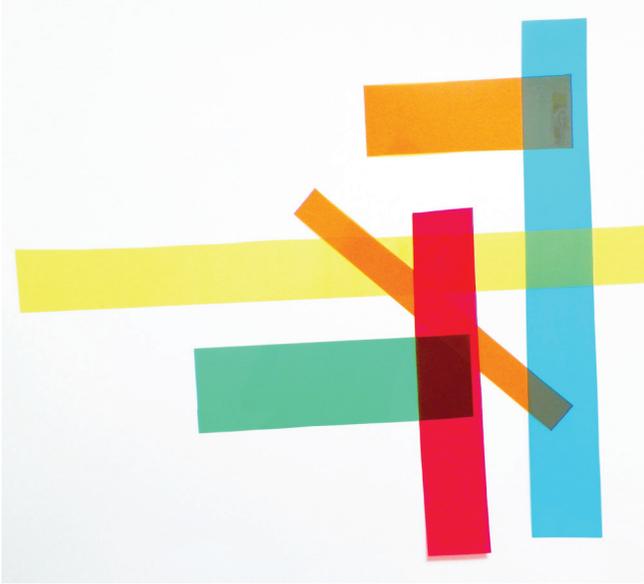


SYNTHESIS

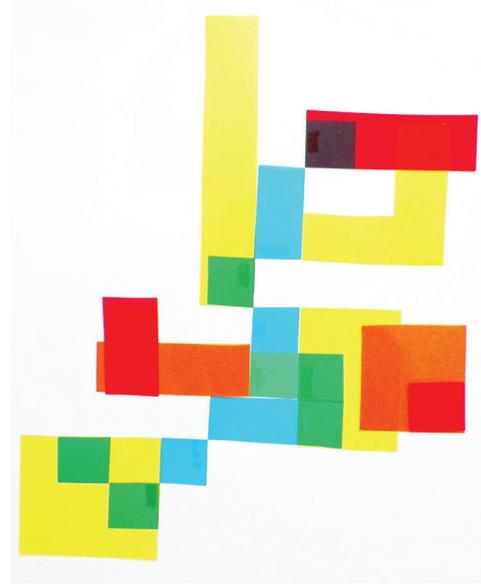
This site synthesis diagram shows on site conditions that should be addressed. Certain areas of the site (indicated in red) receive sun at the hottest time of day in the summer. These sunny and exposed areas should be addressed and utilized in the design for ultimate user comfort and compatibility. The next opportunity is the connections. The north site is right across the street from a GreenThumb Community Park and is also across the street from the south site. This creates a green linkage amongst these sites and makes the northern site function more as a conduit. This increased foot traffic will need a design response. Due to these connections, the edges of the sites that face the street are highly visible and important for wayfinding and directing the user towards the site. These are great opportunities for signage placement. Since the sites are narrow with some through traffic, this activates the central interior space. The edges of the site, which back up to large brick walls, would be an opportunity for seating and reflective space with the brick walls hugging the backs of users and full views of the park in front of them. This is especially needed for caretakers of the children to be able to see the entire park at once to keep an eye on their child. It also can provide more quiet time for adults as kids play and learn in the center.



DIAGRAMMING PIXELS



These explorational diagrams were inspired by the pixellated form that the ancient habitats took in the Oasis maps. They are not representative of the exact habitats but explore the different configurations the aesthetic form of the site can take since due to spatial and environmental constraints, an exact re-creation is not possible. They play with the blending and distortion of the habitats into further pixellated constructions.

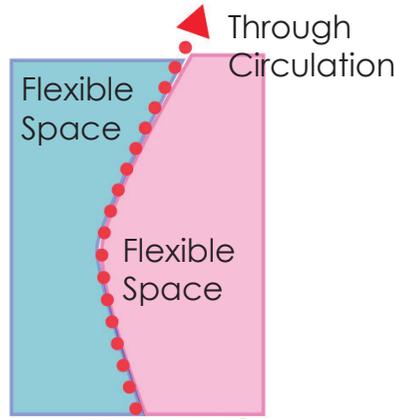


INITIAL CONCEPT

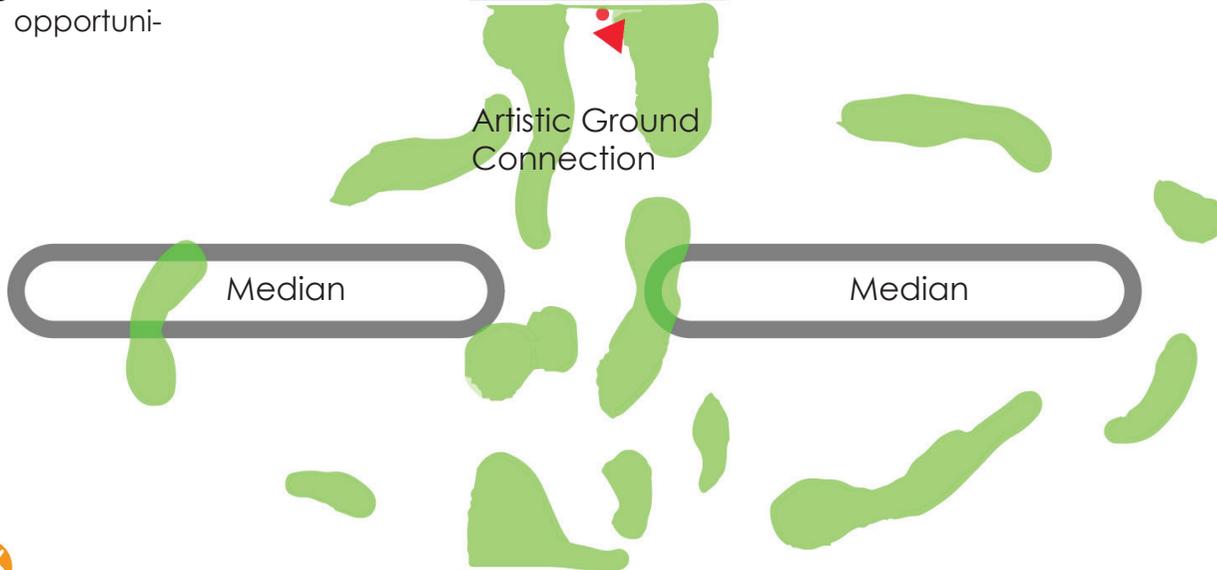
The site design process includes program organization and aesthetic form design. While different elements help to inform each, program and form in the end blend and overlap to produce the final plan. At the beginning of my design process, very loose functional diagrams are drawn to explore spatial and programmatic possibilities. They investigate how the relationships between these program elements.



Compatibility: Flexible space accommodates changing program and various program areas add more opportunities.



Coherence: Well defined functional areas and pathways.



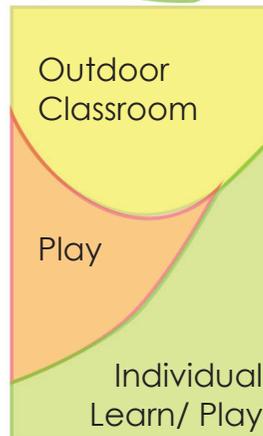
Artistic Ground Connection

Median

Median



Fascination: The varied and changing program keeps the user interested.



Outdoor Classroom

Play

Individual Learn/ Play



Escape: The sites' spatial layout expands the site and makes it seem larger than it is. The design stands out from its context and creates an oasis.



CONCEPT DEVELOPMENT

After the functional diagramming to determine how the sites will work together as a whole and exploring spatial opportunities such as sightlines and active, passive areas, the actual design of the site comes together to reflect these studies.



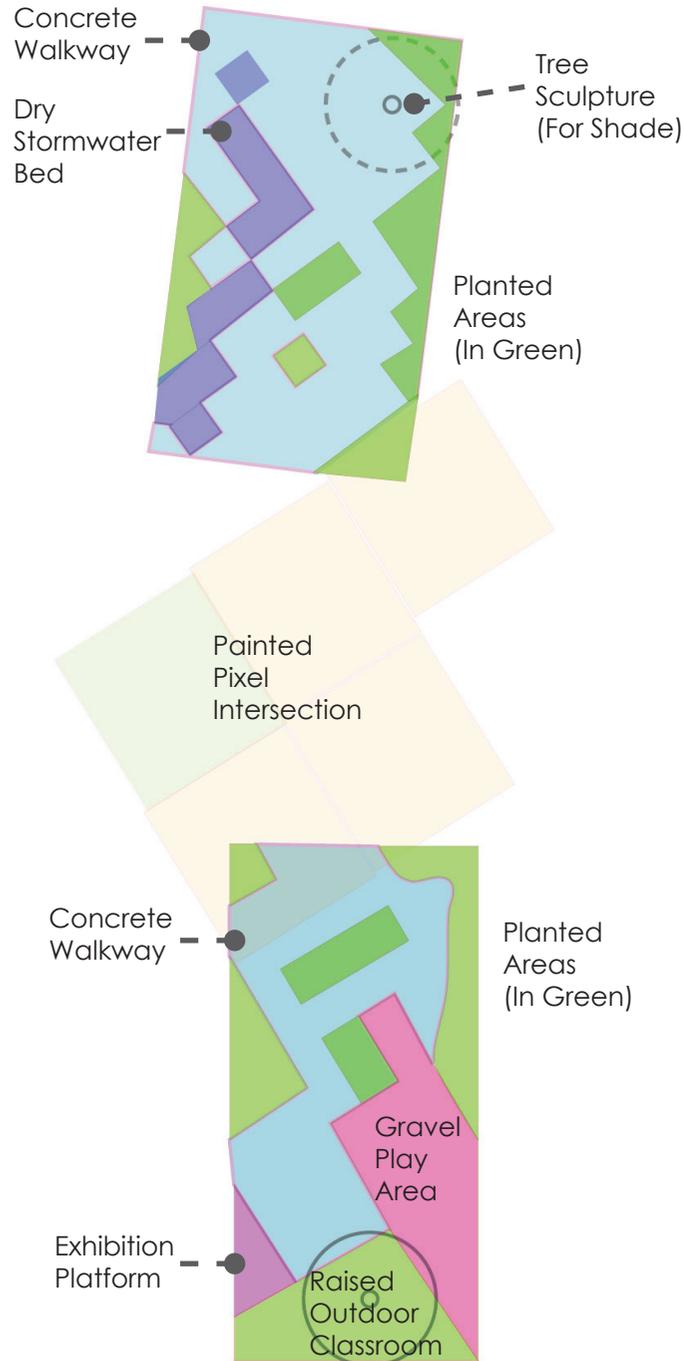
Fascination: The program and spatial layout goes from conceptual nature to more organic nature.

Conceptual Nature

Digital Interaction

Traditional Nature

Physical Involvement



Coherence: Well defined functional areas and pathways. Gravel and concrete ground textures define structured and un-structured movement.



Compatibility: Real and sculptural trees provide shade and area for contemplation.



Escape: The sites uses levels through raised program areas, depressed river beds, and trees to create a sense of depth to this urban environment.



- Compatibility
- Escapism
- Fascination
- Coherence

Masterplan Idea Board



the

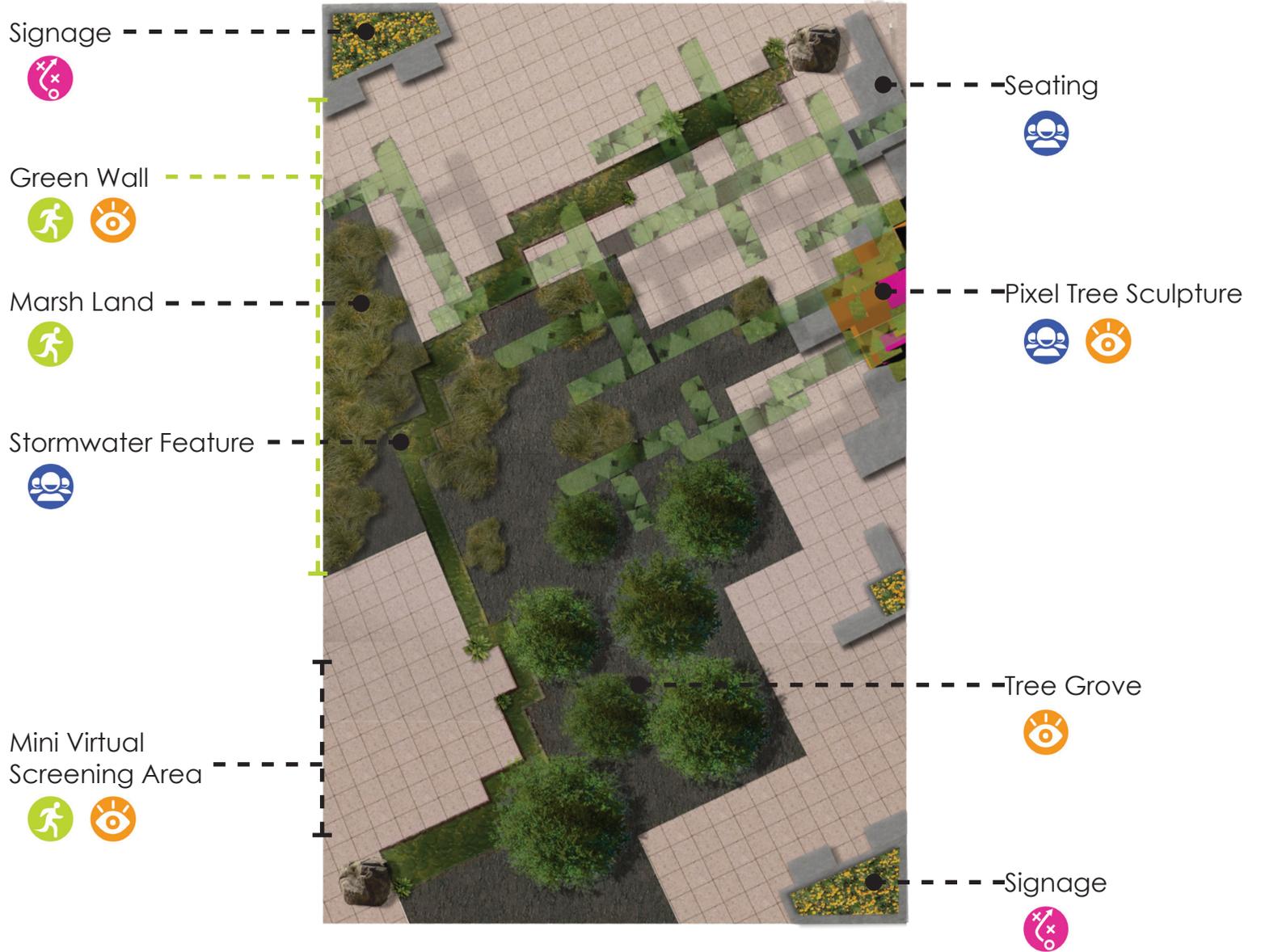
narrative

MASTERPLAN

The RIZE Forest Site extends across East Houston Street and includes a northern site and southern site. The project represents a spectrum of nature interaction from the more urban abstract on the north end to a more hands on naturalistic experience on the south end. To connect these sites, a painted crosswalk extracts the pixellated ecosystems from the OASIS map and transfers them onto the road. This visually connects users and alerts drivers to the pedestrian activity. The crosswalk is buffered by speed bumps and flashing lights to ensure safety. A pathway is cut through the existing median to serve as a halfway point in the road.



NORTH SITE



 COMPATIBILITY  ESCAPE  FASCINATION  COHERENCE



 15ft

SOUTH SITE

Signage



Dry Bed for Stormwater



Seating



Elevated Planting Beds



Log for Exploration and Play



Ramp Access to 2ft Raised Outdoor "Classroom"



Tree Stump Seating under Classroom Tree



COMPATIBILITY



ESCAPE



FASCINATION



COHERENCE



N

15ft

Since the purpose of the augmented reality site is to connect kids with nature, the program has to make them aware of the cycles of nature in their community. This awareness will create better understanding and hopefully foster environmental values and inspire kids to get out into the real ecosystems that are represented. The seasonal program tells the overall story of RIZE Forest and shows how the site and activities transform from season to season. Activities are categorized as either occurring in the physical environment or the virtual environment. Each activity's theme is based around the environment, cultural/historical, or a combination of both. These categorizations are denoted with line types and line colors surrounding activity pictures. These activity pictures point to where on the site they would occur, physically or virtually.

SEASONAL PROGRAM

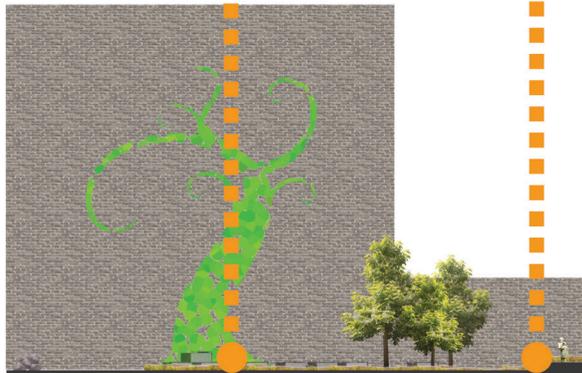


The first seeds are planted, plants and animals begin to wake up... Rize Forest blooms and explodes with color...

spring

- Virtual Activity
- Physical Activity
- Environmental Theme
- Historical/ Cultural Theme

Virtual baby wildlife roams the north site. Kids will learn what ecosystem niche these animals live in and why this is important by looking for the appropriate food in a virtual scavenger hunt. They can build friendships with these little creatures if they can identify the right plant and animal foods.



EAST ELEVATION
25 FT

In late spring, school classes can plant seeds in their designated planter box and assist Rize Forest in its regeneration. These boxes can be decorated for the season so kids can display their artwork and plants. Interactive apps lets kids name their plants and reminds them when their plant needs watering or fertilizer.



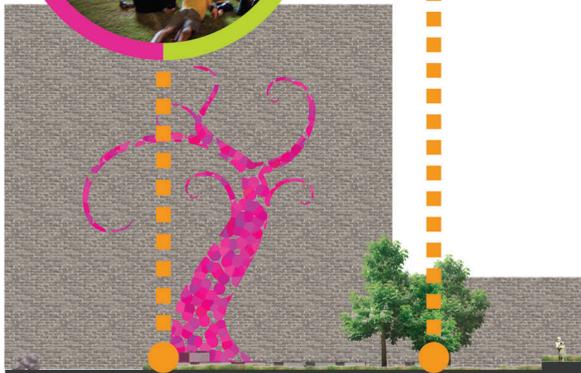
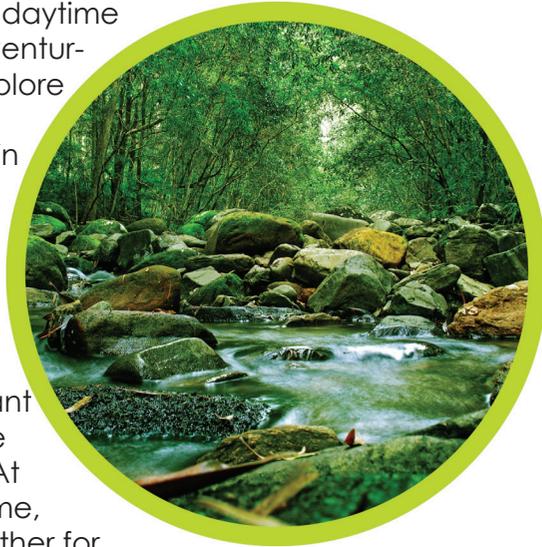


Rize Forest is fully awake and buzzing with excitement. Fireflies dance the days away eager to tell their stories...

summer

- Virtual Activity
- Physical Activity
- Environmental Theme
- Historical/ Cultural Theme

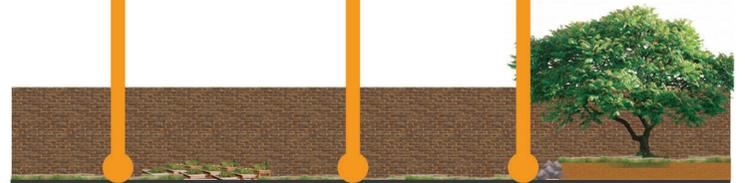
During the daytime young adventurers can explore the virtual Rize forest in full bloom and learn about local plants. Games will center around plant knowledge and uses. At evening time, families gather for movie screenings and watch for fireflies!

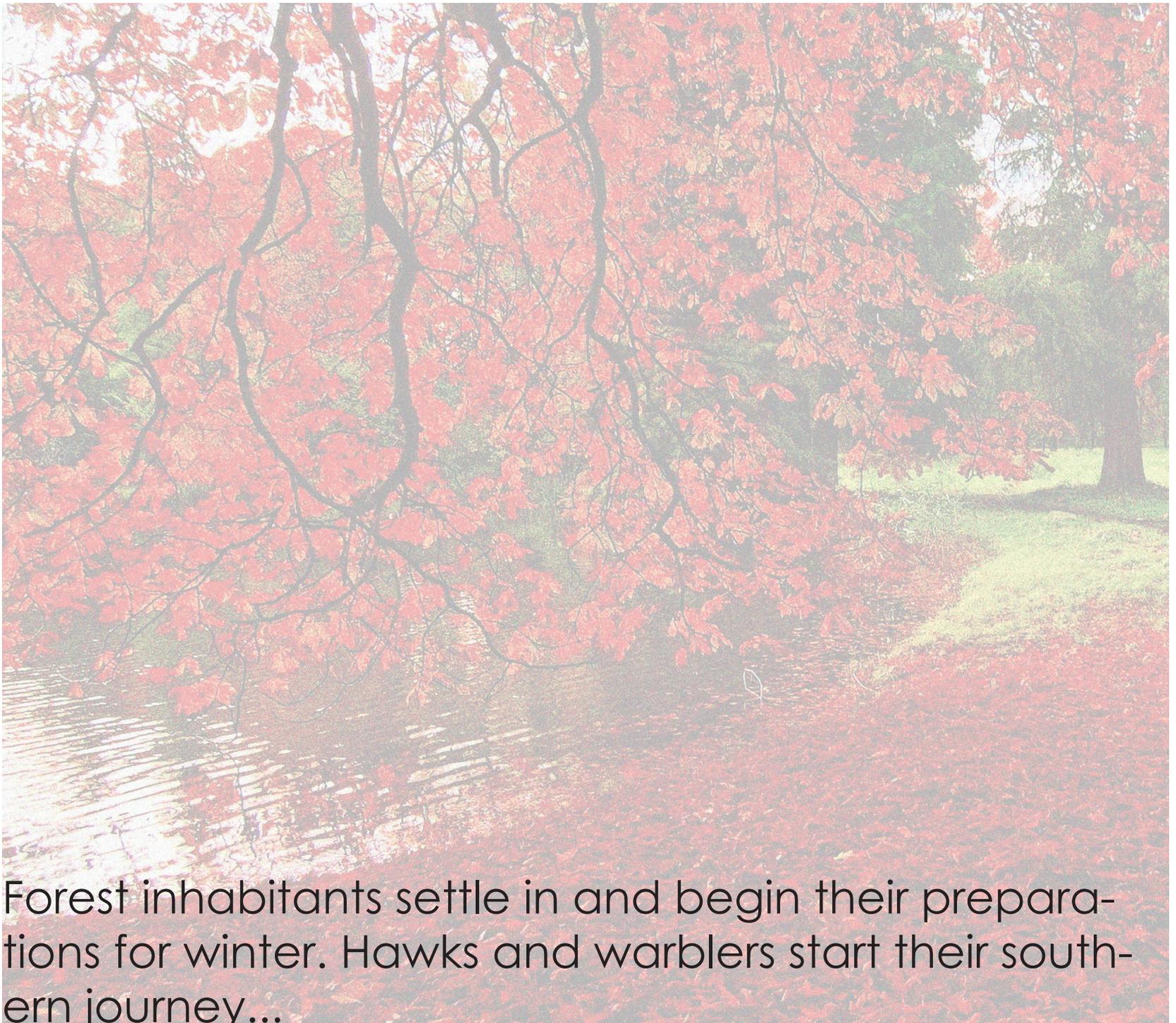


Summertime is perfect for outdoor crafts and stories under the tree. These activities allow kids to explore their creative side with nature as the backdrop and inspiration. The hot days of summer are excellent for building forts that also serve as temporary sculpture exhibition!



EAST ELEVATION
25 FT

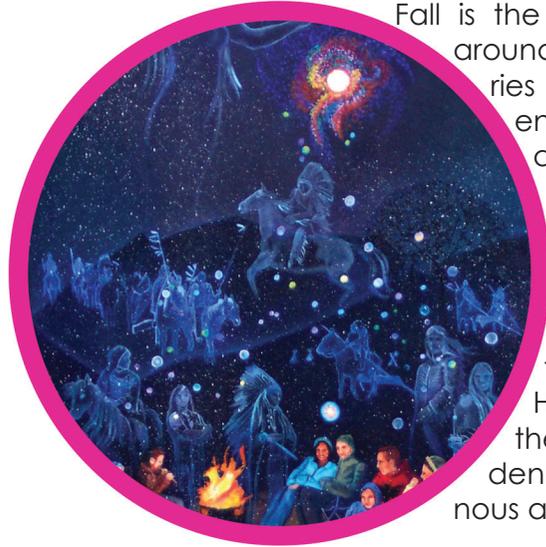




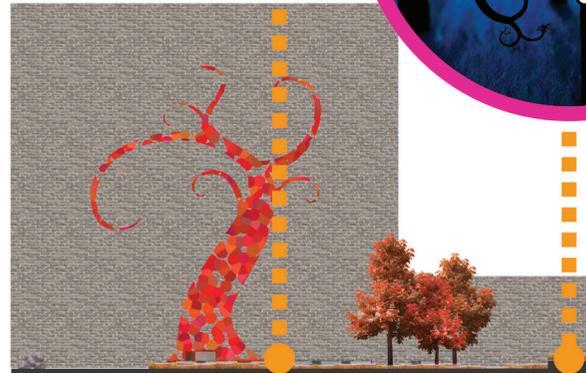
Forest inhabitants settle in and begin their preparations for winter. Hawks and warblers start their southern journey...

fall

- Virtual Activity
- Physical Activity
- Environmental Theme
- Historical/ Cultural Theme



Fall is the time to gather around and hear stories of Indian legends. Kids will learn about the Native Americans in their area and their beliefs about nature. Then mysteriously around Halloween time, the Rize Forest suddenly becomes ominous and "spooky"...



EAST ELEVATION
25 FT

Virtual migrating birds fly overhead. Kids will learn to identify these birds and listen to their calls. Once identified correctly, they wave goodbye and start their journey.



School craft fairs will give public schools a chance to fundraise while showcasing the talents of their students.



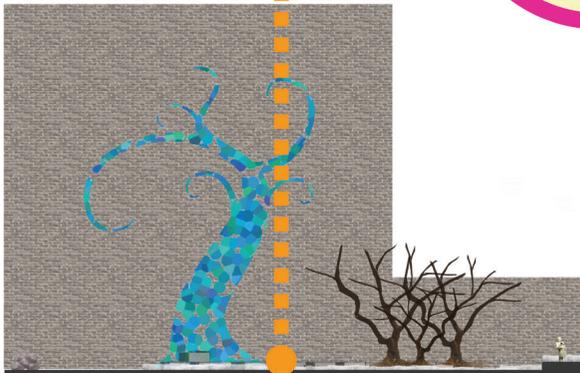
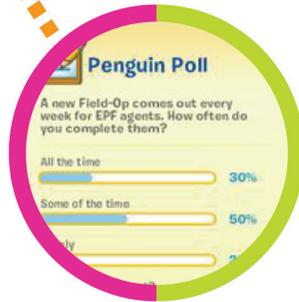
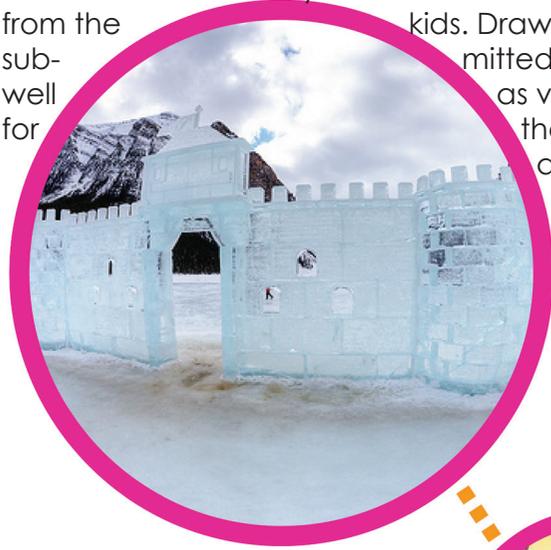


Rest and reflection has fallen upon Rize Forest. The plants and animals are storing up their energy for spring festivities...

winter

- Virtual Activity
- Physical Activity
- Environmental Theme
- Historical/ Cultural Theme

Although Rize Forest rests during the winter, virtual ice castles can be explored! While the forest rests, activities for the next year are decided with input from the kids. Drawings can be submitted for ideas as well as voting polls for the next years activities.



EAST ELEVATION
25 FT

Winter apps let kids know the snowball, snow angel, and snow man forecast. They are alerted to which days are optimum for these winter activities.



RIZE FOREST STORYBOARD

This storyboard is a series of images that were taken from the virtual simulation. The first set shows what the physical experience of the north site would be. Then it switches over to the virtual overlay that shows how the virtual site could look like in Fall. Each image also demonstrates how the A.R.T. principles were used in both the physical and virtual worlds. To better experience how this simulation would work, please watch the videos on the CD at the back of this book.

The simulation was modeled in 3D Studio Max and exported into the CryEngine Editor where vegetation, effects, and terrain were added. The gaming software that will be used is the CryEngine 3 SDK (Software Development Kit) developed by Crytek. This software is referred to as a sandbox editor, and appropriately so. Similar to a real sandbox your structure (building, park, sand castle) is imported or placed into the sandbox. Trees, small objects, and water can be put in too. Unlike a real sandbox, however, the editor can script these various objects to act as they would in the real world. The trees can sway in the wind, birds can chirp, objects respond to gravity, etc. As long as you can program it, there are few limitations.

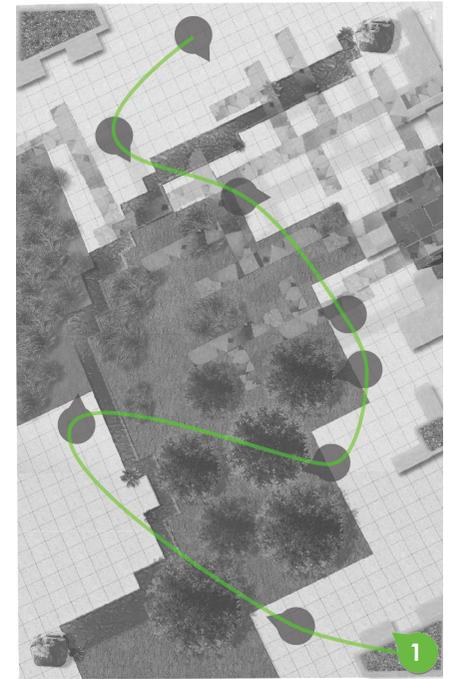


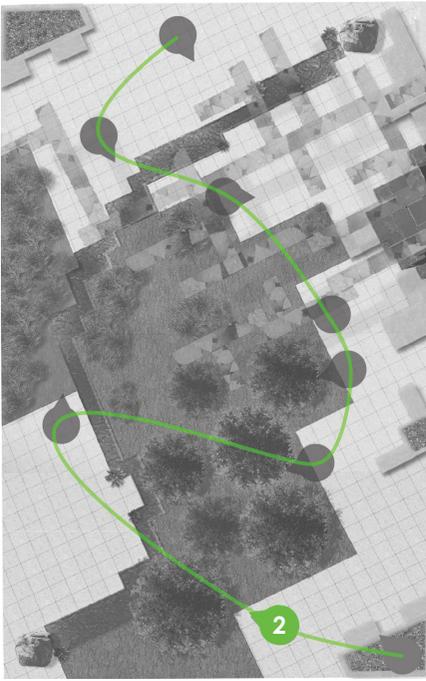
This site plan shows storyboard locations that are keyed to the “screen captures.” The green path shows the journey through the physical site only, while the magenta shows the journey onsite aided by the virtual augmented overlay.





At the north intersection, the planter welcomes visitors. The location allows passersby on the busy street to understand that this is a park.

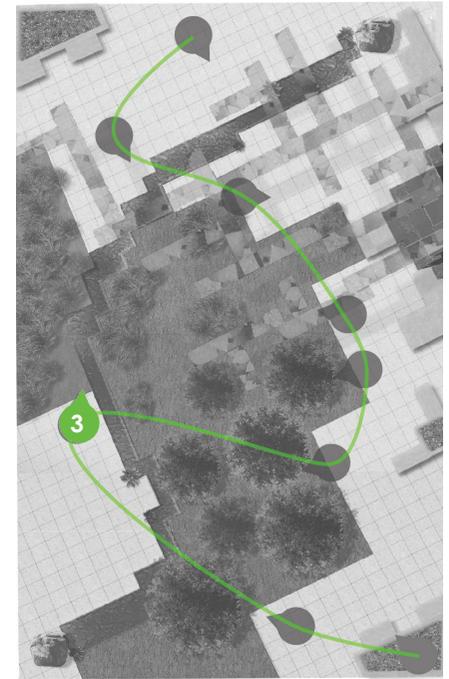




There are many options to traverse the park. They range from concrete tiling, gravel, and rocks in the stormwater bed.

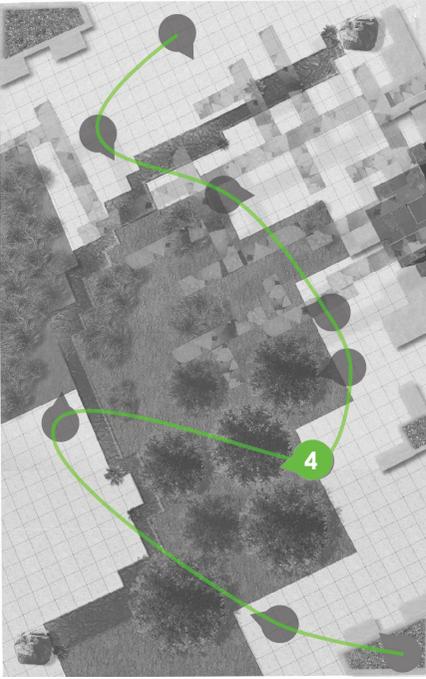


These different textures depart from the usual urban streetscape.

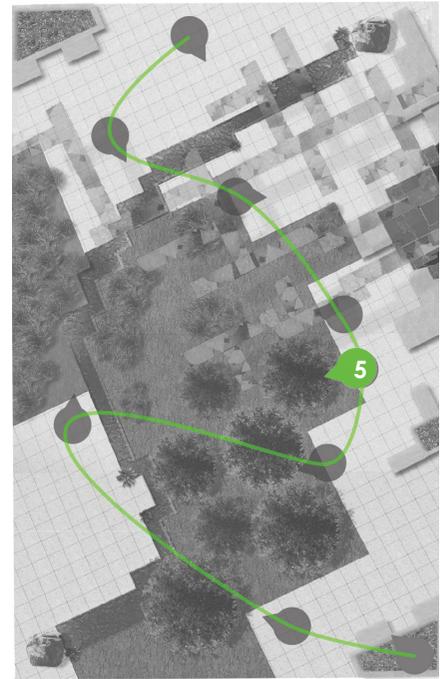


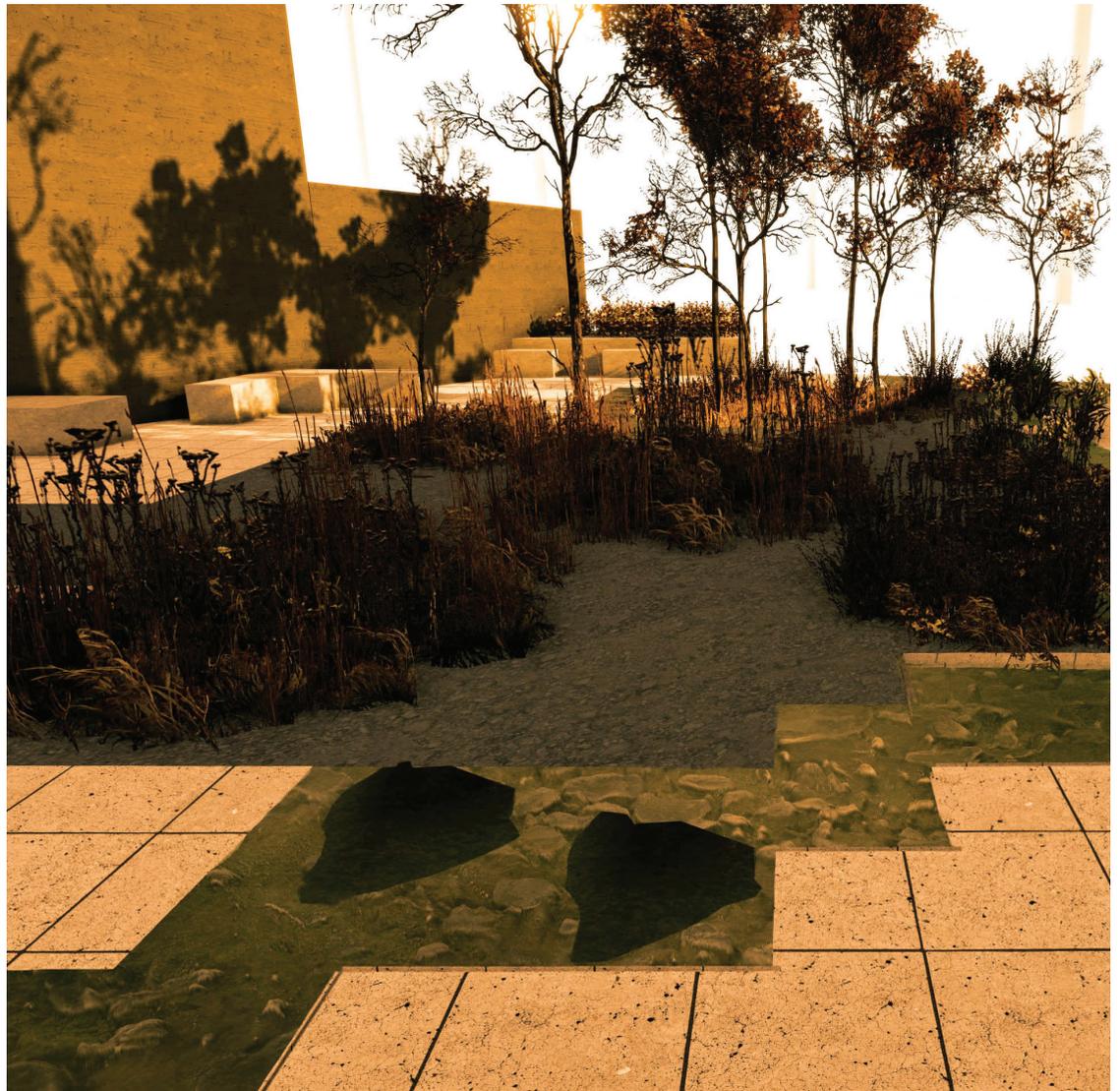
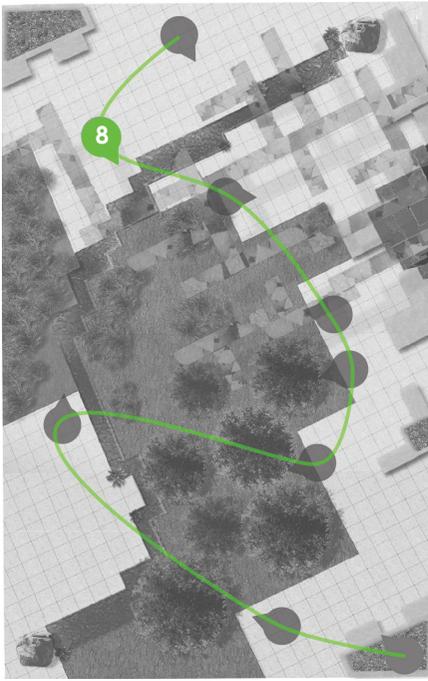
The geometric shape of the stormwater feature contrasts against the naturally ordered vegetation and creates interest.



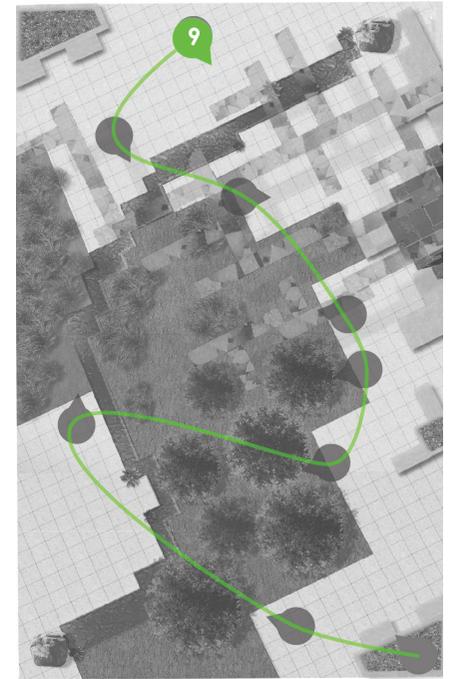


The wall in this space can be used as a virtual screening spot to watch virtual films that correspond to the season's program.



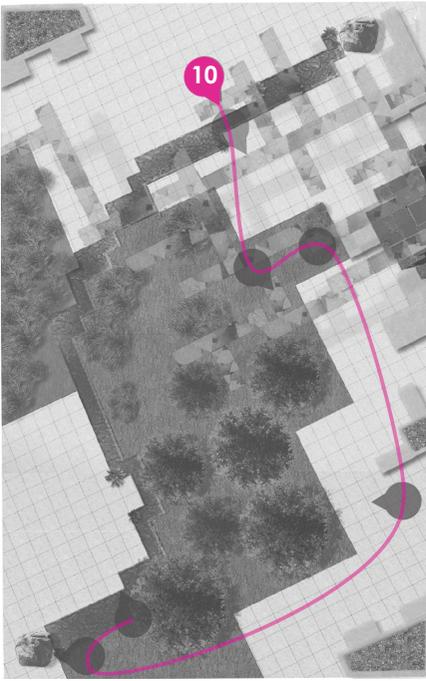


Large rocks in the stormwater feature allow kids the delightful opportunity to hop across the “river” from rock to rock.

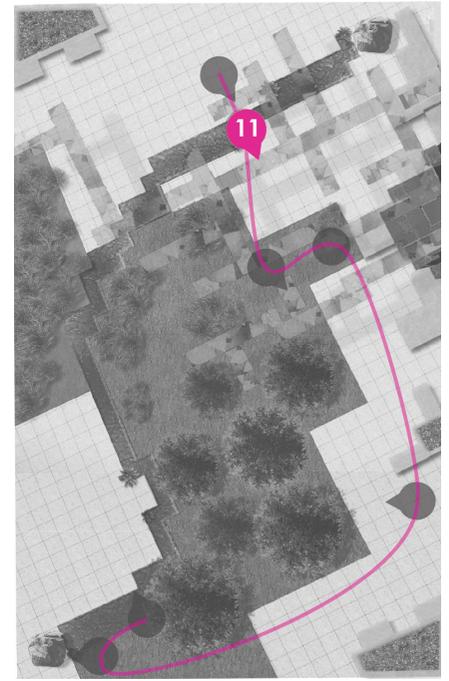
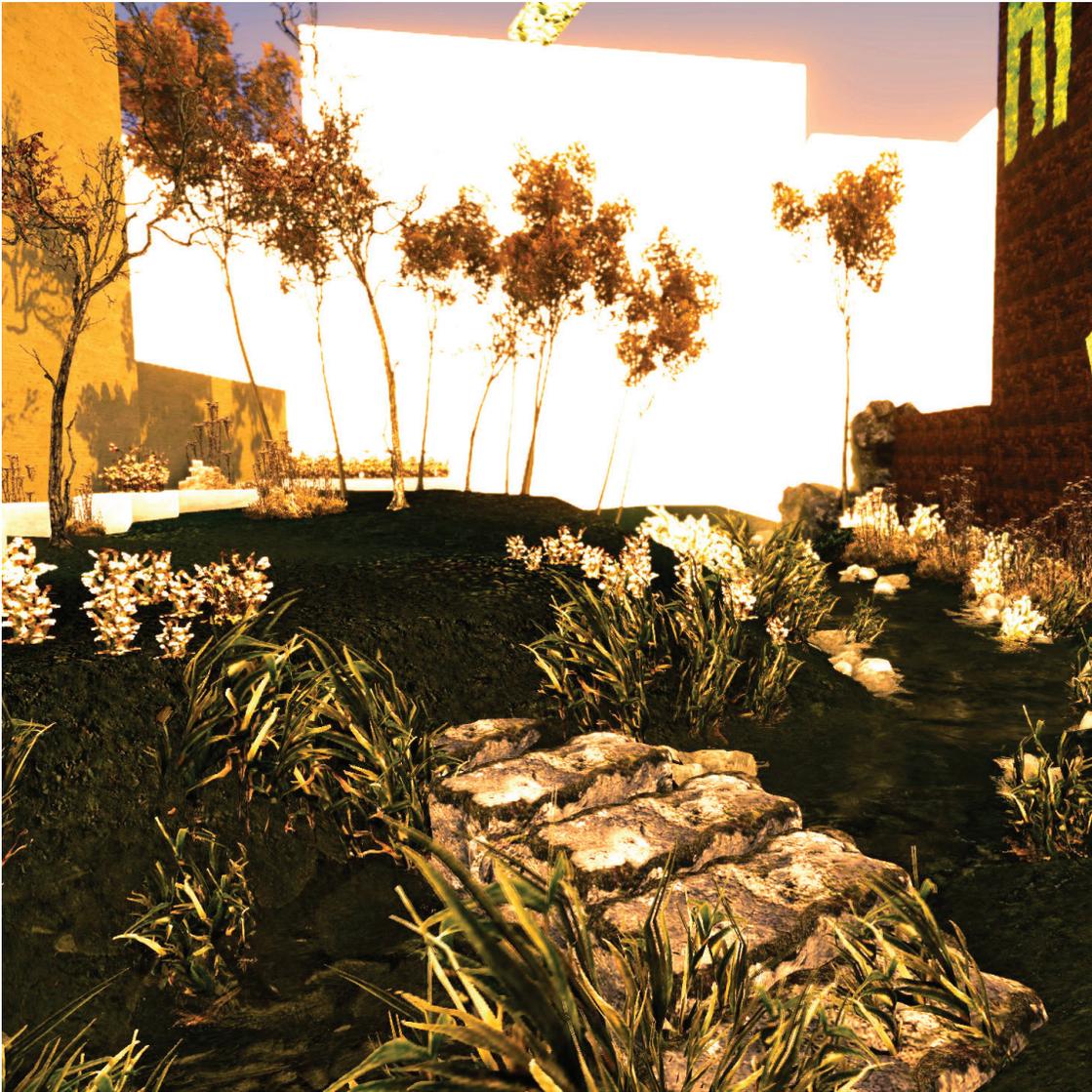


Seating is provided underneath the pixel tree sculpture. It faces another wall that can be used as physical screening space during the evenings for families. The seating here on various levels provides casual theatre seating.



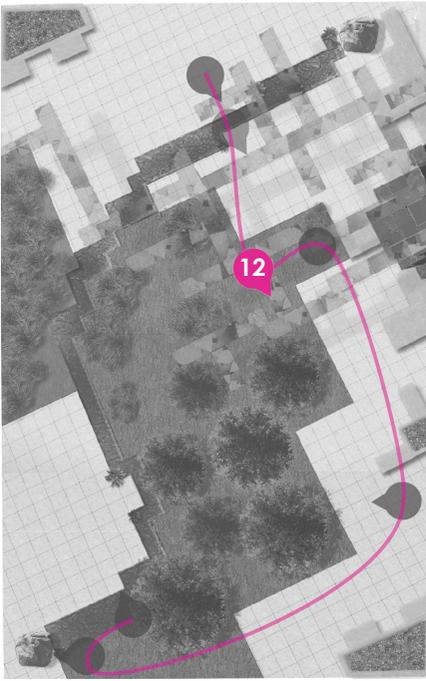


The virtual overlay adds a wild, natural experience to the site but keeps the basic form and elements of the site for easy navigation and comprehension.



The view to the other side of the site reveals a small waterfall in the distance. This overlay extends the site and possibilities in the child's imagination.

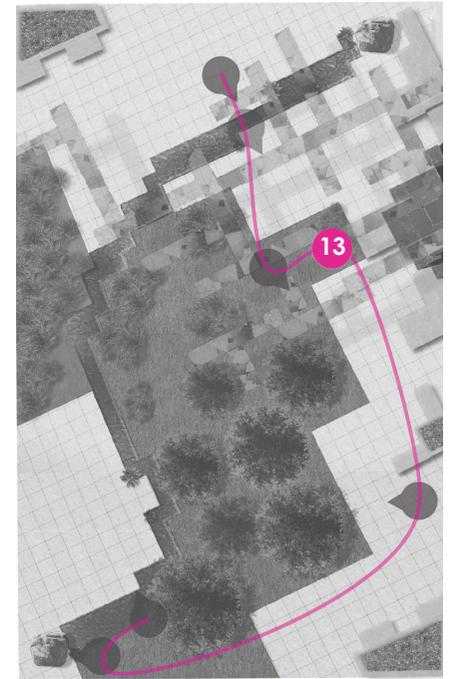


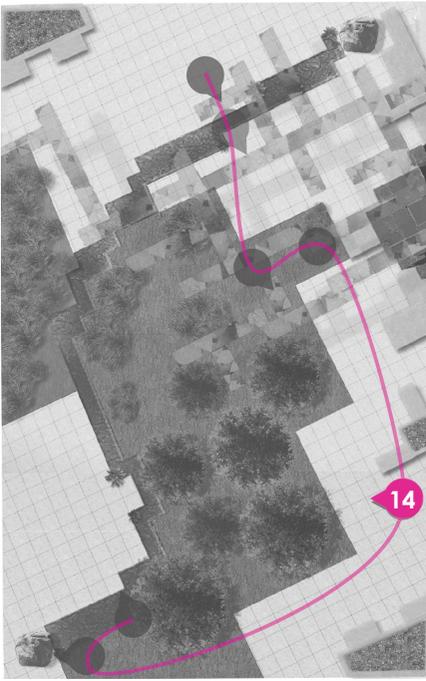


Physical objects are still viewed with overgrown vegetation as if the site were reclaimed by nature.



The virtual world allows for the integration of animal experience and education where natural animals could not survive. Here children get to learn about bird migration.



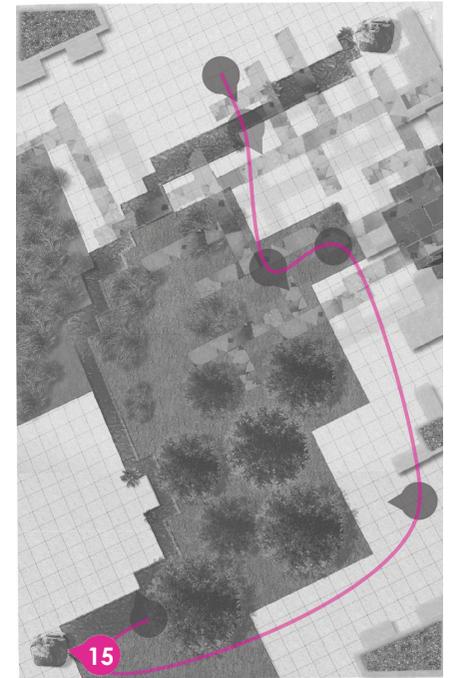


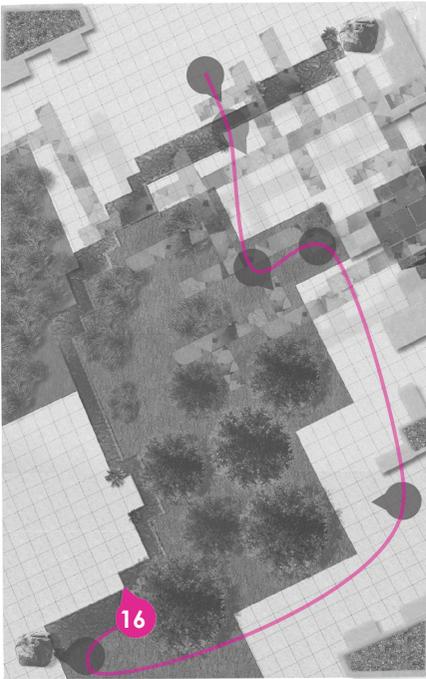
The virtual view adds even more texture to the site through the forest floor and tree stumps.



The waterfall and river create a unique experience that takes the user from the site and fully immerses them in the fantasy virtual world complete with the sound of rushing water and virtual mist.

The virtual waterfall and river have a one to one connection with the stormwater feature.





The virtual river is a departure from the urban environment.

conclusions

This project explored the A.R.T. principles and virtual technology integration in an urban park space. It showed that Nature Deficit Disorder in children can be helped in an urban alternative without full nature immersion. This will become increasingly significant as our cities continue to grow and more children are born and raised in these cities. This project also explored what implications the A.R.T. principles would have on an urban park if it were incorporated from the beginning. These principles were applied to a spectrum of materials that included plant, manmade materials, and digital world technology. RIZE Forest explored how these different materials could interface and blend together under the direction of the A.R.T. principles to create a restorative environment and prove that there are other methods to mitigate N.D.D. in kids. Another aspect that this project was able to explore was how technology can be integrated into a site's program and not merely be a design tool, but an enriching program element. The virtual dimension of RIZE Forest was able to expand on the site's meaning and create new types of interaction in the physical world. It illustrates a way that the physical urban environment and nature-inspired virtual reality can come together to produce memories and relate to nature in the physical and virtual realms. The process took a traditional landscape architecture approach and expanded it with the new spatial and experiential possibilities that virtual reality has to offer.

One of the main things I learned in this project, was that I had to design a new type of space that you do not encounter in the landscape architecture master's program. This space was the seam where the physical space and digital spaces merged. If I were designing a completely physical park space, there are already established guidelines and studies of good design. I would just have to reinvent them for my purposes. Similarly, if I were only designing a virtual, video game world, there are also many successful examples of formats. The new issue I ran into was how this site could be successful in combining the two. I almost had to create my own rules for this. For instance, the locations of physical and virtual water features and pathways should line up. However, I did not know how much the virtual site could deviate from the physical site and still be believable and safe. I could only use my judgment gained from playing very basic virtual overlay games through Microsoft's Kinect sensor. Unlike these games, the realism I aimed to achieve was much higher, and it would have to be easily navigable. Once I was in this design phase, I quickly realized how new this idea was. It was challenging to design for a new genre of spatial design. I think to be successful, basic design guidelines in augmented reality need to be explored deeply.

If there were no time limitations, virtual activity would be explored further. Physical sites were assessed according to how well they met the A.R.T. principle. However, I think this should also be done for specific games or digital applications. Case studies that explore how different games have achieved these principles would be useful in designing the virtual component. This would have created a richer virtual experience. Furthermore, a narrowing of focus on just one season would have helped to develop it to a greater extent.

The ideas that were explored in this thesis can be taken and applied to other urban environments where a physical space and environmental resources are at a minimum. Since creating a virtual component to a space requires a sufficient amount of time, it would serve its highest function in a very public area where the greatest amount of users can access it. To begin the creation of these sites that have the dual physical/virtual reality, perhaps an existing park can be digitally retrofitted to test these ideas before a real park that interfaces with this technology is built. In this setup, it will be easy to explore which parks have conditions that are most conducive to this interface. Do these parks have to be simple with basic shapes, or can the program easily integrate into more vegetated parks? Also, it would help to explore the content of the virtual programs to discover what types do people like and what forms are most successful at providing the best experience. I think this would have to be studied first before a successful park can be built or digital program created. Another alternative for the creation of these parks is by the citizens themselves, at least when it comes to retrofitting. Many video game companies provide development programs to the public for free to develop their own games, such as the CryEngine. Perhaps parks can have their own development programs where users can create their own new experiences and share them with others. This especially would give kids more room to imagine and create.

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Figure 1: Retrieved from Google Earth

Figure 2: Viele, Egbert L. 1865. Sanitary & Topographical Map of the City and Island of New York Prepared for the Council of Hygiene and Public Health of the Citizens Association. Under the direction of Egbert L. Viele, Topographical Engineer. Entered ... 1865 by Egbert L. Viele ... New York. Ferd. Mayer & Co. Lithographers, 96 Fulton St. N.Y.

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Figure 2: Retrieved from Google Earth

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Azimuth calculated using calculator from <http://aa.usno.navy.mil/data/docs/AltAz.php>

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Map retrieved from <http://www.oasisnyc.net/map.aspx>

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Figure 1: Retrieved from <http://www.nhdfi.org/about-forests-and-lands/bureaus/natural-heritage-bureau/photo-index/SystemPhotos/salt-marshsystem.aspx>

2 www.nhdfi.org

3 http://www.dcr.virginia.gov/natural_heritage/natural_communities/ncEll.shtml

4 and 5 <http://acris.nynhp.org/>