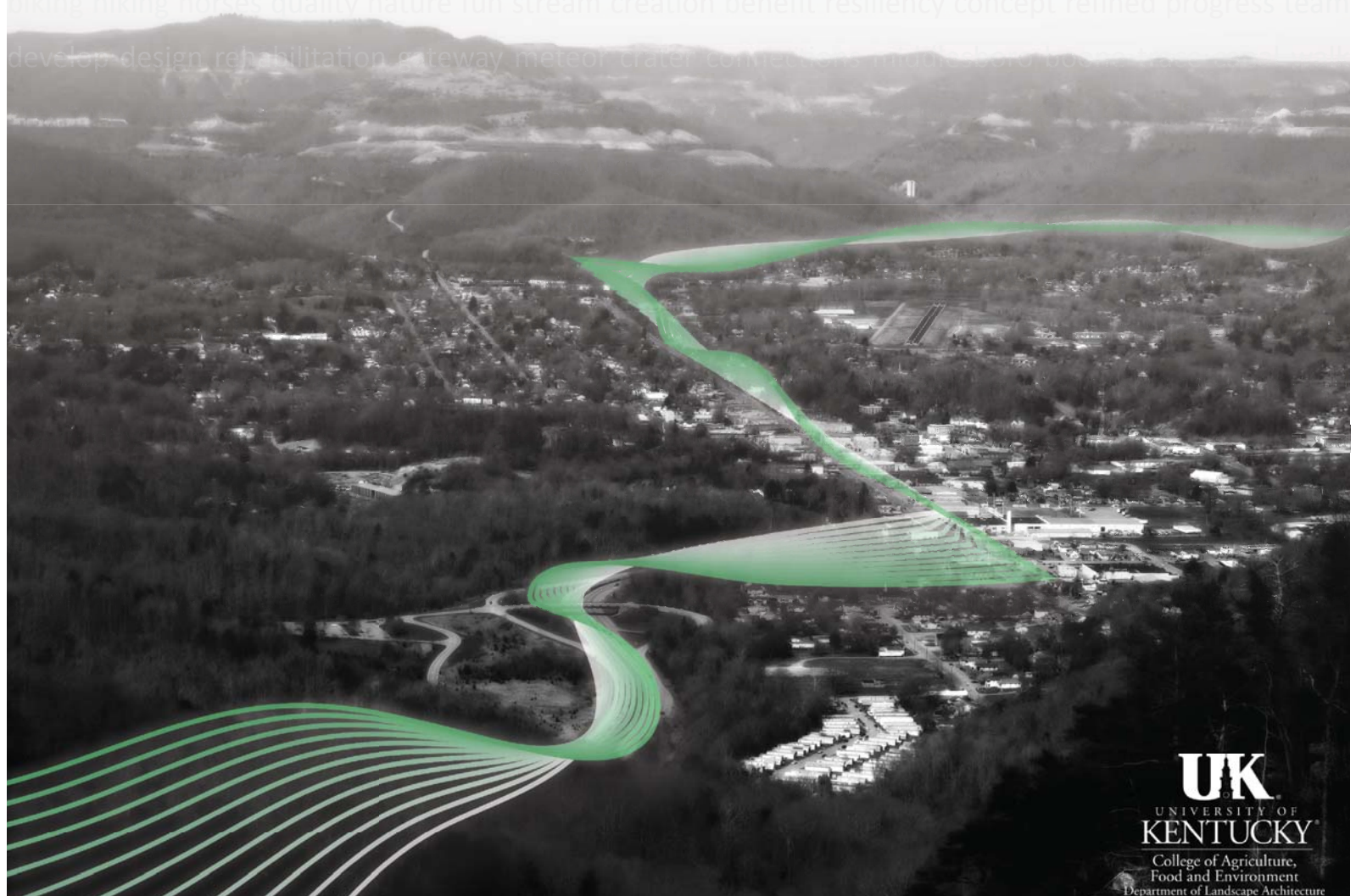


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GATEWAY TO THE GAP

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Gateway to the Gap

“Connecting Cumberland Gap National Historical Park & Middlesboro Via The Boone Trace”

University of Kentucky
College of Agriculture, Food, and Environment
Department of Landscape Architecture
Design Studio VII

Undergraduate Students

Hillary Barron, Lloyd Bridges, Andrew Ciammaichella, Matthew Clark, Ben Craven,
Clayton Crum, Rachel Cunningham, Maureen Dreckman, Andrew Filcik, Liwei Han,
Charles Hunt, Curtis Mucci, Kara O'Connor, Scott Stokes

Faculty

Jayoung Koo, PhD, *Assistant Professor*
Jordan Sebastian, MLA, *Adjunct Professor*

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Acknowledgements

Jill Barry

Community Member

Kristy Bay

Discover Downtown Middlesboro

Carol Borneman

Cumberland Gap National Historic Park

Keith Bowling

Cumberland Gap National Historic Park

Thomas Bridge

Community Member

Joe Brown

Community Member

Vicki Byrne

Discover Downtown Middlesboro

Stephen Cambron

Discover Downtown Middlesboro

Russell Clark

National Park Service

Jacob Cline

Discover Downtown Middlesboro

Fiora Cruey

Community Member

Zoe Cruey

Community Member

Ron Dubin

Community Member

John Fox

Friends of the Boone Trace

Judy Grandy

Community Member

Larry Grandy

Community Member

Dana Green

Community Member

Joe Guidali

Community Member

Linda Guidali

Community Member

Sulla Jacobs

Cumberland Gap National Historic Park

Thomas Josiah

Community Member

Isaac Kremer

Director, Discover Downtown Middlesboro

Jan-Michael Lambdin

Community Member

Keith Nagle

Discover Downtown Middlesboro

Becky Powell

Community Member

Bill Powell

Community Member

Brian Powell

Community Member

Lauren Rice

Community Member

Charlena Rucker

Discover Downtown Middlesboro

Jay Shoffner

Discover Downtown Middlesboro

Donna Smith

Discover Downtown Middlesboro

Ken Smith

Bell County Historical Society

Kirby Smith

Discover Downtown Middlesboro

Channyn Walker

Community Member

Jill West

Community Member

Toni Winston

Community Member

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Executive Summary

The City of Middlesboro, Kentucky, presents a unique opportunity to increase tourism related activities due to its proximity to the Cumberland Gap National Historical Park. The town has historic significance due to its geographic location as an entry to the west and Daniel Boone's trail-blazing back in the late 1770s. However, over time the community has been hit hard economically, along with others in the eastern Kentucky region, due to its dependence on coal and its related revenue. The community is challenged with repeated flooding events, ineffective walkable paths, aging infrastructure, declining population, and increasing unemployment. The downturn in economic activities not only weakened the social fabric of the community, but has also diminished its place identity which must be overcome in order for the area to prosper. The city does not have effective physical connections within the town or to the surrounding areas and lacks supporting features, such as a cohesive wayfinding system throughout the area. One way to address these challenges and issues is to develop a trail system that connects the City of Middlesboro with the Cumberland Gap National Historical Park which will increase connectivity for residents and visitors in and around town.

During this project, the fifth year students from the University of Kentucky Department of Landscape Architecture (UKLA), Landscape Design VII studio, researched and identified an inner and outer loop trail system for the City of Middlesboro. The goals for the trail system planning and design project were to increase the quality of life, enhance degrading infrastructure, and improve the environment to encourage potential business opportunities. The student designers gathered and analyzed information on and off site and during community feedback sessions. A multitude of design solutions were produced to resolve challenges but also to illustrate visions for the future. The design solutions create a complete trail system within and around Middlesboro that also has the potential to extend and connect to existing trails within the Cumberland Gap National Historical Park. The inner and outer loop trail system design focused on three primary areas: Downtown Connection, the Canal Walk and the Greenway. The design suggestions serve to lay a foundation for development to benefit Middlesboro's citizens as well as visitors to the region. The trail system should help the town receive designation as a potential Trail Town. Ultimately, the enhanced trail system will bolster the community's place identity as the "Gateway to the Gap."

Middlesboro Trail System

Chapter One



View of Middlesboro, Kentucky from the Pinnacle Overlook in Cumberland Gap National Historical Park

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1.1 Community Background

Brief History

Alexander Arthur, a businessman from Knoxville, TN, who saw great promise in the land, founded historic Middlesboro, KY in 1890. Arthur's grand city went through some tough times during construction and dealt with many setbacks. One of the most notable delays in the construction of the City of Middlesboro was the fire in 1890, which destroyed much of the town. After the city recovered from the fire, Arthur continued to build his city. In 1892, \$1.5 million was spent to build The Four Seasons Hotel. Unfortunately fires and poor iron ore required the project to cease, ending the dream of Arthur's grand hotel. The city also suffered from the Great Depression, but then triumphed when they installed the first electric cars to the west of Washington, D.C. In the 1930s, the city was known as "Little Las Vegas" because of its vast supply of slot machines, saloons, and brothels. In the 1950s, the population had grown to about 15,000 and the city's nickname was changed to "The Athens of the Mountains" because of the area's considerable support of the arts. During the 1960s, the city's first shopping mall was built (City of Middlesboro, n.d.; Geographical Studies & Research Center EKU, 1990).

In the 1970s, the coal industry was rejuvenated, which in turn brought the city back to life and it once again prospered. In 1996, the Cumberland Gap Tunnel opened, creating a unique way to travel through the mountains and hills. During the 2000s, the city has gone through a period of renovation with improvements to Fountain Square, multiple store fronts, and other historical markers throughout the area (City of Middlesboro, n.d.).

Plans: Past & Present

The City of Middlesboro has put much effort into improving their built environment throughout the years. Several plans reflect the community's effort to enhance the downtown commercial

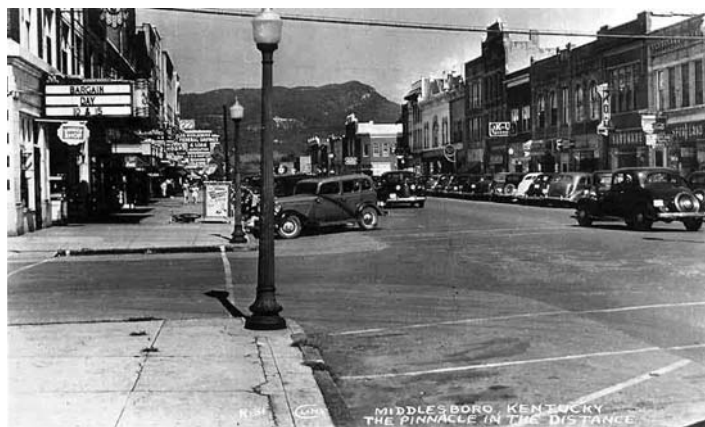


Figure 1.1.1 Historic Cumberland Avenue (1955) (Middlesboro, KY, n.d.)

area. A bike plan mainly focused on the introduction of bike lanes to reduce the use of motor vehicles in and around the downtown area was created in the mid-1970s but does not seem to have been implemented (*"Bikeways for Middlesboro, KY,"* n.d.). The plan also mentions a recommendation for the city to construct a park system which also does not seem to have been implemented. However, with the growing interest in cycling in the community, some of the strategies in the earlier plans are worth revisiting in an effort to provide a safe and comfortable environment for pedestrians and cyclists.

In 1981, the Kentucky Design Assistance Team (KyDAT) proposed ideas for downtown Middlesboro to gain strength to compete with the then new commercial corridor that was approved along US-25E (The Kentucky Society of Architects and The Department of Community and Regional Development, Commonwealth of Kentucky, 1981). The following year streetscape improvements were proposed for Cumberland Avenue (James B. Evans & Associates, 1982). In 1989, the community's downtown was nominated and became registered in the National Registry of Historic Places (MCBreeding Associates, 1989). In 1990, the city developed a comprehensive plan to shape its environment for future changes (Geographical Studies & Research Center EKU, 1990).

More recent plans explore and reflect ideas to re-establish a working community. Community members in Middlesboro have sought out strategies and plans for advancement that depend on the area's historical and cultural significance (DDM, 2013). They have strategic plans in place that will guide improvements to the aging infrastructure. In 2013, Discover Downtown Middlesboro (DDM), local residents and students from the Lincoln Memorial University School of Business developed a strategic plan for the revitalization of Middlesboro. Their strategies consists of three main areas:

- Physical improvements to change the overall look and appearance of the downtown area
- Supportive renewal culture that makes downtown revitalization the most profitable, cost effective, and realistic way to redevelop
- Catalytic strategies that combine emerging trends of restorative development, citizen led renewal, and crowd technologies (DDM, 2013).

Community Accomplishments and Growth Strategies

Middlesboro is accomplishing a great deal in their endeavor to become a regional hub for tourism. Discover Downtown Middlesboro (DDM) has secured a RTP grant from the Kentucky Transportation Cabinet (KTC) to improve and extend the existing Canal Walk. DDM also received a technical assistance grant

through the National Park Service's Rivers, Trails, Conservation Program (RTCP) which this collaboration is a part of. The groundwork is in place for the revitalization of existing trails as well as the restoration of the Canal Walk and waterways in and around the city.

Another objective related to built environment improvements is to get Middlesboro designated as a "Trail Town." In 2012, the Office of Adventure Tourism announced the KY Trail Town Program with the intent to designate towns along established trails and bike routes as Trail Towns. Trail Towns are destinations along a long-distance trail or adjacent to an extensive trail system. Currently there are two Trail Town designations in Kentucky: Dawson Springs in western Kentucky and Livingston in eastern Kentucky. Middlesboro has an active Trail Town Initiative and plans to apply for the program in the near future. Along this line of action, DDM has held events to promote and educate the community about on-going activities such as the "Build a Better Block Middlesborough" event in October 2013 (Figure 1.1.3).



Figure 1.1.2 Build a Better Block Middlesborough in October 2013
(Photo Courtesy: UKLA Student Chapter, 2013)

The community leaders are also seeking other grants related to public space, arts, etc. Hopefully, the efforts of the UKLA design team will aid in the attainment of additional grants by giving DDM and the City of Middlesboro a defined vision for their future and a solid starting point for a comprehensive trail system.

Middlesboro's growth strategies to revitalize the downtown area are laid out as follows:

- Look for opportunities to develop and attract "location neutral" retail businesses
- Make downtown Middlesboro the city's priority location for new retail businesses and small industries
- Expand the arsenal of downtown property rehabilitation and development tools
- Focus on developing locally owned businesses
- Attract and retain young entrepreneurs (DDM, 2013).

1.2 Project Background

The Need for Middlesboro Trail System

The University of Kentucky's Department of Landscape Architecture (UKLA) students partnered with Discover Downtown Middlesboro (DDM) to create a trail system. This collaboration helped the City of Middlesboro to identify and visualize design ideas for a trail system in and around the city as part of a service-learning project. The proposed local trail system also has the potential to be extended beyond the city boundary and connect with the existing trails established within the Cumberland Gap National Historical Park (CGNHP). This potentially extended connection would enable a stronger linkage between Middlesboro, KY, and the national park which lies south of the city. The design proposals are conceptual ideas to help the community envision their future. The suggested ideas are not final designs that can be implemented right away. However, the proposed trail system reflects opportunities for the City of Middlesboro to become a state designated Trail Town and a regional tourist hub with the CGNHP as a central destination.

Considering the city's location in relation to the CGNHP as well as the rich history of the area, Daniel Boone's trace on his way to expand the entry to "the West," the central theme for this trail project was agreed on as "Gateway to the Gap." The city serves as a gateway to the national park as it lies just outside the city and is the last stop before entering the park from Kentucky.

With a trail system, the city will have the means to promote economic growth through tourism, highlight its historical significance, and renew and enhance its natural environment. By emphasizing opportunities through existing infrastructure, the UKLA team is suggesting a trail system with an inner loop and outer loop trail in Middlesboro which will focus on three main areas: the Downtown Connection, the Canal Walk, and the Greenway.

UKLA students gathered and analyzed information to gain a better understanding of the context, culture, economy, environment, and history of Middlesboro. On February 1, 2014, the class made an initial site visit to Middlesboro to gather further information and experience the areas of focus. After the initial site visit, teams focusing on different segments of the trail system developed a range of conceptual ideas and preliminary design proposals. The students presented their ideas to the community and received feedback in March. Further refined ideas were presented to the community in April.

Goals & Objectives

The Middlesboro trail system has the potential to effectively connect the city internally, while also linking with the CGNHP. The overall system includes an inner loop and an outer loop that



Figure 1.2.1 2014 UKLA Landscape Design Studio VII students



Figure 1.2.2 Cumberland Avenue, Middlesboro, KY (2014)

lay out the grounds for increased connectivity. Users will be able to decide different routes depending on individual ability and interest. The system also has the potential to extend into the national park at different locations. This can further diversify the types of length of trails for its users, residents and visitors.

Goal: To improve quality of life

Objectives:

- To connect the people and places
- To provide facilities and promote activities that will improve health, education and relationships

With the trail system established, Middlesboro will be a strong candidate for a Trail Town designation through the Kentucky Office of Adventure Tourism. The potential trail system not only provides trail routes to connect to the national park and its existing trails but it also provides opportunities for small business entrepreneurs. In order to become a renowned trail town, supporting services need to be established for trail users and visitors.

These objectives will also support the goals DDM has established in their strategic plan for 2014-2018 (DDM, 2013). In addition, the trail system project should be able to trigger further ideas for tourism and relevant activities. Historical preservation of the town at large should also be considered beyond the downtown area which is already nationally registered. A trail system that incorporates Daniel Boone's trace or path through the national park, around the town and along the route to Fort Boonesboro will also strengthen the identity of Middlesboro.

Goal: To improve economic conditions through tourism

Objectives:

- To improve the connections to the Cumberland Gap National Historical Park
- To provide services for users and attract visitors to downtown Middlesboro
- To emphasize downtown Middlesboro as a destination

Certain existing physical elements, such as the Army Corp of Engineers' flood protection project, provide challenges for the overall trail system. However, the UKLA team's proposed trail system offers design solutions that go beyond the site limitations through careful consideration of existing conditions and creative design ideas.

Goal: To enhance the natural and built environments

Objectives:

- To rehabilitate existing infrastructure
- To retain functions through current design principles and standards

The overall goals are further considered and reflected in each trail area of focus. We recognize the true potential for how the city could become a major tourist attraction with the proposed trail system in addition to enhancing the overall quality of life for residents and visitors. We are optimistic that readers will also recognize the great and unique opportunities that are achievable by Middlesboro.

In the long run, the proposed trail system can become a catalyst for Middlesboro to become a regional tri-state trail hub. Initial discussions are already underway between the city and neighboring communities in surrounding counties and states.

The opening chapter of this report provides a general overview for the Middlesboro Trail System project with this section laying out the city, its history, current growth strategies, community accomplishments, short and long term goals, as well as the definition and scope of the trail system plan and design.

Chapter 2 transitions into the inventory and analysis phase of the project where many variables were explored. The chapter discusses the history, location, demographics, biophysical resources, current land use, and the potential trail system.

Chapters 3, 4, and 5 detail the steps taken during the design phase. The Downtown area is discussed first, followed by the Canal Walk, and the Greenway which ties the entire trail system together. Additionally, applications for a wayfinding system are introduced in Chapter 6 in order for the trail system to be more effective. Lastly, the report wraps up with a brief conclusion.

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Inventory & Analysis

Chapter Two



Aerial image of Middlesboro, Kentucky (Imagery Source: Kentucky Geography Network, 2014)

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2.1 Location & Regional Context

Middlesboro is located in Bell County in south eastern Kentucky within the tri-state region. The county borders Claiborne County in Tennessee and Lee County in Virginia. The city is located within an hour distance from Knoxville, TN, and within a 2.5 hour distance from Lexington, KY, by car. Middlesboro is relatively close to such major cities and thus has the potential to attract visitors from multiple areas (Figure 2.1.1).

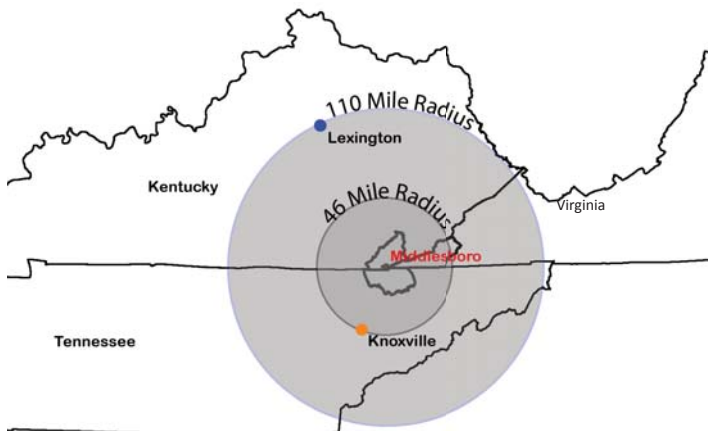


Figure 2.1.1 Middlesboro in relationship to tri-state area (Data Source: Kentucky Geography Network, 2014)

Middlesboro and Bell County, KY, lie within the Cumberland Valley Area Development District and also in the Daniel Boone Country Tourism Region (Figure 2.1.2). Yellow Creek flows through the city and ends up in the Cumberland River. Daniel Boone traveled through the Cumberland Gap wilderness in the 1700s and opened the door to the west for those who came after him. At the regional scale, Middlesboro shares a significant cultural and historical identity with Appalachia and the eastern coal fields.

At the local level, Middlesboro is in the center of the tri-state, tri-county region with the Cumberland Gap National Historical Park at its footsteps. There are several smaller towns scattered within the area. Additionally, there are natural amenities/

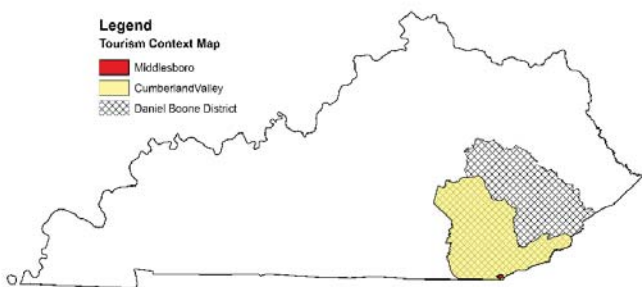


Figure 2.1.2 Regional Context of Middlesboro (Data Source: Kentucky Geography Network, 2014)

resources throughout the area which can strengthen and support economic activities for residents of the tri-state (Figure 2.1.3). Middlesboro can become the tri-state hub by taking advantage of its geographic location, historical significance and network of natural and cultural resources.

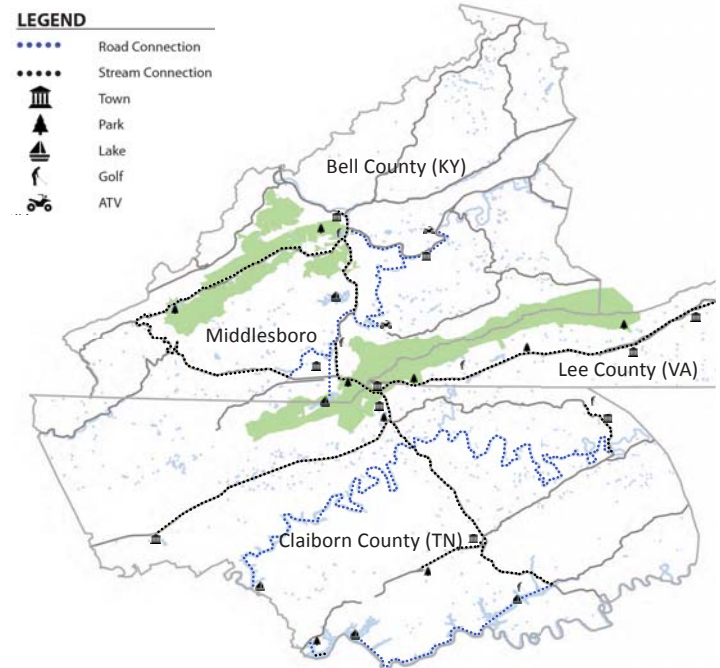


Figure 2.1.3 Regional attractions in relationship to Middlesboro (Data Source: Kentucky Geography Network, 2014)

2.2 History

Boone Trace

Boone Trace, the historic trail formed by Daniel Boone and his team in 1775, runs through the CGNHP and through the city of Middlesboro. This trail was a monumental feat for a person to accomplish during the 1700's, because the wilderness was seen as treacherous and few dared to explore new lands. Daniel Boone was hired by Richard Henderson, a well-known judge in North Carolina, to make this trek and gladly took on the task while changing the look of our country in the process (National Park Service, 1983).

The Boone Trace was the first road ever blazed into what would eventually be the state of Kentucky for the purpose of drawing in settlers. Not only was venturing into the wilderness considered deadly, but the path he took was just large enough for horses and could not accommodate wagons at the time. This was literally a turning point in history as more than 200,000 settlers would pass over a part of or the entirety of the route nearly 20 years after the trail was formed (National Park Service, 1983).

There is a plaque that sits atop the stone at the Flat Lick marker that states how significant Daniel Boone's trail is (Figure 2.2.1). This historic Kentucky trail created the first 'Gateway to the West' and opened up a new world to many settlers after the Revolutionary War.

Relating to Middlesboro, there are four "fixation" points of Boone Trace including:

- The junction of the Davis Branch and Little Yellow Creek, just northeast of US 25E near the trailer park. Davis Station was located there on the Trace.
- The junction of the Bennett Branch and Yellow Creek located just north of the corner of 15th St and Ashbury Ave at the high school. This is the area where the Boone Trace crossed over the creek.
- The "Colson House" in Middlesboro is located at the corner of Hurst Rd and 19th St and the Boone Trace followed along Hurst Rd.
- Old Pineville-Middlesboro Rd (Hwy 3486) paralleling Yellow Creek on the north end of town (Fox personal interview, March 2014).

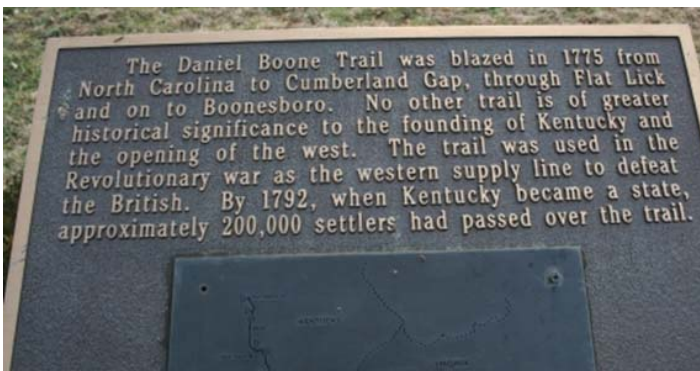


Figure 2.2.1 Plaque Atop Flat Lick Marker (Source: Fox, 2012)

Cumberland Gap National Historical Park

The Cumberland Gap National Historical Park is situated at the borders of Kentucky, Tennessee and Virginia. The Cumberland Gap is the first gateway into the west, where Native Americans traveled through the gap, and later Daniel Boone made his way into the west. The park itself expands over 26 miles along the Cumberland Mountains, and in places reaches a maximum width of 4 miles. This creates a park that is 24,000 acres, with 14,000 of those being proposed wilderness (United States, 2014). The park is host to 80 miles of hiking and equestrian trails as well as five back-country camp sites (States, 2014). The CGNHP was dedicated on July 3rd, 1959, by Vice President Richard Nixon (Figure 2.2.2).



Figure 2.2.2 Vice-President Richard Nixon at CGNHP dedication ceremony, July 3, 1959 (Source: National Park Service, n.d.)

Middlesboro Meteor

Adding to the uniqueness of Middlesboro is the meteor crater in which the town is located (Figure 2.2.3). Originally, the town of Middlesboro was developed in the crater area in order to exploit the rich deposits of iron and coal. However, the site was not actually discovered to be an impact structure until 1962 and then later confirmed in 1966. Without this crater it would have been difficult for packhorses to navigate the Cumberland Gap and implausible for wagon roads to be constructed as early as they were. In 2003, Middlesboro was designated a Distinguished Geologic Site by the Kentucky Society of Professional Geologists. This phenomenon contributes to the rich history of Middlesboro and makes it a distinct place to visit (Milam, Evenick and Deane, 2005).



Figure 2.2.3 Middlesboro Impact Crater. (Source: United States Meteorite Impact Craters, 2013)

Middlesboro Country Club

The Middlesboro Country Club's opening date is unknown, but the earliest known golf was played here in 1889. This makes the course the oldest one to be continuously played on and second oldest course in the nation (Middlesboro Country Club, 2014).

There have been a several names for the golf course throughout the years with the earliest being the Kentucky Golf Club, then the Middlesboro Golf Club, and now the Middlesboro Country Club (Middlesboro Country Club, 2014). It is a significant element in

Middlesboro as it sits in the heart of the meteor impact site. The #9 hole green is essentially “ground zero” of the meteorite impact structure that formed the distinctive geology of the Middlesboro Basin (Figure 2.2.4). This spot is found about 200-300 feet to the right of where the photographer was standing (Greane, D. personal interview March 2014). Although its name has changed over time, the citizens take pride in this course and it remains one of the most popular courses in the state of Kentucky (Middlesboro Country Club, 2014).



Figure 2.2.4 View of Middlesboro Country Club at the Number 9 Green. (Source: Wentzel, n.d.)

Middlesboro-Bell County Airport

Middlesboro is home to the Middlesboro-Bell County airport. The airport has one runway and serves general aviation. The airport was created in 1944 but the first recorded airplane to fly into the city was in 1912. There are currently 45 aircraft housed here and more than 16,000 flight operations per year. This airport also housed and restored the historic and famous P-38 Lightning, Glacier Girl, which was a World War II fighter plane that was frozen in ice in Greenland for over 50 years. Once the plane was restored at this airport, it made its first flight since being frozen in 2002 from the Middlesboro-Bell County airport (City of Middlesboro, 2014).

2.3 Existing Infrastructure

The current conditions of Middlesboro’s infrastructure lack continuity throughout the city. This infrastructure includes sidewalks, bike lanes, and vehicular infrastructure. There are two main thoroughfares that run through the city. One of these thoroughfares is Cumberland Avenue, which runs east and west throughout the city. The other is US 25E, which is a major highway that connects into the surrounding region. The areas surrounding Cumberland Avenue are structured in a more traditional grid pattern. The surrounding areas adjacent to US 25E tend to have a sprawling structure.

Currently the pedestrian and cycling access throughout the city of Middlesboro is lacking. There is little consistency of bike lanes

throughout Middlesboro. In the 1970’s there was a plan drafted to implement a network of bikeways throughout the city of Middlesboro but this was never implemented. This plan called for many of the same standards that are still used today, such as 5’ bike lanes, adequate stopping distances and visible signage (*“Bikeways for Middlesboro,”* n.d.).

The pedestrian experience is also one that is lacking throughout Middlesboro. Along Cumberland Avenue there is more than adequate sidewalk space for pedestrians to use. However, there is a large surface area of roadway to cross. Crossing four lanes of busy traffic along the avenue can be difficult for the user. This heavy load of vehicular traffic with little buffer for pedestrians causes it to be uncomfortable.

Along US 25E sidewalks are not consistent on both sides of the highway. There also lacks a buffer between the pedestrian and the busy roadway. A buffer helps to separate pedestrians from traffic and provides the user a comfortable experience.

Throughout the rest of the city there lacks a consistent presence of sidewalks for pedestrians to use. Cumberland Avenue currently is four lanes of traffic, with street parking along certain portions. Previously, Cumberland Avenue consisted of 2 lanes of traffic with angled parking along the street. Throughout downtown there are also many lots that are either under-utilized or vacant. There are certain portions of Middlesboro where there are vacant homes. These areas of vacancy are not dense but still provide potential development opportunities for public green space and other improvements for the city.

The lack of continuity of infrastructure throughout the city is a problem that can mitigated by implementing Complete Streets strategies. Complete Streets is a program that helps ensure that all users have equal and universal access (Smart Growth America, 2014). These changes are needed to help serve all users of Middlesboro and be more accommodating to visitors drawn in by the trail system.

2.4 Biophysical Resources

Climate

Located at 1,138 feet above sea level, and inside the footprint of a meteorite crater, Middlesboro has a unique climate. The precipitation and temperature averages for each month, as well as the precipitation averages are shown in Table 2.4.1 (U.S. Climate Data, 2014).

Table 2.4.1: Overall Temperature and Precipitation Averages (Source: U.S. Climate Data, 2014)

	JAN	FEB	MAR	APR	MAY	JUN
Average high in °F:	45	49	58	68	76	83
Average low in °F:	24	26	33	39	48	58
Av. Precipitation in inch:	4.84	3.9	5.24	3.9	5.08	4.65
	JUL	AUG	SEP	OCT	NOV	DEC
Average high in °F:	87	86	80	69	58	48
Average low in °F:	62	62	56	43	34	27
Av. Precipitation in inch:	4.33	4.41	2.95	3.15	4.33	4.45
Annual high temperature:	67.3 °F					
Average low temperature:	42.7 °F					
Average temperature:	55 °F					
Average annual precipitation:	51.23 inch					

Soil

There are nearly 30 different types of soils found in Middlesboro, each possessing a unique set of characteristics. The three most common soil composites in the area are SgE (Shelocta-gilpin silt loam), making up 14.3% of the town’s soil; Ud (Udorthents-urban land complex), making up 11.4%; and ShF (Shelocta-highsplint-gilpin complex), with 10.9% of the soil make up. While SgE and ShF are found on the outskirts of the town on sloped areas, Ud can be found right in the heart of the city. Ud soil is found predominantly in flat, developed areas, in downtown Middlesboro and near waterways. It is found along almost the entire length of the canal, and over half of the area surrounding the greenway. Ud soil is prone to occasional flooding, which is why the canal and greenway in Middlesboro are subject to flash flooding. Sb (Shelbiana loam) comprises the balance of the soil along the canal near Cumberland Avenue. This soil, like Ud, is prone to occasional over saturation, frequently flooding the canal in the downtown area (USDA, 2013). Overall, flooding is a continuous problem in Middlesboro, partly due to the soil content and its permeability.

Native Flora & Fauna

Middlesboro is home to a large variety of plants and wildlife. Its close proximity to the CGNHP particularly plays a major role in its diverse wildlife. The park is home to nearly 33 different types of mammals, 89 bird varieties, 29 types of amphibians, 15 reptile species, 27 fish varieties, and 178 different types of insects. In addition to the multitude of wildlife, CGNHP is home to over 855 species of plants. A large portion of the vegetation and wildlife found in the CGNHP can be found in Middlesboro. Some animals commonly found in Middlesboro include cottontail rabbits, gray squirrels, opossums, striped skunks, white-tailed deer, raccoons, various bats, song birds, wild turkeys, hawks, vultures, snakes, and turtles (U.S. Department of the Interior, n.d.). Specific areas of Middlesboro can be improved to better sustain the habitats for flora and fauna, while continuing to diversify the existing

ecosystem. Wildlife and plant materials encountered along the trail systems will give trail users the opportunity to interact and learn about them.

Hydrology

Historically, the hydrology of the Middlesboro Basin held significance in the success of settlers passing through the Cumberland Gap to the West. The lowlands provided plenty of water from the hillsides of the Appalachian Mountains; however, the abundance of water also created soft, boggy land that gave way under the feet and obstructed traveling through the region (Milam & Kuehn, 2005).

Yellow Creek was naturally formed by the influx of runoff due to the surrounding topography and from water sources such as Fern Lake which sit higher in elevation. The creek is the main waterway traveling through Middlesboro. Multiple forks and branches run 1500 feet down mountain slopes and converge into Yellow Creek to fuel the system. Yellow Creek and all of its tributaries create a sub-watershed of the larger Cumberland River Basin and eventually empty into the Cumberland River (Figure 2.4.1).

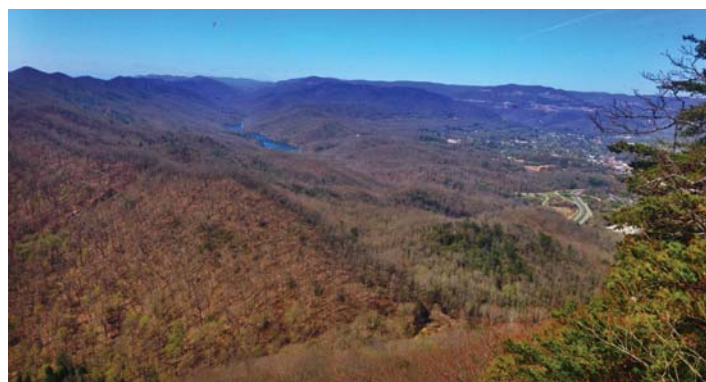


Figure 2.4.1 View of Fern Lake from Pinnacle Overlook in Cumberland Gap National Historic Park

Yellow Creek is only able to hold a certain amount of water during storm events. Yellow Creek runs through a meteor impact site and, because of that and soil characteristics, is prone to water levels rising above the banks. Flooding issues were addressed by the United States Army Corps of Engineers in the early 1900s (US Army Corps of Engineers, 2012). The local flood risk management project is a two-part solution. Part one is a flood protection levee system running roughly five miles along the northwestern boundary of Middlesboro, and the second part is a canal (oriented north-south) spanning across the eastern portion of downtown. The project re-routes and diverts Bennett’s Fork, a significant section of the system, through the commercial corridor downstream to a confluence with Yellow Creek. A concrete armored channel accelerates flows out of the city.

In 2001, the Army Corps implemented another major project.

This effort was to widen and deepen the canal portion, also referred to as Little Yellow Creek (fed by Fern Lake), for roughly five miles to handle larger volumes. According to the Army Corps, both parts of the project combined have prevented over \$416 million in flood damages since the initiation in 1938, whereas the maintenance costs annually amount to between \$230,000 - 240,000 (US Army Corps of Engineers, 2012).

Because of the nature of the area's geology, in any given 100-year period most of the city of Middlesboro is likely to experience the effects of a major flooding event, as occurred in 2011 (San Francisco Chronicle, 2011) (Figure 2.4.2). As a result of these hydrological issues, any future land-use planning decisions must consider all potential flood prone areas (Figure 2.4.3).



Figure 2.4.2 Cumberland Avenue During Flood Event (Source: San Francisco Gate, 2011)

2.5 Demographics & Economics

Demographics

The highest population level in Middlesboro was recorded in 1950, with a population of 14,482, but the city has experienced a steady decline since. Middlesboro has seen a 40% drop in population since 1950 to the current population of 10,334 (Discover Downtown Middlesboro, 2013). Table 2.5.1 shows the percent change in population for Middlesboro, Bell County, Kentucky, and the U.S. over the last 100 years.

There is limited racial diversity in the Middlesboro. The community is composed primarily of Caucasians, with a smaller population of African Americans, as well as other classifications and multiple race citizens (Table 2.5.2).

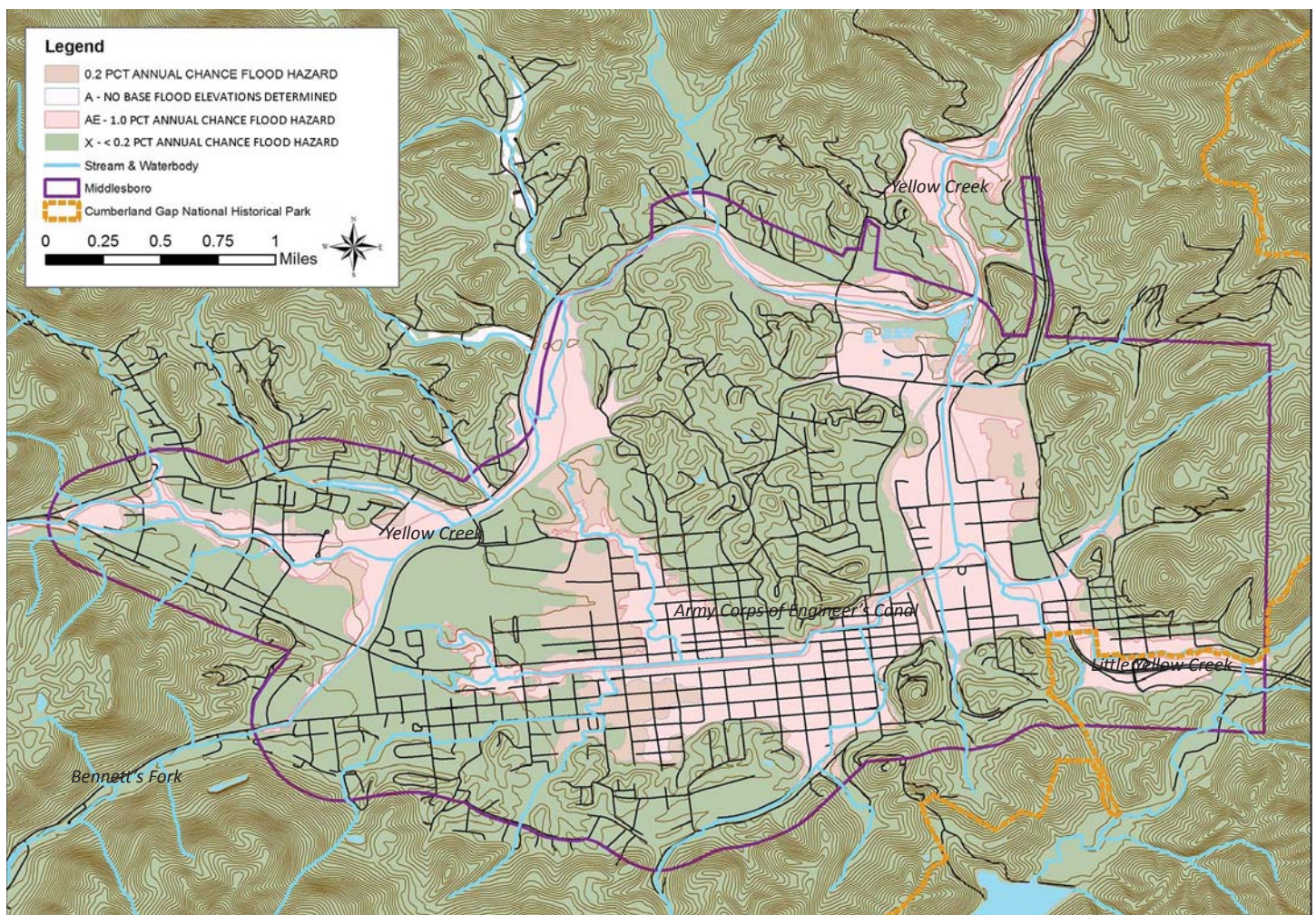


Figure 2.4.3 Areas in Middlesboro Prone to Flooding (Data Source: Kentucky Geography Network, 2014)

Table 2.5.1: Comparison of the population and percent of change of Middlesboro, Bell County, Kentucky, and the USA over the past 100 years (Source: Discover Downtown Middlesboro, 2013 via U.S. Census Bureau)

Year	Middlesboro	% chng	Bell County	% chng	Kentucky	% chng	USA	% chng
1910	7,305	76%	28,447	81%	2,289,905	7%	92,228,496	21%
1920	8,041	10%	33,988	19%	2,416,630	6%	106,021,537	15%
1930	10,850	35%	38,747	14%	2,614,589	8%	123,202,624	16%
1940	11,777	9%	43,812	13%	2,845,627	9%	132,164,569	7%
1950	14,482	23%	47,602	9%	2,944,806	3%	151,325,798	14%
1960	12,607	-13%	35,336	-26%	3,038,156	3%	179,323,175	19%
1970	11,878	-6%	31,121	-12%	3,220,711	6%	203,302,031	13%
1980	12,251	3%	34,330	10%	3,660,777	14%	226,545,806	11%
1990	11,328	-8%	31,506	-8%	3,685,296	1%	248,709,873	10%
2000	10,384	-8%	30,060	-5%	4,041,769	10%	281,421,906	13%
2010	10,334	-0.5%	28,691	-5%	4,339,367	7%	308,745,538	10%

Table 2.5.2 Demographic of Middlesboro (Source: U.S. Census Bureau)

Race	Population
Caucasian	9,418
African American	409
American Indian/Alaska Native	16
Asian	50
Native Hawaiian/Pacific Islander	10
Hispanic	105
Other	36
Multiple Races	257

The Kentucky State Data Center projects that Bell County’s population will drop by 23 percent over the next four decades while the 65 years old or older age group is projected to increase by 31 percent. The projected population of Bell County in 2050 is 22,026 (Table 2.5.3) (Discover Downtown Middlesboro, 2013).

Based on the 2010 US Census Bureau report and the Downtown Middlesboro Retail Market Analysis, results indicate that the majority of the Middlesboro population is in the middle-aged range and the population is becoming older. Between 2000 and 2011, the median age of Middlesboro’s residents increased

Table 2.5.3 Projected population change of four different age groups in Bell County from 2020-2050 (Source: Discover Downtown Middlesboro, 2013 via Kentucky State Data Center)

Age group	Middlesboro		Bell County	
	2020	% change 2010-2020	2030	% change 2010-2030
0-19	6,430	-8.4%	5,960	-15.1%
20-44	8,137	-8.6%	7,636	-14.2%
45-64	7,684	-7.0%	6,491	-21.4%
65+	5,397	19.7%	5,896	30.8%
	27,648		25,983	
				22,026

Table 2.5.4 Comparison of population change in age groups between 2000-11 in Middlesboro and Bell County, Kentucky (Source: Discover Downtown Middlesboro, 2013 via U.S. Census Bureau)

Population by age	Middlesboro			Bell County		
	2011 ACS	2000 Census	% change	2011 ACS	2000 Census	% change
Total population	10,366	10,384	-0.2%	28,744	30,060	-4.4%
Under 5	645	632	2.1%	1,703	1,826	-6.7%
5-9	530	629	-15.7%	1,388	1,979	-29.9%
10-14	659	747	-11.8%	2,037	2,188	-6.9%
15-19	778	740	5.1%	2,075	2,169	-4.3%
20-24	670	623	7.5%	1,788	1,875	-4.6%
25-34	1,426	1,272	12.1%	3,355	4,055	-17.3%
35-44	1,346	1,487	-9.5%	3,808	4,563	-16.5%
45-54	1,472	1,379	6.7%	4,333	4,191	3.4%
55-59	763	603	26.5%	2,305	1,677	37.4%
60-64	628	504	24.6%	1,561	1,408	10.9%
65-74	913	913	0.0%	2,553	2,213	15.4%
75-84	400	642	-37.7%	1,240	1,439	-13.8%
85 and over	136	213	-36.2%	598	477	25.4%
Median age	40.2	38.6	4.1%	41.1	37.0	11.1%

by 4.1 percent, from 38.6 in 2000 to 40.2 in 2011. This trend is contributing to the lack of appeal and interest in Middlesboro and is leading to the steady decline of the youthful population. The lack of amenities and programs for younger age groups seems to be one of the causes young adults leave the area and discourages families from moving to Middlesboro (Table 2.5.4).

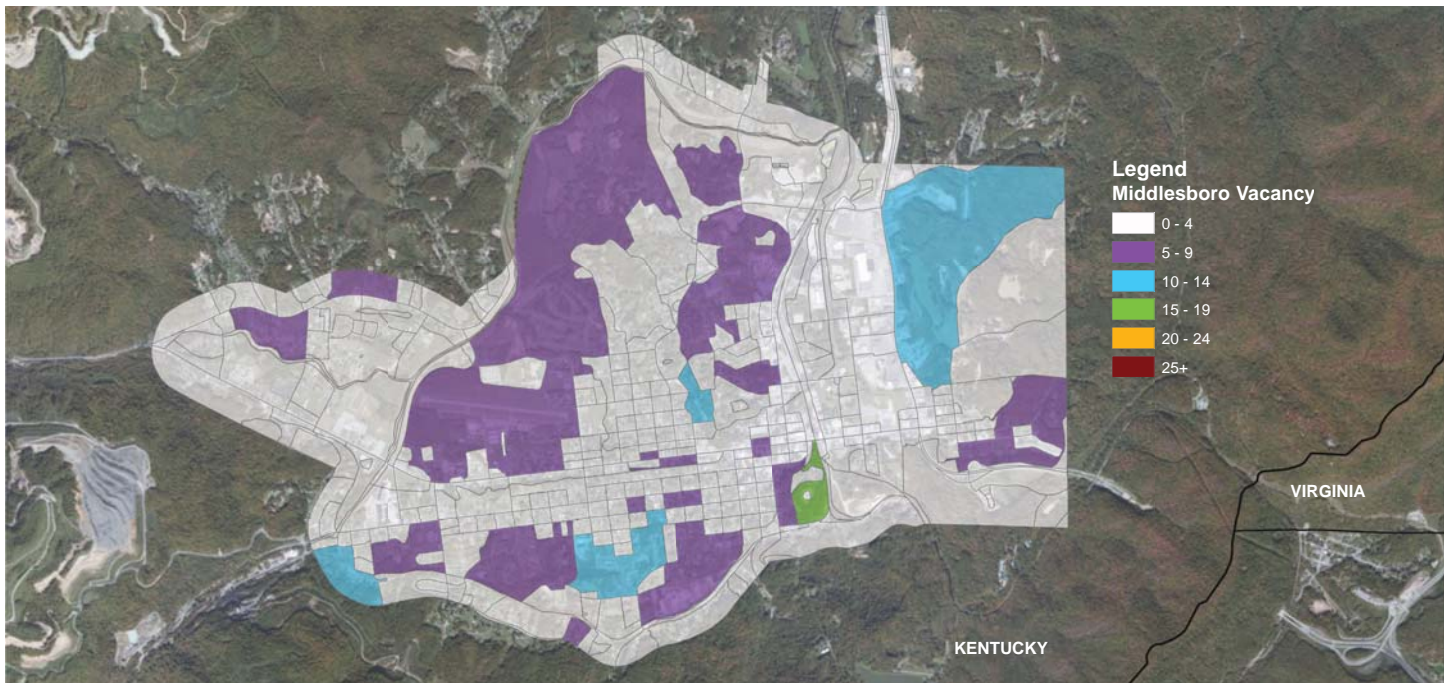


Figure 2.5.1 Map of Vacant Units (Data Source: Kentucky Geography Network, 2014)

Economics

About half of the households in Middlesboro and Bell County earn less than \$25,000 annually compared to 25% of households nationwide. The poverty rate in Middlesboro and Bell County is much higher when comparing it to Kentucky and the nation as a whole. More than half of the Middlesboro and Bell County households have income from earnings (wages, investments) but still have a lower average income than the national average (Table 2.5.5) (DDM, 2013).

Table 2.5.5 Median per capita income, and percentages of households with income from various sources, in Middlesboro, Bell County, Kentucky, and the US in 2011 (Source: Discover Downtown Middlesboro. Inc, 2013)

	Middlesboro	Bell Co,	Kentucky	USA
Median household income	\$20,069	\$24,724	\$41,576	\$51,144
Per capita income	\$13,189	\$11,526	\$22,515	\$27,334
Percent of individuals below poverty line	28.1%	31.1%	19.0%	15.3%
Sources of household income:				
Households with earnings	58.6%	59.3%	74.1%	78.3%
Households with Social Security income	38.6%	40.5%	32.0%	28.4%
Households with retirement income	16.3%	18.6%	19.5%	17.5%
Households with Supplemental Security income	11.9%	11.5%	6.7%	5.1%
Households with cash assistance income	3.9%	3.2%	2.4%	2.9%
Food Stamps/SNAP benefits in the past 12 months	28.6%	25.7%	14.9%	11.9%

Middlesboro and Bell County have lost many jobs in production, transportation, and material moving between 2000 and 2010. The area also had a decline in national resources (coal), construction, and maintenance occupations. Middlesboro had a dramatic decline in agriculture, forestry, fishing/ hunting, and mining industry employment and Bell County had a drop in manufacturing industry positions. The housing industry has also suffered in the area. As the populations in Middlesboro and Bell County have grown smaller, the overall demand for new housing has declined (DDM, 2013).

In Bell County, Middlesboro serves as the primary retail center, accounting for more than one third of the total amount spent in the county. Two-thirds of Bell County's business entities are based in Middlesboro. Middlesboro's businesses are attracting more shoppers from outside the community than from inside the community (DDM,2013). "The buying power of households in the Knoxville and Kingsport-Bristol Metropolitan statistical areas for products and services that residents of these might be likely to spend when traveling out of town, such as food, lodging, and gas. If Middlesboro can capture only a fraction of a percent of these expenditures, it might help to increase economic opportunity" (DDM, 2013, 15).

According to the National Park Service, the CGNHP attracted 854,000 visitors in 2012. These potential customers could be an important factor to help increase business opportunities in Middlesboro for such things as dining and lodging. If Middlesboro can attract just a portion of this, it could mean many thousands of dollars. According to the DDM, the percentage of retail buying power that downtown businesses could likely capture from the regional tourist and visitor market segment is much higher than

the percentage likely to be captured from tourists along US 25E or other market segments (Table 2.5.6) (DDM, 2013).

A limitation to capitalizing on this increased potential is that only a small handful of the businesses remain open after 5 PM. When a survey asked people why they come downtown, other than for work, most cited restaurants and errands. Survey respondents in general would like to see more restaurants and bars, and businesses open for extended hours (DDM, 2013).

Table 2.5.6 Estimated annual retail buying power of Cumberland Gap National Historic Park visitors and visitors to Middlesboro (Source: Discover Downtown Middlesboro. Inc, 2013)

Product/service	Cumberland Gap	People driving	People driving
	NHP visitors	US Rt. 25	Cumberland Ave
Dining out	586,779,000	37,149,000	22,424,000
Alcoholic beverages consumed in restaurants	41,701,000	2,640,000	1,594,000
Gasoline and motor oil	797,868,000	50,513,000	30,490,000
Lodging on out-of-town trips	63,153,000	3,998,000	2,413,000
Movie, theatre, and other admissions	23,856,000	1,510,000	912,000

2.6 Land Use

Land use is an important indicator of a town's development patterns. The land use map was created based on identifying built environment patterns from aerial imagery and comparing it with PVA property classification information and ground truthing the findings (Figure 2.6.1). Because there is little to no land use planning in Middlesboro and the county, the patterns are less structured. Middlesboro has a variety of land uses, from residential and institutional to commercial and industrial. Approximately 60% of Middlesboro is comprised of residential use, which is more dense towards the middle of the city. The majority of the commercial zone is along US 25E and in the downtown area. There are industrial areas scattered along the outskirts of town. Institutional areas including churches, schools, post offices, and libraries, are scattered throughout town. There is a small amount of private green space within the city, but it is mostly located around the edges of Middlesboro.

The breakdown of land use exposes patterns of development and enables people to see areas to be improved. In Middlesboro's case, it is evident that there is not an even distribution of land uses. There are certain land uses, such as commercial, that are more isolated than others. On the other hand, the residential space is spread throughout the town. There is an adequate amount of private green space around the outer boundaries of Middlesboro, but the map indicates a lack of green space in the center of the town as well as along the commercial stretches.

The commercial use areas would particularly benefit from public green space as it would encourage people using the commercial space to stay longer in the area. Spending more time in-town could mean they may spend more money there, aiding the economy. It would also provide pedestrian connections between commercial space, such as restaurants and shops, so users can

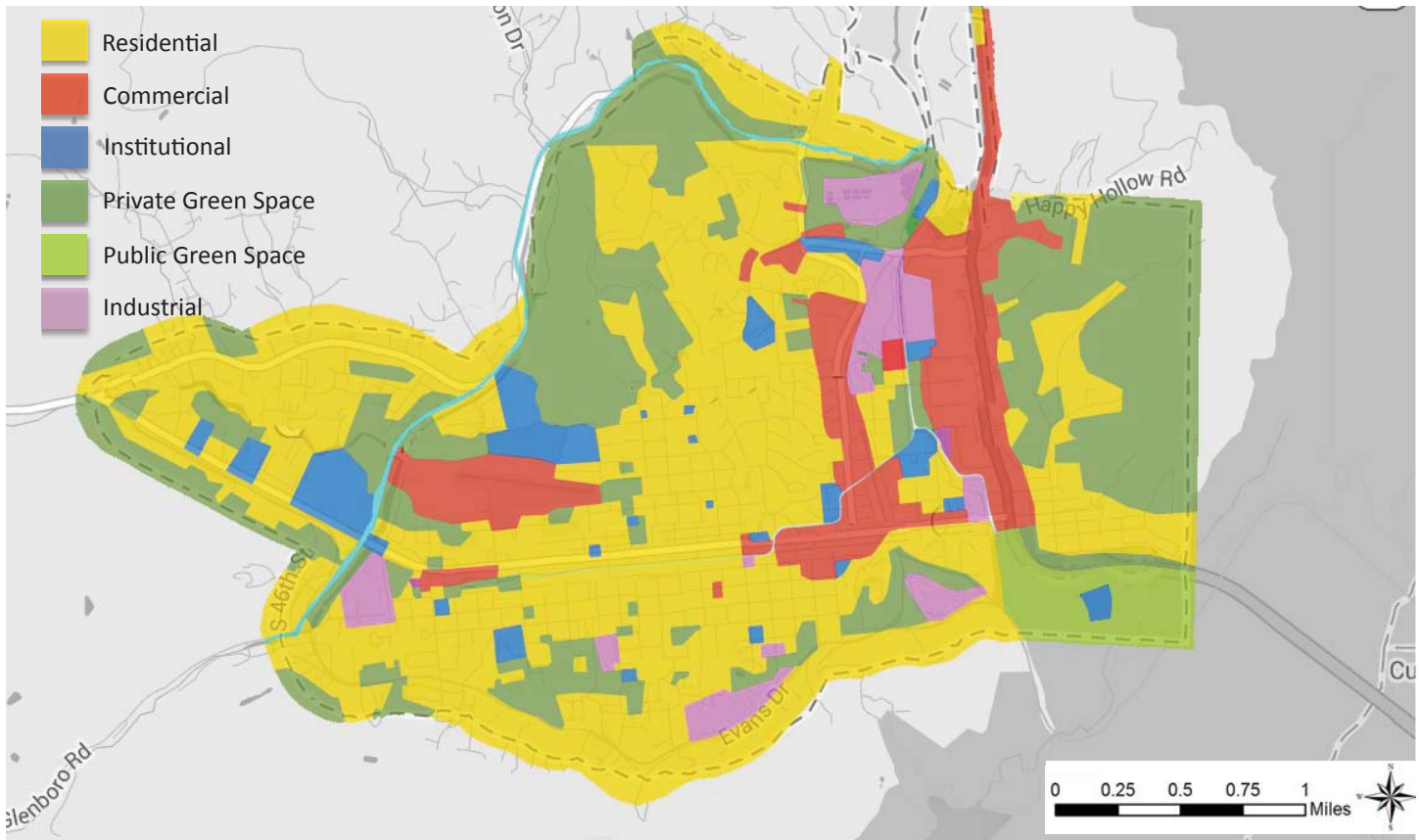


Figure 2.6.1 Middlesboro Land Use (Map Image Source: Google Maps, 2014)

rely less on vehicular transportation. There is a need to expand the network of commercial space and draw people passing-through into downtown Middlesboro from US 25E. The land use map reveals that there is also an opportunity for greater connection between public green spaces.

The current disconnect between adjacent green spaces and an overall lack of public green space causes fragmentation of the pedestrian environment. Implementing trails and developing vacant spaces downtown into inviting, usable public space would help to generate higher connectivity, ultimately creating more networks of space for people to move through (paths, parks and public space). This would encourage community development by hosting interactive spaces for the residents of Middlesboro and establishing a recreational corridor. Connecting potential future public green space in Middlesboro via a trail system can enhance the town by encouraging socialization, providing a healthy environment, creating tourism opportunities, and ultimately increasing connectivity.

2.7 Tourism Resources

The existing infrastructure of tourist amenities within the city can adequately accommodate visitors. These amenities include hotels, restaurants, retail sites, gas stations, and recreational trails and activities. By providing these facilities and services,

Middlesboro can make a positive impression on visitors which will encourage repeated visits. The existing tourism infrastructure and amenities are mostly concentrated along US 25e and Cumberland Ave (Figure 2.7.1).

Tourism can become a major source of revenue for the area. The city has the foundation to become a successful Trail Town which will help boost the economy. If Middlesboro becomes a trail hub, the city has the potential to capitalize on the increased number of visitors coming to the area. Middlesboro can improve the tourist experience by providing a welcome center. The welcome center could supply visitors with trail maps as well as resources to learn more about the area and what Middlesboro has to offer.

Middlesboro could improve its tourist awareness by registering for a Trail Town designation through a program sponsored by the Office for Adventure Tourism. The criteria to obtain this designation includes: “close proximity to a national or state park, forest or recreational areas and near trail systems including water trails, integration of cultural, historical and agricultural elements into the overall experience, and intent to be part of the Cross Kentucky Trail system” (Office of Adventure Tourism, n.d.).

Middlesboro possesses all of the attributes necessary to achieve Trail Town designation. Benefits of becoming a Kentucky Trail Town are as follows:

- Eligibility of marketing dollars for matching funds through

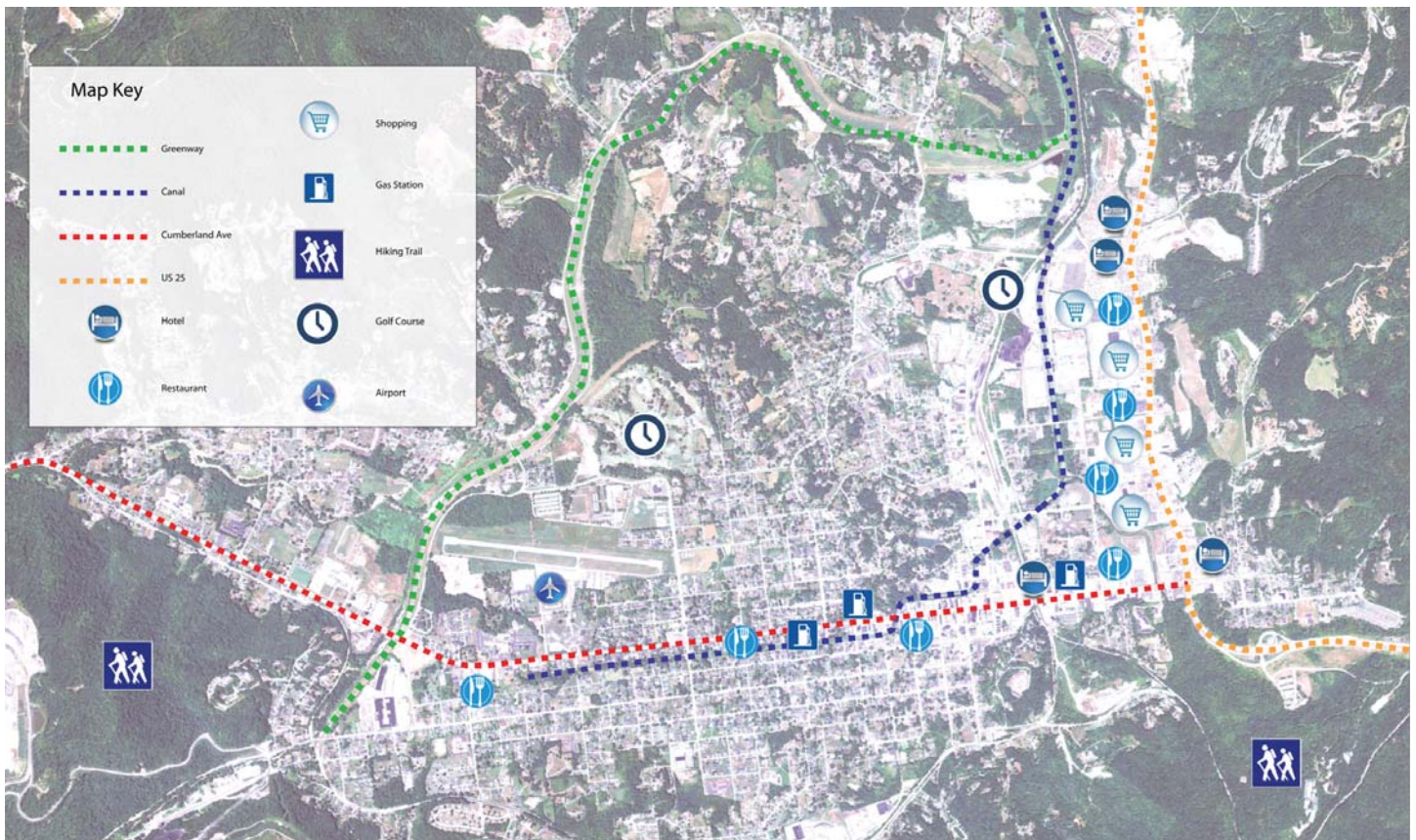


Figure 2.7.1 Middlesboro Tourism Amenities (Imagery Source: Kentucky Geography Network, 2014)

the Kentucky Department of Travel and Tourism

- Designation in state maps and visitor guides and on the Adventure Tourism website and other state tourism marketing materials
- Highway signage designating the community as a Kentucky Trail Town
- Proclamation from the governor designating it as an official Kentucky Trial Town
- Public ceremony with state and local officials for announcement of designation and unveiling of signage
- Window decals for participating businesses (Office of Adventure Tourism, n.d.).

Middlesboro can strengthen its economic position by becoming a Trail Town through its direct connections to the CGNHP and surrounding recreation resources.

2.8 Potentail Trail Connections

A key factor to Middlesboro becoming the ‘Gateway to the Gap’ is to make physical connections and linkages from the city to the Cumberland Gap National Historic Park (CGNHP). The city can attract visitors and tourism while creating recreational opportunities for its residents.

To create an extended trail system, the UKLA team utilized

a geographic information system (GIS). We factored in four components: potential trail heads, existing CGNHP trails, CGNHP boundaries, and slope derived from topography (Figure 2.8.1).

We selected two trail heads along the southern edge of Middlesboro to serve as entrances to the extended trail system. The western most trailhead connects with the proposed outer loop trail, and the eastern trailhead connects with the Boone Trace and proposed inner loop trail.

The second component factored into the GIS model was the destination points along the existing ridge trail. Currently there is private property surrounding parts of Fern Lake. Our model generated potential trail connections that are routed around the private property boundary but within the CGNHP boundary.

The final component considered for the extended trail system was the slope and elevation. All proposed routes are less than 5% slope, which complies with the Americans with Disabilities Act (ADA) trail standards. Residents and visitors of all abilities will be able to enjoy universally accessible trail connections from the city into the national park.

Additionally, further trail connections between the Yellow Creek and adjoining neighborhoods were identified (Figure 2.8.2). These additional connections can build upon community proposed trails and the outer and inner loops. By promoting activity throughout the city through the trail system, increased

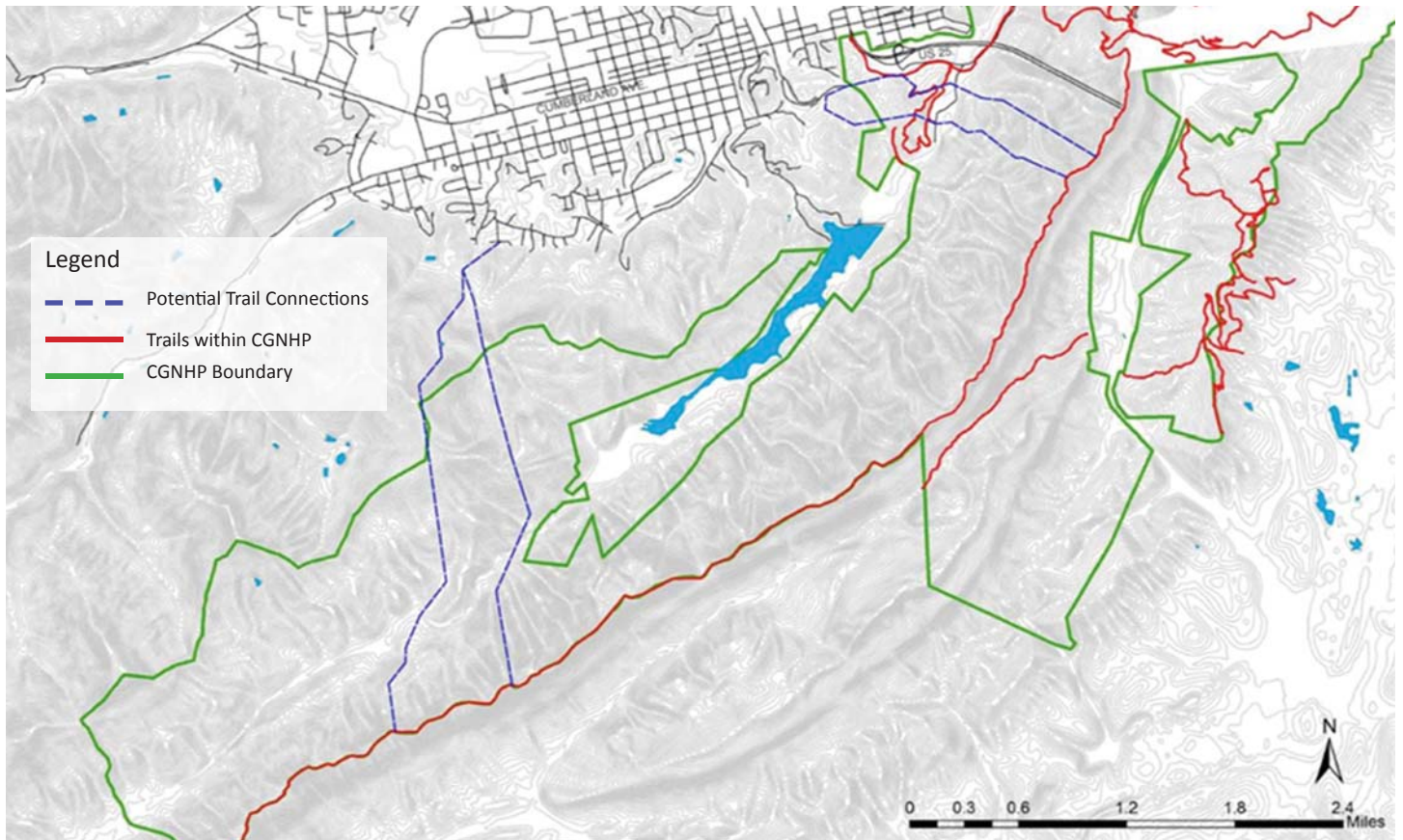


Figure 2.8.1 Potential trail connections with existing trails within CGNHP (Data Source: Kentucky Geography Network, 2014; US Department of Interior, National Park Service, 2014; US Geological Survey, 2014)

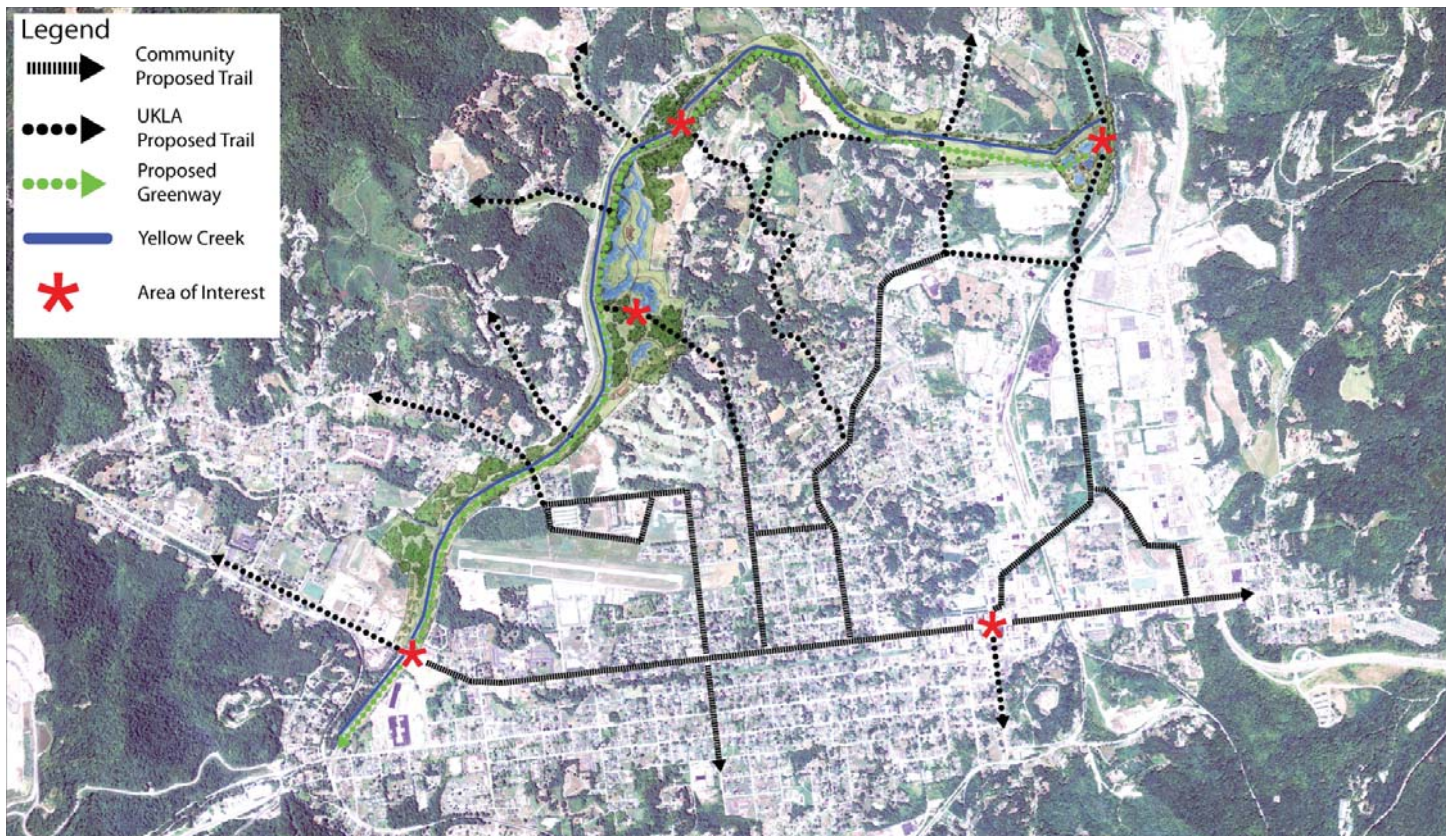


Figure 2.8.2 Middlesboro Further Possible Trail Connections (Imagery Source: Kentucky Geography Network, 2014)

connectivity could foster local businesses as well as improve the overall health of the community.

2.9 Summary of Analysis

Based on the inventory, analysis, and research discussed in this chapter, we selected three sites in and around Middlesboro to propose design solutions. They are the Downtown Connection (Cumberland Avenue, from 25E to the Yellow Creek), the Canal Walk (from where it intersects with Cumberland Avenue to where it meets with the Yellow Creek in Northeastern Middlesboro), and the Greenway (the section of Yellow Creek that is included in the Army Corps of Engineers Flood Protection Project).

The proposed solutions will consist of an “inner loop” (Orange line in Figure 2.9.1) and an “outer loop” (Green line in Figure 2.9.1). These routes are proposed based on existing infrastructure, the ability to connect to existing amenities, and cultural/historical significance in the city. Natural features such as vegetation, soil composition, and wildlife were also considered.

This trail system would serve to restore historic trails such as the Boone Trace, connect with the Cumberland Gap National Historic Park, and improve on the existing infrastructure. The local ecology would be preserved and restored, and connections

provided to various downtown businesses and residential areas. A comprehensive trail system would also serve to improve the local economy and attract/retain a wider range of residents.

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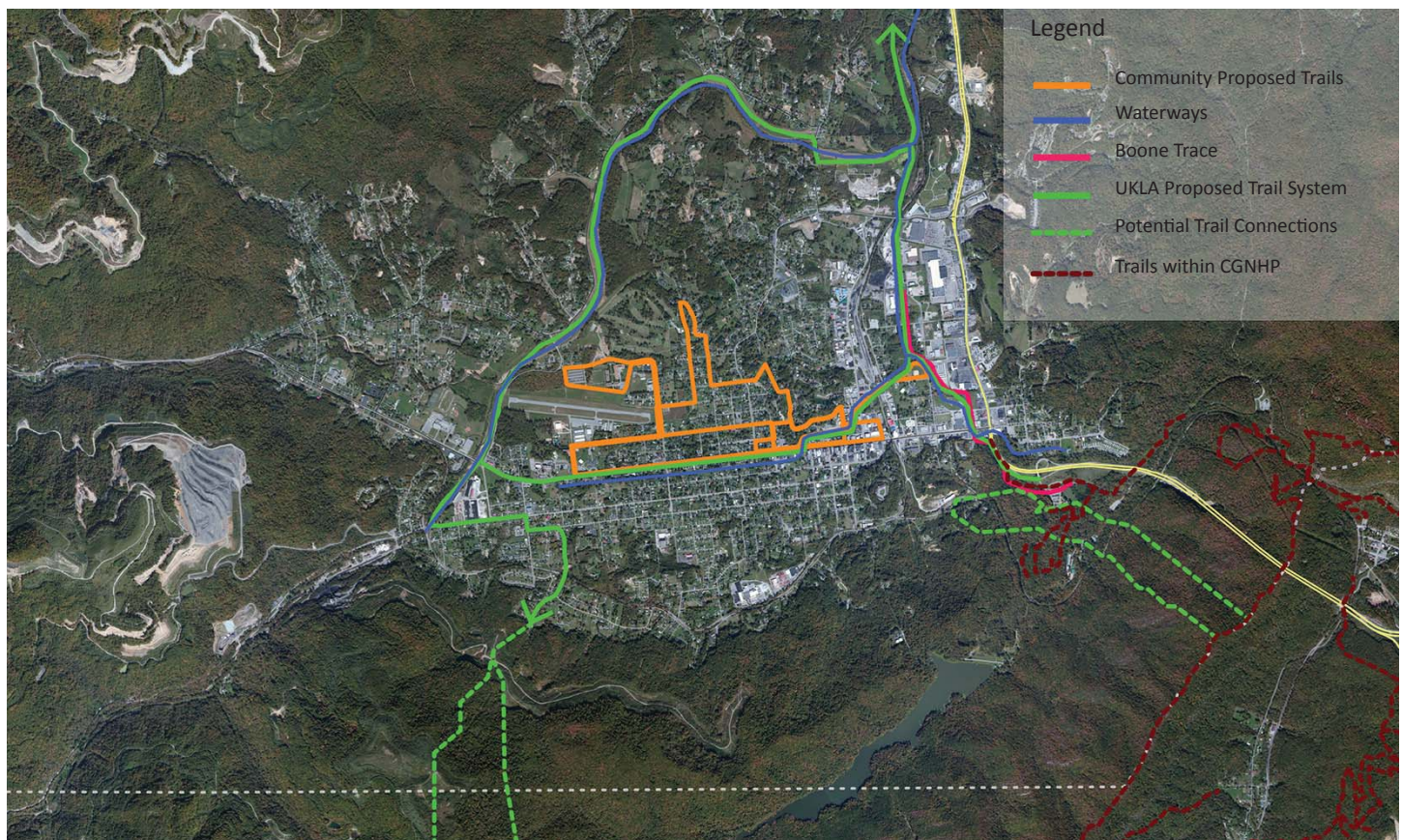
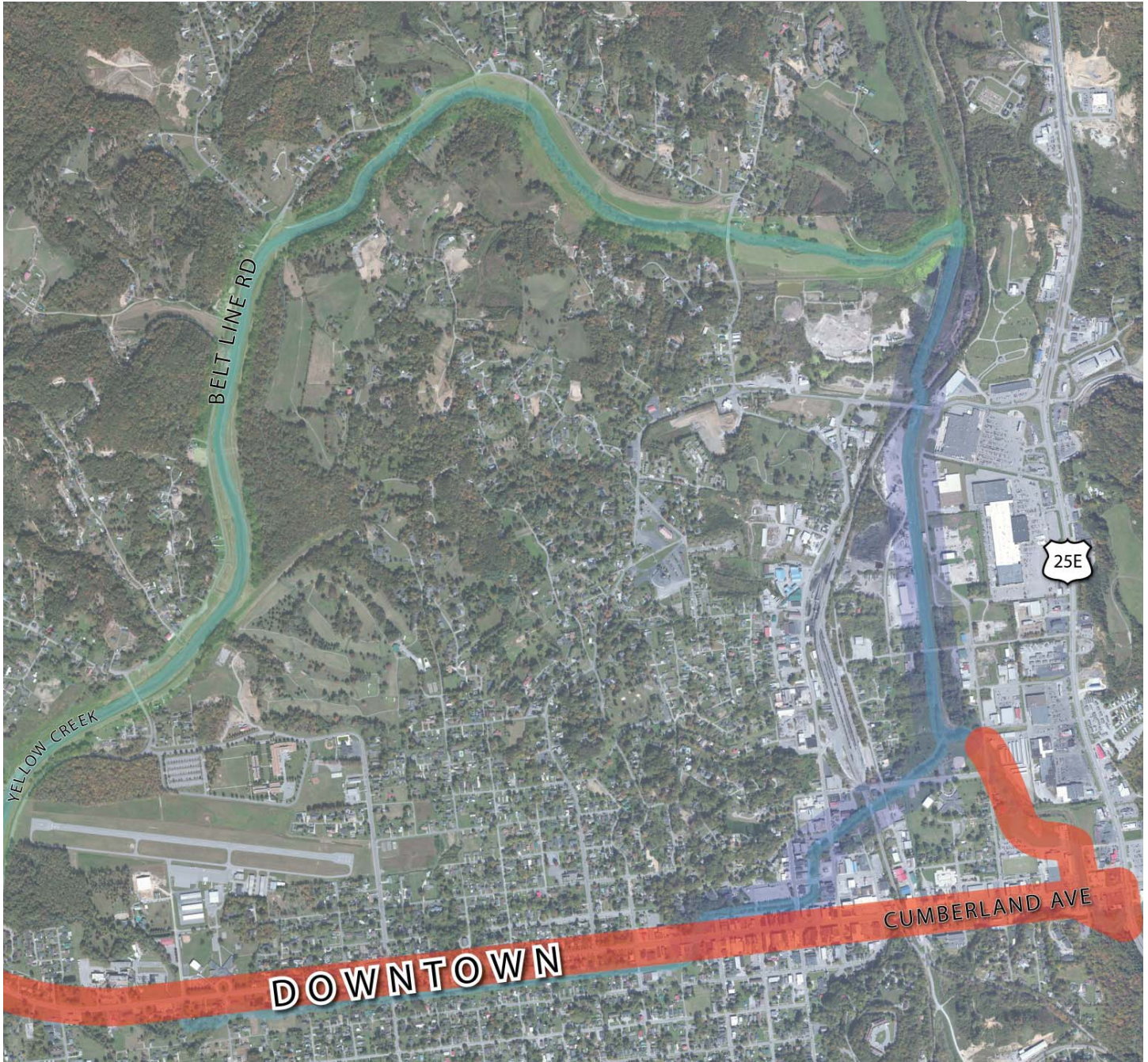


Figure 2.9.1 Middlesboro Trail System Plan (Data Source: Kentucky Geography Network, 2014; US Department of Interior, National Park Service, 2014)

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Downtown Connection

Chapter Three



Middlesboro Trail System: Downtown Connection (Source: Kentucky Geography Network, 2014)

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3.1: Downtown Connection Background



Figure 3.1.1 Context map of Downtown Connection design proposal sites

Introduction

The downtown section for the trail system is defined as the section of Cumberland Avenue bounded by 12th Street/US 25E to the east and Yellow Creek to the west. The areas to the north and south of Cumberland Avenue include the land adjacent to Little Yellow Creek north until the creek's intersection with 15th Street and south to the creek's intersection with US 25E. Design concepts were developed for the areas around the Canal Walk entrance off Cumberland Avenue to Lothbury Avenue, downtown vacant lots, and along Cumberland Avenue (Figure 3.1.1).

The downtown target areas are immediately surrounded by commercial, industrial, and institutional land use types. Given the close proximity of national and local amenities (Figure 2.6.1) such as the Cumberland Gap National Historic Park (CGNHP) and the Middlesboro Canal Walk, the downtown area is well positioned to make a highly effective trail system with very successful connectivity. Connectivity from downtown to these features is crucial for the revitalization of Middlesboro because easy access to these trails can increase the number of visitors to Middlesboro who are interested in hiking, jogging, and enjoying the outdoors. In addition to the surrounding natural features, Middlesboro has significant historic and cultural resources which have potential to be capitalized on and add identity to the trail systems.

Goals

In an effort to revitalize Middlesboro so that it may become the regional trail hub our goals are to:

- Link downtown to the neighboring portion of the Canal Walk, north of Cumberland Avenue and highlight the canal as a downtown attraction.
- Form clearly defined public spaces and develop existing vacant parcels as green space with economic generating opportunities.
- Create a strong sense of place when entering the downtown that welcomes and attracts visitors while recognizing historic attributes.
- Provide trail connections linking existing and proposed trails to encourage visitors of the Cumberland Gap National Historic Park to explore Middlesboro.
- Offer a strong network of safe pedestrian connections that encourage residents of Middlesboro to be more physically active as apart of their daily routine.

Analysis

A variety of analysis studies were conducted within the downtown area to guide the design of refined diagrams and master plans. The Downtown design team looked into the walkability of Cumberland Avenue, the vacant lots, and the connectivity of downtown Middlesboro. The analysis of these features assisted the team in developing applicable design solutions based on the existing conditions and areas of opportunity within the downtown area.

Walkability

A walkability analysis of the existing sidewalks and sidewalk conditions was conducted to assess the inclusive accessibility of the retail section of Downtown Middlesboro. The condition of the sidewalks found within the analysis area was based on how they scored on the Walkability Assessment Tool (Figure 3.1.2). Higher scores indicate sidewalks in good condition that have high accessibility for a wide range of people. Lower scores indicate sidewalks in poor condition and only accessible to a limited range of the population.

Connectivity

The connectivity analysis assessed the spatial relationships between the existing downtown sidewalks, the waterways, and the community proposed trails (Figure 3.1.3). We identified various important access points based on the existing trails, the community proposed trails, and sidewalk conditions. Based on our team’s findings, Cumberland Avenue is a good candidate for becoming a successful Complete Street due to the walkability and number of connection points at or near Yellow Creek/Little Yellow Creek, the Canal Walk, CGNHP and the proposed Greenway trail. The existing infrastructure of sidewalks and waterways can support the development of trails along the canal and help inspire the residents of Middlesboro to become a healthier and more active community.

Underutilized Lots

An assessment of the underutilized lots within the downtown area was conducted to identify lots with development potential. Underutilized lots were defined as lots without permanent built structures, and those with less than 50% of the lot utilized for parking in order to retain as much existing parking



Figure 3.1.2 Walkability Analysis Map of Downtown Middlesboro

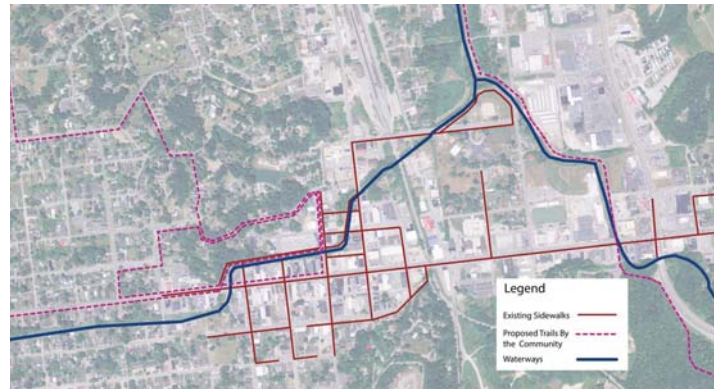


Figure 3.1.3 Sidewalks, waterways, and Community Proposed Trails Map



Figure 3.1.4 Empty parking lot in downtown Middlesboro

in the downtown area. Multiple lots fitting this definition were identified (Figure 3.1.5) and further analyzed by conducting site visits and studying existing site photos. The importance of identifying the underutilized lots in the downtown area was to find where public spaces could developed, since there is a lack of public space in Middlesboro as illustrated in the Land Use map (Figure 2.6.1).



Figure 3.1.5 Potential Green Space

Design Focus: Downtown Canal Walk

Context

The Downtown Canal Walk runs parallel to Cumberland Avenue, starting on 22nd Street and ending on 19th Street (Figure 3.1.6). Due to this close proximity to both the Middlesboro downtown core as well as the Court House, this area is a prime location for public and commercial development and creek restoration. This close proximity to the downtown core can offer both visitors and support from local business to the adjacent spaces.

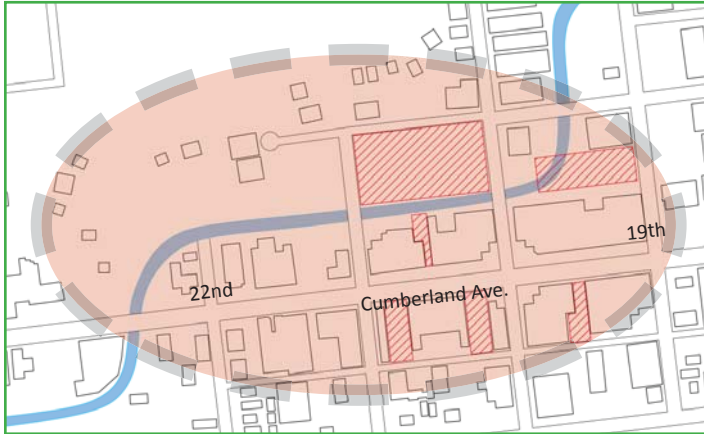


Figure 3.1.6 Context Map of Downtown Canal Walk

Challenges/Issues

A key issue to be addressed with the design process was to provide space for programmable events. Currently, there is no event space provided along the downtown Canal Walk. This challenge was addressed without threatening the amount of parking within the downtown corridor. With both concepts there was also a need to create and encourage movement to the canal walk from Cumberland Ave. Currently there are unsafe conditions surrounding the canal walk. These issues consist of unbuffered sidewalks and small crosswalks. By creating safer streets and points for access parallel to Cumberland Ave. visitors could then enter the site from all sides. The lack of trail heads currently could make entering the canal walk slightly confusing. This could lead to users not accessing the site in its entirety.

Opportunities

By developing a space for programmable elements within this area, more functions can be held downtown, thus creating more opportunity for interaction and visitation to this under used space. Because there is already a path with users along the existing Canal Walk, creating a trail head in this area to advertise the downtown Canal Walk will bring in even more users. With a secure and paved path along the canal more residents and tourists can be encouraged to utilize the luxury of a downtown Canal Walk. With more activity drawn to this downtown corridor through this section of the Canal Walk, local businesses can benefit from increased customers and there are greater opportunities to incorporate new businesses that cater to Canal Walk visitors. Creating space to both draw people in and

accommodating their visit is key to increased downtown activity, activity that can be sparked by revitalizing the Canal Walk.

Conceptual Diagram

In both concept one and two (Figure 3.1.7), event space is provided in the area which exists currently as parking. Event space was created by developing a portion of the parking lot, while reconfiguring existing parking spaces and incorporating new parking elsewhere within the site. This reconfiguration allowed for minimum parking disturbance while adding new areas for events. Trail heads were also proposed on either side of the Canal Walk. Currently there is one small trail head in between 22nd Street and 23rd Street. By incorporating two trail heads in this area pedestrians can easily find entrances on both sides of the route, thus encouraging movement throughout the site. These trail heads can also draw attention to the canal walk and highlight its use to residents and visitors who would not typically utilize the site.



Figure 3.1.7 Downtown Canal Walk Conceptual Diagrams

Concept one features two areas for programmable events, compared to only one event area in concept two. By creating a large event space paired with a smaller space two activities can occur at the same time or a large event can be spread throughout the canal walk. These spaces can accommodate current events as well as provide opportunity for new events. Allowing the possibility for new events will also make the proposed site flexible for the future.

Refined Plan

The final refined plan (Figure 3.1.8) was derived from the first two concepts. The refined concept features a large trail head located in the west end of the site. This allows for easy access and denotes the beginning of the Canal Walk. Moving further into the site there are two “overlook” points. These points allow for users to get a better vantage point of the canal. The western side was left in a more natural state, keeping with the current

theme and cutting costs of development. Moving into the event space, a large pavilion has been added to accommodate events and community functions (Figure 3.1.9). This pavilion features a large paved plaza with an extensive network of sidewalks connecting to the Canal Walk. Adjacent to the pavilion is a pedestrian bridge leading to the other side of the canal (Figure 3.1.10). This area has been proposed to be plaza space, adding space for business opportunity and access from Cumberland Ave. This plaza feature steps down to the canal, allowing visitors to get a closer look while being fenced off for increased safety. A large multi-use lawn has been proposed along side the pavilion, adding greenspace which features a playground.

Moving to the eastern side of the site a smaller event space has been proposed. This space features a sunken plaza leading closer to the canal. This smaller venue is ideal for concerts, community

meetings or just a peaceful view of the canal. During a large event this area can be used for overflow. A large sidewalk with plantings leads to the second trail head, creating a secondary entrance and exit point (Figure 3.1.11). Creating these points simplifies the canal walk experience.

Throughout the site crosswalks have been enlarged and added to increase pedestrian flow and safety. Crosswalks along the path make the canal more fluid along its entirety. This proposed concept allows for users to access more of the walk while extending the route and increasing safety. Pockets and strips of vegetation have also been added, providing opportunities for both shade and sun. This vegetation also helps to cool the canal, increasing the potential for aquatic life. The combination of both paved surfaces along side natural space allows the user to choose their setting within the downtown environment.



Figure 3.1.8 Downtown Canal Walk Plan



Figure 3.1.9 Downtown Canal Walk Section



Figure 3.1.10 Pedestrian Bridge and Event Space



Figure 3.1.11 Potential Trailhead

Design Focus: Pocket Park

Context

A vacant parcel located at approximately 1919 Cumberland Avenue currently sits between 'Antique and Modern Jewelry' and 'East End Pawn Shop' (Figure 3.1.12).

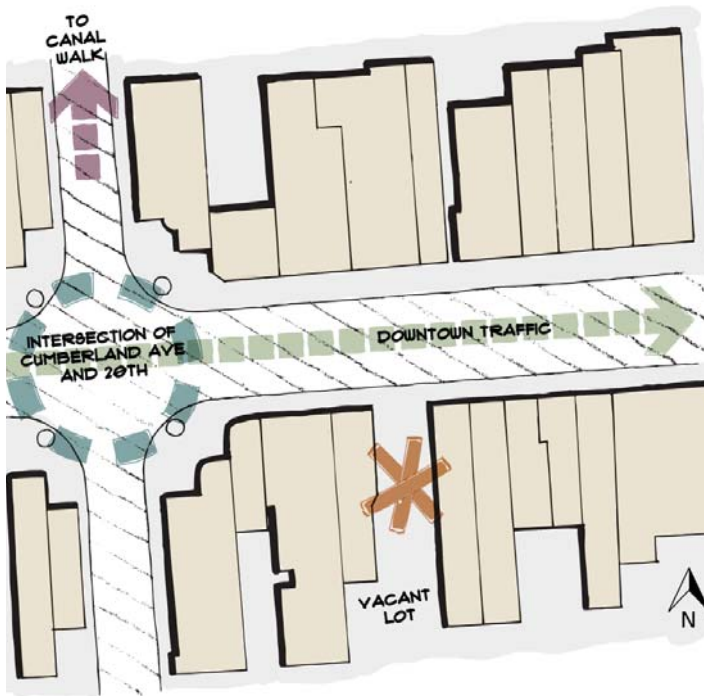


Figure 3.1.12 Pocket park analysis

Challenges/Issues

The main concern with transforming this vacant lot into a pocket park is the loss of current parking spaces. A small park can be implemented while retaining some parking in the back. Other issues are the use of impermeable surfaces. The built environment along Cumberland Avenue is mostly concrete or asphalt. The blank walls of adjacent buildings and the exposed beam are not welcoming and should be addressed (Figure 3.1.13).



Figure 3.1.13 Site of proposed pocket park (Source: Google Earth, 2014)

Opportunities

A makeshift parking lot has been created in the space to provide parking for the surrounding businesses. Underutilized space is ideal for small parks which can serve as resting places for visitors and residents. The road frontage along Cumberland Avenue provides great exposure to attract people. The parcel size is large enough to accommodate both a small park while retaining some parking spaces. This entire lot can be used for green space and support on street parking. By reducing parking lots and encouraging on-street parking, walkability opportunities improve. In Jeff Speck's book "Walkable City: How Downtown can save America, One Step at a Time," he suggests that great cities can be measured by their walkability (2013). Pedestrians who are forced to walk a little further are exposed to more businesses and experiences, increasing the likelihood that they will spend more time and more money downtown, creating a revitalized Middlesboro. Small parks, such as one that can be implemented here, can be a unique characteristic to the downtown.

Conceptual Diagrams

Upon initial planning and development for this vacant lot, the conceptual ideas involved utilizing the entire lot for use as a green space. After review from the community, concerns were voiced about the loss of parking in the conceptual plan. Other elements considered were stationary tables and chairs along with centralized vegetated planters.

Refined Plan

The concept for this pocket park is to create a place for people to enjoy green space while being in the heart of downtown. The proposed design calls for a facade veneer which will assist in providing enclosure and also provide building continuity along Cumberland Avenue (Figure 3.1.14). Building continuity is important because it creates a holistic visual appeal when observing the streetscape. The addition of a facade veneer will also provide a unique space which adds to the character of downtown Middlesboro (Figure 3.1.15). The proposed pocket park plan (Figure 3.1.16) features seat walls with built in planters that will flank the neighboring buildings, holding vegetation such as flowers and shrubs. These planters also double as additional seating for visitors. The central corridor through the pocket park is to be decorated with alternating furniture and small trees. Furniture should be movable because visitors who can position seating to fit their needs feel a sense of ownership of the space. Details can attract people to this park and keep them coming back to enjoy its character. Permeable surfaces are used to allow stormwater to enter the ground. Options for this range from permeable concrete, bricks, pavers and even compacted soil. Trees in this park will be small, flowering and of native habitat, such as the Stellar Pink Dogwood.



Figure 3.1.14 Streetview of building discontinuity created by the vacant parcel



Figure 3.1.15 Rendering of facade veneer

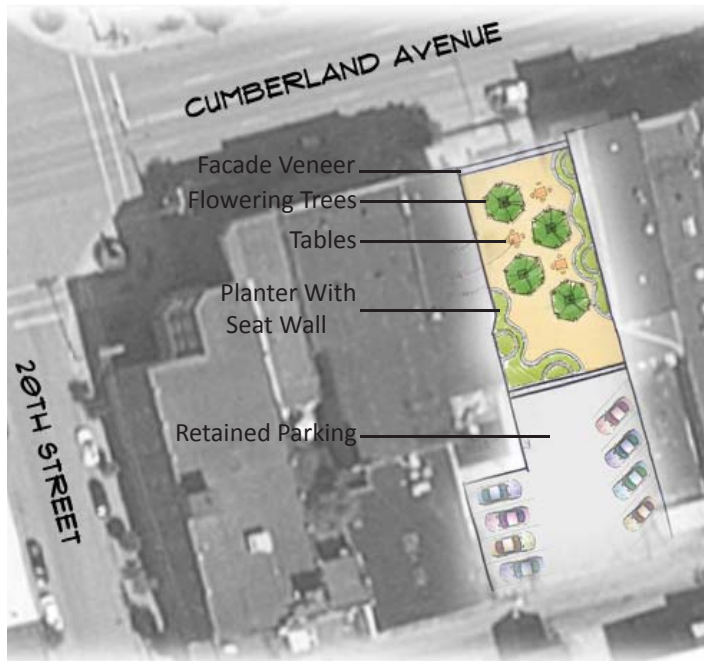


Figure 3.1.16 Pocket park plan with retained parking (Image Source: Google Earth, 2014)

Design Focus: Community Garden

Context

A vacant lot across from Community Trust Bank near the corner of 21st Street and Cumberland Avenue was identified as a space on which to develop a community garden (Figure 3.1.17).

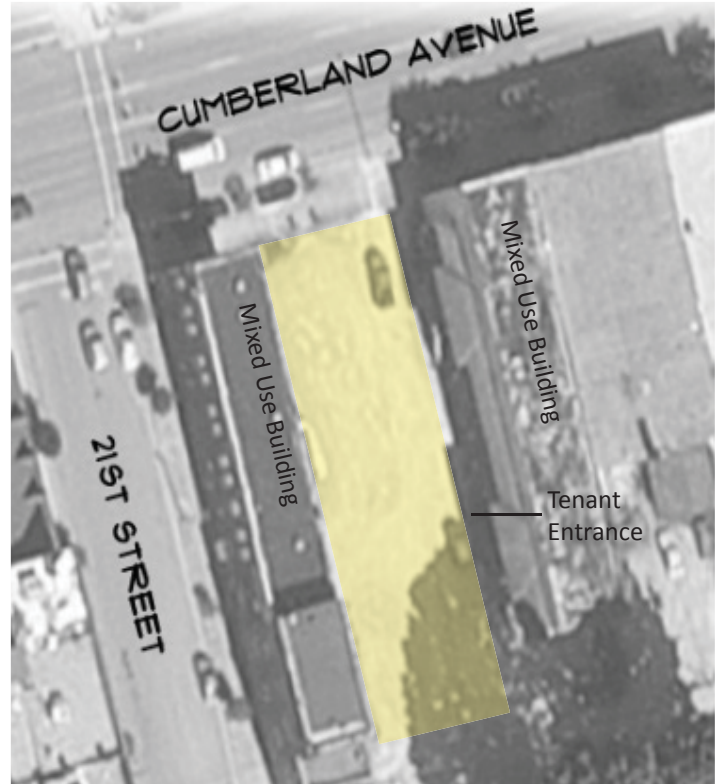


Figure 3.1.17 Vacant lot parcel, site of community garden (Image Source: Google Earth, 2014)

Challenges/Issues

One issue facing this site is the future maintenance of the proposed concept. While a community garden will provide many benefits for people, it is a site that must be tended to and maintained in order to receive those benefits. It could be a challenge to find a group of people who would be willing to keep up with the community garden. The mixed used building on the east side of the site has an entrance for tenants located on the side of the building facing the site and presents a challenge. It can be accommodated in the design so that tenants can still use this entrance. Finding a source of fertile soil may also pose a challenge to creating a community garden at this site. The advantages of developing a community garden that provides a sense of community, educational opportunities and a source of food greatly outweigh the challenges associated with it.

Opportunities

A huge opportunity associated with this site is the location between two mixed use buildings, with businesses on the first floor and tenants living on the second floors. The proximity to residents increases the likelihood that people spend time there and develop a sense of ownership, and will be more apt to care for and maintain the space. Its road frontage and access to Cumberland Avenue also increases its visibility to visitors and the community alike (Figure 3.1.18). Currently no activity is occurring in this space. A community garden is proposed because the benefits will provide a sense of community, produce food and be an educational component to the downtown.



Figure 3.1.18 Existing view from vacant lot proposed for community garden looking out on to Cumberland Avenue.

Examples of what could be taught here include a composting station that promotes recycling organic matter for use as fertilizer and a station about how to adjusting soil pH. Further into the community garden a pergola structure boasts seating underneath and will provide shade for those looking to relax.

In order to accommodate the tenants with a side entry to their building, a separate pathway was created for their access. This pathway is concrete and its wavy design was intended to evoke a fun atmosphere within the community garden. Pods of vegetation sit between the waves of the path to serve as a buffer and increase privacy for the tenants of the mixed use building.



Figure 3.1.19 Proposed community garden plan (Image Source: Google Earth, 2014)

Refined Plan

In the refined plan (Figure 3.1.19), the community garden space provides raised planters for a variety of gardens and features a pergola, educational stations, and pathways. The community garden greets visitors with a traditional iron gateway (Figure 3.1.20). Inside the gateway raised planters will grow produce. Planters are raised so that they can be accessible to children and those in wheel chairs.

Located along the other side of the low maintenance path (suggested fine aggregate) are four large educational work stations. These can be utilized to teach visitors how to maintain the gardens and illustrate the importance of sustainability.



Figure 3.1.20 Sketch of proposed community garden

Design Focus: Vendor Park

Context

The site for Vendor Park is located along Cumberland Avenue, near the intersection at 20th Street. This area is currently underutilized. It has a successful food vendor on site which could be accentuated better. There is parking on site but it is unclear if parking capacity is used fully (Figure 3.1.21). This offers the potential to make a unique space for residents to use downtown and also help draw people in.



Figure 3.1.21 Current Conditions (Source: Google Earth, 2014)

Challenges/Issues

The vendor is located in the middle of the space and vehicles park around it. The site is underutilized and looks bleak and uninviting to users. It is not aesthetically pleasing and there is very little usable space besides the parking area. There are no places for people to sit and eat after visiting the food vendor. It can be seen as an eye sore for the surrounding buildings. This portion of the downtown area lacks a place for children to play which this site could provide.

Opportunities

This location has the potential to be a community gathering space for people of all ages. With other retail and businesses located nearby it could serve as a useful gathering spot during lunchtime and the weekends as well. Although the site is currently not very child friendly, it could become one with a change in design.

Refined Plan

This design will reposition the vendor space on the site (Figure 3.1.22). This will allow for better flow of users through the site. There will also be spaces for people to eat and sit. One of the main features of the design will be earthwork mounds that will allow children to play on or for other users to rest on. Half of the parking will be retained in the rear of the site as parking is still vital for the retail of the area. The redevelopment of this space could help the surrounding businesses by drawing people into this area.

The green kidney shapes represent earthwork mounds that will provide space for children to play and other users to rest on as well. There are also tables for eating. Parking was retained in the back for the businesses of the site and the surrounding area. The vendor that is currently on site has been repositioned to an inner location.

The earthwork mounds are located in the middle of the site and the vendor shop has been repositioned towards the back of the site. In this configuration, the space becomes more lively and inviting (Figure 3.1.23). People of all ages can use the site and this can make the vendor more profitable. Not only does it have the potential to help the vendor, the redesigned area can also help surrounding businesses as well with the increased usage of this space.



Figure 3.1.22 Plan For Vendor Park



Figure 3.1.23 Proposed Perspective of Vendor Park

Design Focus: Boone Trace

Context

The section of Little Yellow Creek, to the north of Cumberland Avenue and continuing south toward CGNHP, has many opportunities for development and signage to emphasize the history and identity of Middlesboro. The original Boone Trace runs through this area of Middlesboro. This presents a unique opportunity for the town to celebrate its history with permanent paths and graphic information that will also support the idea of Middleboro as a regional trail hub.

Challenges/Issues

Currently there is no continuous path along Little Yellow Creek from the western side of 15th Street, where Fords Woods Park is located (E, Figure 3.1.24), to the eastern side that leads to the Cumberland Gap National Historic Park (CGNHP) (D, Figure 3.1.24). The intersection of Little Yellow Creek and 15th Street (A, Figure 3.1.24) is also a point where the original Boone Trace lies (brown dotted line, Figure 3.1.24); however, there is no existing marker here or at any other point along Little Yellow Creek to indicate the location of the historically significant route.

In addition to a lack of clear connections and signage, this stretch lacks public green space which can encourage use of the proposed and existing trails and support the Boone Trace and CGNHP as a destination in Middlesboro (Figure 3.1.25). There are multiple undeveloped properties along this stretch with potential for future development to complement the trail system.

Opportunities

There are many opportunities for trail connections, historic signage, and public open space. Considering the existing conditions of this area of downtown, at the intersections of 15th Street and Little Yellow Creek (A, Figure 3.1.24) there is an opportunity for a crosswalk and signage that clearly marks the intersection as a point along the Canal Walk (green dashed line, Figure 3.1.24) and historic Boone Trace. Following the creek south, there is space for a paved and marked path where currently there is no path.

Adjacent to Little Yellow Creek lie multiple undeveloped properties which create opportunities for public green space, particularly the land around the currently vacant Shell gas station along US 25E (G, F, Figure 3.1.24). As a point of high visibility along US 25E, development of this site for tourism could increase the number of visitors to Middlesboro and create an opportunity to relocate an existing tourism information center currently located in the Aaron's parking lot.



Figure 3.1.24 Conceptual Diagram showing Development Opportunity Areas



Figure 3.1.25 (Top) Existing 15th Street/Little Yellow Creek intersection
(Bottom) Existing undeveloped land adjacent to Little Yellow Creek behind a vacant Shell gas station

Refined Plan

The proposed trails can help create the necessary connections to allow residents and visitors to travel from CGNHP along Little Yellow Creek to downtown Middlesboro (Figure 3.1.26). Signage in this area will also help express Middlesboro's character and clearly mark the Canal Walk and the historic route of Boone Trace. These marked paths would be reinforced by adjacent green

space with amenities that support outdoor activities (Figure 3.1.27). Developing the land between the Little Yellow Creek and the vacant Shell gas station as a tourism information center will increase interaction with the proposed trails and strengthen the idea of Middlesboro as a regional trail destination.

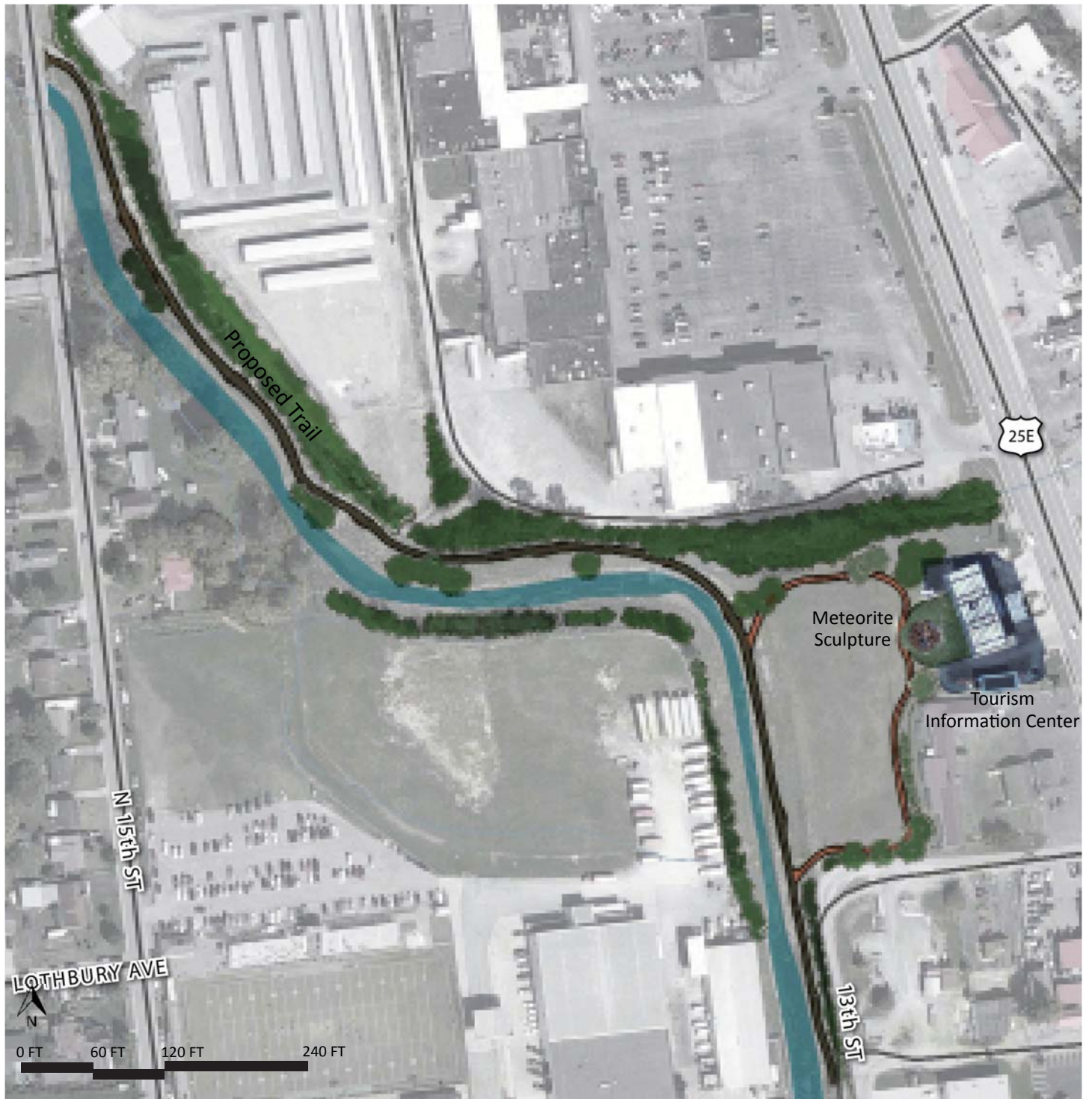


Figure 3.1.26 Design for Canal Walk/Boone Trace Connection



Figure 3.1.27 Tourism Information Center Area Design Before (top) and After (bottom)



Figure 3.1.28 Canal Walk/Boone Trace Connection Design Before (top) and After (bottom)

The vacant Shell gas station site is just one of many areas of opportunity along Boone Trace (top, Figure 3.1.27). Many development features can turn these opportunities into amenities for residents and destinations for visitors. Currently unused land can become a point of information, connection, and interaction north of Cumberland Avenue along Little Yellow Creek. Utilizing its location on US 25E, this lot has the potential to encourage more visitors to Middlesboro. The existing lot has little to no grade change, making it a good location for food vendors, playing fields and picnic tables. With the high visibility from US 25E this site would benefit from a feature that attracts attention and invites interaction, such as a large, climbable ‘meteorite’ sculpture (bottom, Figure 3.1.27). The field behind the Shell gas station, along Little Yellow Creek and Boone Trace, can become a public playing field. By making this site into an inviting and connected tourism information stop, the number of visitors to the surrounding area as well as overall tourism in Middlesboro can be increased.

Additionally, there is no marked path along which residents and visitors can enjoy the natural amenities of the area along Little Yellow Creek (top, Figure 3.1.28). A paved trail with vegetation can block the visitors from the traffic on 13th Street and make this stretch of Little Yellow Creek safer and more comfortable to walk along. The proposed trail continues to follow Little Yellow Creek north to 15th Street to connect the proposed and existing Canal Walk to West Cumberland Avenue and finally to CGNHP.

This proposed trail would also create an opportunity for a partnership with the Coca-Cola plant as a canvas for community art works (bottom, Figure 3.1.28). A public art space along the trail at which residents and visitors could view and help create culturally relevant art would become a destination point within Middlesboro. This would not only encourage healthy outdoor activity but also boost community pride and involvement, reducing the potential for trail destruction or vandalism.

Design Focus: Cumberland Avenue Intersection

Challenges/Issues

Currently there is limited signage or design at the intersection of Cumberland Avenue and US 25E that advertises the character or location of downtown Middlesboro, Boone Trace, CGNHP, or the Canal Walk. There are almost no street trees or vegetation along this portion of Cumberland Avenue to help separate pedestrians from the 45 mph vehicular traffic. In addition there is a lack of a designated bike route along the road, making the area difficult to safely navigate on foot or bike. Another impact of the shortage of signage and streetscaping is a weak connection from downtown Middlesboro to the CGNHP. There is no existing, clear, and safe path that pedestrians or bikes can use to reach CGNHP from the northern side of Cumberland Avenue (top left, Figure 3.1.29). To the south of Cumberland Avenue, there are buildings along Little Yellow Creek which are contributing to the erosion of the creek bank and creating a potential hazard to the structures themselves (bottom left, Figure 3.1.29).

Opportunities

The land around Cumberland Avenue where it meets US 25E is completely developed, thus making it difficult to propose a realistic design for a large, inclusive sign and greater accessibility at that location. Therefore, the area at the intersection of Cumberland Avenue and Little Yellow Creek (C, Figure 3.1.24) has greater potential to make an impression on those travelling on US 25E that is both inviting and appropriate in displaying the character of the city. This intersection is also another point along the original Boone Trace (brown dotted line, Figure 3.1.24) creating an opportunity to emphasize the historic significance of the location.

Little Yellow Creek, to the south of Cumberland Avenue poses an opportunity to redirect the pedestrian route into the CGNHP (D, Figure 3.1.24). The land on either side of the creek has the potential to become a clear trailhead, connecting the CGNHP to the Canal Walk, Boone Trace, and the commercial and residential areas of Middlesboro. This connection can be successful with the development of Cumberland Avenue as a safer street.



Figure 3.1.29 (Top left and right) Existing Cumberland Avenue bridge over Little Yellow Creek, (Bottom left) Existing buildings along Little Yellow Creek south of Cumberland Avenue and (Bottom right) Existing trail along Little Yellow Creek in CGNHP entrance

Refined Plan

The intersection of Cumberland Avenue and Little Yellow Creek would benefit from a formal trailhead. This would not only promote tourism in the area, but also make a safer and more accessible connection from the proposed trails (A, Figure 3.1.30).

The existing trail into CGNHP leads users along the KFC parking lot and to a path next to US 25E (B, Figure 3.1.30). The proposed trail to CGNHP follows a ridge (C, Figure 3.1.30) and keeps pedestrians and bikes from having to travel next to fast moving traffic on a path that lacks the naturalistic, safe quality of the proposed route.



Figure 3.1.30 Refined Design for Cumberland Avenue/CGNHP Connection



Figure 3.1.31 North of Cumberland Ave and Little Yellow Creek intersection design Before (top) and After (bottom)



Figure 3.1.32 Potential CGNHP trailhead south of Cumberland Ave along Little Yellow Creek Before (top) and After (bottom)

Visually eye-catching design can increase tourism and use of the trails in the area by pulling those travelling along US 25E into downtown. Signage and art can attract attention and also inform visitors about the character and features of Middlesboro (Figure 3.1.31). This location can be enhanced by developing Cumberland Avenue as a Complete Street, which can increase foot and bike traffic to the proposed trails and businesses along Cumberland Avenue. A safe and clear route from the northern side of Cumberland Avenue to the southern side is essential for these connections and will encourage use by a wider range of demographics.

There is an area along Little Yellow Creek to the south of Cumberland Avenue that has the potential to be a beautiful natural asset for Middlesboro. This is an ideal location for a path leading from CGNHP to downtown Middlesboro (Figure 3.1.32). The entrance to this path could be a parking area for

cars and bikes, making access to CGNHP easier for those not within walking distance. The entrance is another opportunity for signage that reinforces the idea of Middlesboro as a regional trail hub and a tourism destination. The existing entrance to CGNHP located by the KFC building does not have any signage to encourage exploration of the trail and the trail is uncomfortable to travel on since it follows closely along US 25E. By recreating the path into CGNHP away from US 25E, trail users can enjoy the natural amenities that can make Middlesboro a great regional trail hub. A bridge crossing Little Yellow Creek makes the path interesting, while allowing CGNHP maintenance crews access to the area. It also sets the trail to lead to the CGNHP visitor's center as it currently does, through the woods and away from US 25E.

Design Focus: Complete Streets

Context

Cumberland Avenue is the main thoroughfare that goes through the center of Middlesboro and intersects with US 25E. It is one of the main routes for the proposed trail system. Currently there is a lack of continuity of design standards throughout the road.

Challenges/Issues

Cumberland Avenue lacks continuity. The wide lanes and heavy traffic make it problematic for pedestrians to cross. Limited streets have bike lanes. The intersection of Cumberland Avenue and US 25E is very intimidating to cross. This intersection is a major gateway into Middlesboro and into the Cumberland Gap National Historic Park (Figure 3.1.33). Some sidewalks on Cumberland Avenue are 20 feet wide while others are 5 feet (Figure 3.1.34). These are rather wide sidewalks that are comfortable to walk on but the excess space can be used more efficiently. At the widest point, Cumberland Avenue is 60' wide and consists of 4 lanes of traffic in areas where retail and industrial traffic are heavy. In the residential portions traffic is just 2 lanes. Limited portions of Cumberland Ave. have turn lanes and a small section has a vegetated median.

Concepts

The Complete Streets strategy accommodates safe access for all modes of transportation: pedestrians, cyclists, motorists and others (Smart Growth America, 2014). Complete Streets will positively affect vehicular traffic and make it safer for other modes of travel along Cumberland Avenue. With increased safety for cyclists and pedestrians, the risk for accidents can be reduced. The pedestrian experience can be more pleasant with the increase of sidewalk coverage and compliance with ADA standards will ensure unhindered access for users of all ages and abilities. Pedestrian crossings will reduce the road surface area that needs to be crossed. Vegetated median buffers will help to increase the safety and experience for pedestrians. Bicycle lanes will help to ensure the safety for cyclists as well as motorists.

Another aspect of Complete Streets is the integration of green infrastructure which helps make communities healthier and vibrant places. Green infrastructure helps to maintain clean

water and make communities more sustainable as well as provide other environmental benefits (EPA, 2014). Measures for clean water and water runoff are accommodated through features such as rain gardens, bio-swales and other methods that allow for water to be infiltrated. Alternative paving with materials such as permeable pavers, pervious concrete and grass-crete allow for water to permeate the surface and thus reduce stormwater runoff. Planting native species also aids in the water infiltration process and can require less maintenance. Green infrastructure can help to remediate storm water runoff problems and make places more viable and healthier to live in.

Cumberland Avenue was divided into 3 portions: residential, retail, and industrial (Figure 3.1.35). The intersection of US 25E and Cumberland Avenue was also addressed. The Complete



Figure 3.1.33 Existing Conditions at US 25E Intersection



Figure 3.1.34 Existing Conditions along Cumberland Avenue



Figure 3.1.35 Portions of Cumberland Avenue

Streets design standards comply with regulations at the state and national level. Elements taken into consideration are roadside barriers, curbs, median barriers, barrier end treatments and crash cushions (“KYTC Highway Design,” 2014). ADA standards are also considered in these designs. Some considerations for accessible routes are walking surfaces, handrails and ramps (“ADA Standards for Accessible Design,” 2010). The design portions will help increase user comfort, ease and access to these parts of Middlesboro. As a main vein through the town, it will also help increase the accessibility to the trail system that is interconnected throughout the area.

Refined Plan

The residential portion consists of West Cumberland Avenue until the intersection at 24th Street. The design suggestions for this portion will help to increase the health, safety and welfare for users in the area. The vehicular traffic will be two lanes. Reducing traffic lanes will help to slow down traffic and increase safety for pedestrians, motorists and cyclists. A vegetated median will help to soften the aesthetics of the area, shield pedestrians and limit the amount of roadway needed to be crossed. The medians will not be continuous through intersections and allow for vehicular traffic to make left turns or cut through. Five feet wide bike lanes will be implemented throughout this section (Figure 3.1.36). Bike lanes will allow for cyclists to use this area more comfortably. Increased bicycle usage could also decrease vehicular usage which will allow for increased safety for all users.

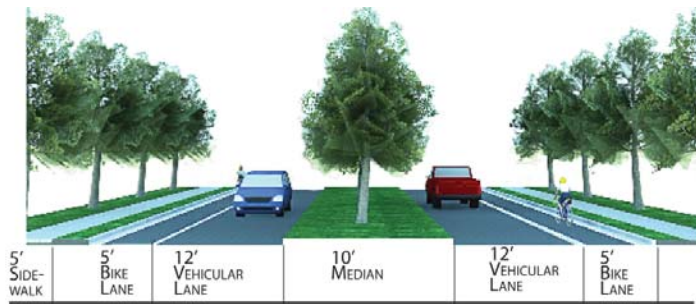


Figure 3.1.36 Residential Design Section

The retail portion along Cumberland Avenue is between the intersections of 22nd Street and 18th Street. This section is where a majority of retail businesses and mixed use properties exist. The design for this portion will cut vehicular traffic down to two lanes to increase safety for all users and to make the downtown area seem more lively. Building on previous designs in Middlesboro, there will be angled parking along the street. Businesses will have access to increased street parking. Bike lanes will be implemented throughout this section (Figure 3.1.37). A variety of travel modes will help to increase access to businesses in this area. Slower vehicular traffic will make it safer for pedestrians. This will encourage users to shop and eat, and also easily connect to the Downtown Connection of the trail system.

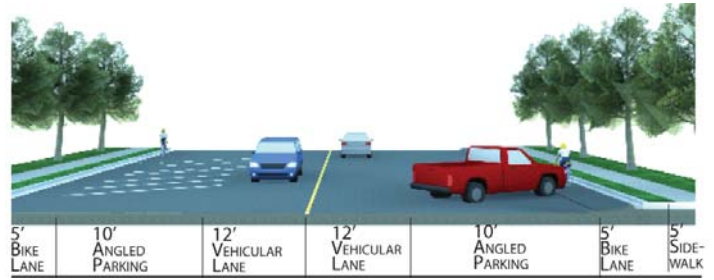


Figure 3.1.37 Retail Design Section

The Industrial portion runs between the intersections at 17th Street and US 25E. A large number of industrial businesses are located along this area, such as the Coca-Cola bottling facility. This portion of Cumberland Avenue will remain at four lanes to accommodate large trucks in this area. As in the residential portion, there will be a median to buffer traffic and help increase the safety of pedestrians crossing the street. Bike lanes are implemented as well in this section that help to accommodate alternate modes of traffic. There is a major node of Cumberland Avenue that intersects with US 25E and is currently dominated by vehicular traffic. The section drawing below illustrates how continuing the implementation of cohesive sidewalks and bike lanes will allow for safe use by all (Figure 3.1.38).

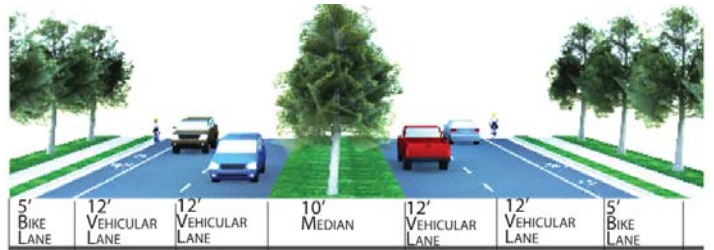


Figure 3.1.38 Industrial Design Section

Bulb-Outs

One way to remedy safety concerns at busy intersections is by implementing bulb-outs (Figure 3.1.39). Bulb-outs are curb extensions that extend out into the roadway and reduce the width of the roadway surface that pedestrians need to cross at intersections (PEDSAFE, 2014). Bulbouts will help increase safety and thus encourage connection into the national park.



Figure 3.1.39 US 25E Bulb-out Perspective

3.2: Downtown Connection Case Studies



Figure 3.2.1 Bicycle Underpass (Source: <http://streetswiki.wikispaces.com/>)

Project Name

Davis Greenway

Location

Davis, California

Date Designed

1989

Construction Completed

2007

Construction Cost

\$4.7 Million as of 2007

Landscape Architect

Mark Francis, Kerry Dawson & Stan Jones

Developer | Client

City of Davis

Manager

City of Davis

Introduction

In 1986 the City of Davis Council contacted Mark Francis to help design the greenway. He was appointed with the task of designing an integrated greenway including the future growth of the City of Davis. Francis, Dawson and Jones' plan was greeted with support from the City of Davis when it was initially proposed (Francis, Jones, and Dawson, 1988).

The Davis Greenway Plan proposed parks and natural areas within the City of Davis, California. The Greenway incorporated over fifty miles of existing bike paths. The City of Davis was concerned about the lack of green space within the urban limits. The main feature of the greenway system was a fifteen mile greenway surrounding the urbanized area of Davis (Francis, Jones, and Dawson, 1988). The continuous system now allows for bike races, casual walking and marathons to occur throughout the greenway. In addition to the existing greenway, there has also been a proposal to connect to Sacramento and Yolo Basin Wildlife Preserve east of the city. By 2007, 60% of the plan was implemented (*"Davis Greenway Plan: Davis, California"*, 2013).

The proposal of the Davis Greenway was in response to the concern of the rapid urbanized growth of the city with a projected population of 80,000 by the year 2000, although the population is only around 65,000 currently. The City was set on providing public space for residents. The greenway was not only to increase the amount of public space but to improve the

quality of life within urban areas. A number of parks within the city were underused at the time. The City knew that they needed much more than athletic fields and hard-courts to increase use. The new designs for the Greenway incorporated creative, adaptable amenities accessible to everyone within Davis. The Greenway was an exciting alternative to the traditional park and had the potential to expand in the future. The ability to change the programmable elements within the park for changing recreational demands makes the Greenway quite a unique experience. With these goals eventually accomplished, the idea of an Urban Greenway was established (Francis, Dawson, and Jones, 1988).

Analysis

The greenway system within the City of Davis is a coordinated network of open space which links existing natural and cultural features. With the constructed greenway, citizens were granted new recreational opportunities all while preserving open space around the urban areas of the city. The Davis Greenway provides citizens a number of opportunities throughout the trail. According to the Greenway Plan these opportunities include:

- Recreational activities
- Providing school children with the chance to observe ecological relationships
- Conserving open space in and around the urban areas of the City of Davis
- Increasing the value of adjacent property
- Complementing and connecting the existing and potential future parks, increasing accessibility and cohesion between parks
- Providing a safer alternative to streets for users
- Increasing the economic basis of the city by revitalizing the downtown area and attracting more tourists
- Integrating the Davis open space system with the University's open spaces, creating a much larger network (Francis, Dawson, and Jones, 1988).

Site Limitations

Throughout the planning and implementation process there were several key limitations. The first limitation was getting the community involved and creating support for such an expansive network; however, once the plan was showcased most of the community supported the idea. Another limitation was physically connecting the proposed parks with the existing parks via a trail network. Another issue was the barriers created by highways and roads. The plan proposed to connect trails in such a way as to limit roadway crossing. This was achieved by creating under and overpasses, allowing walkers, joggers and bicyclists to go under and over such obstructions with few road crossings.

Design & Development

Project Elements

By creating a comprehensive trail network, new recreational opportunities and activities were created for the community. Recreational opportunities include recreational sport fields, open space and different park settings. These provide more options than just for walking and bicycling which attracts more people to use the space, making the project a greater success. By conserving open space, not only can these areas be used for whatever opportunities arise in the immediate future, but they can serve as places for long range design endeavors and future parks.

Amenities within the Greenway include the following:

- Amphitheater
- Public art
- Areas for cookouts
- Combined play area
- Exercise par course
- Dog park
- Wildlife viewing area (Elmen, n.d.).

Incorporating design elements like an amphitheater, exercise par course and dog park allow for all residents to find something to do within the Greenway. The Davis Greenway has become much more than a park, it has become a focal point for all types of activity. Due to the Davis Greenways comprehensive trail network it is now also a means for inner city travel. By connecting the Greenway with existing attractions and centers residents now use the Greenway as a means for safe pedestrian travel. Working with the previously existing bicycle network, the Greenway capitalized on its existing connections, making them even stronger.



Figure 3.2.2 Pedestrian Trail and Bike Path (Photo Courtesy of Jayoung Koo)



Figure 3.2.3 Bicycle Lane (Photo Courtesy of Jayoung Koo)

Criticisms & Lessons Learned

The main lessons learned from this case study are the importance of involving the community and the working with both the community and state agencies in a cooperative manner.

Conclusion

Future Plans & Opportunities

- Conserving future open space
- Integrating other trail networks within the city
- Providing more recreational opportunities
- Increasing economic base for through Greenway visitors.

Relevance to Middlesboro

This project can be directly applied to Middlesboro in that Middlesboro also wants a cohesive and comprehensive trail network. A comprehensive walk/bike network could be a key feature within the city and give both residents and visitors a reason to utilize the trail for more than just hiking and walking.

Another lesson that Middlesboro can take from the Davis Greenway is the importance of providing pedestrians and other users with safe ways to cross and interact with roadways. Although developing a pedestrian underpass may not be feasible for Middlesboro, a comprehensive bicycle lane could be implemented. Allowing safe passage for both walkers and bicyclists is key for the success of the trail network in Middlesboro. The community of Middlesboro must also be on board to help oversee and drive this project through community involvement.

One key point to be taken from the City of Davis project is the importance of incorporating any greenway plan into the city's comprehensive plan.

The Davis Greenway is also valuable in the sense of wildlife habitat preservation. Middlesboro can benefit in a variety of ways by providing space for different forms of biota to thrive within the confines of the urban environment. All life can find its own place within the Middlesboro Greenway. By creating places for nature to thrive, residents and visitors can engage in wildlife related recreational and educational activities.

Connecting the National Cumberland Park with the city through a trail system gives the community a cohesive network that provides access not only through the city but to the different parks provided. This makes the park network more effective as a whole, allowing residents and visitors the ability to safely go to any park within the Middlesboro Greenway. By connecting multiple parks and trails together with the Greenway plan, the city can have one large network of parks consisting of different recreational opportunities.

There is much to be learned from the Davis Greenway project whether it's the concepts developed by the plan or the planning efforts of both the community and city council. By working together the project became a reality over time and so can the goals of the trail system in Middlesboro, Kentucky.

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Contacts

Name: Mark Francis
 Professional Title: Landscape Architect
 Company: CoDesign
 Email: mofrancis@ucdavis.edu
 Webpage: <http://lda.ucdavis.edu/people/websites/francis.html>



Figure 3.2.4 Indianapolis Cultural Trail - Indianapolis, IN (Source: United Consulting, n.d.)

Project Name

Indianapolis Cultural Trail

Location

Indianapolis, IN (USA)

Date Designed

2001-2005

Construction Completed

May 2013

Construction Cost

\$63 Million

Landscape Architect

Rundell Ernstberger Associates

Developer | Client

City of Indianapolis Department of Public Works

Manager

Brian Pierson & Carl Kincaid

Introduction

The Indianapolis Cultural Trail is, as the name suggests, located in Indianapolis, Indiana. Many tend to think of Indianapolis as a ‘crossroads’ referring to the hub of multiple interstate highways and location of the city.

In 1820, Indianapolis was established as close to the geographic center of the state of Indiana as possible. This location was not decided by settlers but by proclamation in 1816, the year Indiana gained statehood. When the capital was moved north in 1821 it was designed as only a square mile of development, less than the four square miles allotted for the city, since the chief city surveyor, E. P. Fordham, believed Indianapolis would never reach a size that covered four square miles (Hoosier Rails to Trails Council, n.d.).

Alexander Ralston was hired to design the future city of Indianapolis. Ralston had previously been an assistant planner for the District of Columbia and applied the capitol city as a model for Indiana’s capitol, with four broad avenues extending diagonally to the north, south, east and west from Monument Circle, a central circular site in Indianapolis (Advameg, Inc., n.d.).

As a result of this central design, an uninterrupted route could be taken around the city and allow users to interact with multiple districts surrounding the core of Indianapolis. Although there was no original plan for such a path the design of the city was well suited for the future creation of the cultural trail.

The complete eight miles of the Indianapolis Cultural Trail takes users through a variety of districts as it encircles downtown Indianapolis including the city’s visitor and business district, arts and cultural district, and seven neighborhood districts (Figure 3.2.5) (Visit Indy, n.d.).

Analysis

Context

The name—the Cultural Trail—is named so for the five official cultural districts that the trail interacts with on its route. Previously there was no physical relationship linking these cultural districts. Now the unique areas, loaded with culture, are part of a bigger picture, enhancing their appeal and maximizing their potential. This is highly effective since the trail passes within one block of every major arts, culture, heritage, and sports venue in the city (Simmons, 2014).

After 12 years of planning starting in 2001 and six more years of construction, the resulting Indianapolis Cultural Trail has connected both residents and visitors with every major cultural and entertainment venue in the downtown area. “The trail’s design is as innovative as the concept...the construction process incorporated about \$20 million in city infrastructure improvements that might not have been done otherwise” (Visit Indy, n.d.).

Along with infrastructure improvements, this project used existing traffic lanes for pathways, adding to the pedestrian safety by reducing surrounding traffic. There was still enough room for both motorized and non-motorized traffic along the streets. Crosswalks were made safer for those on foot and bike by decreasing the distance across streets with bulb-outs and reducing car traffic by reusing a lane of traffic for the trail (Figure 3.2.7).

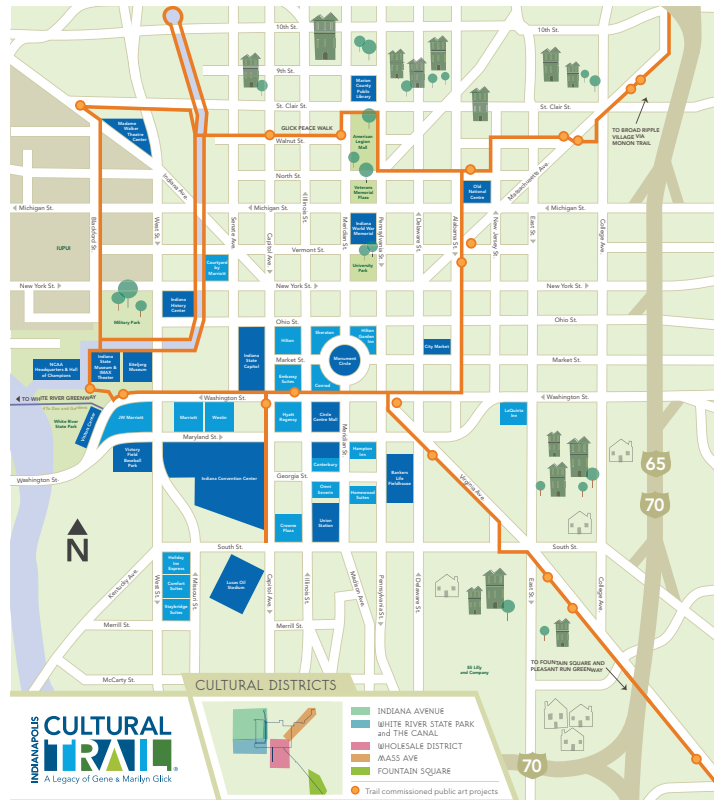


Figure 3.2.5 Indianapolis Cultural Trail Map (Source: Indianapolis Cultural Trail Inc., Map, n.d.)



Figure 3.2.7 Pedestrian Crosswalk Depicting Safety Features (Source: Rundell Ernstberger Associates, LLC, Indianapolis Cultural Trail, n.d.)

Design & Development

Project Elements

- Over half of the path is divided into separate sides for cyclists and pedestrians
- Bright, contemporary signage
- Stormwater planters
- Pedestrian-friendly street intersections
- Original art work

The trail is 25 feet wide in some places which allows space for all types of traffic, including foot and bike. Along the trail are many design features that show how Rundell Ernstberger Associates were thinking about sustainability and beauty as they designed the path. Sustainability is illustrated in the use of stormwater planters “with open bottoms that allow rain to drain to the ground, reducing runoff and the burden on the city’s sewer system” (Visit Indy, n.d.). At crosswalks there are audio components to assist the visually impaired. The plaza style corners, extending into the street more than a typical sidewalk would, shorten the distance pedestrians must walk from one corner to the other, making the crossing safer.



Figure 3.2.8 Glick Peace Walk Art (Source: Rundell Ernstberger Associates, LLC, Glick Peace Walk, n.d.)

Other design features, such as the near \$2 million worth of artwork, make the Indianapolis Cultural Trail a beautiful place to travel along in the city (Figures 3.2.6 and 3.2.8). “The large-scale art pieces include an LED image of a woman dancing — designed by internationally renowned artist Julian Opie — large gates with solar-powered ambient lighting, a scent vault, a sculpture garden honoring great visionaries throughout history, resin bus shelters displaying original poetry, and a light installation that simulates a swarm of fireflies along what used to be a dark stretch of road” (Visit Indy, n.d.).

Criticisms & Lessons Learned

There are few apparent criticisms associated with the Indianapolis Cultural Trail. By creating a cultural trail with the sidewalk and one lane of the still generously wide streets, Indianapolis residents and visitors can easily connect and interact with more parts of their city.

Signage and wayfinding are an important part of any trail and a suggestion for this project would be clearer directional signage for the Cultural Trail. Although United Consulting detailed the signs and marker plans for the trail there are instances where the actual path is unclear for users. An account from one trail user, Mary Milz, describes areas of confusion where signage and paving patterns differ from the typical Cultural Trail styles and the user missed turns on the path and had to turn around as a result. A team dedicated to ensuring successful signage and wayfinding can help avoid any directional issues while on a trail.



Figure 3.2.6 Prairie Modules at Night (Source: Rundell Ernstberger Associates, LLC, Indianapolis Cultural Trail, n.d.)

“Before the path arrived, Indianapolis didn’t have a mainstream bike scene — just streets designed to improve traffic flow. Now, children and the elderly have joined the spandex swarms of longtime cycling enthusiasts. The pathway has connected people with the places they want to go and encouraged physical activity in a state with the eighth-highest obesity rate in the country” (Simmons, 2014).

Conclusion

Relevance to Middlesboro

Like Middlesboro, most people in Indianapolis see ordinary sidewalks when they travel downtown. It took a group of progressive community leaders to imagine the possibilities of the wide paths that are accessible to both pedestrians and cyclists (Visit Indy, n.d.). Middlesboro has the infrastructure (existing Canal Walk, Army Corps of Engineers canal and levee project, national and state parks, etc.) to build upon and support such a path as the Indianapolis Cultural Trail. Utilizing the same design techniques that were used for the Indianapolis Cultural Trail, such as paths lined with lighting and landscaping and enriched with original large-scale art, Middlesboro can achieve similar connectivity and tourism that Indianapolis achieved as a result of the trail.

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Contacts

Name: Kaeren Haley
Professional Title: Manager
Company: Indianapolis Cultural Trail, Inc.
Address: 615 N. Alabama St. Ste. 119
Indianapolis, IN 46204
Phone: 317-631-6542 ext. 139
Email: Gaill@IndiCulturalTrail.org
Webpage: <http://www.indyculturaltrail.org/index.html>



Figure 3.2.9 Downtown Peru, Indiana (Source:Jenson, 2005)

Project Name

Peru, Indiana - Complete Street Policy

Location

Peru, Indiana (USA)

Date Awarded

2013

Construction Completed

Ongoing since 2013

Construction Cost

Unknown

Planner

Peru City Planning Commission

Developer | Client

City of Peru, Indiana

Introduction

Peru, Indiana, is located in the north central region of Indiana on the Wabash River. It is the largest city in Miami County and covers 5.181 square miles. According to the 2010 Census the population is 11,417 residents. Peru is also home to the Miami Nation tribal headquarters.

Analysis

Context

The city of Peru has a main thoroughfare with 4 lanes of traffic and no bike lanes. Poor walking conditions and insufficient lighting are also issues. There is a lack in continuity of infrastructure throughout the city.

The city has put into place a Complete Streets policy with the purpose to help increase the accessibility, health, safety and liveliness of its communities. This can be achieved by accommodating people of all ages, abilities, and user types, including pedestrians and cyclists. The Complete Streets process emphasizes improved walkability, cycling and safety in association with motorized traffic. The city's implementation of this process was voted #2 for Complete Streets Policy in 2013 by Smart Growth America (Smart Growth America,2014). Peru's commitment to Complete Streets helps set a precedent for Complete Streets implementation throughout the entire state of Indiana.

Site Limitations

Existing conditions include poor paving, inadequate lighting and inaccessibility for cyclists. The city's policy to improve conditions also has measures in place for exceptions to its implementation. Exceptions may be issued if the implementation affects the current traffic laws of major highways, are currently too expensive to adequately implement, or are not viable options to accommodate current traffic in the area (City of Peru, 2013).

Design & Development

Project Elements

Improved walkability will be implemented following ADA accessible design standards. This will allow users of all ages and abilities to more safely use the sidewalks. Improved cycling will be implemented by increasing bike lanes thus allowing cyclists to be more comfortable on roadways which previously might have been too intimidating to ride along because of vehicular traffic. These two modes will help increase the volume of alternative traffic to businesses, retail areas and schools where traditional parking is limited. The improved connectivity will allow for less motorized traffic and increase safety for walking and cycling.

Criticisms & Lessons Learned

Peru's Complete Streets policy is just being put into place, so it is not possible to cite examples of its implementation at this time. However, the city is establishing a good system for the design and management of the policy. It will take time before the successfulness of these practices can be evaluated.

Conclusion

Future Plans & Opportunities

The city will have a standard in place to guide future opportunities for Complete Streets and a process to implement the policy throughout the city.

Relevance to Middlesboro

Peru is a city similar in size to Middlesboro with similar issues. Implementation of the Complete Street policy in Peru can serve as a model on which Middlesboro can build and develop its future plans. A Complete Street policy in Middlesboro would increase the likelihood for greater connectivity via the Trail System within the region, promote a thriving local economy, and improve the overall quality of life.

With an increase in walkability and cycling, Complete Street policies help limit the dependence on vehicular traffic. The emphasis on universal access is an important asset to an aging community. Middlesboro is a community where a large percentage of the population is aging. The implementation of ADA accessible standards for walkability will allow for increased access on sidewalks for all users.



Figure 3.2.11 Downtown Peru (Source:blogspot, n.d.)

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- ### Contacts
- | | |
|--------------------|---|
| Name: | Planning Commission of Peru |
| Professional Title | |
| Company: | City of Peru |
| Address: | 35 S. Broadway Peru, Indiana 46970 |
| Phone: | 765-472-400 |
| Webpage: | http://www.cityofperu.org/planning_commission.html |



Figure 3.2.12 Flagstaff Urban Trail System (Source: City of Flagstaff, 2013)

Project Name

Flagstaff Urban Trail System (FUTS)

Location

Flagstaff, Arizona (USA)

Date Designed

Ongoing since 1988

Construction Completed

50 miles of trails completed and 80 miles of future trails planned

Construction Cost

\$7.5 Million

Landscape Architects

JRC Design, Peak Engineering Inc., ADYE Design, WLB Group

Developer | Client

City of Flagstaff [Flagstaff, AZ]

Manager

City of Flagstaff [Flagstaff, AZ]

Introduction

Located in northern Arizona, the city of Flagstaff has a population of approximately 65,000 (roughly the size of Bowling Green, Kentucky). The city is a distribution hub for its lumber and railroad driven economy. Flagstaff’s economy is boosted by its tourism sector due to its proximity to the Grand Canyon, Route 66 and the Barringer Meteor Crater (Wikipedia, 2014).

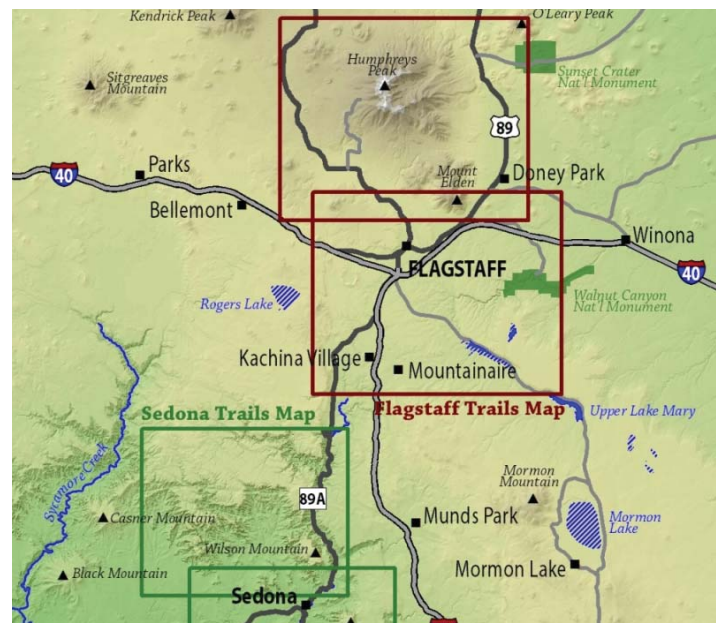


Figure 3.2.13 Flagstaff Trail Area (Source: Emmitt Barks Cartography, n.d.)

The Flagstaff Urban Trail System (FUTS) is a network of shared use trails throughout the city. Trails are accessible to people walking, running, hiking and riding bikes. Trail materials range from paved surfaces like asphalt and concrete to gravel and compacted soils. FUTS gives users a wide range of experience options that allow the user to choose the setting or route that is appropriate for their needs. Trails are located in both picturesque natural settings, such as the McMillan Mesa and Switzer Canyon, as well as urban settings that connect destination points like the local college, museum and schools. According to the City of Flagstaff, “The system connects neighborhoods, shopping, places of employment, schools, parks, open space, and the surrounding National Forest, and allows users to combine transportation, recreation and contact with nature” (City of Flagstaff, n.d.).

Analysis

Context

The Flagstaff Urban Trail System (FUTS) can be found in many different types of locations throughout the city. Its wide spread context ranges from the urban downtown to the scenic mountains. This system encompasses a local and regional scale with connection points to the public bus transit system (The Mountain Line). FUTS connects all major points of interest in the city of Flagstaff including an airport, retail, community college, and parks (Figure 3.2.13).

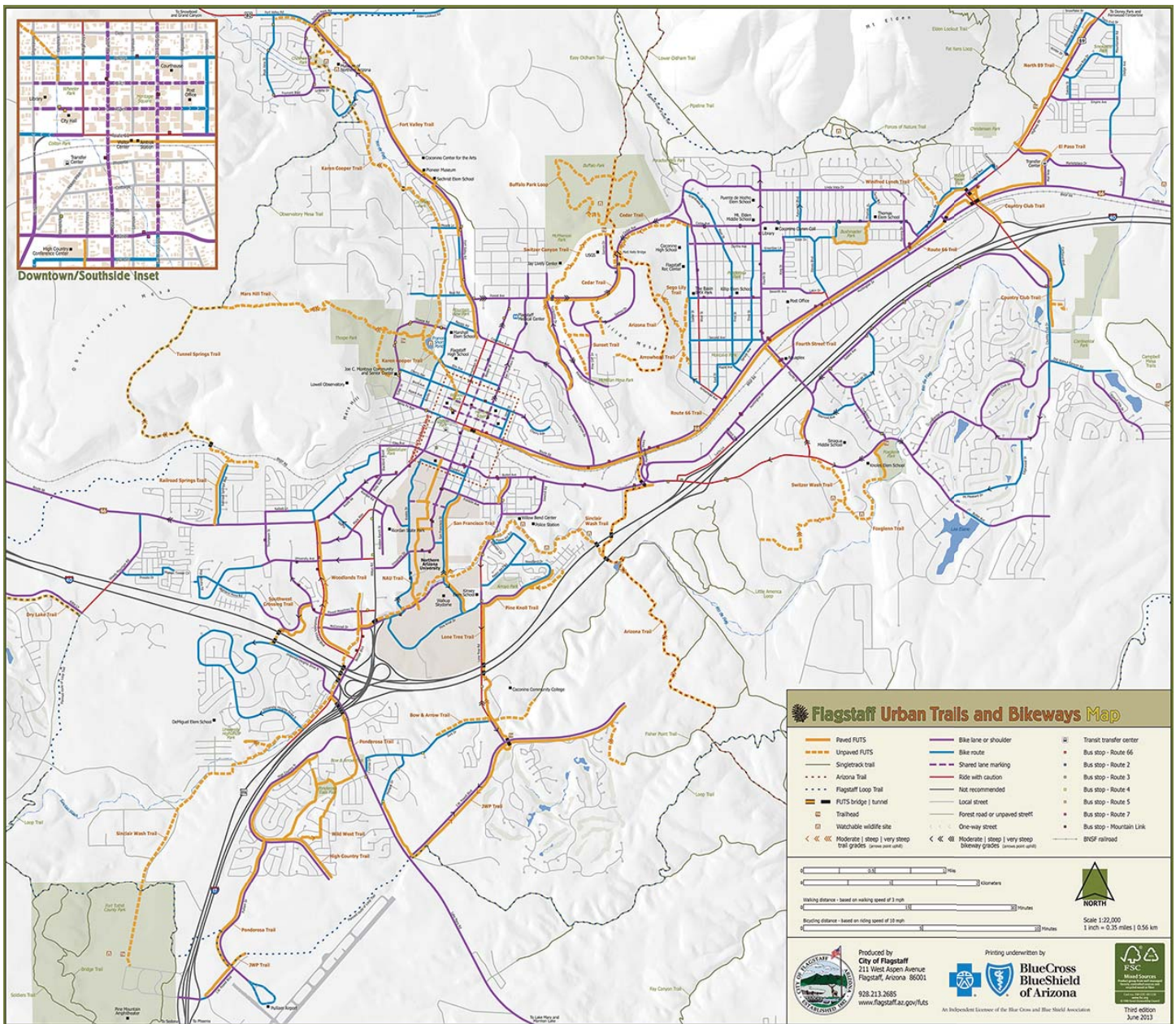


Figure 3.2.14 Flagstaff Urban Trails and Bikeways Map (Source: City of Flagstaff, 2013)

Site Limitations

Since this project was enacted by the local government, the property necessary to create the trail system had already been obtained. Regarding funding and implementation, a city report states, "... it is important to establish priorities so that trails that are needed most are built first. It is equally important through this process to share information with the public about trails planning and prioritization, to make the process open and transparent, and to encourage meaningful public involvement and participation" (City of Flagstaff, 2010).

Design & Development

Project Elements

Unique features and elements can be found throughout the Flagstaff Urban Trail System (FUTS). A natural feature, McMillan Mesa is an ancient lava flow that created an open grassland which boasts panoramic views of the surrounding mountains. Trail goes venturing through this area can take in the peaceful serene views, escaping fast paced city life.

A built element, US Route 66, is part of the original United States highway system and a popular tourist attraction. The drive from Chicago to Los Angeles appeals to those with a desire to experience the ultimate classic American road trip.

The Matt Kelly Urban Trail Bridge is a pedestrian and cyclist only bridge ovetop busy Cedar Avenue. The bridge serves as a memorial for Matt Kelly, who was killed while cycling with traffic on Cedar Avenue. The bridge is a safe route created by cyclists in his honor.

Picture Canyon is a geological feature located 15 minutes east of Flagstaff. Listed on the National Register of Historical Places, the site has hundreds of archaeological remains and pictographs drawn by native people.



Figure 3.2.15 Matt Kelly Urban Trail Bridge (Source: City of Flagstaff, 2013)

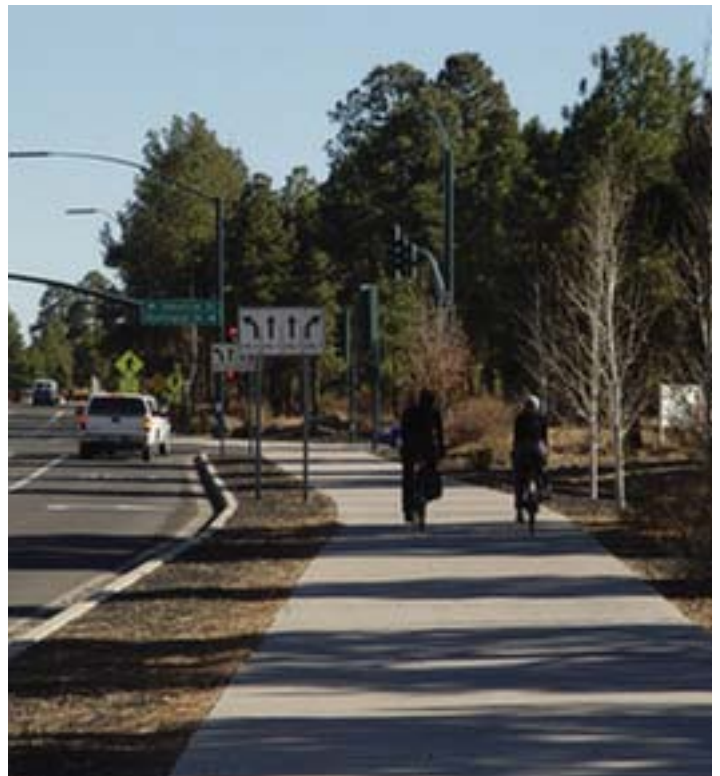


Figure 3.2.16 Fourth Street Trail (Source: City of Flagstaff, n.d.)



Figure 3.2.17 Bow and Arrow Trail (Source: Absolute Bikes, 2014)

Criticisms & Lessons Learned

Throughout the Flagstaff Urban Trail System's development, criticisms associated with it have focused on the availability and strategic locations of bicycle storage. The city has seen the need for overflow bike racks in user heavy locations.

Some critics are concerned that future plans for additional trails might not be reflective of the city's projected growth patterns. Plans may need to be adjusted overtime to ensure appropriate solutions to create a network of connections across the city.

People of Flagstaff have also voiced their concerns about vehicular traffic discouraging cyclists from using certain parts of the trail system. This problem must be addressed on a site specific basis, to provide the best possible solutions.

From the user perspective, people voiced concerns related to maintenance of the trails, cleanliness and safety issues (City of Flagstaff and Flagstaff Metropolitan Planning Organization, 2012, p4).

The FUTS system users access the trails for recreational purposes, health and exercise, and to experience open space and nature. Additionally, more than half of a user survey's respondents stated they use the trail system for travel and commuting (City of Flagstaff and Flagstaff Metropolitan Planning Organization, 2012, p4).

Conclusion

Future Plans & Opportunities

The City of Flagstaff has 80 miles of future trails planned which will branch off of existing trails. Currently, there are 2 trails under construction, 6 trails in the design process and 3 trails in the planning process. Potential opportunities of the Flagstaff Urban Trail System are that the diverse selection of trails could become an tourist attraction within its self.

Relevance to Middlesboro

The FUTS is a great trail system connecting both natural attractions and the downtown area. Middlesboro can benefit from this example by observing the level and intensity of organization necessary within the city government and how they can partner with surrounding communities and other organizations in the region. A good trail system needs not only very dedicated individuals but also continuous users who support and make the the project successful.

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Contacts

Name: Martin Ince
Professional Title: Multi-Modal Transportation Planner
Company: City of Flagstaff, Arizona
Address: 211 West Aspen Ave,
Flagstaff, AZ 86001
Phone: (928) 213-2685
Email: mince@flagstaffaz.gov
Webpage: <https://az-flagstaff3.civicplus.com/index.aspx?NID=1379>

3.3: Downtown Connection Summary

Summary of Downtown Middlesboro

Within the Downtown Connection section of the Middlesboro plan, several key goals were addressed. Using design, a strong sense of place was created when entering Middlesboro by proposing a richly cohesive entrance/gateway into the community along Cumberland Avenue and US 25E. This strong sense of place is welcoming to visitors and attracts tourism while recognizing historic attributes in an effort to promote regional identity.

The design plan features clearly designated public space while developing existing vacant parcels as green space with economic generating capability. This was accomplished by creating community gardens and public pocket parks as well as providing event space and a comprehensive trail network along the Canal Walk. The link to Downtown from the neighboring portion of the Canal Walk was an important area of focus for Downtown Middlesboro.

Similar to connecting the Canal Walk to the downtown came the issue of connecting existing trails throughout the area. A trail system was proposed that utilizes existing trails combined with new trails to form a trail network around the city of Middlesboro. A navigable trail network becomes another asset by which the community can attract tourists as well as provide recreational opportunities for residents. This network was achieved through the proposed connections to the Cumberland Gap National Park and Daniel Boone Trace. The trail network would also connect with the proposed Greenway, creating an inner and outer loop further linking Middlesboro with the region.

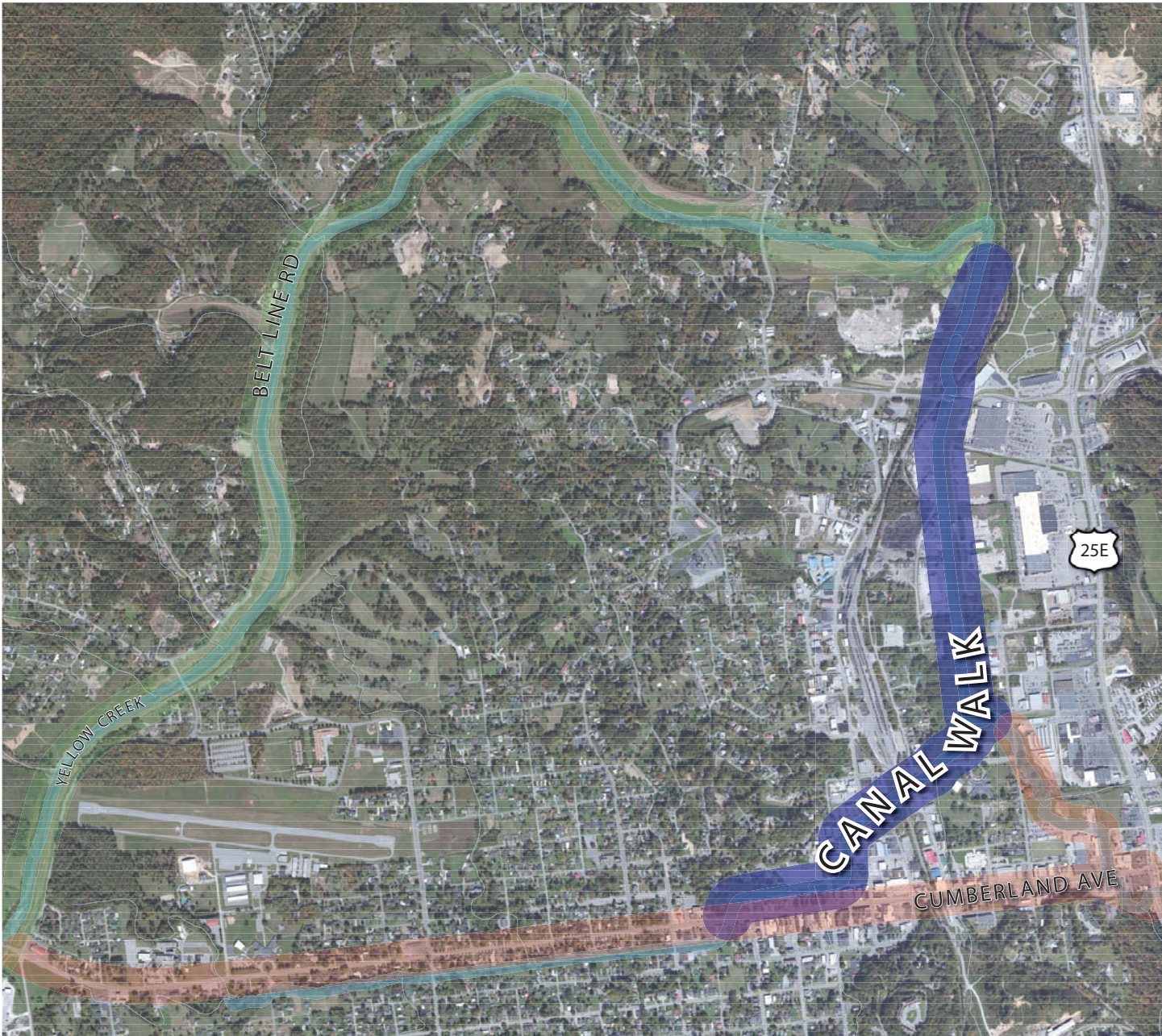
These opportunities are only the first step for revitalizing the downtown portion of Middlesboro. In order for these areas to work as a whole, connectivity between each site must be established. Connectivity was facilitated in the overall plan by incorporating a comprehensive Complete Streets network to increase walkability and bikeability. Offering a strong network that encourages a variety of users within the community to engage the entire stretch of Cumberland Ave and the Downtown area will improve the overall quality of life and support a thriving economy.

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Canal Walk

Chapter Four



Middlesboro Trail System: Canal Walk (Imagery Source: Kentucky Geography Network, 2014)

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4.1: Canal Walk Background

Introduction

Originally constructed in the 1930s, the Middlesboro canal stretches 2.7 miles and serves as the main drainage-way for the city. Over time, the canal and the adjacent land have been converted into a recreational and interactive space. The Canal Walk spans from the corner of 22nd Street and Cumberland Avenue to Hollywood Drive where the proposed Greenway meets the canal. Based on the current conditions of the canal and surrounding area, several issues will be addressed in the proposed development plan. The existing Canal Walk lacks cohesion and excitement leaving users confused and bored. Currently it serves a very limited purpose to the local community and surrounding area. The following ideas aim to unify the area and make the Canal Walk a destination for all.

Goals

The overall goal of the Middlesboro Canal Walk proposal is to create a sustainable and inclusive design. The intent of the design is to eliminate negative environmental impacts through creative yet sustainable water-sensitive designs. Successful sustainable design should have little to no impact on the environment while connecting people with their surroundings. This will eliminate negative environmental impacts and promote a healthy, active Middlesboro. Sustainable green design creates an attractive balance between the ecosystem and people by being mindful of the environment. The desire is to create positive relationships between people and the services that water and trails can supply to them (Clayden & Dunnett, 2007). Key design goals include:

- Providing the community of Middlesboro and tourists with spaces for public functions
- Helping to create an active healthy community
- Providing a continuous multi-use trail system that connects to local and regional trails
- Developing a connection to the Cumberland Gap National Historical Park
- Connecting to the historic Boone Trace
- Educating the public about best practices for water management
- Creating a series of interactive and educational spaces



Figure 4.1.1 Canal Walk Master Plan



Analysis

A variety of elements were analyzed at the site level such as hardscape areas, traffic patterns, bridge properties, and potential trailhead locations. These findings further supported the design decisions for the Canal Walk.

Hardscape

We analyzed hardscape areas of the existing Canal Walk and surrounding areas near downtown. The hardscape areas included any built material but excluded dirt or gravel paths. In order to evaluate the existing conditions and indentify areas for improvement, it was important to determine where the Canal Walk consists of a definite path. We discovered that the canal is easily accessible; however, once on the Canal Walk, the path is fragmented and difficult to navigate. Potential pathways were identified to create effective design solutions. In addition to looking at paths that make up the Canal Walk, sidewalks surrounding the canal were noted. Potential canal access points were also identified which can be further developed. Each of these analyses were based on walkability as well as connectivity (Figure 4.1.2).



Figure 4.1.2 Hardscape Analysis

Traffic

A traffic analysis was done to identify areas of high, moderate, and low traffic. This was conducted by looking at each of the road classifications and determining whether they are arterial, collector or local roads. Existing crosswalks and speed limits adjacent to the canal were also considered. There are places where it is safe for pedestrians and cyclists to cross throughout the Canal Walk, and places where it is not safe to cross. It is important that users feel safe when using the improved Canal Walk. Therefore, safety for pedestrians and cyclists was an important criteria to consider when developing the new design ideas (Figure 4.1.3).



Figure 4.1.3 Traffic Volume Analysis

Bridges

There are eight bridges along the proposed Canal Walk varying in size, height, condition, and material. The characteristics of the bridges dictate the path placement; for example, whether a path can go over or under a bridge. In several cases, the height underneath the bridge deterred the potential for paths unless the canal can be made deeper. In other situations, trails needed to go around areas where bridges exist. After our analyses, we identified a continuous path throughout the Canal Walk section (Figure 4.1.4).



A. W Cumberland Avenue



B. 21st Street



C. 20th Street



D. W. Lothbury Avenue



E. Aylesbury Avenue



F. Fitzpatrick Avenue



G. Salisbury Avenue

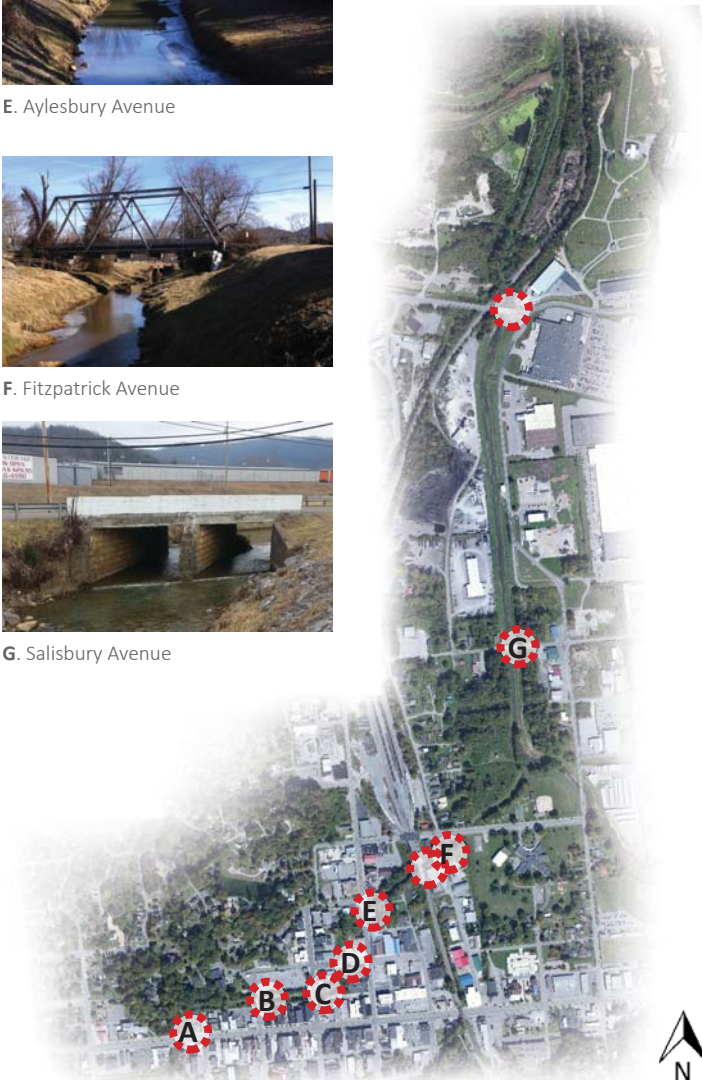


Figure 4.1.4 Bridge Inventory

Potential Trailheads

Important trailheads and connection points were identified based on pedestrian traffic and their relationship to popular attractions and facilities in the area. These locations have the potential to become high pedestrian traffic areas, such as event spaces and meeting areas. Some locations have the potential to serve as main gathering spaces or entrances along the Canal Walk (Figure 4.1.5).



-  Primary Trailhead
-  Secondary Trailhead



Figure 4.1.5 Potential Trailhead Locations

Design Focus: Entrance to the Canal Walk Option 1

Context

The Entrance to the Canal Walk section is the beginning of the proposed master plan for the Canal Walk. The proposed site is located between 20th and 21st Streets right off of Cumberland Avenue.

Challenges/Issues

Because there is running water, the area is prone to flooding and water pollution problems which also dramatically affects the water cycle process around neighborhoods. The natural processes of percolation into the ground and evaporation back into the atmosphere are reduced or eliminated and, as a result, there is often a large volume of excess water to be dealt with following storm events.

Opportunities

One opportunity for improvement is for the canal to be engineered to treat and infiltrate a precise amount of water, for instance, the general volume of water runoff expected after a typical storm. The presence of the canal on the site also presents the opportunity for people to interact with water for recreational and educational activities. In addition, it provides opportunities for the integration of sustainable design principles (Figure 4.1.6).



Figure 4.1.6 Bridge Perspective

Conceptual Diagrams

Conceptual Diagram One (Figure 4.1.7)

This concept design takes up most of the parking for the city but in return the city would get a beautiful green park. This park would connect to the courthouse park and mimic the same design as the park. Green practices would be installed in both proposed concepts and water cleaning elements would support the green design. There will be a pedestrian street along with a pocket park that leads to a bridge over to the large park. The park can be used as a programmable event space, such as for a farmers market that would allow vehicles to park on the grass.



Figure 4.1.7 Entrance to Canal Walk Option 1 Concept 1

Conceptual Diagram Two (Figure 4.1.8)

The second concept design is smaller and takes up very little of the parking for the city. There will be a pedestrian street along with a pocket park that leads a bridge over to the small green strip.



Figure 4.1.8 Entrance to Canal Walk Option 1 Concept 2



Figure 4.1.9 Entrance to the Canal Walk Master Plan

Refined Plan (Figure 4.1.9)

The intention of this sustainable design is to mitigate negative environmental impacts through artful, water sensitive design (Clayden & Dunnett, 2007). This design incorporates green practices while making the canal healthier for users.

There is a great enthusiasm for opportunities where people can interact with water rather than just looking at it. Research has shown that in most urban environments children have limited opportunities for informal play with water. There are many examples of urban spaces that create opportunities for play with water, while also using it to provide an identity to the culture of the city (Clayden & Dunnett, 2007). This attitude should inspire us to explore and create alternative ways of merging water into the landscape while also enabling interaction.

The canal can provide a visual and sensory indulgence, which is great for appealing to people and especially children, to interact with the water (Clayden & Dunnett, 2007). One of the best things about the canal is the potential to animate and bring life to a landscape. The canal provides a designer with new opportunities to study how to gather and move, store and deal with rainwater. This not only achieves more environmentally stable designs but also creates stimulating playful environments for children and adults. Water is used to create a clear and comprehensible design that links different parts of the design, while also creating chances for human interaction, both intentional and unintentional..

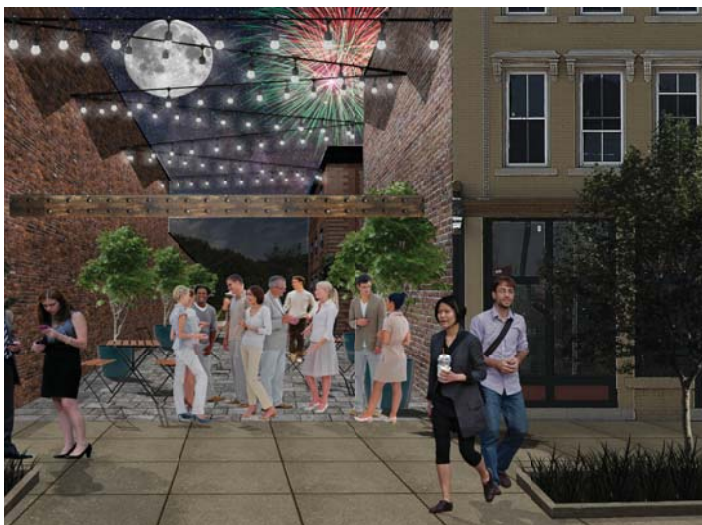


Figure 4.1.10 Pocket Park looking towards the canal at night



Figure 4.1.11 Pocket Park looking towards the canal

Design Focus: Entrance to the Canal Walk Option 2

Context

The Entrance to the Canal Walk begins on Cumberland Avenue and ends at 20th Street. There is a public parking lot and City Hall close to the canal. Along the site, this is the most used portion and where people can access the Canal Walk, located just steps away from Cumberland Avenue.

Challenges/Issues

One of the main problems with the area is the disconnection with the trail. There is no continuous trail throughout the area. Even if it is connected, it is very difficult to get to the other end and unsafe for pedestrians to experience. Another problem is issue of flooding for those who live and work in downtown Middlesboro. In past years, there were storm events that flooded the downtown basements. For this reason, people took steps to address this problem and keep damage at a minimum. The water quality of the canal is another big issue. The water quality does not create a pleasant walking experience for pedestrians and the depth of the water fluctuates greatly from season to season. Thus, several design concepts have been proposed to mitigate these problems and eventually create a better and more pleasant environment for the people who live and work in downtown Middlesboro as well as for pedestrians who utilize the Canal Walk.

Opportunities

Along with the downtown and surrounding pedestrian paths, we recommend implementation of a “green street” - a street that is pedestrian friendly and environmentally sustainable. Some sustainable features also could be implemented along the Canal Walk. Along the green corridor and parking located on the north side of this section, we recommend storm water planters which use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality (Figure 4.1.12). Stormwater planters bring a sense of “green” to the Canal Walk and provide pleasant views to enhance the overall look.

As mentioned earlier, the main surface runoff is from paved areas and is what causes flooding of the canal. For this reason we proposed that all the walkable paths implement permeable paving. The permeable pavement is an alternative to asphalt or concrete which allows stormwater to drain through its porous surface. The park located at the north side of the entrance presents another problem area which could be improved by implementing green parking. There are many benefits to green parking. It reduces the contribution of parking lots to total impervious cover, thus reducing water runoff. It creates the maximum number of parking spaces but minimizes the dimension of the entire parking lot footprint. Green parking utilizes alternative pavers in overflow parking areas and bioretention



Figure 4.1.12 Storm Water Planter (Source: Smith Manage Group, 2010)

areas to treat stormwater. It also encourages shared parking. There is a potential to implement bioretention cells along the side of the canal which would help to encourage filtration and infiltration. In order to address the connectivity problem, we designed a trail system that runs from the beginning of the Canal Walk to the Daniel Boone Connection so that people who use the canal can have a cohesive, interpreted experience.

Conceptual Diagram

In order to address the flooding issue and improve water quality in the canal, we have proposed the idea of integrating bioretention areas where the site is mostly vegetated. There are several benefits of bioretention but for the site’s existing conditions, bioretention would serve to better handle excessive rainfall during the flood season. The public parking lot can be reconstructed utilizing green parking techniques which would reduce the water runoff and also cleanse the water that goes into the canal (Figure 4.1.13).



Figure 4.1.13 Conceptual Diagram

Refined Diagram (Figure 4.1.14)

Along the canal, we designed a green buffer zone with heavy vegetation as a detention area. This vegetation could protect banks from erosion and naturally filter water from the surface runoff. An area with 10-20% impervious surface has less surface runoff when compared with a more urbanized area with 75-100% impervious surface (California Water and Land Partnership, n.d.) (Figure 4.1.15). Thus, this design solution could help with the flooding issue when there is too much surface runoff from the



Figure 4.1.14 Entrance to the Canal Walk Refined Plan

surrounding areas. While the green buffer zone works as a water filter, it can also block trash coming from the surface areas from entering the canal. The proposed design alters the appearance of the canal by reshaping it to increase the water depth and holding capacity. The existing canal is shaped like a bowl, but this shape does not hold the greatest volume. In the proposed design, the canal will have a wider area at the top and a more narrow, stepped channel at the bottom. Figure 4.1.16 shows a cross-section of the altered canal. With a more narrow bottom, the canal will have running water even during the low rain season thus creating a more aesthetically pleasing experience (Figure 4.1.17). During the high rain season, the upper widened canal area can maximize the canal’s water holding capacity.

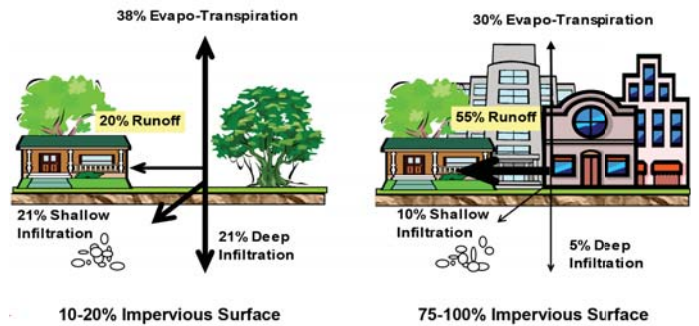


Figure 4.1.15 Water Infiltration Process (Source: California Water and Land Use Partnership, n.d.)

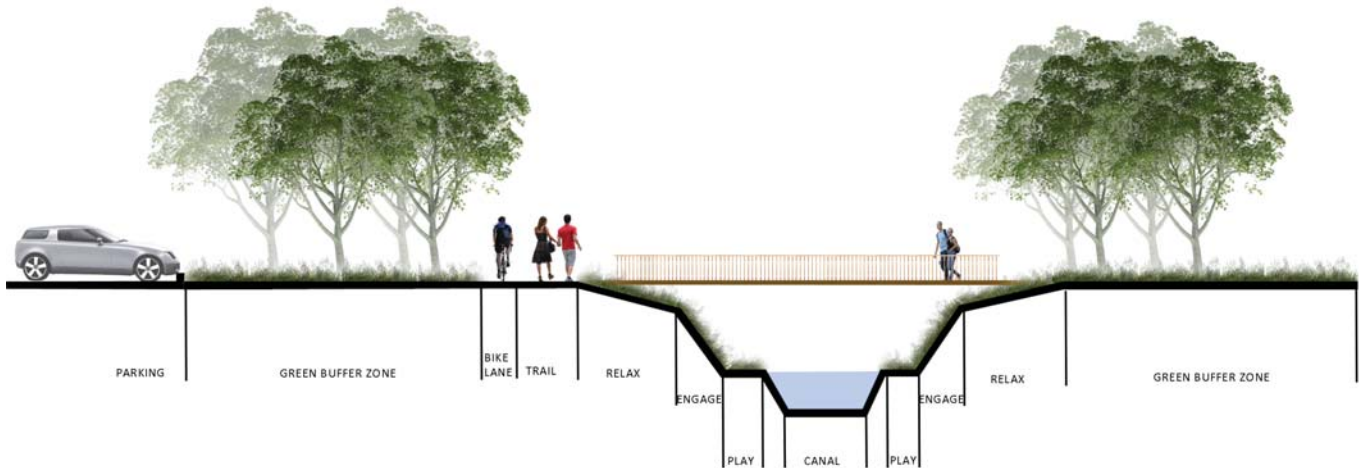


Figure 4.1.16 Cross Section of the rehabilitated Canal Walk



Figure 4.1.17 View of Rehabilitated Canal Walk (before and after)

4.1 Canal Walk Background: Design Focus

Design Focus: The Link

Context

The Link section is an important part of the proposed master plan for the Canal Walk because it establishes a connection between the Downtown Entrance and the rest of the canal. The area covered stretches from 20th Street to Ashbury Avenue and 17th Street. This section also focuses on water management practices that are to be implemented along the trail and in the canal itself. The Link is important because it provides opportunities for the community to become directly involved with the water and preserving and improving its condition.

Challenges/Issues

Currently, the Link portion consists of an unattractive and uninviting pathway that is almost physically non-existent. Once the trail passes over Lothbury Avenue, there is no clear trail for users to follow (Figure 4.1.18). The path segment composed of a planked walk is in disrepair and about to collapse (Figure 4.1.19). Between 19th Street and 17th Street there is no path



Figure 4.1.18 Existing grass path



Figure 4.1.19 Unsightly and beaten path

along the canal and there is a strong presence of trash and poor water flowing into the canal. The signs along this stretch of the trail are badly rusted and dampen the spirit of people wishing to walk along what should be an aesthetically pleasing canal.

Opportunities

Several key elements that can be integrated into the conceptual and refined plans as potential opportunities include:

- Ecological restoration of the canal
- Spaces for community involvement including education, recreation, leisure, and local events
- A wide path suitable for a range of visitors
- Strong connecting points at 20th Street and Ashbury Avenue, and an area for visitors to be able to rest before continuing along the trail

There are two large vacant lots between Ashbury Avenue and Short Street that provide a great opportunity to implement informative areas about environmental issues, such as how to improve the quality of water flowing throughout the canal. Each of these elements provide opportunities that are incorporate into the following conceptual plans.

Conceptual Diagrams

The two conceptual diagrams include the same programmable components, with a few exceptions, but the locations of these components varies in each concept.

The first concept is designed to make water management education the primary focus for the site. The main area for this focus is found near Ashbury Avenue (Figure 4.1.20). In this area, there are wetlands and an educational plaza where community members and visitors alike can be informed about the benefits of creating a clean and efficient water system. The trail in this concept strays off of the straight canal into the proposed wetlands so visitors may visualize how the filtration system functions. Other aspects of this concept include a leisure lawn, a food truck plaza on Lothbury Avenue, a green walkway, and a rest area for trail users.

The second concept is also concerned with water management but the main focus here is to create large recreational and community oriented spaces for users (Figure 4.1.21). A few ideas for these community spaces include an event plaza along Lothbury Avenue and two large recreational lawns between Ashbury Avenue and Short Street. The event plaza can host any number of events from birthday parties to a weekly farmers market. While there are many vacant lots surrounding the canal, not many of them provide enough space to construct large, attractive areas. Therefore, the proposed recreational lawns would make up for the lack of green space in the area. These

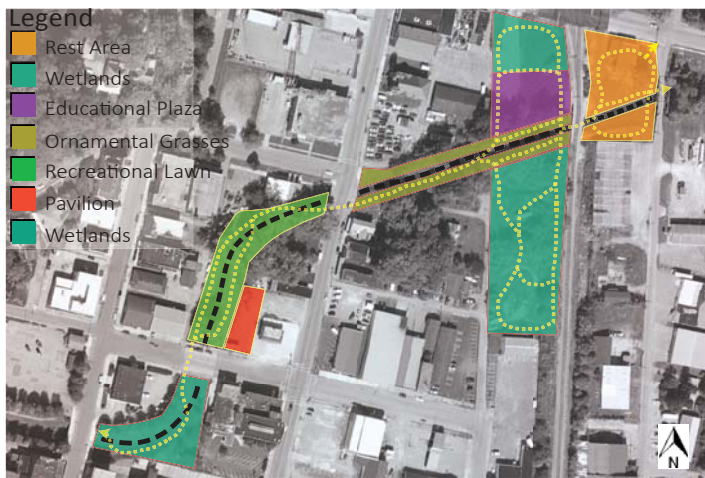


Figure 4.1.20 Conceptual Diagram 1

lawns provide enough space for picnicking, exercise groups, weekend leisure, and any number of recreational activities. Since these lawns run along the existing railroad and children may be playing here, safety buffers are proposed.

A new entry to the canal via 19th Street behind Jeff’s Pharmacy is also presented. This new entrance will attract more pedestrians who are traveling along Cumberland Avenue and will make the Link a more noticeable area of interest (Figure 4.1.21).

Refined Plan

The refined plan (Figure 4.1.22) showcases the importance of this part of the proposed Canal Walk. This area is a vital component to the success of the trail because it provides key connection points between downtown and the rest of the walk.

This section of the trail breaks away from the initial geometric design that is seen in the Entrance of the Canal and begins to follow the curves of the canal with a free form pathway throughout. This design proposes widening the path to a consistent 8 feet in order for pedestrians and cyclists to use the trail at the same time with ease. The Link is meant to be a more natural space that will provide a sense of relaxation for all who travel along it. The refined plan provides areas for both educational and recreational activities with the implementation of a detention basin, wetlands, and areas for events more oriented to community activities.

In order to get the community more involved with the design, the path does not stray away from the water. Visitors may have an up-close or personal experience with the canal while walking, running, or biking along the Link. There are some portions along the way where the pathway traverses over sections of the water to bring people even closer to nature.

Continuing from the Entrance of the Canal, the Link section begins at 20th Street and bends its way around Lothbury Avenue. Along this bend there is a proposed picnic area as well



Figure 4.1.21 Conceptual Diagram 2

as a new entryway to the canal from 19th Street. This section is the perfect spot for the Link to begin due to its proximity to Cumberland Avenue and it helps visitors become immediately intimate with the canal. The picnic area provides a nice green space to pass through or stop at before beginning the trail if people are not coming from the entrance closer to downtown.

The trail continues over the Lothbury Avenue bridge to the other side where it then crosses over the water. This portion of the canal has been restored as a wetlands area so the water flowing through may be better filtered and cleaned. The canal is proposed to be widened and deepened by about six feet (actual size to be determined later) along this stretch in order to accommodate a small detention basin to slow down the flow of the water and hopefully become home to new aquatic wildlife.

Also, just off Lothbury Avenue there is an old railcar that will be restored and the lot where it sits converted into a pavilion area large enough for a variety of community events. The trail passes right below this new pavilion area and then bends its way back across the canal and detention basin where people may stop and observe the fresh water and its surrounding environment (Figure 4.1.23).



Figure 4.1.23 Lothbury Avenue Pavilion

Once the trail reaches the 19th Avenue bridge, travelers may either go under or over the bridge in order to continue along the canal. This stretch of the site between 19th Avenue and the existing railroad will let the visitor truly be in touch with nature, as this section is surrounded with various ornamental grasses along with two elongated wetlands. The trail winds its way through these tall grasses as well as the wetlands so that those on the trail are completely immersed in the natural environment. There will be plaques along the wetlands walkway explaining the purpose of the aquatic grasses.

The Link features educational areas, such as a detention basin and wetlands, where visitors may be informed about water management practices. Along with the aquatic aspect of the site, there is a pavilion area and a large recreational lawn which will be used for community events and leisure activities. There is a rest area for visitors that will feature restrooms and informational maps before the connection is made to the Sports Park. The Link will provide a peaceful respite before continuing on with the rest of the canal walk.

Key:

- A New Entrance to Canal Walk
- B Picnic Area
- C The Lothbury Pavilion
- D Detention Basin
- E Recreational Lawn
- F Ornamental Grass Walk
- G Wetlands
- H Rest Area
- I Connection to Sports Park

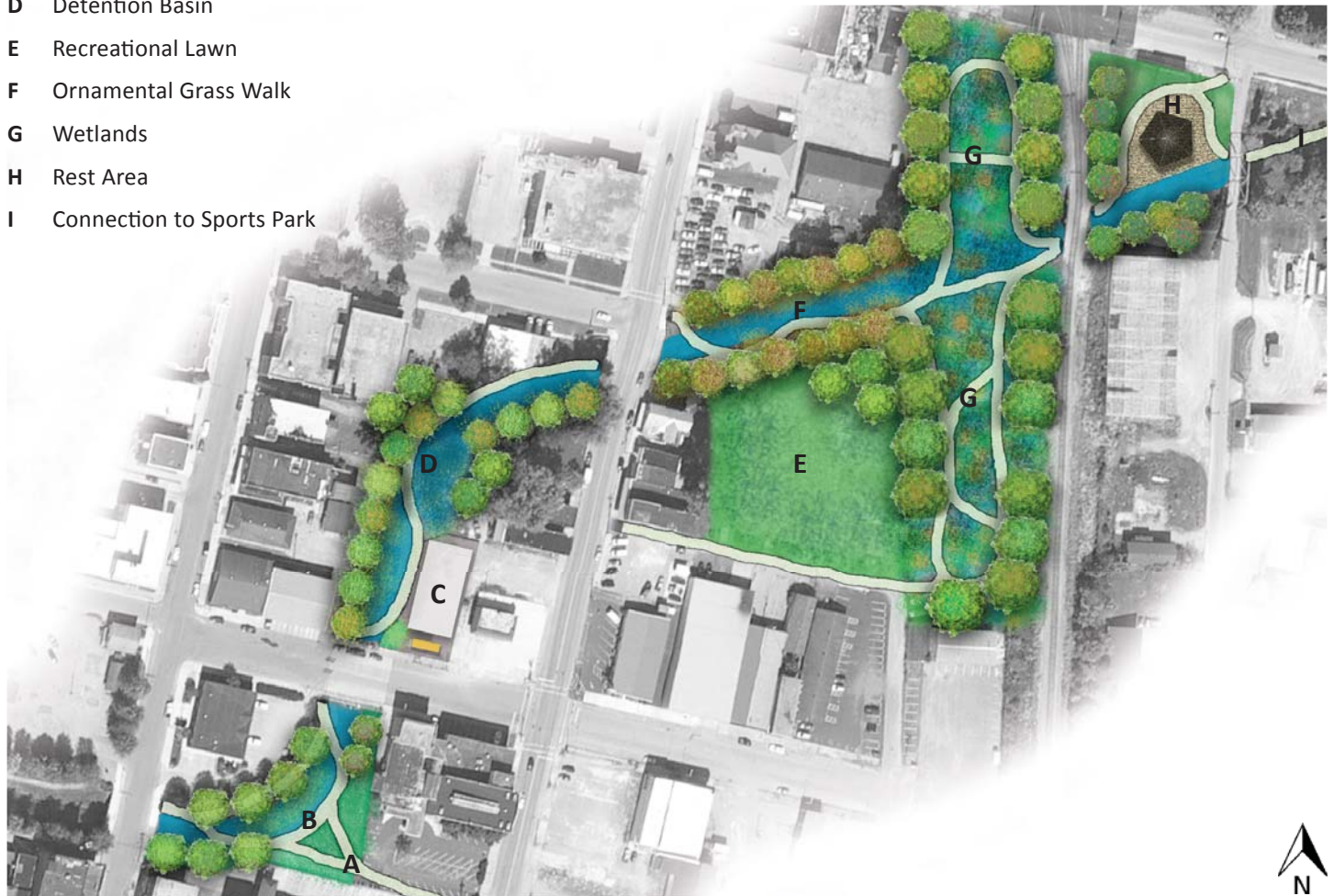


Figure 4.1.22 The Link Refined Plan

Design Focus: Sports Park

Context

As the largest tract of open greenspace in downtown Middlesboro, the Sports Park has much potential and will be an anchor for the Canal Walk. The area is bisected by Ashbury Avenue and is bordered to the east by Fitzpatrick Avenue, to the west by 15th Street, and to the south by Lothbury Avenue. With its geographic location within Middlesboro and the presence of regional trails in the Cumberland Gap National Historical Park, the Sports Park has the potential to be the anchor that ties the local and regional areas together.

Challenges/Issues

The existing features on the site are a deteriorating playground, basketball court, volleyball court, baseball field, and an old school building. The school boundary disconnects the space from the rest of the area with a chain link fence. The Canal Walk trail that encircles the baseball field has no connection point and leaves the user without a clear direction to travel. Lothbury Avenue bisects the site and adds to the emptiness of Sports Park (Figure 4.1.24).

The deteriorating playground, basketball, and volleyball courts portray the area as one that is desolate and less used (Figure 4.1.25). The site must be better maintained to attract the intended user groups.

The existing baseball field is positioned in a way that prevents the use of a large portion of the northern end of the Sports Park. This orientation discourages groups apart from baseball teams from using the site.

The southern portion, the old school yard, of the Sports Park contains a chain link fence that gives a sense of trespass and makes the user feel unwelcome. Currently the site offers no direct connection to Cumberland Avenue; the user must use the existing Canal Walk path (Figure 4.1.26).

Opportunities

On March 1, 2014, community members expressed their vision for the Sports Park. The Sports Park will showcase what Middlesboro is attempting to become, a well connected healthy community. The vision expressed by the community can happen if the Sports Park takes advantage of the following opportunities:

- Alternate connection to Cumberland Avenue
- Connect to Intense Fitness on Lothbury Avenue
- Reuse the old school building and grounds
- Connect/acknowledge the historic Boone Trace
- Create the largest public open greenspace in downtown Middlesboro



Figure 4.1.24 Current condition of Lothbury Avenue



Figure 4.1.25 Current playground and basketball court



Figure 4.1.26 Existing school yard and overgrown drainage ditch

Conceptual Diagram

Three conceptual diagrams were created to showcase the spatial arrangement of various programmatic elements (Figure 4.1.27, 4.1.28, and 4.1.29). Each diagram addresses the challenges and issues presented in the previous section.

Each idea consists of the following elements: trailhead, public arboretum, CSA organic farm, athletic fields, parcourse, picnic area, Complete Street, community garden, and nature center/trail information center/organic grocery store.

All three concepts connect the Sports Park to the surrounding areas which include: Cumberland Avenue, Intense Fitness, the Daniel Boone Connection, the Link, and most importantly, the historic Boone Trace that joins the Sports Park at the trail head. Each concept relates to the adjacent spaces differently and will give the user a completely different experience. After careful deliberation we refined concept 3 (Figure 4.1.29). Concept 3 uses the existing space most effectively and enhances the quality of adjacent spaces.

Refined Plan

The refined plan represents a vision for the Sports Park. The plan can inspire the community and visitors to be active through the park's various programmatic elements (Figure 4.1.30). The Sports Park continues the naturalistic theme for the Canal Walk. The free flowing network of trails provides users with multiple options for travel and connections to adjacent features, like Intense Fitness. The approximately 35 acre tract of land could be the largest public greenspace in downtown Middlesboro. Elements within the Sports Park are for all age groups and physical abilities.

The 8' asphalt path continues from the Entrance to the Canal Walk from Cumberland Avenue and 22nd Street to the Greenway connection point (Discover Downtwon Middlesboro, 2013). A continuous trail and consistent signage are the first steps to providing a unified Canal Walk. Features like the parcourse and Complete Street implementation will take shape once the Canal Walk is unified.

A vital component of the Sports Park is the connection to Cumberland Avenue. The trail segment runs along a revitalized drainage area and the proposed public arboretum. This connection will provide users with a beautiful short cut to the downtown, further improving the trail connection in Middlesboro (Figure 4.1.31).

Lighting features along the trail will extend the usable hours of the Canal Walk (Figure 4.1.32). Lighting increases safety and creates various aesthetic effects during the night.

The Sports Park is a safe and enjoyable place for Middlesboro. The park accommodates multiple user groups with the programmatic elements. The implementation of these ideas will benefit the entire community and help Middlesboro achieve their goal of becoming a tri-state trail hub.

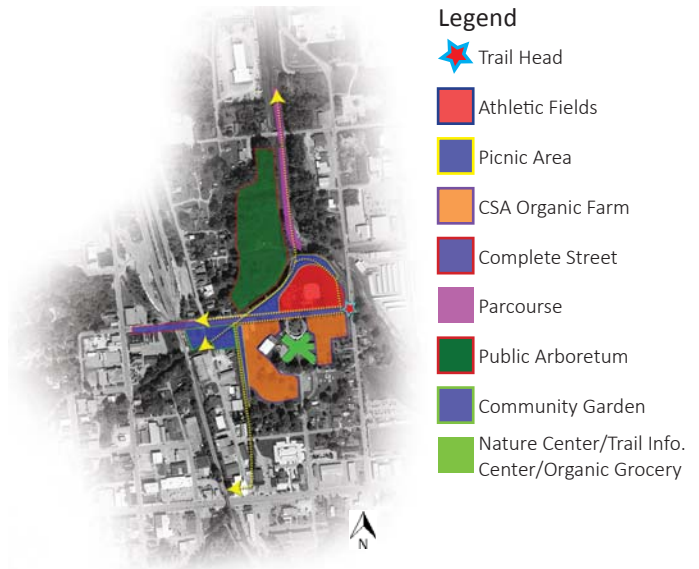


Figure 4.1.27 Conceptual Diagram 1

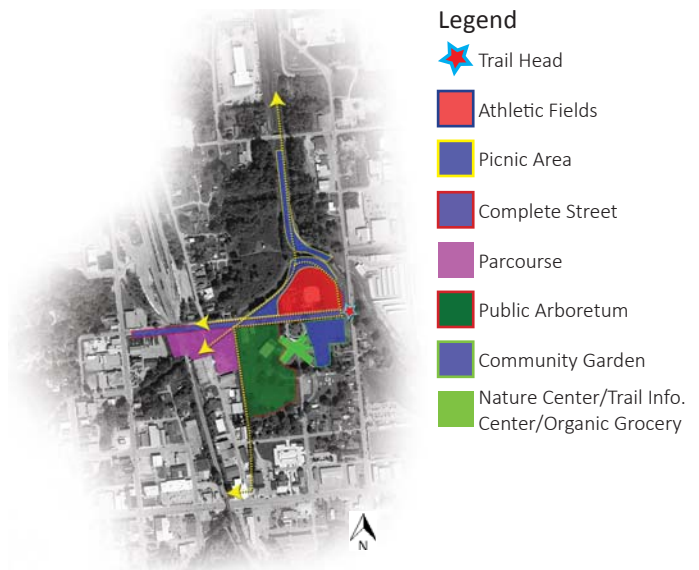


Figure 4.1.28 Conceptual Diagram 2

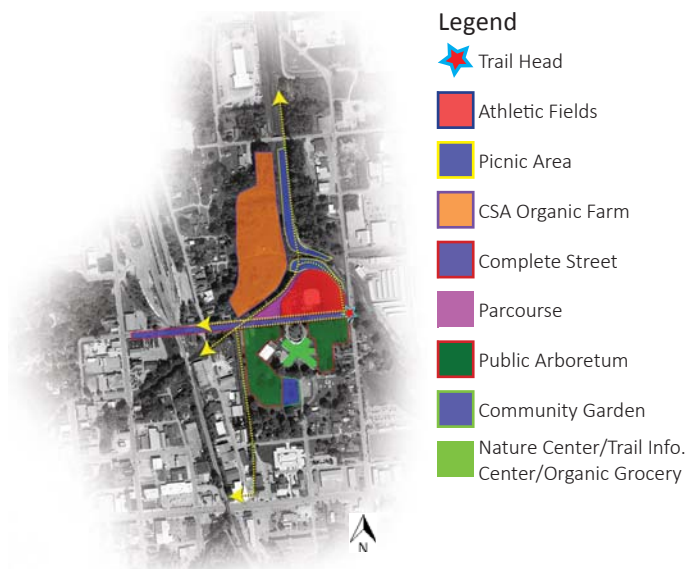


Figure 4.1.29: Conceptual Diagram 3

Key:

- A The Daniel Boone Connection
- B Bridge
- C Picnic Area
- D CSA Organic Farm
- E Athletic Fields
- F Parcourse
- G Trail Head/Boone Trace Connection
- H Complete Street
- I Public Arboretum
- J Connection to Cumberland Avenue
- K Community Garden
- L Information Center/Organic Grocery



Figure 4.1.30 Sports Park Refined Plan



Figure 4.1.31 Cumberland Avenue connection



Figure 4.1.32 Walking trail around athletic fields

Design Focus: The Daniel Boone Connection

Context

The Daniel Boone Connection site stretches from the Sports Park site to where the canal connects with the Yellow Creek and the proposed Greenway. The primary focus of the design plan is the triangular piece of property located between 15th Street and Canterbury Avenue. This location is a focal point for the Canal Walk because of its proximity to a large number of commercial and industrial areas. This area has the ability to become another place Middlesboro can be proud of, as well as a key destination for visitors utilizing the proposed trail system.

Challenges/Issues

Currently, the Daniel Boone Connection point of the Canal Walk offers little to the community of Middlesboro in terms of enhancing the overall quality of the town. The site is uninviting and discourages people from visiting the location, despite the existing horseshoe pits. This can be attributed to a number of factors.

The absence of a pedestrian or cyclist path leading into the area from downtown and presence of nearby commercial facilities presents a problem of accessibility (Figure 4.1.33). In order to take advantage of this public greenspace, one is forced to either drive to the area or walk along 15th Street, which is a busy road without sidewalks. The general isolation of this site holds it back from reaching its full potential as a public greenspace.

The only known patrons of the site are those who utilize the existing horseshoe pits. These users have expressed concern about the lack of shade on the site (Figure 4.1.34). In the hot summer and afternoon sun, this area is very unpleasant to be in. The lack of shade may also be a factor as to why there is little to no leisure activity performed here.

The lack of a natural buffer also presents a problem for the overall aesthetic appeal of the vicinity. There is a heavy industrial setting surrounding the site, making the area around the Daniel Boone Connection unsightly. One is exposed to the unpleasant views of aluminum siding and the backsides of large retail facilities instead of enjoying the natural backdrop of the distant mountains. In addition, this existing portion of the canal is polluted with a detestable amount of garbage, including shopping carts.

Opportunities

The Daniel Boone Connection is rich with historical significance. As a part of the Boone Trace Trail, this connection has the opportunity to become a momentous public greenspace for the community. However, the success of this park is dependent on the quality of the proposed site design, as well as the programmable elements incorporated into the site.



Figure 4.1.33 Existing site conditions looking towards the Sports Park



Figure 4.1.34 Existing site conditions of the greenspace

Conceptual Diagrams

The three conceptual diagrams of the site reflect the same programmable elements, but they are arranged differently throughout the site. Each alternative design creates a different feel and layout for the site. The programmatic elements include an event space, a picnic area that relocates the existing horseshoe pits, fitness stations, ecological restoration zones, and parking.

The first concept explores the possibility of the picnic and horseshoe pits being the focal point of the park, by making it the largest space (Figure 4.1.35). The event space is centralized in this concept and parking is placed on the north end. This diagram integrates the fitness course along the canal so those who are devoted to a hard workout can enjoy the canal but remain separate from those who are using the park for more leisurely activities. The path in this concept curves around to meet up with 15th Street, instead of following along the canal on the south side of the site.

The second concept places an emphasis on physical fitness as well as the canal's water quality (Figure 4.1.36). The fitness stations become the most important points in this concept so they span throughout the entire length of the park. With the



Figure 4.1.35 Conceptual Diagram 1



Figure 4.1.36 Conceptual Diagram 2



Figure 4.1.37 Conceptual Diagram 3

event space, picnic area, and parking placed along 15th Street, the canal becomes a tranquil and peaceful scene. Ecological practices have adapted more space along the canal bank. With the ecological expansion, there is a greater chance of improving the physical quality of the site and the canal as it continues down the Little Yellow Creek. The path in this design continues along the canal instead of running along 15th Street, in order to create continuity and a harmonious experience along the water and up to the Greenway connection.

The third concept was chosen as the best design solution as it illustrates a balance between all of the components. This conceptual diagram was considered to be the most suitable design option based on its layout of elements (Figure 4.1.37).

Refined Plan (Figure 4.1.38)

As a part of the Boone Trace and the proposed trail system of Middlesboro, the Daniel Boone Connection has the potential to become a great addition to the community. Not only can it serve as a pivotal stopping point for those traveling the outer loop trail, but it has the ability to become a destination location for residents and visitors alike.

The refined plan continues the overall theme of the Canal Walk of improving the physical quality of Middlesboro and bettering the bodies and minds of its citizens by incorporating new elements into the design. The design allows for easy access to the water via simple circulation throughout the site. The pathways break from the geometric forms found along the Canal Walk in the downtown area, and take on curvilinear forms.

In order to create a vibrant and active waterfront, the path has been widened to 18 feet wide along the Canal Walk, increasing pedestrian and cyclist flow. Farmers markets, small festivals and fishing competitions, among other events, can take place on this widened walkway along the canal. Simple shaded seating was added alongside the canal in order to take advantage of the view of the water and serve as a resting point for trail users. Large deciduous trees will shade those spending an afternoon relaxing by the canal and offer protection from the sun.

A vegetative buffer will be added along the sides of the canal to mitigate water runoff and filter the water as it flows into the canal. Common rush, *Juncus effusus*, is an example of a plant that can help purify the water runoff. Such plants remove harmful bacteria from the water such as *E. coli* and *Salmonella*, as well as help eliminate heavy metals like copper, nickel and zinc (Raine, 2014). The west side of the canal will be heavily vegetated with a variety of plant species, creating visual appeal and blocking out the back side of the adjacent industrial facilities. This will also create a microenvironment for amphibians, reptiles, small mammals, and birds. Informational signage will be implemented around the canal describing the efforts and purposes of the purifying aquatic plants and the microenvironment.



Figure 4.1.38 The Daniel Boone Connection Park

The event area can be used for concerts, fitness classes, and leisure activity. This space consists of amphitheater style seating which is placed into the landscape. This was done to allow optimal viewing opportunities to the stage for those attending events. The space is placed far enough from the excitement of the Canal Walk and 15th Street to allow users partaking in activities like fitness classes to maintain their focus. The centralization of the amphitheater within the park allows bystanders to have a constant view of the event space, encouraging them to join in the activities as well. The space invites park patrons to engage in social interactions as well as provide a place for the community to get involved in physical recreation (A in Figure 4.1.38).

The picnic area, located just south of the amphitheater will be equipped with picnic tables and grills. This area can be used by large groups. Trail users can stop here for a rest on their way around the loop. Others may come to the area for an afternoon picnic, using the site as a destination point. Employees of nearby retail and industrial facilities can come to the picnic area on lunch breaks and to relax. The picnic area also reintegrates two horseshoe pits which currently exist on the site. Incorporation of large deciduous trees will give players shade and comfort (C in Figure 4.1.36).

The fitness stations will be continued from the Sports Park, located south of the Daniel Boone Connection. They will be

located throughout this park and follow the outer extents of the site near the road. By moving the stations away from the canal, this will allow people to take advantage of the stations with fewer interruptions from other park users and maintain focus on their physical training. The stations will be located an appropriate distance from the road and behind a vegetative buffer to ensure safety (B in Figure 4.1.38).



Figure 4.1.39 Event Space



Figure 4.2.1 Little Sugar Creek Greenway (Source: Land Design, 2003)

Project Name **Little Sugar Creek Greenway (LSCGW)**

Location
Mecklenburg County, NC (USA)

Date Designed
Master Plan Undertaken in 2002

Construction Completed
First sections completed 2012

Construction Cost
Budgeted \$43 Million

Landscape Architect
Land Design, Inc. (Design Studios West, HDR Engineering, HARP, Polk Communications)

Developer | Client
Mecklenburg County Parks and Recreation

Manager
Mecklenburg County Parks and Recreation

Introduction

Little Sugar Creek Greenway is located in Mecklenburg County, North Carolina, within the Catawba Watershed (Figure 4.2.2). According to the US Census Bureau, Mecklenburg County's 2013 estimated population is 990,977 which makes it the most populous county in North Carolina (US Census Bureau, 2013b). Within Mecklenburg lies the 17th most populous city in the United States, Charlotte, NC; the population is 775,202 (US Census Bureau, 2013a).

Little Sugar Creek Greenway extends from Toby Creek Greenway on North Tryon Street to Cordelia Park just north of uptown and continues through the urban section of Charlotte and on to the South Carolina state line. The greenway will feature over 15 miles of trails, habitats, and flowing water (Land Design, 2003a).

Little Sugar Creek has a history that directly reflects the urbanization of Charlotte and Mecklenburg County. The population and economy of the city rapidly grew with the arrival of the Charlotte and South Carolina Railroad from Charleston in 1852. Cotton mills were soon constructed along the banks of Little Sugar Creek, the first being Alpha Mill, coming in 1889.

As the city continued to grow much of the developed land occurred in Little Sugar Creek's floodplain, consequently the creek was dredged in 1911 and which transformed the once natural creek into a canal. As a result, "Little Sugar Creek began

Analysis

Context

The Little Sugar Creek Greenway is well connected at both the regional and local level. It is a contributor to a large trail network called the Carolina Thread Trail or the Thread. The Thread reaches 15 counties, 2 states and 2.3 million people, with 1,500 miles of trail (Mecklenburg County Government, 2014). At a local level, Little Sugar Creek Greenway is composed of seven “segments” or “reaches,” each of which serves an emerging or historic neighborhood, specialty commercial or retail area (Land Design, 2003b). Each segment is focused on the creek’s unique characteristics and constraints in certain areas based on its morphology, adjacent land use patterns and road separations. The seven segments that were outlined by the public in the early stages of planning are as follows:

- Cordella Park to 10th Street
- 10th Street to Morehead Street
- Morehead Street to Princeton Avenue
- Princeton Avenue to Archdale Drive
- Archdale Drive to I-485
- I-485 to Polk Street
- Polk Street to NC/SC State Line (Land Design, 2003)



Figure 4.2.3 Uncovering of Little Sugar Creek in 2002 (Source: Land Design, 2003a)



Regional Context Map

Figure 4.2.2 Little Sugar Creek Greenway Context (Source: LSC Master Plan Inventory)

to be seen as a stinky, dirty nuisance due to sewage dumping, storm runoff, and the upset of the natural balance.” After expansions to roadways and construction of the Charlottetown Mall, Little Sugar Creek was covered and channelized and was forgotten until the 1960’s and 70’s (Land Design, 2003a) (Figure 4.2.3).

Charlotte’s Greenway Movement began in the 60’s and 70’s, and had a vision of creating public greenspaces along the creek. Several steps had to be taken before the Little Sugar Creek Greenway could become the attraction it is today. It was not until 1988 when the Mecklenburg County Department of Environmental Protection initiated and led the first serious discussions of watershed protection in the community. By 1996, the SWIM Program was created and helped Charlotte/Mecklenburg to have one of the most advanced stormwater management programs in the region. Then in 2002, the Little Sugar Creek Master Plan was undertaken by the Mecklenburg County Parks and Recreation Department to help revitalize Little Sugar Creek which had the worst water quality in the state (Land Design, 2003a).

Site Limitations

Mecklenburg County Parks and Recreation ran into several limiting factors when planning the greenway. Some of the issues are as follows (Land Design, 2003a):

Environmental Issues

- Flooding potential
- Preserving native plant communities
- Conserving environmental conservation areas
- Blending the urban and natural environment
- Restoring the creek as a natural feature
- Improving the water quality

Connection Issues

- Acquisition of land around Little Spring Creek (much of the land was privately owned)
- Trying to connect to adjacent neighborhoods

Visibility

- Hidden by commercial buildings
- Lacked uniform signage to inform/educate the public



Figure 4.2.4 Greenway section between Morehead Street and Brandywine Road (Source: Charmeck.org, 2014)

Design & Development

The Little Sugar Creek Greenway Master Plan outlined specific project goals and objectives. These goals were refined through public engagement and are as follows (Land Design, 2003a):

Environmental

- Protect floodplain lands and encourage the restoration of the natural hydrological section and biodiversity of the creek to promote improved water quality

Recreational

- Create a continuous trail system with multiple destinations including multi-modal and regional connections that provide a safe and attractive experience, and create opportunities for social interaction

Neighborhoods and Community Building

- Provide connections from the greenway for adjoining neighborhoods and civic areas. Reinforce the identity of neighborhoods by incorporating public art, recognizing local history, and creating landmark open spaces

Economical

- Existing and newly developing land uses- residential, commercial, and civic should benefit from adjacency to the greenways aesthetic, recreational, and cultural benefits

Educational

- Promote long-term involvement of citizens in the planning, design, implementation, and management of the greenway. Encourage the understanding of natural systems related to the creek, the history, and cultural resources

Implementation

- Implement the greenway master plan within ten years by encouraging public/private partnerships and community participation

Criticisms & Lessons Learned

The Little Sugar Creek Greenway has proved to be successful due to public involvement. Public workshops were conducted in order to determine the communities' highest priorities for the greenway. The information gathered helped guide the particular components for each "segment" or "reach."

Conclusion

Future Plans & Opportunities

Mecklenburg County Parks and Recreation is continuously trying to improve the Little Sugar Creek Greenway. The Greenway was recently expanded to include an urban section, connecting Morehead Street to East Seventh Street. As of 2012, the trail offers four completed sections out of the seven outlined (TrailLink, 2014):

- Cordelia Park to 12th Street
- East 7th Street to Morehead Street
- Morehead Street to Brandywine Road (Figure 4.2.4)
- Huntingtowne Farms Park

Mecklenburg County Parks and Recreation plans to expand the remaining 150 miles of greenway to connect Toby Creek Greenway, in the area near UNC Charlotte, to the South Carolina State line (Ford, 2012).

Mecklenburg County Parks and Recreation created a well organized chain of command and a detailed strategic plan from the start of the LSCGW system (Figure 4.2.5).

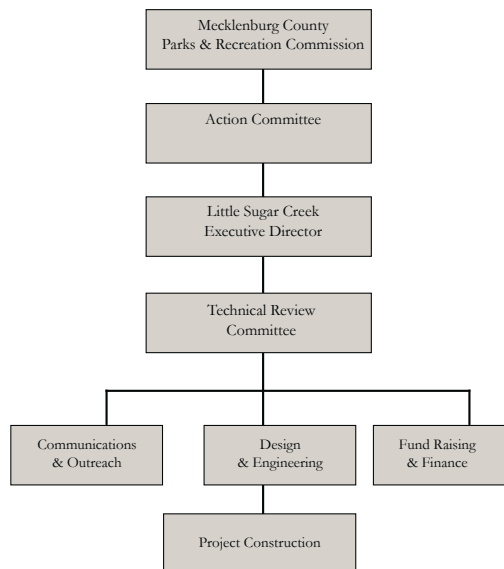


Figure 4.2.5 LSCGW Organization (Source: LSCGW Executive Summary)

Relevance to Middlesboro

Although the scale of context is different, the Little Sugar Creek Greenway project models a great foundation for future greenway/trail projects for cities regardless of size. Middlesboro can benefit from four key elements from the LSCGW project:

- Set up a strategic plan and detailed organization of roles and responsibilities
- Get the entire community involved from the start and listen to what they have to say
- Connect on a both a regional and local scale
- Start small but think big.

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Contacts

Name: Gwen Cook
 Professional Title: Greenway Planner
 Company: Mecklenburg County, NC
 Department of Parks and Recreation
 Phone: 704-432-1570
 Email:
 Webpage: <http://charmeck.org>



Figure 4.2.6 Pedestrian Bridge (Source: McHenry Riverwalk, 2012)

Project Name
McHenry Riverwalk

Location
McHenry, Illinois

Date Designed
Unknown

Construction Completed
Phase I: February 2006 - September 22, 2007
Phase II-IV: N/A

Construction Cost
Phase I: \$2,748,245.90 (as of 2007)

Landscape Architect
VOA Associates SEC Group, Inc

Developer | Client
City of McHenry

Manager
Alliance Contractors, Inc

Introduction

McHenry, Illinois, is home to around 27,000 people and is located 50 miles northwest of Chicago along the Fox River. It is a town surrounded by a few native lakes and streams, gravel banks, and several nutrient rich peat bogs (McHenry, 2014). McHenry has the distinction of being known as a small town but is located in one of the fastest growing counties in the state of Illinois. There are three prominent downtown areas that are abundant with history: Main Street, Green Street, and Riverside Drive. Each area has great opportunity for development and growth as each area is unique in its own way (Downtown Plan, n.d.).

The Fox River is the most notable native feature in the town and was in need of some restoration because it lacks connections to main areas in town. The river bisects the town and gives identity to the entire surrounding area, although only a handful of the townspeople have access to the river as most of it is privately owned (City of McHenry, n.d.). In order for more people to access the river the town has come up with five main goals for the Riverwalk development:

- Create a new image for McHenry
- Revitalize the three downtown areas
- Improve the residents quality of life
- Re-establish McHenry as the Gateway to the Chain-of-Lakes
- Provide the basis for many new development opportunities (City of McHenry, n.d.).

The Riverwalk is a small portion of the plans for Downtown McHenry but defines the city and provides beautiful features. There are various uses for the new Riverwalk such as community events and recreational areas. The area has unlimited potential for success once all of the residents have clear access to the waterfront. The city is going through an exciting growth period and the end result will bring the city new life and make it a destination town in the state of Illinois (City of McHenry, n.d.).

Design & Development

There are many opportunities that are present along the Riverwalk like parks, event plazas, and spaces for public boating. The design that has been proposed takes advantage of many of those opportunities. Major features are being proposed for the most important areas along the river and these new features are presented as follows in no particular order:



Figure 4.2.7 Master Plan of Riverwalk (Source: City of McHenry, n.d.)

Analysis

The proposed Riverwalk is about one mile long and runs from the Route 120 Boone Creek Bridge to Weber's Park. The path runs along the south bank of Boone Creek east to the Riverwalk Place Townhome development. Another prominent feature, a new pedestrian bridge was installed between 2006-2007 and connects the south bank of the creek to Riverside Drive (A in Figure 4.2.7). It is here where the path crosses to the north side of the creek and turns the corner to the west side of the Fox River. The walk proceeds north under both the Route 120 Bridge and the Pearl Street Bridge that span the river ending at Weber's Park (C and D in Figure 4.2.7) with a proposed water feature (City of McHenry, n.d.).

The project is broken up into three zones: Historic, Residential, and Commercial. The Residential Zone is Phase I and is the only section that is currently completed. The entire project has been split up into five phases, where Phase I was completed in 2007 and the other phases are to undergo construction with the redevelopment of the downtown districts, because the Riverwalk relies on TIF (Tax Increment Financing) revenue to fund the project (City of McHenry, n.d.). TIF means that further construction will not continue until there is enough public funding accumulated from economic tax revenue (Downtown Plan, n.d.).

Miller's Point/The Point (Figures 4.2.7 [B] & IV)

(this area lies at the intersection of Boone Creek and Fox River)

- Three large gazebos
- Grand pavilion of brick pavers
- Large space that is suited for any number of large events the town wants to have
- Public and private boat docks (City of McHenry, n.d.)

Riverwalk Pearl St. (Figures 4.2.7 [C] & V)

- Re-use of old Pearl St. Bridge to connect to municipal parking lot on north side of the Boone Creek
- Water will cascade over the terrain and boulders on the embankment (City of McHenry, n.d.)

Riverside Dr. Pedestrian Bridge (Figures 4.2.7 [A] & VI)

- Connects the townhomes to Riverside Dr. or the Residential Zone to the Commercial Zone
- Allows residents to maintain sightlines to the river
- Bottom of the bridge is 10 feet above the water level so boats may easily pass underneath to continue upstream (City of McHenry, n.d.)

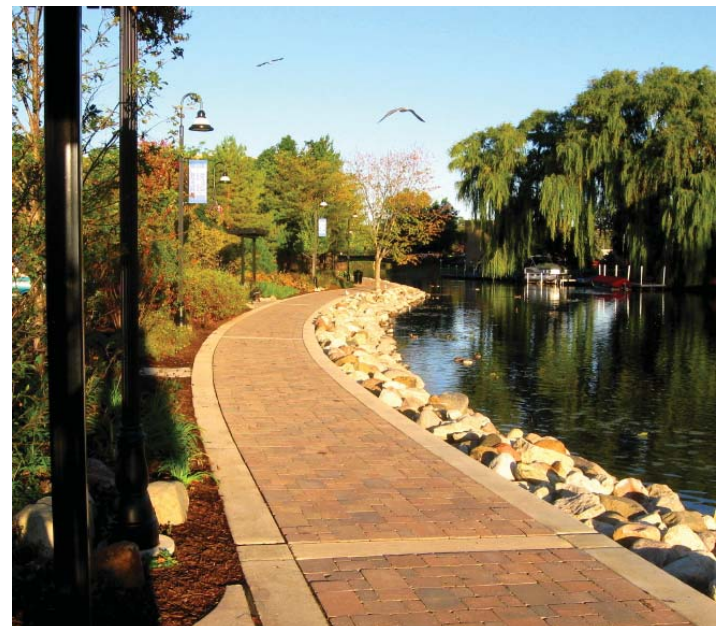


Figure 4.2.8 Riverwalk II (Source: McHenry Riverwalk, 2012)

Weber's Park (Figure 4.2.7 [D])

- Features a zero-depth water feature at the entrance of the site that uses lights and squirts water from the ground for children to play in
- New entryway with short brick wall that will distinguish the park and prevent children from going into the street while playing
- New restroom facility and pathway toward entrance of site
- Private and public boat docks
- Large stacked stones will be placed along the water to increase accessibility for visitors and they will provide a defined edge because there currently is not a clear border (City of McHenry, n.d.)



Figure 4.2.9 Miller's Point (Source: City of McHenry, n.d.)



Figure 4.2.10 Pearl Street Riverwalk (Source: City of McHenry, n.d.)

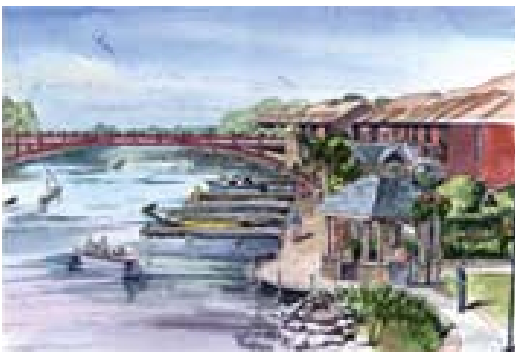


Figure 4.2.11 Pedestrian Bridge (Source: City of McHenry, n.d.)



Figure 4.2.12 Riverwalk (Source: McHenry Riverwalk, 2012)

Criticisms & Lessons Learned

Trkla, Pettigrew, Allen & Payne, Inc., conducted multiple interviews using the *Key Person Interview Process* to identify and dissect the concerns and criticisms regarding the Downtown McHenry planning process (Downtown Plan, n.d.). A few of these concerns that are directly relatable to the plans for the Riverwalk include connectivity throughout the downtown area and to the river, as well as the aesthetics and overall circulation throughout the area. Most of the concerns were addressed in the overall goals list as stated previously. The addition of pedestrian bridges, new walkways, and natural elements make for safe and pleasant walking routes downtown and, more importantly, along the waterfront of Fox River and Boone Creek. Upon completion of the Riverwalk, the city will be given a great economic boost and will be a tourism destination for many visitors from across the United States (Downtown Plan, n.d.).

Conclusion

Future Plans & Opportunities

This project is spread out over five phases with only one that has been completed thus far. The City of McHenry says the Riverwalk will offer a number of unique redevelopment opportunities. Construction of phase was finished in 2007. The construction of future phases is tied to the redevelopment in the downtown districts, as the Riverwalk relies on TIF revenue to fund the project. One phase of the Riverwalk that has unlimited potential is the current site of the Central Wastewater Treatment Plant. The city council made the commitment to abandon the plant and shift capacity to another plant by 2010 and this commitment has been brought up in recent years but has not been honored yet (Coleman, 2014). This peninsula offers some of the best views along the river (Downtown Plan, n.d.).

Relevance to Middlesboro

One main goal for the McHenry Riverwalk is to re-establish the city as a gateway to the Chain-of-Lakes in Northern Illinois. The Riverwalk planning efforts can be directly related to the current project in Middlesboro. The City of Middlesboro can become a Gateway to the Cumberland Gap National Historical Park once the proposed designs are implemented. Middlesboro and McHenry each have the potential to become very popular tourism hotspots in their respective regions with the completion of these projects.

The McHenry Riverwalk provides connecting points around the downtown area, which is very important for the success of the city. Relating to the connectivity issue in downtown McHenry, the Canal Walk can provide connection points to the heart of downtown Middlesboro and to the Greenway as well. The Middlesboro Canal Walk has the potential to be a destination trail in the region and could attract significant tourism. The layout of the McHenry Riverwalk is what makes it a successful and very functional design. The Canal Walk in Middlesboro must have strong connection points, destination areas, strong wayfinding elements, and smooth transitions between each part of the proposed trail for it to be a success.

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Contacts

Name: The City of McHenry
Address: 333 South Green Street, McHenry, Illinois 60050
Phone: 815.363.2100
Email: info@ci.mchenry.il.us
Website: <http://www.ci.mchenry.il.us/departments/downtown/riverwalk.html>



Figure 4.2.17 San Antonio River Walk - San Antonio (Source: <http://images.boomsbeat.com/data/images/full/40546/8-jpg.jpg>)

Project Name

The San Antonio River Walk

Location

San Antonio, Texas

Date Designed

The Museum Reach - May, 2009
 Downtown Section - October, 2002
 The Mission Reach - Under Construction
 The Eagleland Segment - Under Construction

Construction Cost

\$358.3 million

Landscape Architect

Robert. H.H. Hugman
 SWA Group
 Biohabitats, Inc
 PBS & J
 Economics Research Associates
 Sprinkle Robey Architects

Developer | Client

City of San Antonio

Construction Completed

[ongoing]

Manager

The San Antonio River Authority

Introduction

San Antonio, named after Saint Anthony of Padua, is a beautiful city. It is listed as the seventh most populous city in the United States and second most populous city in the state of Texas. The city is located in the mid-southern section, close to the Gulf of Mexico with a population of 1.3 million people and an area of 465.4 square miles. San Antonio serves as the seat of Bexar County and has a strong military presence. It is home to Fort Sam Houston, Lackland Air Force Base, Randolph Air Force Base, and Kelly Air Force Base. San Antonio is unique because of its Hispanic cultural background and the most beautiful walk - the River Walk of San Antonio (SARA, 2014).

The San Antonio River Walk, also known as Paseo del Rio, is a network of walkways along the banks of the San Antonio River, located beneath the streets of Downtown San Antonio, Texas. Around the River Walk, there are many bars, shops and restaurants that are culturally unique and it is an important part of the city's urban fabric as well as tourist attraction. According to the statistics, San Antonio River Walk is the second most visited tourist attraction in the City of San Antonio and is considered to be the most beautiful river walk in the United States (San Antonio Convention & Visitors Bureau, 2014). After the San Antonio Improvement Project, the River Walk became a mainly pedestrian street, one level down from the automobile street. The River Walk winds and loops under bridges as two parallel sidewalks lined with restaurant and shops, making it pleasant, safe, and convenient for pedestrians.

In the early 1700s, the Spanish Franciscans settled along the banks of the San Antonio River. Until the 1800s, the San Antonio River experienced flooding problems due to its geographic location, increasing population, and its related infrastructure developments that led to increasing rainfall runoff. In 1921 a sudden, hard rainfall over the Olmos Basin and the San Antonio River resulted in over 9 feet of water downstream, killed 50 people, and cost millions of dollars in damage. As a result and response to this incident, the City of San Antonio constructed the Olmos Dam in 1925 to control the flooding issue and also make improvements to the river walk. The Army Corps of Engineers recommended the channelization or straightening of the river to protect the city from flooding (D Cox, 2011).

The San Antonio River Improvements Projects is a 358.3 million dollar investment by Bexar County, the City of San Antonio, the U.S Army Corps of Engineers, the San Antonio River Authority and the San Antonio River Foundation. It includes flood control, amenities, ecosystem restoration and recreational improvements to the San Antonio River. The San Antonio River Authority serves as project manager for all sections and as a local sponsor (SARA, 2014).

The project site is divided into four sections. The project's northern section, the Museum Reach, extends approximately four miles from Hilderbrand at Brackenridge Park to Lexington Street. The urban segment of the Museum Reach extends approximately 1.5 miles from Lexington Street to Josephine Street and was opened in May, 2009. The Park Segment continues approximately 2 miles through Brackenridge Park up to Hilderbrand Avenue. The downtown section, completed in October 2002, extends from Houston Street to Lexington Avenue and includes the restored portions of the original San Antonio River Walk which was designed and influenced by Robert Hugman. The Eagleland Segment, from Alamo Street to Lone Star Boulevard, is the transitional segment between the downtown River Walk and Mission Reach. The project's southern section, the Mission Reach, extends approximately eight miles from South Alamo Street to Mission Espada just below Loop 410 (SARA, 2014).

Analysis

Context

The whole project extends over 20 miles within the city boundary and the River Walk section is in the middle of the project. The River Walk section is located in the center of the downtown area and extends only two miles. The famous Alamo and convention center are also located within the River Walk section. The River Walk is bordered on the sides by Highways 35 and 281. This means people traveling from the outer city have easy access to the River Walk (Figure 2).



Figure 4.2.18 Overall map of the River Walk - San Antonio (Source: San Antonio River Authority, 2014).

Site Limitations

Before the project was started there were several challenges to be considered in the design process. In the River Walk area, there was a declining population, lower educational levels, lower median income, and higher poverty levels when compared to data for the overall city. Compared to the city, this area earns nearly \$11,000 less than the city average -- \$30,630 vs \$41,593. Six percent of families citywide live below the poverty level while this area has a 5% overall poverty level or 21.2% of the total population. Most houses were built during the post WWII era and have a current median value of \$54,843 compared to San Antonio's average of \$113,988 (SWA Group et al., 2001).

Design & Development

Project Elements

There are several design elements included along the Downtown River Walk:

Street Connections to River

One of the desired design elements was to retain the interesting and unique situations where streets dead-end at the River, creating both visual and physical access to the river for the public. Parking structures shall provide clearly defined pedestrian access (City of San Antonio, 2011).

Planting

Along the River Walk, it was desirable to provide variety in the landscape experience along the river by varying landscape designs between properties. No more than 75% of the landscape materials, including plants, shall be the same as those on adjacent properties (City of San Antonio, 2011).

Paving

An important San Antonio landscape tradition is the use of decorative surfaces for paving and other landscape structures. Paving materials and patterns on the site are carefully chosen to preserve and enhance the pedestrian experience (City of San Antonio, 2011).

Materials

Along the River Walk, walls and fence materials may be constructed of: stone, block, tile, stucco, wrought iron, tubular steel, welded wire or a combination of masonry and metal, cedar posts and welded wire or garden loop or other materials having similar characteristics. All other properties, not abutting the river may use the above listed materials plus wood fencing (City of San Antonio, 2011).

Buffering and Screening

The manner in which screening and buffering elements are designed on a site greatly affects the character of the river districts. In general, parking and service areas should be screened or buffered. Buffers are considered to be landscaped berms, planters or planting beds; whereas, more solid screens include fences and walls. When site development creates an unavoidable negative visual impact on abutting properties or to the public right of way, it should be mitigated with a landscape design that will buffer or screen it (City of San Antonio, 2011).



Figure 4.2.19 River Walk underutilized - San Antonio (Source: B Hathorn, 2013)

Conclusion

Future Plan & Opportunities

The Downtown Reach was completed in 2002, however, the Mission Reach section is still in progress. In the future, the plan for the Mission Reach section is to attract more business development along the river.

Relevance to Middlesboro

In the San Antonio project, the existing land uses are mainly residential and commercial with some vacant parcels. Similar to the San Antonio River project, the Middlesboro's Canal Walk runs through commercial and residential uses. We can learn a lot of successful design and planning ideas from San Antonio River Improvement Project and apply them to Middlesboro.

One of the most important ideas we can learn from the San Antonio River Improvement Project is that it was split up into three phases and each phase implemented according to funding availability. In San Antonio, the ground breaking of Phase I occurred in 2008, Phase II started in 2010, and the third phase was begun in late 2010. This same phasing idea can be applied to the Middlesboro's canal design as well. The first phase can focus on solving the most critical problems that occur on the site. The second phase can focus on improving recreational areas (parks and public spaces), maintaining the ecosystem by introducing native plants, and erosion control. The last phase, if the budget is available, can expand on designs and provide additional facilities and public open space for pedestrians.

Even though San Antonio has a larger population and ethnic diversity, better funding organizations, and a longer experience with a river walk than Middlesboro, they share many similarities as well. Middlesboro can benefit from San Antonio's knowledge and experience in how they applied creative design solutions to solve problems and methods to use their funding wisely. In the future, Middlesboro will be a beautiful city and the Canal Walk could be one of the most pleasant experiences in Middlesboro and region.

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Contacts

Company: San Antonio River Authority
Address: 100 E Guenther St., San Antonio, TX 78204
Phone: 210-227-1373
Webpage: <https://www.sara-tx.org/>



Figure 4.2.20 Canal Park - Welland, Canada (Source: Neil Fox, Jeff McNeill, n.d.)

Project Name
Welland Recreational Waterway

Location
Welland, Canada

Date Designed
November, 2006

Construction Completed
2010

Construction Cost
N/A

Designer
Welland Recreational Canal Corporation

Developer | Client
City of Welland

Manager
Welland Recreational Canal Corporation

Introduction

The city of Welland in Ontario, Canada, has a population of just over 50,000, and spans nearly 50 square miles in size. Located between Lake Ontario and Lake Erie, the city was once an industrial and shipping hub. However, with gradual urban development, it has transitioned from an industrial town to a thriving and active community (The Corporation of The City of Welland, 2014).

In the 1970's the Welland Canal, which runs through the heart of the city, once served as the main thoroughfare for shipping barges until it was blocked off from commercial use. It was not until November 2006, that the Welland Recreational Waterway Master Plan was produced, and the space began transforming into a social hub for the town. The intention of this proposed canal plan was to “create an exciting, attractive, well-used and self-sustaining recreational waterway that is fully integrated into the fabric and life of the City of Welland” (Welland Recreational Canal Corporation, 2008, p. 2). This almost 1,000 acre project was derived from input given by the Councillors of the City of Welland, Welland Recreational Canal Corporation Board and staff, City of Welland staff, region-wide stakeholder groups and residents through interviews, workshops, community forums and individual submissions (Welland Recreational Canal Corporation, n.d).



Figure 4.2.21 Waterway Aerial
(Source: Welland Recreational Canal Corporation, n.d)

The Welland Recreational Waterway plan was based on the following seven objectives:

- Increase connectivity to, through, and across the Waterway
- Increase visibility of the Waterway
- Increase the quality of the Waterway’s natural environment
- Greatly increase the use of the Recreational Waterway
- Reflect and express the history and cultural identity of the City of Welland and the Watershed
- Ensure that the Recreational Waterway users and adjacent lands are mutually compatible by not allowing uses within the waterway to conflict with adjacent residents or businesses
- Be a catalyst for urban renewal and economic development

(Welland Recreational Canal Corporation, 2008, p. 8-10)

Analysis

The Welland Recreational Canal Corporation (WRCC) manages the Waterway, which is comprised of approximately 585 acres

of land, and 390 acres of water. Before the project was built in 2007, the WRCC analyzed a variety of factors surrounding the site including social, economic, and recreational elements, amongst others, in order to create a plan that would benefit the city as a whole. Prior to the Waterway, there was no clear connection between some of the most momentous attractions and focal points in downtown Welland. This created a disconnection in the community and a strain on economic development because of the inability for tourists and citizens to easily move through the city. Therefore, connectivity became one of the main objectives for the project (Welland Recreational Canal Corporation, 2008).

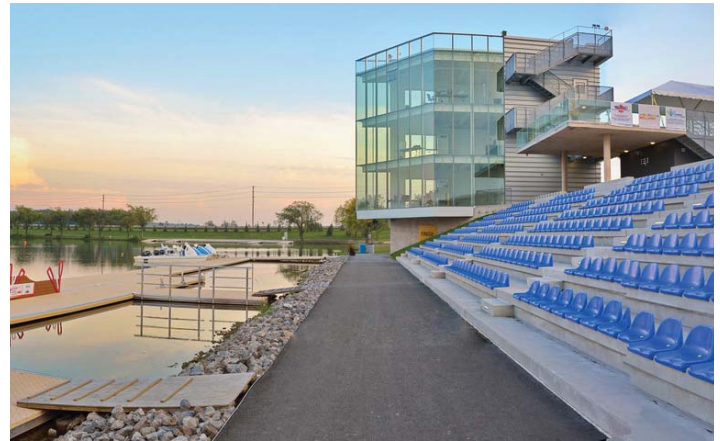


Figure 4.2.23 The Welland International Flatwater Center
(Source: Welland Recreational Canal Corporation, n.d)

Site Limitations

The limitations documented for the project were those of historical relevance. During the planning and construction of the project, it was important to be attentive to the historical elements of the waterway. Preserving the canal walls and locks, along with other components of the original canal, became dominant over any other design proposals. Welland is a community rich with industrial history, and preserving that history is what gives it charm (Welland Recreational Canal Corporation, 2008).



Figure 4.2.22 Vegetation Buffer Planted Along the Shoreline to Reduce Bank Erosion (Source: Welland Recreational Canal Corporation, n.d)

Design & Development

Project Elements

The Welland Recreational Waterway master plan divides the Waterway into eight distinct areas, each possessing unique qualities and components (Figure 4.2.24).

The most northern node is called Northern Reach, where a pedestrian and cyclist path has been installed, and begins a user's journey down the Welland Recreational Waterway. South of Northern Reach is Merritt Island, one of the highlights of the design. This site has incredible views and was kept as natural as possible, promoting a peaceful and tranquil atmosphere. Woodlandlawn Road Activity Node has become a place for tourism based development and a high profile event space. The Aqueduct Linkage consists of a narrow strip of land that runs alongside the canal. This area is predominantly dedicated to improving physical connections to adjacent areas, and serves as a canoe/kayak/small boat launch. The Downtown node serves to improve the aesthetic quality of the downtown, and connects the arts and culture elements from the Waterway to the downtown area. The Community Recreation Linkage encourages mixed use redevelopment and takes on the identity of the 'front door' to the Waterway. The Flatwater Sport Activity Node is an area where permanent structures have been established for rowing competitions and other water events. This is a large pedestrian traffic area and gets people integrated with the Waterway. The Southern Linkage has become a key area for recreational fishing due to the characteristics of this portion of the canal. It is dense with vegetation, provides shade, and is located just outside the heart of the city (Welland Recreational Canal Corporation, 2008).

Criticisms & Lessons Learned

The Welland Recreational Waterway has increased the community's social and physical involvement in the city, as well as promoted economical growth through tourism.

The Waterway has proven to be a pivotal element in the reconstruction of the canal. It has offered patrons continuity and consistency when traveling along to the eight different destination points. The arrangement of destination points and their proximity to each other allow for easy accessibility by foot and bike. They also allow an easy transition from one place to another within the city.

One recommendation for the WRCC would be to work on integrating some of the cultural elements seen along the Waterway into the downtown area, merging them seamlessly.

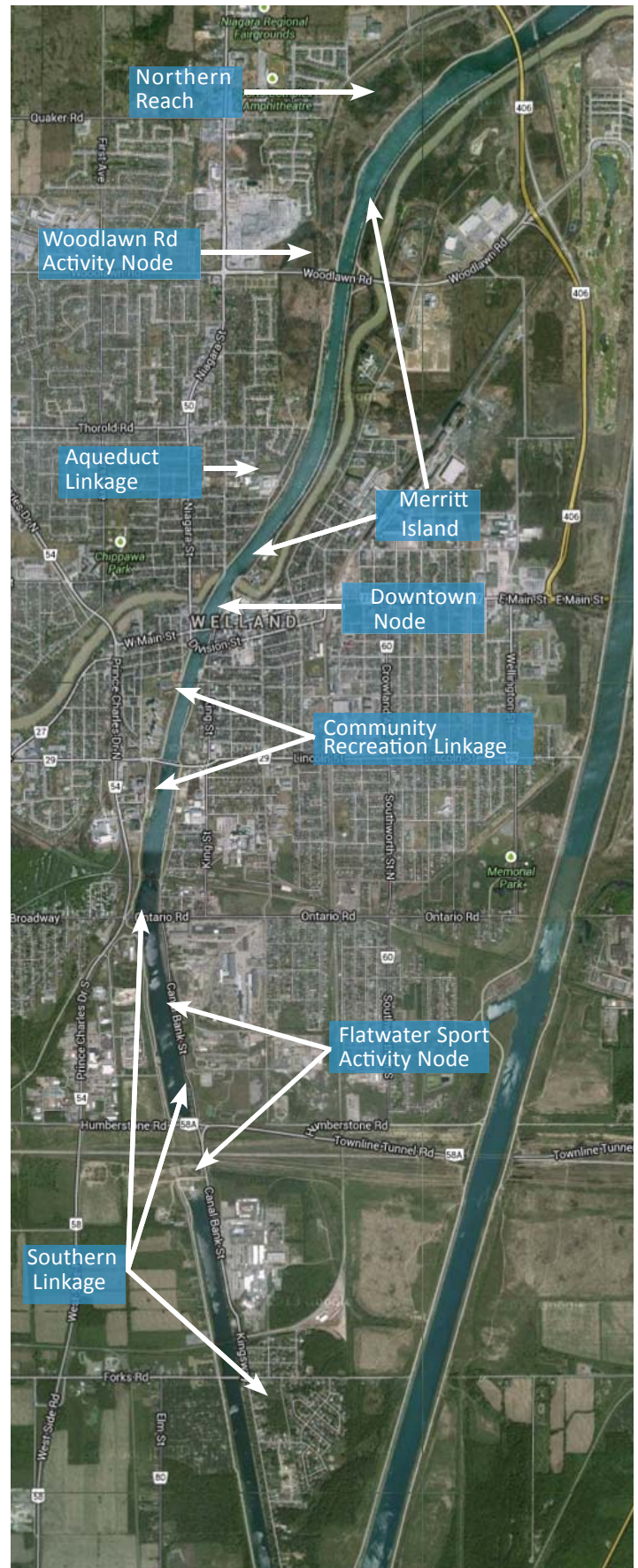


Figure 4.2.24 Waterway Nodes
(Source: Welland Recreational Canal Corporation, 2008)

Conclusion

Future Plans & Opportunities

As of today, the city of Welland's main focus is maintaining the already implemented Recreational Waterway. The Waterway, along with the community, has been very busy hosting a variety of national and international events, like the Pan American Games and the Rowing World Championships (Welland Recreational Canal Corporation, n.d).

Relevance to Middlesboro

Middlesboro, much like Welland, has the desire to bring diversity and life into the community. By highlighting the Middlesboro canal, and creating something as simple as a pedestrian/cyclist route, Middlesboro can also begin creating connectivity within the city. Middlesboro is a unique town, rich with culture and history. With the right design elements and planning surrounding the Canal Walk, Middlesboro, too, has the potential to become a place for social and recreational opportunities, as well as a hub for tourism.

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Contacts

Company: Welland Recreational Canal Corporation

Address: 8 Merritt Island, Welland, ON, Canada L3B 3X4

Phone: 905-788-9511

Webpage: <http://www.canalcorp.ca/site/home>

4.3: Canal Walk Summary

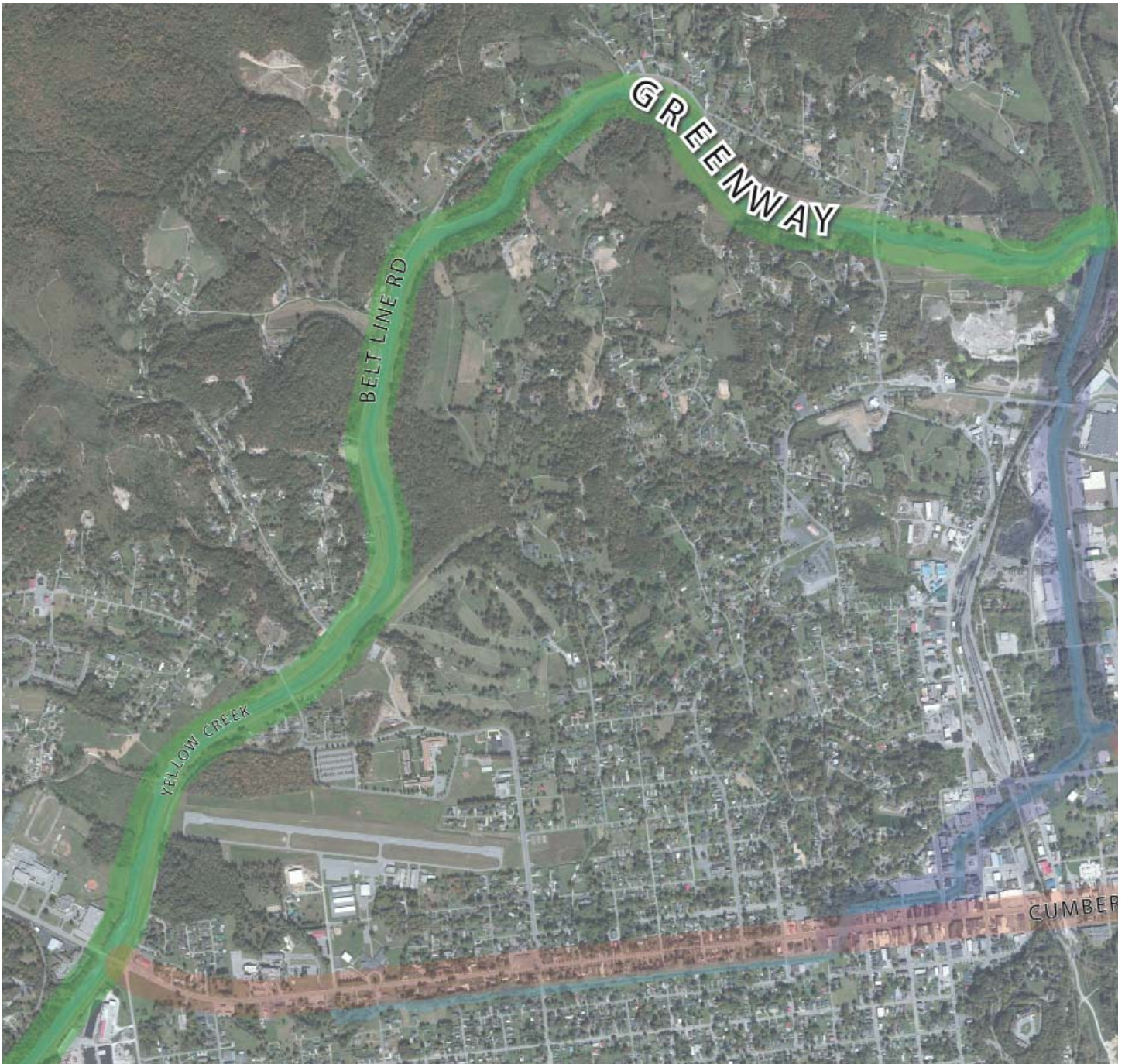
Summary of the Canal Walk

The Middlesboro canal was originally constructed in 1938, and served as a drainage way for the central part of the city. The current state of the Canal Walk is fragmented and serves a very limited recreational purpose for the community. By redeveloping the Canal Walk as part of a cohesive trail system, Middlesboro can become a regional tri-state trail hub. The ideas presented in section 4.1, lay out a starting point for Middlesboro to build upon. It is the community's responsibility to continue their vision and create a Canal Walk that:

- Provides the community of Middlesboro and visitors with spaces to hold public functions.
- Helps create an active, healthy community.
- Provides a continuous multi-use trail that connects to local and regional trails.
- Develops a connection to Cumberland Gap National Historical Park.
- Connects to the historic Boone Trace.
- Educates the public about best practices for water management.

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Middlesboro Trail System: Greenway (Imagery Source: Kentucky Geography Network, 2014)

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5.1: Greenway Background



Figure 5.1.1 Photo overlooking Middlesboro

Introduction

The outer loop of the proposed trail hub design is called the 'Greenway.' The Merriam Webster dictionary defines a greenway as "a corridor of undeveloped land preserved for recreational use or environmental protection." The Greenway can provide Middlesboro with numerous benefits. For one, it has the potential to increase property values within proximity of the trail system. Secondly, the trails can help meet certain compliance requirements that deal with floodplains and wetlands. Also, trails encourage physical activity and overall health. These benefits can have a positive impact on Middlesboro as a trail town as well as an active community (Searns, 2002).

As stated in section 2.4, the Greenway consists of the Army Corps of Engineers' system of a canal and levees implemented to reduce the risk of flooding in the area. Along with the Yellow Creek being a major component of the Greenway, there are other surrounding features that have been taken into consideration. At the southern point of the Greenway, there is the Middlesboro High School as well as an active church. Further north along the Greenway, an airport can be found on the east of the stream, and residential areas found on the west. The most historically important area within proximity of the Greenway is the local golf course. The Middlesboro Country Club golf course is the oldest continuously played golf course in the nation. Tracing north along the Greenway is the Army Corps concrete armored channel system that is a part of the levee system. The northern most tip of the Greenway intersects with the canal that is found in the downtown of Middlesboro.

Design Goals

Given the Greenway's current status, there are numerous opportunities for improvement and growth. Below is a brief list of goals that will be accomplished with the Greenway design. These goals were chosen as the most beneficial based on their positive impacts towards Middlesboro and the Greenway.

- Expand Educational Outreach - The Greenway will contain educational elements that will allow visitors to learn more about what is going on within the city of Middlesboro. These elements include signage and informational packets as well as the Middlesboro High School having field lessons in the vegetable gardens and wetlands.
- Provide Recreational Opportunities - Continuing with the initiative of Discover Downtown Middlesboro to make Middlesboro a trail hub, the Greenway contains a network of recreational trails to cater to walkers, runners and bikers. Along with the trail network, there are several public outdoor spaces for recreation, including disc golf and picnics.
- Creating a Connection to Downtown - It is important to create a connection between downtown Middlesboro and the Greenway because this connection will encourage visitors to discover the aspects that make Middlesboro unique. The connection will also encourage people to participate in longer walking or biking loops.
- Improve Connection to Canal - Similar to the connections to downtown, providing a connection to the canal can inspire visitors to learn about the diverse features of Middlesboro.
- Mitigate Flood Risk - The Army Corp of Engineers' flood risk management project has been implemented to reduce the amount of flood risk in the Greenway. By using a more natural approach to managing flood risks, the Greenway not only functions the way it was originally designed, but provides an intriguing element of natural environments such as wetland habitats.
- Mend Stream Stability - Due in part to the 2001 project that widened and deepened the Yellow Creek, the

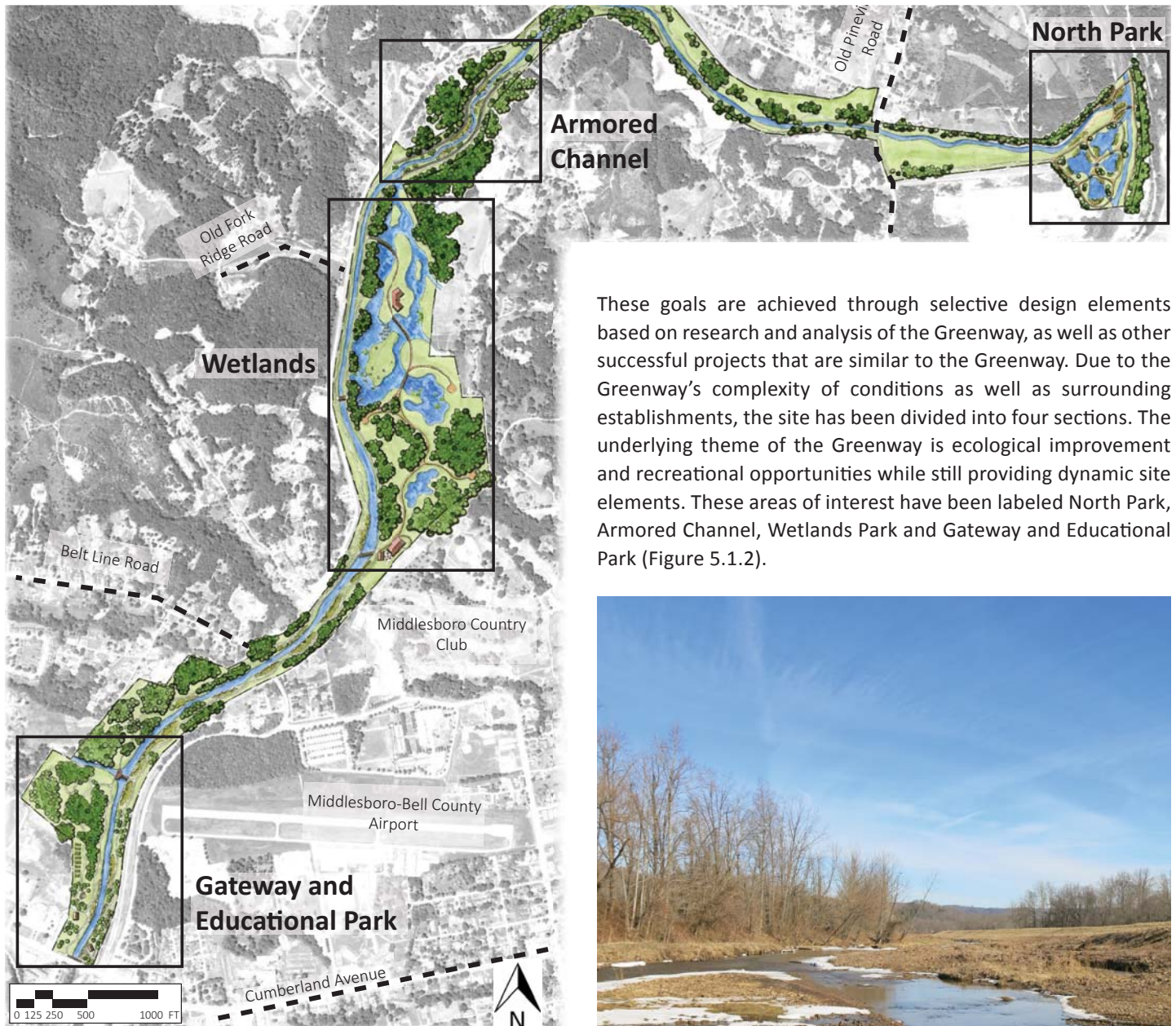


Figure 5.1.2 Refined plan showing specific design focus areas (Imagery Source: Kentucky Geography Network, 2014)

These goals are achieved through selective design elements based on research and analysis of the Greenway, as well as other successful projects that are similar to the Greenway. Due to the Greenway's complexity of conditions as well as surrounding establishments, the site has been divided into four sections. The underlying theme of the Greenway is ecological improvement and recreational opportunities while still providing dynamic site elements. These areas of interest have been labeled North Park, Armored Channel, Wetlands Park and Gateway and Educational Park (Figure 5.1.2).



Figure 5.1.3 Existing conditions of Yellow Creek

stream has the foundations to becoming a stable stream. By addressing the deficient width to depth ratio of the stream, the portion of the stream that is laden with sediment is fixed.

- Improve Overall Ecosystem - By utilizing natural materials and improving the overall condition of the stream, the ecosystem of the Yellow Creek can improve greatly. These improvements of the Yellow Creek will provide the Greenway with the wildlife habitat to make it more inviting and interesting to its users.

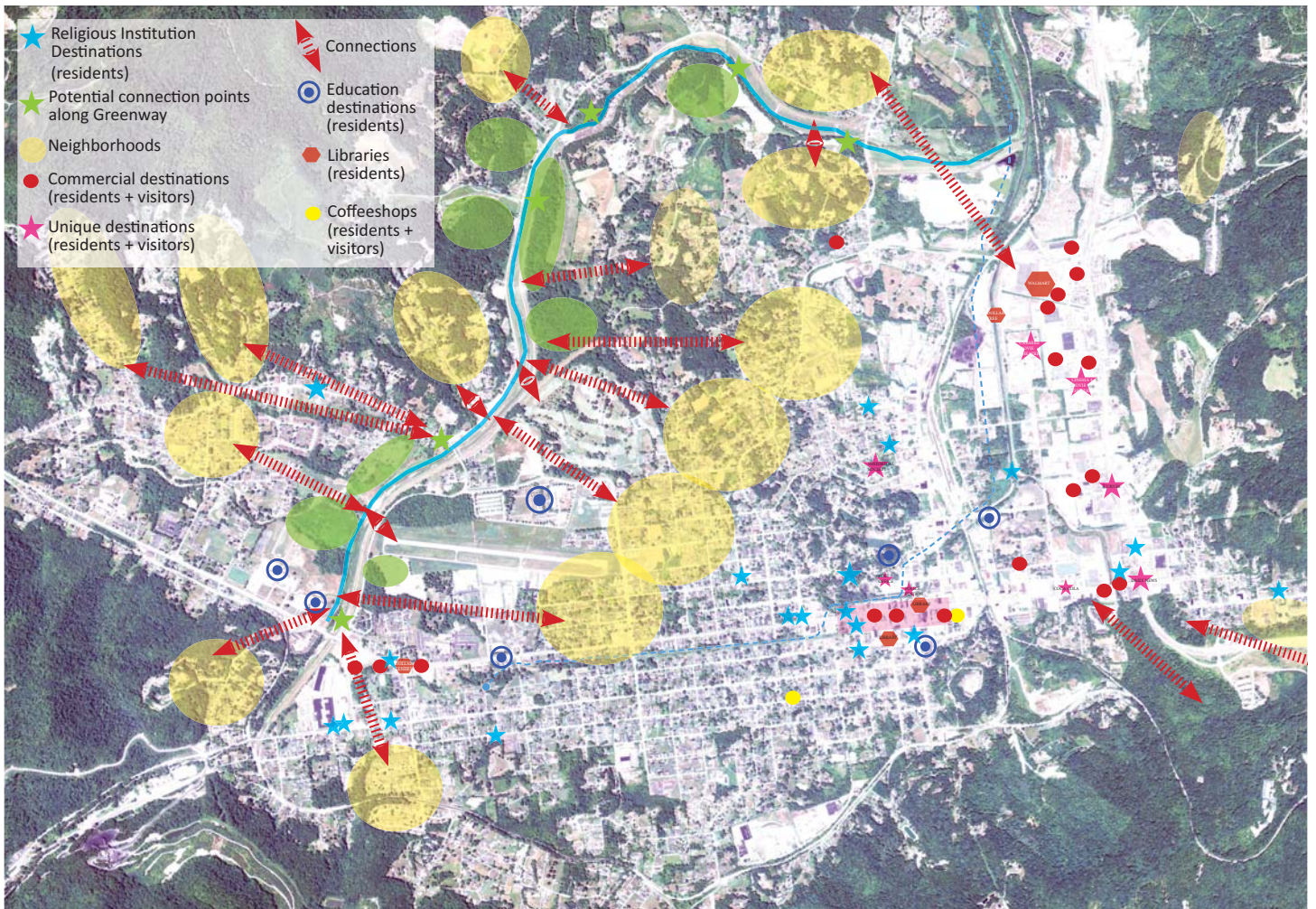


Figure 5.1.4 Destinations for both visitors and residents and the connections points to the Greenway (Imagery Source: Kentucky Geography Network, 2014)

Destination Points

Destination points are important to identify for both residents and visitors. The destinations in Middlesboro include coffee shops, movie theatres, restaurants, shops, grocery stores, libraries, schools, post offices, etc. Mapping these points shows relationships between places across the town and also to the Greenway. It is important to recognize where the neighborhoods are located to identify sources of users of the Greenway. Also, mapping the neighborhoods shows the most efficient access points to the Greenway for the residents of Middlesboro. The reason for identifying destination points is to cater to a wide variety of users and ultimately make it easy for people to access the Greenway (Figure 5.1.4).

Challenges

Community members have voiced a concern for the high volume of ATV users in this area. The negative impact ATV users have on the site were apparent during the site visit. Even though the airport is a low activity airport, it can be considered an eye sore for people within the greenway area. Along with being unattractive,

the plane traffic could produce small amounts of noise and air pollution. With the potential increase of pedestrian traffic in the greenway, this area's flooding probability can be hazardous to its usability. The channel within the Army Corps' flood project has been known to have a negative impact on the aquatic life within the greenway. The shallow waters and increased flow of water has a negative impact on the ecosystem (Figure 5.1.5).

Opportunities

The entrance to the greenway was seen as an opportunity because of its important location for providing a new connection to downtown and the surrounding schools. We viewed the open space in this area as a potential space for new public parks. Along with these positive aspects, we saw that the flood area has the potential to mitigate the flood risks as well as introduce recreation to the area. Finally, we viewed the Army Corp channel just like the flood plain in that there is an opportunity to promote aquatic life and improve the habitat (Figure 5.1.6).

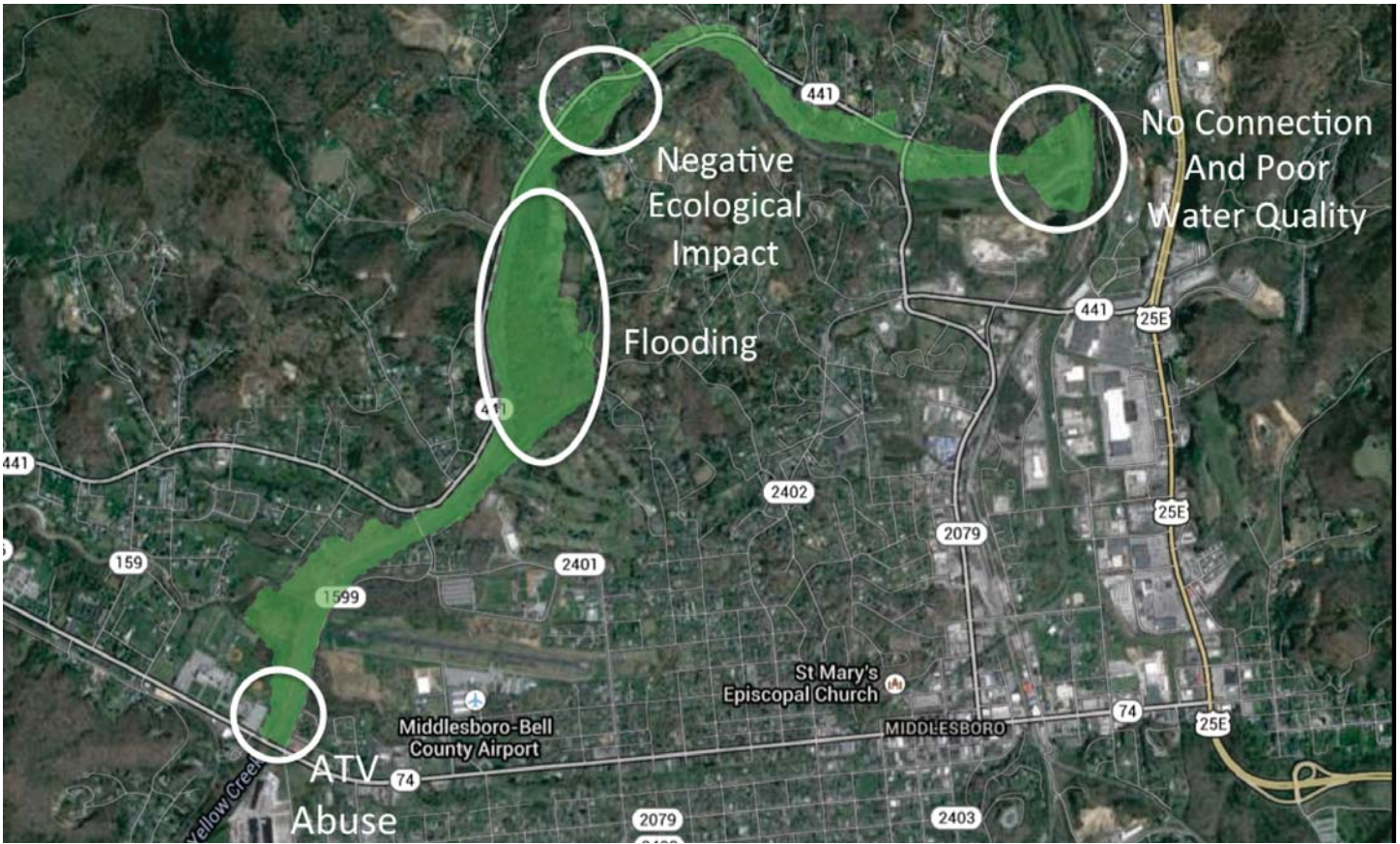


Figure 5.1.5 Challenge areas for the Greenway (Source: Bing Maps, 2014)

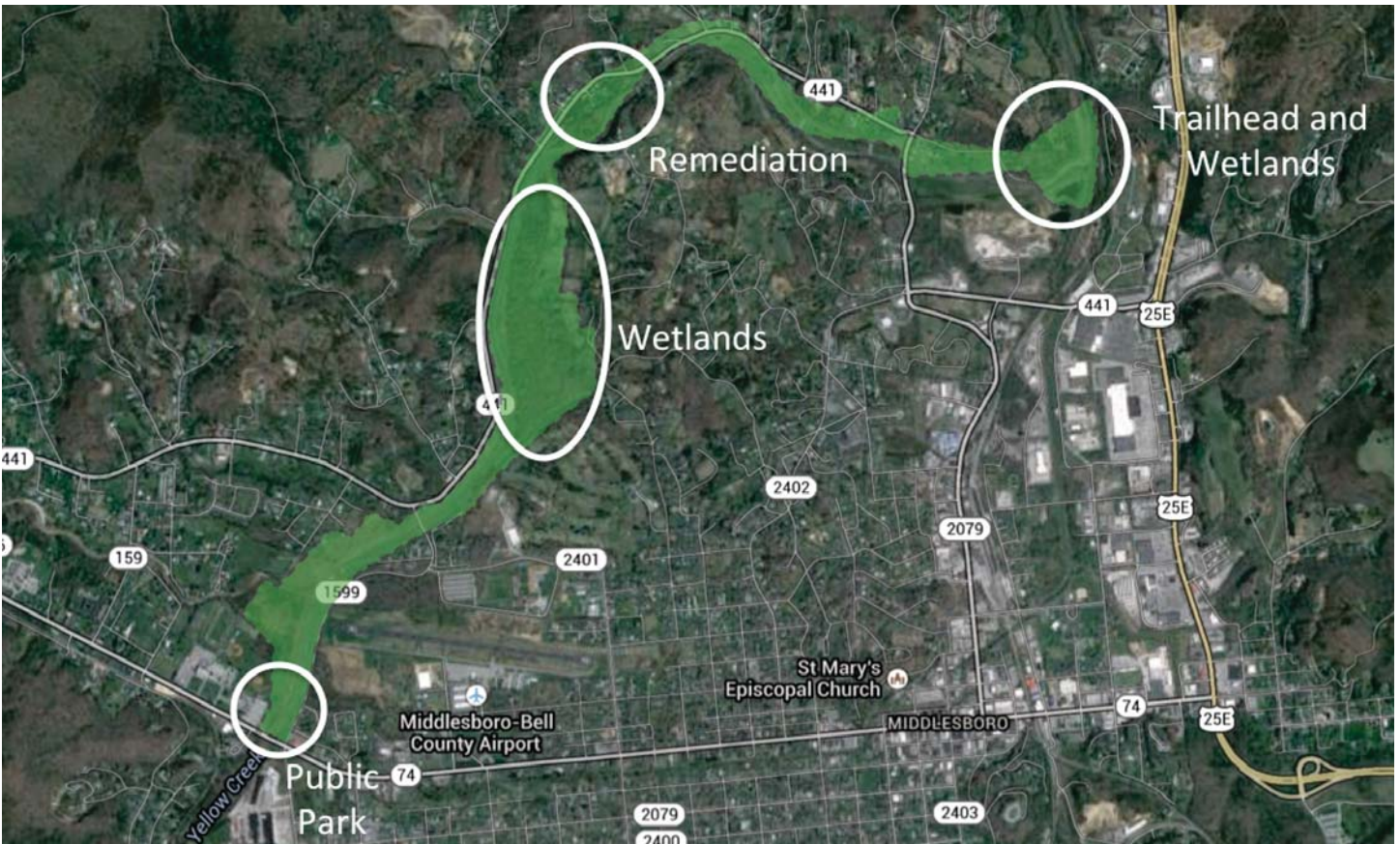


Figure 5.1.6 Opportunity areas of the Greenway (based on the Challenges Map, Figure 5.1.5) (Source: Bing Maps, 2014)

Design Focus: North Park

Context

The proposed North Park is located northeast of Middlesboro in the area where the canal connects to the Yellow Creek. This is currently an isolated area, but can serve as the beginning/ending point of the proposed Greenway in the trail system. The area is in close proximity to the railroad, but there are no current vehicular roads near the site. There is also an unused area located directly to the south of the site that used to be the old City of Middlesboro's waste-water treatment facility that could also be utilized.

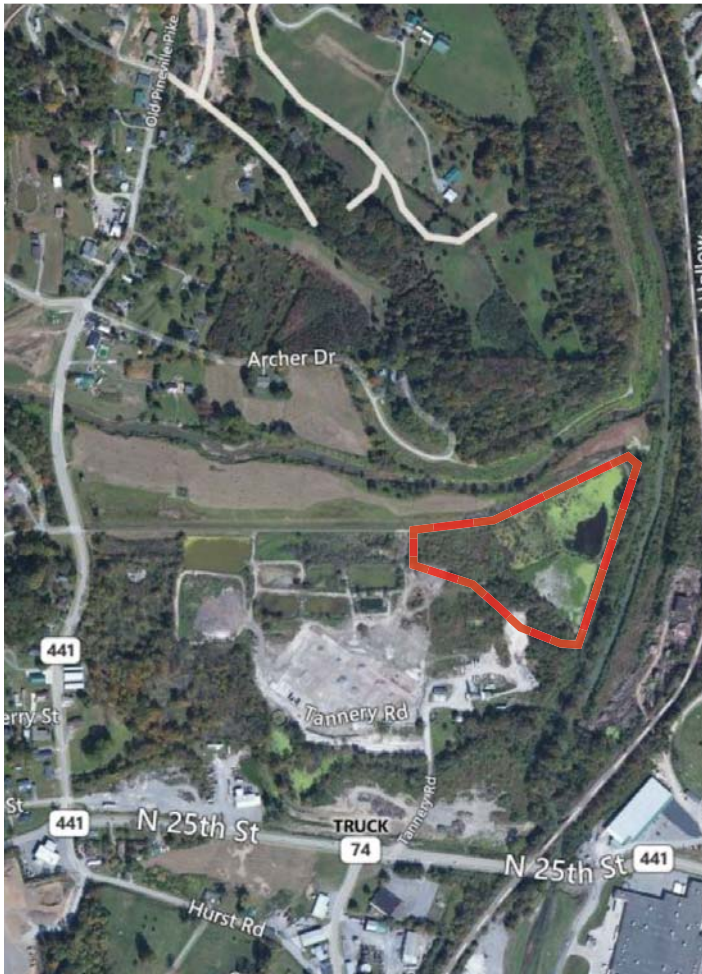


Figure 5.1.7 Context Map of North Park (Source: Bing Maps, 2014)

Challenges

The site's location is in an isolated area with no existing roads in close proximity. This limits the connections with the rest of the community. The only methods of travel would be by foot or bicycle.

Water quality from the canal is also a concern. The canal passes through downtown Middlesboro and by many industrial sites before connecting with the Yellow Creek. Surface water run-off



Figure 5.1.8 View looking toward the North Park site

from parking lots and other impermeable surfaces introduces pollutants and other contaminants into the water system.

The channelized nature of the canal also has a negative impact on the actual stream conditions. The lack of sinuosity in the canal increases water velocity, which causes erosion during heavy rain events. The increased velocity also moves more sediment and other contaminants downstream, worsening the overall water quality.

Seasonal flooding poses a problem as well. Vegetation and material selection will be limited due to the excess water in certain areas. Placement of the actual trails could also prove to be challenging, as they would have to be placed in areas where they could still be used after a flood event.

Opportunities

The location of the area offers many unique opportunities that could make the North Park an asset to Middlesboro. The Canal Walk section of the trail system connects with the Greenway section here. There is a defined node that can serve as a destination point and trailhead in the overall trail system. The North Park's proximity to the Boone Trace could also be utilized for educational and historic purposes as well.

The location also provides opportunities for trail users to interact with the water. The unused waste-water treatment facility directly to the south of the site is monitored by the government, but still provides many design opportunities.

help control the seasonal flooding. There is also open space at the trailheads for the trail users to use as rest areas and for recreational purposes. Appropriate signage would be included to direct users to the Boone Trace (Figure 5.1.9).

Conceptual Diagram 2

The second concept is more detailed compared to concept one. The wetland system is more complex, allowing for better filtration of the excess water entering the site from the canal. Trailhead areas and open spaces are larger and more defined, allowing for more programmable spaces. Restoration of the riparian zones was considered in order to create habitats and revitalize the stream in the process. As in concept one, signage will be implemented, directing users to the Boone Trace which follows Old Pineville Road on the west side of the North Park Site (Figure 5.1.10).

Refined Plan

The final design proposal incorporates aspects from both of the concepts. Due to the need to improve the water quality of the stream and the canal, the wetland filtration system was the primary focus of this proposal (Figure 5.1.11).

A portion of the water from the canal could be redirected into the wetland area, where it will then pass through a series of pools and spillways where it will be filtered using native plants and the process of evapotranspiration. Once the water travels through the wetlands, it could then re-enter the stream, thus improving the water quality.

There will also be an elevated boardwalk system through the pools and water channels that would allow users to navigate through the area. This would allow users to experience the wetlands and serve to educate them about the various processes. These could include information on the various species of plants, what the water is going through before it re-enters the stream, and information on the wildlife and their habitats. The wetlands would also collect floodwater and store it until it slowly re-enters the stream.

Signage indicating where the Greenway and Canal Walk begin and end will be established at the trailhead, along with open and programmable recreation areas. This would provide users with a destination point, and also give them a place to rest before continuing to the rest of the trail system (Figure 5.1.12).

Restoration of the stream would also be accomplished. Riparian plants would be planted on the stream banks which would stabilize the edges. Sinuosity would be added to the stream as well. This would help control the speed of the flowing water by making the channel longer and more curvy which would then limit the erosion of the stream. These riparian zones would also create habitats for local fauna, increasing biodiversity and improving the overall ecosystem in the area.

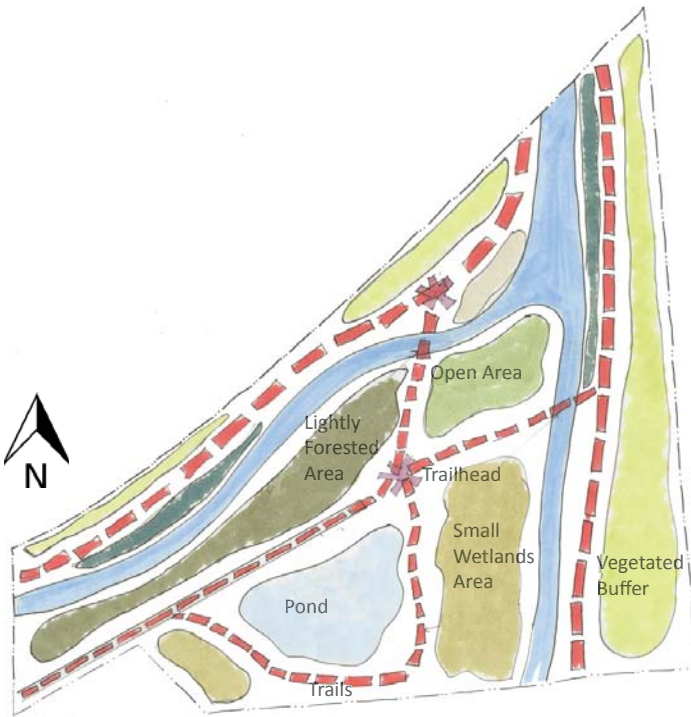


Figure 5.1.9 Conceptual Diagram 1

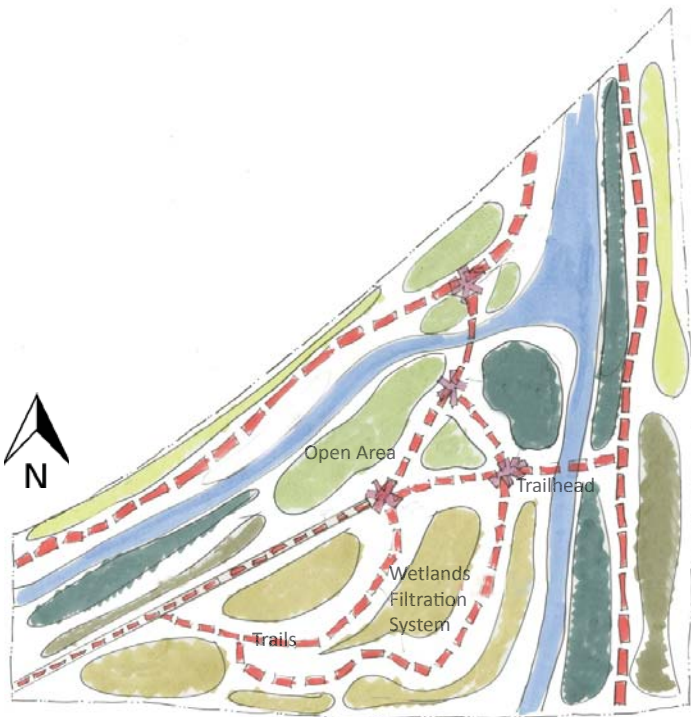


Figure 5.1.10 Conceptual Diagram 2

Conceptual Diagram 1

The first concept looked at the most basic improvements that could be made. Trailheads and buffers were added to provide connections to the Canal Walk and Greenway, while separating the park from the railroad and surrounding residents.

In the area directly adjacent to the south-side of the park, a wetland area is proposed along with a detention basin to

A “beach area” was also considered where the canal and Yellow Creek actually join. Improvement of the water quality of the stream would allow users of the trails to interact with the water. A beach area can permit the users to safely travel to the water’s edge for fishing, swimming, or other aquatic activities.

While the actual Boone Trace does not pass directly through the North Park area, it is relatively close. Proper signage will direct users to the trail at the trailheads. Educational signs would also serve to inform users of the significance of the historic trail in relationship to Middlesboro and surrounding communities.

The North Park is an important point on the outer loop of Middlesboro’s trail system. The proposed ideas can help clean and filter the contaminated water, and the proposed stream restoration practices would improve the local ecology and make the park a viable habitat for native species of flora and fauna.



Figure 5.1.12 Potential Trailhead



Design Focus: Armored Channel

Context

The armored channel section of the Greenway is located northwest of Middlesboro. Specifically, water from Yellow Creek enters the system at the intersection of Lick Fork Road and Belt Line Road and runs adjacent to Belt Line Road. It is currently isolated from the city as there are no established paths or connections. Residential areas and private land surrounds the majority of the site which adds to the connectivity issue.

Challenges/Issues

Concrete armored channels, such as the one located on Yellow Creek, are designed to prevent flooding and stabilize the banks of a stream. However, armoring a stream poses many issues that disrupt both the stability of a stream and the health of the adjoining ecosystem. “These channels are relatively straight and impermeable, offer no resistance to an increase in water flow, and do not allow any water to infiltrate into the soil, thus increasing the speed of the stream” (Jones, 2002). The decrease in permeability and increased speed causes an increase in erosion and sediment transportation. Though risk of flooding in Middlesboro is effectively mitigated with this armored system, the higher discharges cause issues downstream such as increased flood risk and sediment deposition. Furthermore, during periods of normal flow the water level in the channel is dangerously low. These shallow conditions pose issues to aquatic life by both increasing temperature and disrupting transport. The lowhead dam at the end of the channel poses additional environmental and public safety issues. These include disruption of natural flow, sediment flow, and fish migration.

Opportunities

Though it is currently aesthetically unpleasing, the armored channel section of Yellow Creek presents many unique opportunities for the Greenway. These encompass everything from ecological restoration to community involvement through education. The following is a list of opportunities:

- Create floodplain
- Improve stream health
- Preserve and protect aquatic resources
- Restore ecological integrity
- Restore natural structure and function
- Restore native species
- Involve community
- Provide educational components

Conceptual Diagram

Many natural rivers and streams travel across the landscape in large sweeping patterns known as “meander.” The meander is a product of erosion and deposition processes, causing cut banks and point bars to appear along a stream. “This process, in combination with the moist, often wet soils and high water table found next to streams, creates a corridor called a riparian area” (Ellis, 2002). Riparian areas serve many useful purposes such as flood mitigation, decreasing stream velocity and erosion, improving water quality, and providing habitat for a diverse collection of species. The armored channel has effectively destroyed the natural function of the stream. For this reason it would be prudent to take measures to rehabilitate the area and restore some semblance of natural function.

During the initial site visit we noticed sediment deposits at the base of the concrete channel. When viewed from an aerial photograph, it becomes apparent that these deposits are distributed in such a way to inform a greater purpose. The stream is depositing sediment and attempting to create a floodplain and riparian area. In essence, the stream is attempting to mend itself within the channel. Because of this, we propose that this sedimentation process be expedited by building upon these dispersal patterns (Figure 5.1.13).

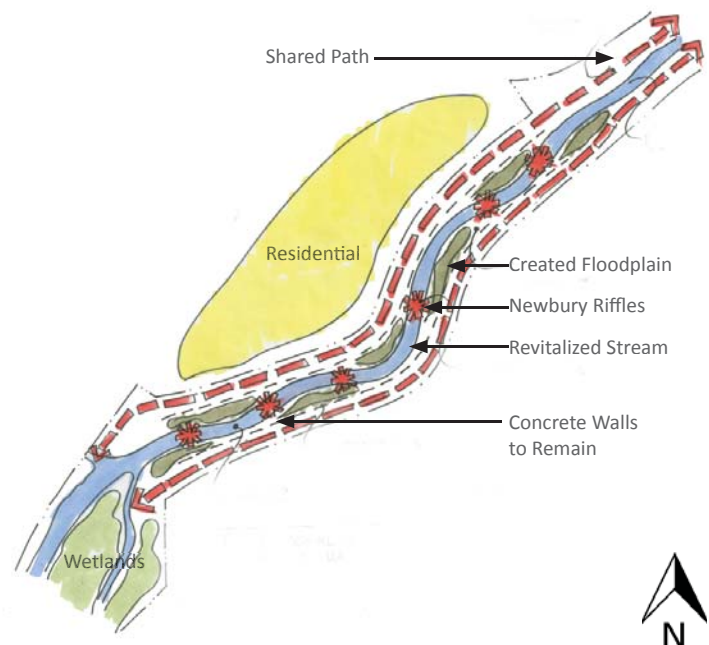


Figure 5.1.13 Conceptual diagram for Armored Channel. The diagram indicates the partial removal of the concrete armored channel and introduction of naturalized stream.

Refined Plan (Figure 5.1.14)

The proposed plan removes the concrete base of the channel and adds soil in the areas where sedimentation was seen. This will narrow and deepen the stream as well as create a floodplain and riparian areas. These riparian areas will then be planted to

add stability and create vital habitat. The objective will be to follow the patterns of deposits allowing the stream to regain natural sinuosity within the walls of the channel. The element of grade change will also be addressed by adding riffle structures throughout the stream. By stepping down and increasing the slope of the stream bed the need for the lowhead structure will effectively be nullified.

Aside from ecosystem and stream health improvements, the plan includes the addition of the continuous greenway trail which will bisect the area. These paths will run on the outside of the armored channel walls, allowing visitors to view the entirety of the project. There is also an educational component to the site with signage to educate the public on natural stream function, riparian ecosystems and aquatic life (Figure 5.1.14).

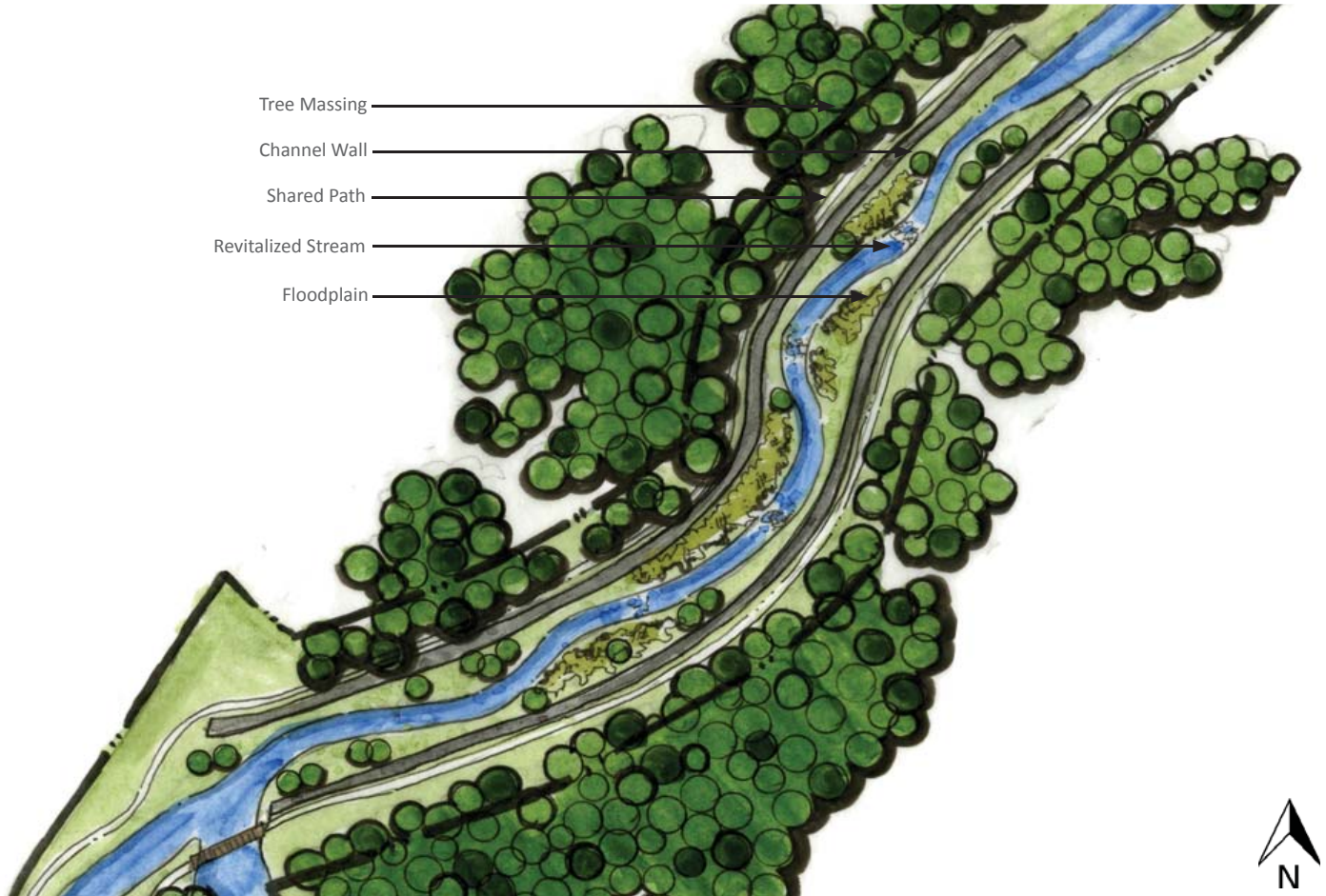


Figure 5.1.14. Refined plan for Armored Channel. Shows addition of stream meander, floodplain creation and naturalization within the concrete armored channel.



Figure 5.1.15. Existing conditions of Armored Channel



Figure 5.1.16. Perspective of Proposed Armored Channel Enhancements.

Design Focus: Wetlands Park

Context

Mid-way through the greenway corridor, there is a large, unique piece of flat, forested terrain (Figure 5.1.17). Historic Middlesboro Country Club is linked to Yellow Creek via this piece of land and there are residential neighborhood developments on the other side of the road. This area of interest is nestled between the end of the flood protection levee and beginning of the concrete armored channel project. This area is very susceptible to destructive flooding events. Therefore, this area has the potential to be an ideal place to implement a wetlands program.



Figure 5.1.17 Aerial view of Wetland (Source: Google Earth, 2014)

Challenges/Issues

Practicing conservation and keeping this area heavily forested saves site character, preserves the riparian edge, and introduces recreational opportunities for potential greenway users. There is a delicate balance between a healthy ecosystem with limited amenities and an energetic recreation area with little aquatic life and habitat. It is important to consider how the area's ability to function as a floodplain can impact creation of a universal design (i.e., for users with all types of physical abilities and disabilities).



Figure 5.1.18 Existing conditions of the wetlands area.



Figure 5.1.19 Existing conditions

Opportunities

Based on the surrounding land uses (recreation, residential, green space, etc.), there is a multitude of potential opportunities. Wetlands maintained adjacent to streams promote healthy waterways, improve aquatic habitat, and trap floodwaters (United State Environmental Protection Agency, 2014). In this particular project, wetlands can provide the ability to decrease the intensity of flooding in the greenway. The selected site can successfully contain natural, sustainable riparian habitat and trails to stimulate interaction between people and wildlife.

The programmatic elements included in the proposed designs are part of a long-term vision rather than what can be accomplished immediately.

Conceptual Diagram 1

Concept 1 is the simple alternative with solutions that could be implemented within in a shorter term. The idea is to preserve the heavily forested nature of the land and to propose a multi-modal trail for walkers, joggers, and bicyclists. A 9-hole disc golf course would complement the historic Middlesboro Country Club and golf course and offer an activity that users of all ages could enjoy. It would work in the proposed wetland because disc golf can be played in wet conditions. An iconic pedestrian-safe crossing bridge is also included. "Snack shacks" are a recurring element in these conceptual diagrams and allow greenway users to sit down and purchase refreshments at regular intervals along the trail (Figure 5.1.20)

Conceptual Diagram 2

Concept 2 is a more openly organized alternative. The idea suggests a wet detention pond feature to replace a portion of the dense forest. The detention pond offers space for water to pool. There is also a great opportunity to combine and create a fun recreational space for sporting events, such as fishing and bird watching, while also creating habitat (Figure 5.1.21).

Conceptual Diagram 3

Concept 3 incorporates all the elements from Concepts 1 and 2 and embraces the natural water pooling effect during the inevitable flooding events (Figure 5.1.22). An elevated boardwalk system works in unison with forest conservation practices. This technique is effective around the world and at a variety of scales (Figure 5.1.23). This elevated system can take on an organic shape around and through the wooded space like a winding “freeway” and offer lookouts for sightseeing. This gives users the opportunity for epic views and educational opportunities along the greenway.



Figure 5.1.23 Tetsuo Kondo Architects’ “A Path in the Forest”. Example of successful forest canopy boardwalk system. (Source: Dezeen Magazine from October 10, 2011)



Figure 5.1.24 Example of a safety beacon

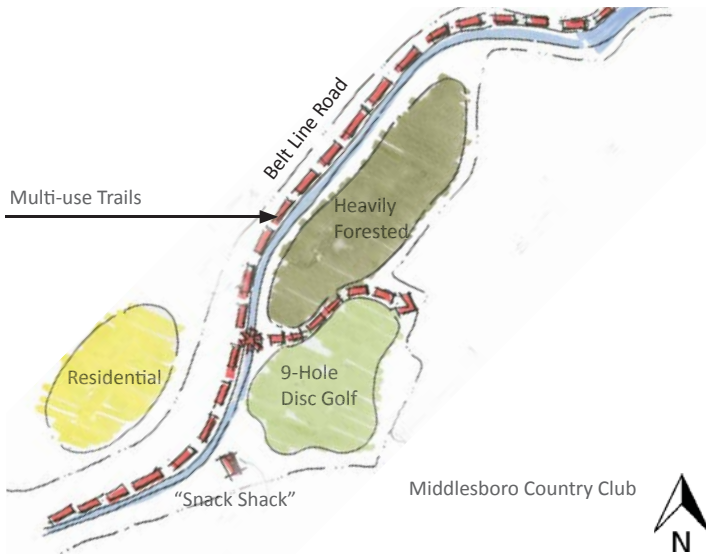


Figure 5.1.20 Conceptual Diagram 1

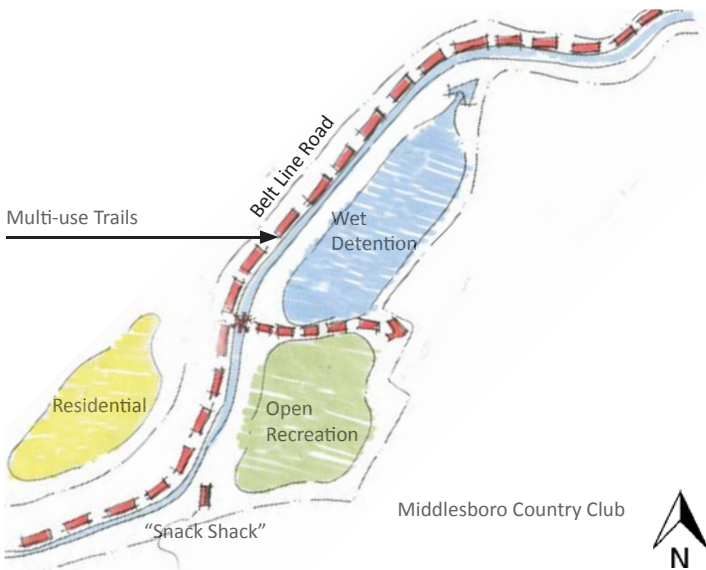


Figure 5.1.21 Conceptual Diagram 2

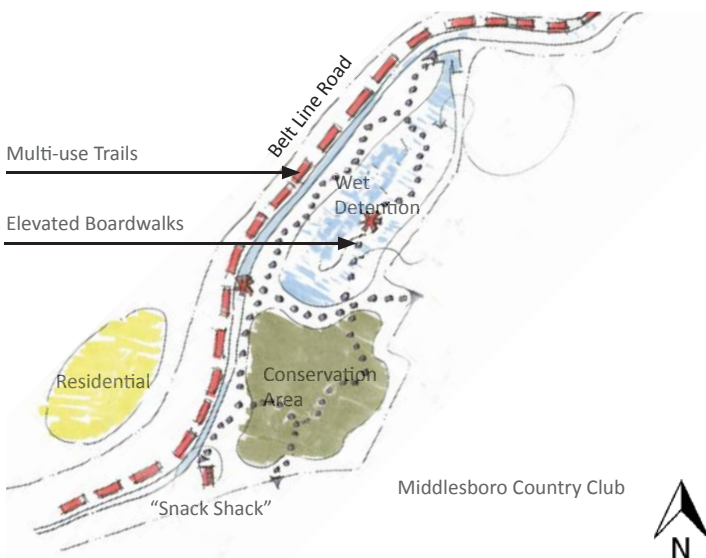


Figure 5.1.22 Conceptual Diagram 3

Refined Plan

The refined design is a visionary solution that encapsulates all three concepts and reinforces that the sky is the limit for a strong, natural corridor running alongside Yellow Creek in Middlesboro (Figure 5.1.25). The visualization features riverside themes, “freeway” motif elements like on/off ramps and exits, and encourages the user to spend however much time in the proposed space as desired to get the full experience. Shelter stops are to be at regular intervals along the greenway, complete with emergency response beacons for safety that could be directly linked to local authorities (Figure 5.1.24). Man-made island features imposed through the wetland creation could add to the recreation opportunities (Figure 5.1.27).



Figure 5.1.26 Existing conditions



Figure 5.1.27 Proposed Trail System Adjacent to Wetlands

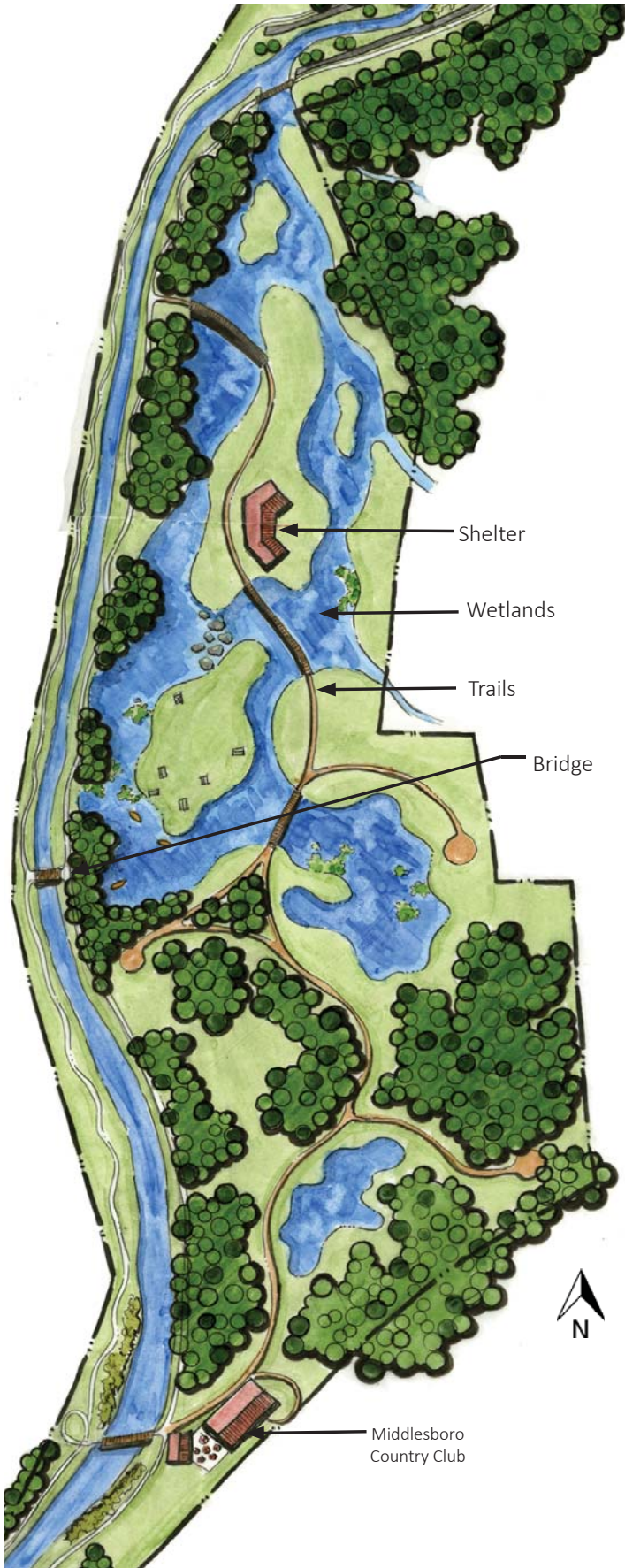


Figure 5.1.25 Refined Diagram for Wetland Area.

Design Focus: Gateway and Educational Parks

Context

The proposed Gateway and Educational Parks are located on the southern end of the greenway near Cumberland Avenue, and extend north along Yellow Creek until Stony Fork. Middlesboro Middle School and High School are adjacent to this site as well as the Middlesboro-Bell County Airport (Figure 5.1.28).

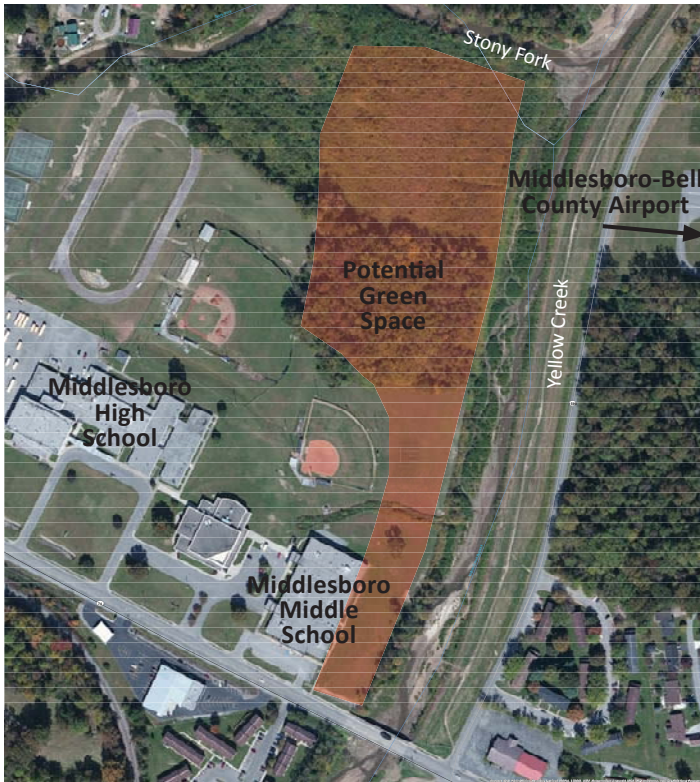


Figure 5.1.28 Aerial Image of Yellow Creek, Middlesboro High School, and Middlesboro Middle School. (Source: Bing Maps, 2014)

Challenges/Issues

There are several problem areas around the Gateway and Educational Parks. First, the creek and creek bank see a great deal of ATV use, despite the fact that they are prohibited (Figure 5.1.29). Problems that arise with ATV use include soil erosion, soil compaction, impacts on wildlife and native plant communities, sedimentation of the creek, aquatic environment pollution from sedimentation and also pollutants from ATVs, to name a few (Assessing, 2002). According to the Minnesota Department of Natural Resources, “[s]oil compaction results in increased runoff and can lead to increased erosion...” (Assessing, 2002). Erosion can increase along the creek banks and ultimately become large gullies, which can result in losing large amounts of nutrient-rich topsoil. The negative environmental impacts of ATV use are enough to justify prohibiting ATV use around Yellow Creek, but additionally, the appearance of the area after ATV use is universally unappealing, which can cause fewer and fewer people to consider utilization of the area. In addition, there also can be a social aspect that is important to consider. In some



Figure 5.1.29 Existing sign prohibiting All-Terrain Vehicles near the Cumberland Avenue Bridge

cases, communities have taken action against “local and regional governments that fail to protect their basic rights for peaceful enjoyment of their properties that are disrupted by recreational ATV use” (Bissix, 2012). Residents near Yellow Creek in areas that receive ATV use may experience noise disturbances.

Opportunities

The Gateway and Educational Parks are located adjacent to Cumberland Avenue, Middlesboro High School, and Middlesboro Middle School. There is unused greenspace near the schools and along Yellow Creek. Proximity to the schools provides a unique outdoor educational opportunity, including potential educational gardens, nature trails, exercise stations, outdoor classrooms, and an outdoor social space. Cumberland Avenue sees high volumes of traffic when school begins and ends everyday. For this reason, the greenspace along the creek and near the bridge would be an ideal access point for future users of the Greenway. Also because of the unused greenspace, this site has potential as a successful public park, and ultimately a destination point along the Greenway. There is a great opportunity for an overlook where Stony Fork and Yellow Creek intersect, which would allow Greenway users to not only view the creek, but also the airport.



Figure 5.1.30 Yellow Creek along the proposed Greenway.

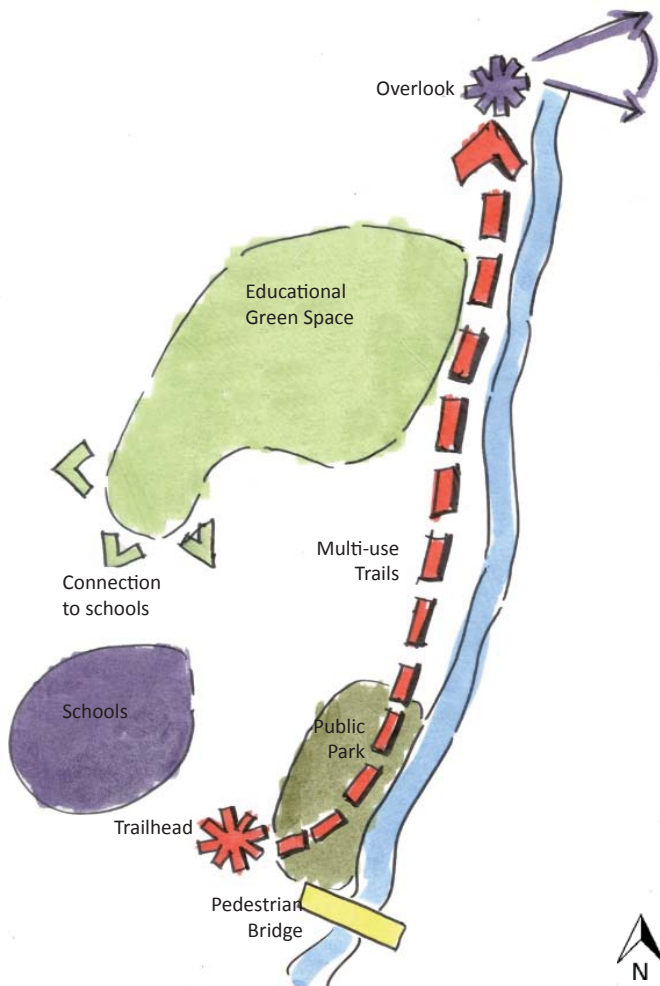


Figure 5.1.31 Conceptual Diagram 1

Conceptual Diagram 1

This concept focuses on connections and unifies the available greenspace located behind the schools directly to the schools. This space can host an outdoor classroom, trails, exercise equipment, and an open space. This design features a single trail on the eastern side of Yellow Creek, a main trailhead for the Greenway near Cumberland Avenue, and a public park with access near the front of the schools and Cumberland Avenue (Figure 5.1.31).

Conceptual Diagram 2

Concept 2 features the educational green space along the length of Yellow Creek, rather than behind the schools. It includes educational vegetable gardens for the schools, exercise equipment, and an outdoor classroom. Multi-use trails are located on both sides of Yellow Creek, along with public parks, connected by a pedestrian bridge. Parks on both sides of the creek allow greater usage of the Greenway, enlarging the available space along Cumberland Avenue. Both multi-use trails lead to an overlook which has an open view of the creek as well as the airport across the creek (Figure 5.1.32).

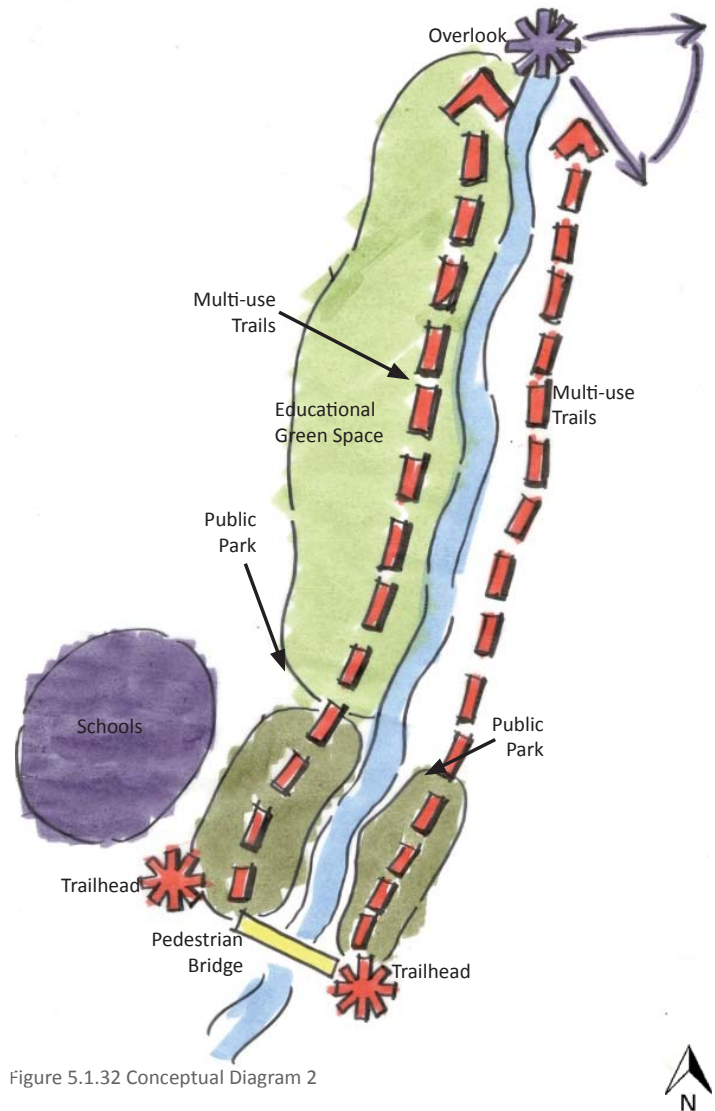


Figure 5.1.32 Conceptual Diagram 2

Conceptual Diagram 3

Concept 3 offers a design solution similar to concept 2, but with a few important differences. The educational green space extends down along Yellow Creek, to take advantage of the proximity to the body of water. There is a separate educational trail for the schools that eventually connects in with the main public trail at the overlook. The public park is on the western side of the creek to avoid encroachment onto school property. There are also educational, student maintained vegetable gardens which will serve to teach students about sustainability and growing their own food (Figure 5.1.33).

Refined Plan

Concept 3 was selected for further refinement because it has the most potential. First, the public park on the corner of Cumberland Avenue and Airport Road provided a destination access point for the Greenway as a whole. This area is in close proximity to the park that would be accessible by all types of users. The park also serves as an important trailhead for the Greenway, and ultimately unites the outer loop of Middlesboro by creating a

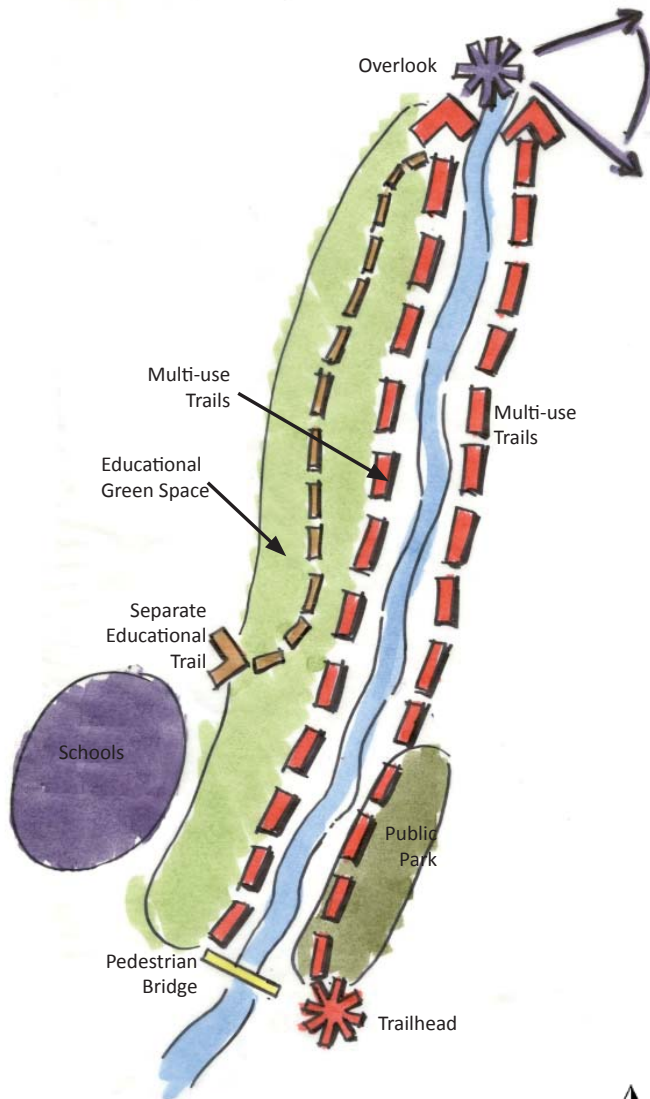


Figure 5.1.33 Conceptual Diagram 3

connection to downtown Middlesboro. The pervious, winding, multi-use trails throughout the site will withstand any potential flooding during 100-year storms and also accommodate users of all types. There will be benches along the path that extend north through the rest of the Greenway for frequent resting. Except for the multi-use trail that follows the creek, the eastern side of the creek was maintained for strictly school-use. This was done for safety reasons to keep students separate from the public during school hours. As well as being gated, the separate school trail will incorporate a thick tree buffer in between it and the public trail.

In the educational green space, there will be an outdoor classroom in close proximity to the schools as well as the creek. There are large raised planters that the students of the schools can adopt to maintain throughout the growing season. Both the public trail and the multi-use trail lead to the overlook, which has a clear view of the airport as well as to the creek, and acts as a bridge across Stony Fork (Figure 5.1.34).



Figure 5.1.34 Refined Plan for The Gateway and Educational Park

Ultimately, this concept will enhance the social, environmental, and economic aspects of Middlesboro. The public park and trail system invites residents and visitors alike to use the site and interact with nature. The health of the stream will be improved with the planted riparian zone, which helps to filter water as well as provide habitat for wildlife. The enriched ecological systems along the creek will cleanse the creek so that it will be healthy enough for people to directly interact with the water. All in all, the Greenway will encourage visitors to Middlesboro, thus establishing the city as the tri-state trail system hub.



Figure 5.1.35 Montage Perspective of Gateway Park from the school side of the Greenway.



Figure 5.2.1 - Morris Farm Wetlands (Source: Mill Creek Watershed Council,)

Project Name
Mill Creek Restoration Project (MCRP)

Location
Cincinnati, Ohio (USA)

Date Designed
December 2005

Construction Completed
2012 [phase 1]

Construction Cost
\$806.5 Million [To Date]

Landscape Architect
Amec, CDS Associates, Woolpert

Developer | Client
Mill Creek Watershed Council, Groundwork Cincinnati

Manager
Schumacher Construction Management, Inc.

Introduction

Mill Creek is located in Cincinnati, Ohio, which is the third largest city in Ohio with a population of 296,943 (Graves, 2010). It is located in Hamilton County in the south-western part of the state, on the border of Ohio and Kentucky; specifically along the Ohio River at the confluence of the Licking River. “The headwaters of Mill Creek is located in Butler county and flows 28 miles south, covering 37 political jurisdictions, to its confluence with the Ohio River which is located west of downtown Cincinnati” (Jax Dem, 2013).

Settlers came to the Mill Creek watershed in the 1800’s and built paper mills, wool mills, and factories, leading to continued development, deforestation, and pollution (Brown, 2010). After fostering industry in Cincinnati, the waterway became a dumping ground that remained unfit for people to swim in and for most fish to live in. “In 1992, the Ohio EPA Chemical and Biological Survey uncovered a host of pollutants in Mill Creek. Among others they found raw sewage, bacteria and viruses, heavy metals, organic compounds and pesticides” (Jax Dem, 2013). By 1997, Mill Creek was rated one of the most endangered streams by American Rivers (Mill Creek Watershed Council). Within the watershed they found “degraded stream banks, reduced water quality, little

instream habitat, lack of recreation, degraded riparian zones, an eroding landfill, and flooding” (Wimmer and High, 2010). Due to this, the EPA advised against swimming or fishing in the creek because of the potential for illness. By the 1990’s the Mill Creek was more a liability than the thriving asset it had once been (Wimmer and High, 2010).

Knowing that this was an issue to the health of their community, the people began to work towards rehabilitating the stream. In 1994, Groundwork Cincinnati - Mill Creek was founded with the mission to “serve as a catalyst for developing sustainability in the Mill Creek Watershed through community-based planning and empowerment, environmental education, and economically sound ecological restoration” (Groundwork Cincinnati, n.d.). In 1995, the Mill Creek Watershed Council of Communities was formed. The council is a non-profit organization that “uses its funds to implement improvement in the Mill Creek Watershed. From stream restoration to wetland construction to innovative stormwater management, the council puts projects in the ground that deliver environmental and economic benefits in the Mill Creek Watershed” (Mill Creek Watershed Council, n.d.). Their goals are watershed action planning, project implementation, education, and advancing research and knowledge. Since their inception, the above groups have been instrumental in laying the foundation for change and have implemented projects within the watershed.

Analysis

The Mill Creek Watershed covers 166 square miles and spans 37 communities, directly tied to the future of Cincinnati. Historically it has been integral in human development; however, it is currently far from spectacular. “During the 28-mile course from its headwaters, the creek flows through a patchwork of concrete channels along the Interstate 75 corridor. It passes blighted buildings, ugly factories, old slaughterhouses and some of the region’s poorest neighborhoods” (Brown, 2010). Though projects have been implemented successfully, some limitations do exist. No one person or group is in charge of Mill Creek which has caused planning issues to arise. Due to the size of the watershed there is a disconnect between the many political jurisdictions that it traverses. Each have their own governments with certain expectations and funds for projects and management within their area. As of now, the Mill Creek Watershed Council has created a master plan for the Upper Mill Creek watershed. Local governments are working on dozens of projects to stabilize stream banks, create wetlands and reserve the creek corridor for conservation. Another issue is that “there is no master plan to repair the lower portion of the watershed south of the Butler county line” (Brown, 2010).

Design & Development

Organizations and governments have completed and are currently working on a host of projects that encapsulate everything from stream restoration to recreation creation. The following are a selection of the projects and their elements and goals from the Mill Creek Watershed Council:

- Greenway development
- Outdoor exercise and recreation
- Trails and bike paths
- Stormwater management and flood damage reduction
- Housing and community revitalization
- Ecological regeneration
- Environmental education
- Twin Creek Preserve
- 8 acre floodplain wetland
- Bio engineered stream banks with meandering bends
- Man-made riffles and other in-stream features
- Stream-side and wetland plantings with native species
- Scenic nature trail
- Liz Claiborne Wetlands
- Constructed floodplain wetland
- Erosion control coir matting
- Newbury riffles
- Turf reinforcement matting in drainage swales



Figure 5.2.2 Map of Mill Creek Watershed (Source: Mill Creek Watershed Council, n.d.)



Figure 5.2.3 Beaver Run (Source: Mill Creek Watershed Council, n.d.)

- Creation of wildlife habitat
- Beaver Run
- Bank stabilization of 1600 linear feet for phase I and 230 linear feet of stream for Phase II
- Native shrubs and trees
- Terraced walls composed of soil lifts encapsulated in coir matting
- Widened stream channel
- Gently sloped streambank
- Stone-lined channel
- Plunge pool consisting of rock and gabion walls
- Morris Farm Wetlands
- Grading design that introduced a mosaic of surface elevation changes and contours
- Enhancement and expansion of the restored wetlands
- Restoration of bank sinuosity and floodplain functionality
- Extensive seeding, planting and live staking program to introduce a variety of native and self-sustaining habitat communities
- Multi-year monitoring program to track progress and ensure adequate performance

- West Fork Mill Creek Headwaters Restoration
- Partial removal of concrete channel armoring
- Channel re-grading and 200 feet of streambank stabilization
- Removal of invasive honeysuckle and cattail
- Re-vegetation with native trees and shrubs
- Terrace walls composed of soil lifts encapsulated in coir matting staked with native vegetation
- Laughing Brook Wetland
- Wetland habitat
- Biosculptures to cleanse runoff
- Renewable solar energy
- Reused and recycled materials

Criticisms & Lessons Learned

According to Wimmer and High (2010), there are a multitude of lessons to be learned from this project. Given the poor soils and steep slopes within the watershed, water is the limiting factor for successful vegetation establishment. Because of this, maintenance of vegetation should be accounted for in the long term. For safety reasons, construction and maintenance of aging infrastructure, such as bridges, roads and existing trails, should also be accounted for. Within the design process, one should carefully focus on the allowance and exclusion of different forms of access. The public is creative and tend to make their own way, especially on ATVs.

As a project progresses, there are planning based issues to account for such as changes in quantities and site conditions. Some of these conditions are difficult to account for so coordination should begin early. However, some things are inevitably missed so it is prudent to establish contingency funds that may be allocated later in the construction process. Attaining approval of these projects can also be challenging so approvals should be sought early and repeatedly. As this infrastructure is uniquely tendered to a specific community, property owners and community members should be included in the planning and design process.

Conclusion

Mill Creek has shown that it is possible to construct a successful urban stream restoration project. Furthermore, the project has shown that it is possible to achieve optimal water quality, habitat, and recreation opportunities within a multitude of communities. Ultimately, this project can serve as a blue print for other future restoration and greenway projects.

Relevance to Middlesboro

The Middlesboro Greenway site is one of great potential that has not yet been exploited. It is envisioned as a recreational corridor with a series of trails, parks, and opportunities to interact with the water. Additionally, restoration and revitalization of this stream and its watershed is vital in order for the full breadth of the Greenway project to be achieved. A multitude of factors within this project can be looked at and adapted to specific design considerations within Middlesboro:

- Greenway development including outdoor exercise and recreation, shared nature trails and bike paths, and community revitalization surrounding the site.
- Stream restoration through bank stabilization, erosion control, stormwater management, flood damage reduction, man-made riffles and other in-stream features.
- Ecological restoration and wildlife habitat creation through re-vegetation.
- Repaired riparian zone and wetland creation.
- Partial removal of Army Corps of Engineers concrete channel.
- ATV mitigation through careful access design.

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Contact

Name: Annie Rahall
Position: Administrative Assistant
Organization: Mill Creek Watershed Council
Address: 1223 Jefferson Avenue
Reading, Ohio 45215
Phone: (513) 401-877
Email: arahall@millcreekwatershed.org
Webpage: <http://millcreekwatershed.org/>



Figure 5.2.4 Historic Fourth Ward Park, Atlanta, GA (Source: Beltline Lifestyle, 2014)

Project Name
Atlanta Beltline

Location
Atlanta, Georgia

Date Designed
April, 2005

Construction Completed
Ongoing; Expected completion 2030

Construction Cost
\$3.6 Billion

Landscape Architect
Perkins + Will

Developer | Client
Wayne Mason, Atlanta, GA

Manager
Atlanta Beltline, Inc.

Introduction

Atlanta is located in the southeastern United States, in the northern part of Georgia. In 1837, Atlanta was founded due to its location at the end of the Western and Atlantic Railroad line. Transportation is central to Atlanta’s successful environment, and can be seen in its wide spread public transit as well as its major airports with international flights entering and departing everyday. Businesses are thriving in the city, home of major banking centers, Fortune 500 companies, and more than a thousand international companies. Atlanta is one of the fastest growing cities in the nation. It currently has 5.4 million people within its 28 county Atlanta metropolitan area. Over the last six years, the city has increased in population by nearly 500,000 people per year (U.S. Bureau of Labor Statistics, 2014). The city is also one of the youngest since the average population age is only 34 years old. According to Atlanta.net, “the city’s racial diversity is greater than that of the nation as a whole” (Atlanta Convention and Visitor Center, 2014).



Figure 5.2.5 Atlanta Skyline (Source: Atlanta Area Attractions, 2014)

The Atlanta Beltline project was developed due to the city's growth limitations, the abandoned railway around the perimeter of the city, the lack of greenspace within the city, and the vision of a graduate student's thesis.

The Beltline first got its start in 1999 when the idea was presented as a master's thesis by Ryan Gravel. He proposed connecting the historic railway surrounding Atlanta via a new public transit system and connected parks throughout (The Trust for Public Land, 2014). The Beltline gained headway when local citizens and civic leaders caught wind of the idea. They strongly supported its development and in 2005, the Atlanta Beltline Partnership was formed (Atlanta Beltline, 2014).

According to Beltline.org, "The Atlanta Beltline is the most comprehensive transportation and economic development effort ever undertaken in the City of Atlanta and among the largest, most wide-ranging urban redevelopment programs currently underway in the United States" (Atlanta Beltline, 2014). This vast network of public parks and multimodal trail system (Figure 5.2.6) supported through the historic railway will help to connect nearby communities and increase the city's green space by 40% (Atlanta Beltline, 2014).



Figure 5.2.6 Park areas both existing and future development. (Source: Atlanta Beltline, 2014)



Figure 5.2.7 Public Art called 'Fruition (Source: Hense x Born, 2011)

Analysis

Upon completion, the Atlanta Beltline will be a 22-mile transit system connecting areas surrounding the city of Atlanta. It will tie together 45 neighborhoods through its 33 miles of multi-use trails around and through the city. The Beltline encompasses 6500 total acres of land (Atlanta Beltline, 2014).

Because of the extensive scope of the project, it will have regional economic impacts. Not only will people be able to easily travel along the edges of Atlanta, but they also will have easy access to regions adjacent to Atlanta. With such ease of transportation, more and more people will be active along the Beltline. The green space along the Beltline will encourage people to stay, which ultimately will increase commercial activity across Atlanta. Increased movement of people will encourage greater economic development across the region.

Not only are there economic benefits, but there are also positive environment outcomes due to the careful design of the Atlanta Beltline. With more public transit available, fewer citizens will need to use a personal vehicle to travel to and from destinations, helping to decrease pollution from vehicles. Also, ecological conditions were improved with creek restoration projects, urban forest revitalization, and industrial reclamation (Atlanta Beltline, 2014). The Atlanta Beltline is also seen as a corridor for scientific research since the 22 miles of trails will also be a 22 mile arboretum.

Site Limitations

After the initial idea was proposed, more and more people began to support the Beltline. While there could have been major issues acquiring adequate financial support, this project was fortunate to have such a strong support base and leadership team. They formed the Atlanta Beltline Partnership and were able to raise \$1.4 billion for the project. Additionally, the Trust for Public Land has helped to acquire 33 properties for use in the Beltline project.

The Transportation Investment Act was voted on by citizens across the ten counties that will be affected by the Beltline construction. This act will generate hundreds of millions of dollars that will be put toward the development of a light rail line (Cummings, 2012). Despite the wide-spread support for the project, there was some opposition. Some citizens believe that it will ultimately "create huge profits for private developers who own nearby property and want taxpayers to help fund the cost of improvements" (McWilliams, 2012).

Ultimately, since the scope of the Beltline is so incredibly large, the main problem the project will face over time will be acquiring adequate funds to continue development.



Figure 5.2.8 Northside Trail (Source: Davidson, 2011)

Design & Development

Project Elements

Below are some of the main project elements of the Atlanta Beltline (Atlanta Beltline, 2014):

- Parks: 1,300 acres of park land is in the masterplan for the Atlanta Beltline. The sustainable new parks are designed to filter industrial waste from the ground and establish a healthy environment.
- Trails: there will be 33 miles of multi-use trails that connect to nearby neighborhoods.
- Transit: the proposed lightrail system along the Beltline will connect to the existing system called MARTA.
- Affordable Housing: approximately 5,600 units are planned to be built by the end of the project. These will be both rented and sold.
- Art: along the Beltline, public art is displayed that is both temporary and permanent.

Criticisms & Lessons Learned

Despite all the financial supporters that the project has gained, they are still having difficulties finding and appropriating funds. According to peachpundit.com, "...the State Supreme Court heard arguments from a group of taxpayers who say school taxes have been spent unconstitutionally to pay for part of the BeltLine."

The large scale of the project, in both size and time, makes it difficult to complete. Citizens want to see essential parts of the project done, such as trails, so they can begin using the Beltline, but many other parts of the project will not be completed for some time (McWilliams, 2012).

Some citizens believe that the trail and park system of the Beltline will be a wonderful and useful aspect of the project, but that the transit system of street cars is unnecessary. Those against the Beltline argue that the transit system within the Beltline "does not go where people want it to go" (Cantrell, 2013).

Conclusion

Future Plans & Opportunities

The Atlanta Beltline is expected to be completed in approximately 17 years. The 2030 Strategic Implementation Plan was developed in December 2010, and details how the project will progress in five-year segments. Over the next five years, the Strategic Implementation Plan explains the following project priorities (Atlanta Beltline, 2014):

- Obtaining Right-of -Way for the 22-mile loop
- Finishing the Westside Trail
- Beginning first phase of Westside Reservoir Park
- Constructing light rail system on both the east and west side of Atlanta

Relevance to Middlesboro

The Atlanta Beltline project is similar to the Middlesboro community development project in that the Beltline will ultimately implement miles and miles of trails as well as various parks. The goals of the Greenway in Middlesboro include implementing trails and parks to connect to the rest of Middlesboro. Developing a system of trails is important because it provides opportunities for community members and visitors to exercise and explore Middlesboro on-foot. Similar to the Atlanta Beltline, the Greenway in Middlesboro is expected to be a destination point for tourists and residents alike. The program elements, such as parks, wetlands, trails, and gardens, etc., will attract people to the site. Also, similar to the Atlanta Beltline, the Greenway in Middlesboro is designed to handle flooding. There are areas of parks in Atlanta designed to take on a great deal of water to prevent flooding elsewhere (Figure 5.2.4). Handling the water carefully is crucial so that the site can maintain itself.

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Contacts

Name: Atlanta Beltline, Inc
Address: 86 Pryor Street, Suite 300
Atlanta, GA 30303
Phone: (404) 477-3003
Webpage: <https://beltline.org>



Figure 5.2.9 Lexington, Legacy Trail - Lexington, KY (Source: Landstory, 2010)

Project Name

Legacy Trail

Location

Lexington, KY (USA)

Date Designed

2008

Construction Completed

[Ongoing since 2010]

Construction Cost

\$10 million

Landscape Architect

Landstory

Developer | Client

Lexington Fayette Urban County Government [Lexington, KY]

Manager

The Blue Grass Community Foundation

Introduction

The Legacy Trail is a 12 mile walking and biking trail in the city of Lexington, KY. Lexington is the second largest city in Kentucky, covering an area of 285 square miles. As of 2012, there are 305,489 people that live in Lexington (Lexington-Fayette, 2013). Lexington has been deemed the “Horse Capitol of the World” due to the region’s limestone terrain, which is responsible for creating strong thoroughbred horses. The Lexington Horse Park can be found at the north end of the Legacy Trail, just outside of I-75. Along with Lexington’s roots in horse culture, the city is host to the University of Kentucky. In 2014, the university has exceeded an enrollment rate of 29,000 students for the first time (Blackford, 2013). Considering the dynamics of Lexington, there are a wide range of demographics within the city limits; horse industry workers, college students, and business employees, to name a few.

In part with the horse culture of Lexington, the Alltech World Equestrian Games were held in Lexington in 2010. The Legacy Trail was developed as a legacy project for the Equestrian Games and was completed before the start of the games (Eblen, 2010). The Legacy Trail stretches to the Lexington Horse Park, which is where the Equestrian Games were held (Eblen, 2010). This allowed visitors to experience the diverse landscape of Lexington.



Figure 5.2.10 Legacy Trail Map, Lexington, KY. Source (Source: "Legacy trail," 2012)

The Legacy Trail is north of the city of Lexington (Figure 5.2.10). The first installment of the trail was an 8 mile section making connections between the Northside YMCA on Loudon Ave and the boundaries of the Kentucky Horse Park (Figure 5.2.11). The trail makes passes through the Coldstream Research Park, which provides a resting place for walkers and riders looking to travel the full trail.

The second and final installment of the trail is a 4 mile section that connects the Northside YMCA to the Isaac Murphy Memorial Art Garden Trailhead (Figure 5.2.10). Construction on this will begin in the second half of 2014.

Analysis

The Legacy Trail is a 12 mile long trail system consisting of a paved trail allowing for biking and walking. Along with the pedestrian traffic, the trail will provide Lexington with collections of artwork. The finished trail connects the Kentucky Horse Park, north of I-75, to the Isaac Murphy Memorial Art Garden, which is located at Third St. and Midland Ave (Beverly, 2013).

The trail crosses over urban, suburban and rural landscapes between its two end trailheads, which are located at the Lexington Horse Park and the Isaac Murphy Memorial Art Garden. It provided Lexington with connections to a variety of destinations including the Kentucky Horse Park, the Lexmark Campus, Transylvania University, and the Northside YMCA (Landstory, 2010).

The construction of the project also "included strategic use of land swapping, easements, and existing right of way" (Landstory, 2010). The design of the trail limited the number of easement negotiations to only 6 property owners (Eblen, 2010). Along with



Figure 5.2.11 Legacy Trail Rock Wall, Lexington, KY (Source: Grady, 2010)

Design & Development

Project Elements

The Legacy Trail has a few project size elements that make the trail structure. These elements include public art displays, 12-foot wide trails, interpretive signage, rock walls, and multiple trail heads. The public art displays are for artwork created by local artists (Figure 5.2.12). By using 12-foot wide trails, bikers and walkers can use the trail simultaneously. Interpretive signage for the Legacy Trail creates consistent signage for users to easily recognize their bearings. The rock walls, which are a recognizable Kentucky country side feature, helps link the trail to the history of the Kentucky horse culture (Figure 5.2.11). Finally, numerous trail head locations allow users to decide on their own route to take. By utilizing these project elements, the Legacy Trail can exist as a project that will be easily recognized by the community. Not only will the Legacy Trail be somewhere for the community members of Lexington to engage in recreation, the art displays will provide an ever-changing element that will keep the trail intriguing.

Criticisms & Lessons Learned

The Legacy Trail has improved Lexington by contributing to the city's doubling of trails in the last ten years. The implementation of the trail has encouraged Lexington residents to be more active. Jay McChord, who is a former Urban County Council member, said "physical activity is the silver bullet...the more active we are, the more the good things go up and bad things go down." This is a key indicator that by providing more places for community recreation, you can encourage more people to engage with these public spaces. McChord went on to further emphasize the importance of these trails by saying, "there's not another piece of infrastructure where you can put a grandfather and a grandchild, a world-class athlete and person in a wheelchair, and they can exercise" (Beverly, 2013).

The Legacy Trail in Lexington has added to the existing bicycle and pedestrian access through the iconic horse farms of Kentucky. Although Lexington has experienced time limitations in regards to getting the approved funding as well as the approved paperwork, the community members have more space to engage in outdoor activities. Along with the increased opportunities for recreation, the public art displays are a way for the community members to experience the local artists' work.

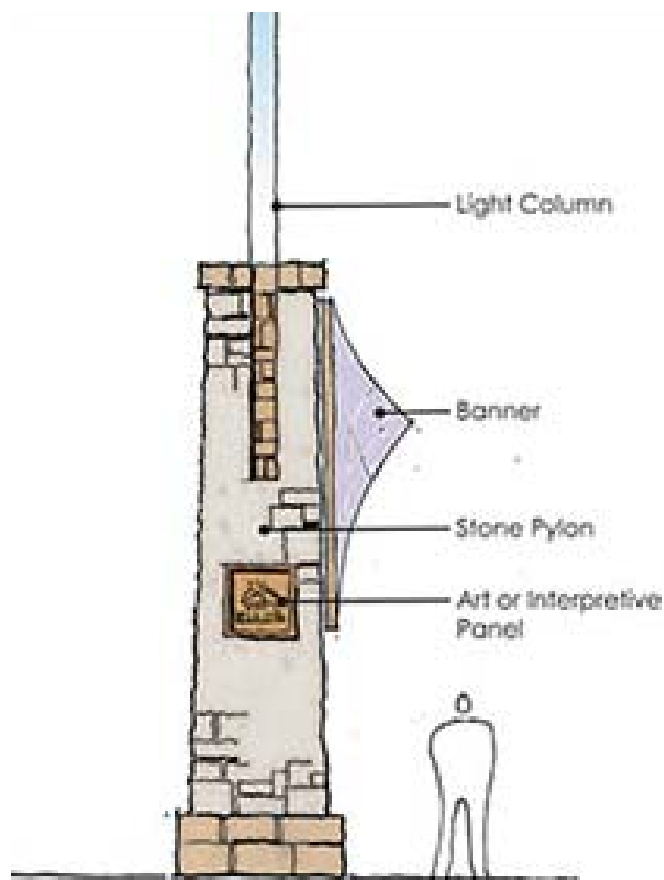


Figure 5.2.12 Legacy Trail Art Display Concept (Source: Landstory, 2010)

the local artists showing off their work in public art displays, rock fences (Figure 5.2.12) were used as the underlying theme to maintain a "consistent trail character as it passed through a myriad of natural environments" (Landstory, 2010).

Site Limitations

The Legacy Trail has been constructed in sections, due to limited funding. The first 8-mile section of the trail has already been completed, and the remaining 4 miles are expected to be started in the summer of 2014. The segmented approval of funding has slowed down the stages of construction for the trail.

Along with the financial limitations, the trail found some physical limitations. In the rural setting, acquiring land from private property owners took time. Because the trail crosses through sections of properties, easement approvals were also required. In the urban setting, the limitations can be found on the street level. In areas where space was limited to create a separate bike lane, drivers have to be aware of shared road use with bikers.

Limitations can be seen in physical and financial forms. These limitations caused the project time line to be extended further than expected.

Conclusion

Future Plans & Opportunities

The Legacy Trail has completed 8 miles of its 12 mile trail plans. The remaining 4 miles, due to start construction in the summer of 2014, will bring the trail into the east end of Lexington, ending at the Isaac Murphy Memorial Art Garden trail head. When looking at opportunities, Keith Lovan has stated that, “when you look at a map of where we have shared-used trails, it looks like someone threw a handful of spaghetti up there (Beverly, 2013).” This statement illustrates how Lexington could benefit from the opportunity to create a city wide trail network.

Relevance to Middlesboro

There are many elements of the Legacy Trail that would benefit the city of Middlesboro. The Legacy Trail has elements, such as the interpretive signage and 12-foot wide trails (Figure 5.2.13), that can be utilized in the Middlesboro trail town initiative. The signs and wide trails can allow the entire community to engage in recreational activities without losing their sense of surroundings. Also, recognizing that the Legacy Trail has been built in stages can help Middlesboro understand that projects of this scale take time to develop due to its stages of construction required for the project to be complete.

The Legacy Trail project is a good example of how a small scale city like Middlesboro can create exciting trails to accommodate the city’s recreational needs. Middlesboro has the potential to become a successful trail town and becoming a regional trail hub.



Figure 5.2.13 Legacy Trail, Lexington, KY (Source: Laub, 2012)

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Contacts

Name: Landstory
Position: Landscape Architect
Company: Landstory
Address: 901 N. East Street, Indianapolis, IN 46202
Phone: (317) 951-0000
Email: info@landstoryla.com
Webpage: www.landstoryla.com



Figure 5.2.14 Logan Aluminum Wetlands - Russellville, KY

Project Name

Logan Aluminum Wetlands

Location

Russellville, KY

Date Designed

Fall, 1991

Construction Completed

Summer, 1992

Construction Cost

\$1.6 Million

Design Team

Camp, Dresser, & Mckee Inc.; Consulting with in-house engineers

Developer | Client

Logan Aluminum, LLC

Managers

Phillip Porter (Logan Aluminum) 1992-2014

Jamie Stobaugh (Logan Aluminum) 2014-Present

Note: The information contained in this case study was gathered via personal correspondence and interviews with Phillip Porter (Engineering, Site Maintenance - Logan Aluminum), Jamie Stobaugh (Water Services - Logan Aluminum), & Tim Anderson (Environmental, Safety, and Security - Logan Aluminum), who have agreed to have this information published, unless otherwise noted.

Introduction

The Logan Aluminum Wetlands is an award winning project in rural western Kentucky. Over the past twenty years, the wetlands have filtered the water used in the cooling towers and other industrial processes at Logan Aluminum, LLC, a major factory in the area.

Logan Aluminum, located in Russellville, KY, is an aluminum mill responsible for the fabrication of over one-third of the material used for beverage cans in the United States (Novelis, 2014). Jointly owned by Tri-Arrows Aluminum Incorporated (TAA) and Novelis Corporation, the industrial property sits on approximately 1000 acres and employs nearly 1500 workers. Since Russellville’s population is only 6,947, the factory is the area’s largest employer and plays a major part in the local

economy.

Although Logan Aluminum is currently owned and operated by Novelis and TAA, it was originally built by Arco Aluminum and then later co-owned by Arco, Alcan Aluminum Ltd, and Alcan Rolled Products Company. Each of these companies have developed strong reputations for being environmentally conscious, despite their position as world-wide corporations. They have genuine interest in the localities where their plants are located and work with the local populations to reduce any negative ecological impacts.

The main building houses nearly fourteen acres under-roof. The plant is massive, and surface-water runoff has always been a concern. One would think that the pollution and negative environmental impacts of a factory this large would be severe, but that is not the case (Gillette, 1994).

The factory uses “clean” manufacturing practices, meaning that metals and chemicals used in their processes are not as detrimental to the environment as their alternatives. Aluminum does not pollute water as do other metals, and the chemicals used are not as caustic as the chemicals used in other factories. The relative lack of pollutants in the manufacturing process allows the wetlands to be as effective as they are. The water does not have to be cleaned and filtered as vigorously, and is only required to be the same quality as the water found in the surrounding watersheds.

In 1992, a wetland area was built specifically to mitigate the effects of the somewhat-polluted water from the plant on the natural environment. Prior to 1992, Logan Aluminum relied on mechanical and chemical processes to clean the water used in its industrial processes. Since the water used in the plant was relatively uncontaminated, a natural filtration system was seen as a viable alternative.

The 40 acre wetlands consist of 10 acres of berms and 30 acres of lagoons and buffer zones that filter all the wastewater from the factory. The filtered water can then either re-enter into the natural system or be reused in the manufacturing process. By being able to reuse the water, and save money and time by not manually cleaning the water, Logan Aluminum was able to save enough money to pay for the \$1.6 million treatment system within three years of its implementation.

The economic and environmental benefits of the wetlands have proved to be a boon, both economically and environmentally, for Logan Aluminum. The wetlands are aesthetically pleasing compared to the industrial look of the physical plant, and serve as a natural habitat for local flora and fauna. They have also saved the factory millions of dollars that would otherwise have gone toward the cleansing of the water. The company has been recognized nationally for their success.

The project has won numerous awards, including the Governor of Kentucky Award for Environmental Excellence, the Commonwealth of Kentucky’s Corporate Citizen of the Year Award, and the Take Pride in America Award from the United States Department of the Interior which was personally awarded by former President George H. W. Bush in 1992 (Gillette, 1994).

Analysis

Context

Logan Aluminum is located north of Russellville, KY, in Logan County. It is one of the largest single factories in western Kentucky, yet is not part of a larger industrial park. Since it stands alone in a very rural area, massive infrastructure work was needed when the plant was built in 1982. This included the construction of a three and a half mile stretch of four-lane highway and a rail-line of equal length with a terminal on the plant site to connect with other rail-lines that aid in the transportation of materials.

The 1000 acre property is surrounded on all sides by farmland. The main source for the water used in the manufacturing processes is Spa Lake, which is approximately four miles away. Each day, an average of 725,000 gallons of water is taken in from Spa Lake and 230,00 gallons are discharged through Austin Creek, which then flows into Scout Lake, which is about 10 miles away.



Figure 5.2.15 Aerial view of Logan Aluminum Wetlands (Source: Google Earth)



Figure 5.2.16 Sediment Pools, Logan Aluminum Wetlands

Site Limitations

Since the factory is surrounded by agricultural areas on all sides, the water quality is always a major concern. Special care has always had to be taken to ensure that the surrounding properties are not negatively affected. Local residents live within a few hundred yards of the wetlands and special considerations had to be taken to ensure they would not be negatively affected by the wetlands such as a smell, wildlife, excess runoff, etc.

The major lubricant used in the rolling process of the aluminum has a petroleum base, and the containment of this has always been an issue. In 1992, when the factory was set to undergo an expansion to double its production capabilities, the plant management knew that their current methods of cleaning and filtering would also need to be upgraded and expanded.

Despite the knowledge that their current methods would not work, there was some debate over building this natural system versus building an artificial and mechanical system to clean and filter the polluted water. Various models were looked at and many options considered until they agreed upon the construction of the wetlands because of cost efficiency and environmental considerations.

The selection of the site for the wetlands proved to be a challenge. Not only did the project have to be able to handle the water from the factory, but it also had to be able to withstand the run-off from the local watersheds. The wetlands were meant to be a natural and ecologically friendly way to do this industrial process, so it could not change the area's overall ecology.

The standard method of designing built wetlands, which consists of constructing them on relatively flat sites, could not be applied to the Logan Aluminum site due to the geology and underlying karst topography. Instead of the typical flat system of pools and waterways, the designers and engineers were forced to use a site with a significant amount of grade change (Gillette, 1994).

Soil chemistry and makeup also played a significant role. While some infiltration and percolation was desired, too much would hinder the wetlands ability to clean and filter the polluted water before it exited the system. Each of the main sediment pools has a clay base to control water movement through the water table.

Proximity to the plant was also a deciding factor. A space was needed that was economically feasible to transport the water, while still allowing enough room for the wetlands to properly filter contaminants before expelling the water.

Design & Development

Project Elements

In 1992, Logan Aluminum's management team were in the process of implementing an expansion that would nearly double the amount of rolled aluminum produced by the factory. In order to do this, however, steps had to be taken to ensure that the increased water use due to the increase in production would not have a negative ecological and environmental impact. (Gillette, 1994)

The wetland system uses many special features to

- Store water via a system of containment pools
- Move the water through the system via a series of channels and locks
- Sustain the local ecology by using native plants and attracting native wildlife
- Create a network of paths for maintenance and leisure

When the contaminated water leaves the factory, it is sprayed onto a designated area, where it then flows overland to the first in a series of sediment pools. There it is stored while the native plants and sunlight clean the water via evapo-transpiration.

Once the water levels reach a specific point, it then travels down to a lower level of pools and lagoons and the process is repeated. A pump station is located at the bottom of the wetlands, so the water can be transported back to the factory for reuse. Otherwise it exits the system via Austin Creek.

Overall, it takes about twenty days for the water to travel through the entire wetlands. Up to 725,000 gallons of water can be introduced to the system every day, and once the water has been decontaminated it can re-enter the manufacturing process, or be reintroduced to the natural watershed.

There are various markers used to judge the effectiveness of the wetlands. The presence of fathead minnows (*Pimephales promelas*) and water-fleas (*Daphnia lumholtzi*) are species commonly found in healthy wetlands and their populations are closely monitored.

Although a part of the natural processes of wetlands, occasional algae blooms are often a sign of a pH imbalance. The EPA specifies that the pH of constructed wetlands must be between 6.0 and 9.0, and algae blooms generally mean that the pH has risen above 9.0, so facility managers must take appropriate measures when this happens.

Surprisingly, mosquitoes are not an issue. Purple Martins (*Progne subis*) are birds native to the area. Their diet consists of mosquitoes and there are numerous bird houses constructed for them throughout the site. Recently, a Bald Eagle has started roosting in the site as well, which helps control the populations of small mammals.

Criticisms & Lessons Learned

The Logan Aluminum Wetlands are regarded as being a huge success. They have solidified Novelis and TAA as being at the forefront of environmentally friendly manufacturing practices. That being said, there have been countless lessons learned throughout this entire process.

- Creation of the wetlands attracted invasive species of flora and fauna, such as muskrats, threatening the local ecology.
- Fish also thrive in the lower sediment pools, which is a problem when water levels drop below what is required for their survival.
- The wetlands area only has a 30-year life expectancy.
- There is no room for expansion.
- Although the contaminants from the manufacturing process are being removed, other pollutants have been introduced from the abundance of organic matter.

Conclusion

Future Plans & Opportunities

Always striving to be at the forefront in environmentally sound manufacturing practices, Logan Aluminum is constantly working to improve the wetland areas and relieve the ecological impacts the factory has made. The sediment pools and water channels are constantly being reworked and made to be more effective.

Logan Aluminum hopes to stay ahead of the competition in this area, and by constantly reworking plans and coming up with new ideas, there is no reason to think that they will not succeed.

Relevance to Middlesboro

Parts of the Yellow Creek and Canal in Middlesboro, KY are very polluted and not a good habitat for local wildlife. By implementing a system of wetlands, such as the Logan Aluminum Wetlands, the water quality would be improved exponentially. This could also create a habitat for wildlife and a public green space for the enjoyment of the citizens of Middlesboro. There are various spaces along Yellow Creek that could be transformed into wetlands, and doing so would help cement Middlesboro's spot on the top of progressive and environmentally friendly cities. By improving the water quality of the Yellow Creek and Canal, Middlesboro community members would be able to enjoy interacting with the water and the creation of habitats would be a major asset to the local ecology.

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Contacts

Names:	Phillip Porter
Position:	Project Manager
Company:	Logan Aluminum
Address:	6920 Lewisburg Road, Russellville, KY 42276
Phone:	(270) 755- 6000
Email:	phillip.porter@logan-aluminum.com
Website:	www.logan-aluminum.com



Figure 5.2.17 Cherokee Park - Louisville, KY (Source: City of Louisville, n.d.)

Project Name
Middle Fork Beargrass Creek Stream Enhancement Project

Location
 Louisville, Kentucky

Date Designed
 May 2010

Construction Completed
 Spring 2011

Construction Cost
 ~\$125,000

Landscape Architect
 Stantec Inc.

Developer | Client
 Louisville & Jefferson County Metropolitan Sewer District

Manager
 Louisville Metro Parks
 Louisville & Jefferson County Metropolitan Sewer District

Note: The information contained in this case study was gathered via personal interviews with George Athanasakes (Senior Principal - Stantec Inc., Louisville, KY), unless otherwise noted.

Introduction

Beargrass Creek Watershed is located in Louisville, Kentucky. Louisville Metropolitan is the largest urban area in the Commonwealth of Kentucky with a population of approximately 605,110 people (United States Census Bureau, 2014). The sizeable watershed is very diverse and divided into three major sub-basins: Muddy Ford, South Fork and Middle Fork. All three sub-basins flow through developed suburbia and eventually empty out into the Ohio River (Louisville Metropolitan Sewer District, 1998).

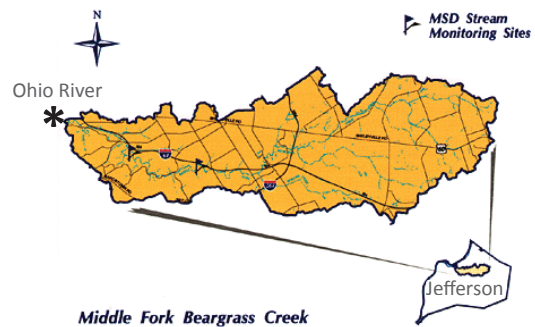


Figure 5.2.18 Middle Fork sub-basin in Louisville, Jefferson County (Source: Louisville Metropolitan Sewer District, 2012)

More recently, restoration efforts have been applied to Cherokee Park, located within the Middle Fork sub-basin. Cherokee Park, designed by Frederick Law Olmstead, is an urban recreation area managed by Louisville Metro Parks (City of Louisville, KY, n.d.). Beargrass Creek Watershed (especially in frequented recreation areas) represents many water quality problems (Figure 5.2.19). These concerns include combined and sanitary sewer overflows, wastewater treatment plants, septic tank seepage, urban stormwater run-off, erosion followed by sedimentation and flood management issues (Figure 5.2.20).

Water quality monitoring stations confirm that fecal coliform and contaminated run-off matter (from vehicle emissions, household chemicals, etc.) enters the stream system upstream at the confluence with the Ohio River (Louisville Metropolitan Sewer District, 1998). As a result, the U.S. Environmental Protection Agency (EPA) has advised against human contact in certain



Figure 5.2.19 Poor water quality (Source: Stantec, Inc., n.d.)



Figure 5.2.20 Exposed piping and stream pollution (Source: Stantec, Inc., n.d.)

locations in the creek. The Middle Fork Beargrass Creek Stream Enhancement Project in Cherokee Park is an effort to mitigate these mentioned concerns.

Analysis

Context

Beargrass Creek Watershed is a 39,000 acre network of urban streams (Louisville Metropolitan Sewer District, 2005). These streams extend across the municipal area and affect many Louisvillian lives daily. During a rain shower, pollution freely leaches into the water systems due to heavy industrial land uses in close vicinity. Healthy riparian edges would act as a buffer against this chemical infiltration. The lives affected are not exclusively human and include every aquatic life form utilizing the waterways as habitat.

Project landscape architect(s), Stantec, Inc., took these issues into consideration when developing design objectives (per client consent decree requirements) (Stantec, Inc., n.d.). The design objectives were to minimize erosion, restore habitat, create a better flow path through the bridge, and to improve the riparian corridor. The goal was to improve natural habitat where it met daily human interaction and public infrastructure such as the bridge (Figure 5.2.21).



Figure 5.2.21 Stream crossing under infrastructure (Source: Stantec, Inc., n.d.)

Site Limitations

While it is clear Middle Beargrass Creek's stream restoration effort's benefits outweighed its costs, some opportunities were limited. Further developing along the waterway, within the 100-year floodplain, was one such limitation. It is difficult to justify development because it would be making negative environmental impact by implementing levees and flood walls for maximum flood protection.



Figure 5.2.22 Cross-Vanes (Stantec, Inc., n.d.)

Design & Development

Project Elements

Stantec values every opportunity for innovation (Stantec, Inc., n.d.). They decided on the following state-of-the-art features over other common solutions:

- Double Step Cross-Vanes
- Log Vanes
- Toe Wood Sod Mat Structures

The double step cross-vane feature can serve many purposes in a stream restoration project. They can provide grade control, reduce streambank erosion, guide sediment transport, create fish habitat, keep a width versus depth ratio, improve boating conditions, help river stability and much more (Figure 5.2.22) (Rosgen, 2006). However, in the Middle Fork Beargrass Creek project, the stream restoration feature was applied to the objectives of minimizing bank erosion and creating a better flow path through and underneath the bridge.

Log vanes mimick partially fallen trees into an active waterway. They, too, prevent bank erosion and potentially create pools on the downstream side. The defining difference between a log vane and a rock or step cross-vane is the physical appearance of the materials (Massachusetts Nonpoint Source Pollution Management, n.d.).

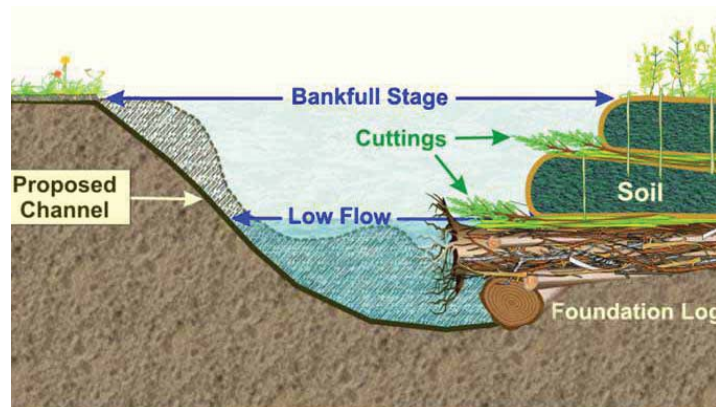


Figure 5.2.23 Toe Wood-Sod Mat (Stantec, Inc., n.d.)

Toe wood-sod mats are a relatively inexpensive stream restoration technique used to generally initiate riparian zone revitalization. This natural method restores channel dimension and function, protects stream sinuosity, and provides habitat. This solution can be applied to a variety of stream scales, all stream sediment types, and for short and long term use. Toe wood-sod mats also restore connection to the floodplain with a bankfull stage (Figure 5.2.23) (DNR Ecological & Water Resources, 2010).

Criticisms & Lessons Learned

Significant environmental problems can be solved by the power of nature itself. With careful monitoring, good management practices, and application of ultramodern restoration elements, streams can see quick results in improved water clarity, return of wildlife habitat, such as fish and birds, and overall user experience.

Conclusion

Future Plans & Opportunities

Based on personal assessments and prior knowledge of Beargrass Creek Watershed future initiatives for the South Fork Beargrass Creek Flood Prevention Project, it is expected that more attention will be drawn to the Middle Fork's potential to occasionally flood in the future (Louisville Metropolitan Sewer District, 1998).

Relevance to Middlesboro

The distinct connections between the situations of both Louisville's Beargrass Creek Watershed and the entire city of Middlesboro are clear. The stream restoration tactics applied in Middle Fork Beargrass Creek are achievable for the Yellow Creek running through and around Middlesboro. Still, the dilemma at Yellow Creek is the continuous, extreme flooding potential. It is important to remain aware that the integrity of flood protection management cannot be compromised by stream restoration design. As mentioned in the design and development section, there are options available to fit different intensities of problems at different scales. It is important to keep function before form.

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Contact

Name: George Athanasakes
Position: Senior Principal
Organization: Stantec, Inc. [Louisville, KY Office]
Address: 10509 Timberwood Cir
Louisville, KY 40223
Phone: (502) 420-2868
Email: george.athanasakes@stantec.com
Webpage: <http://www.stantec.com/>

Summary of Greenway

The Greenway, which follows along the Army Corp of Engineers flood management project, has the potential to provide Middlesboro with an area full of habitat restoration and recreational opportunities. These elements have been highlighted in four sections along the Greenway. The North Park, located at the intersection of the Canal Walk and the Greenway, plays an important role in the overall trail system. Along with being a connection point for the Canal Walk and the Greenway, the stream restoration ideas will help improve the local habitats of wildlife. This will provide visitors an intriguing experience with the natural environment. The Spillway Remediation Park will give visitors an opportunity to view the channel from an elevated perspective. Along with an overview of the channel, the informational signs will allow visitors to understand the elements of the stream. Wetlands Park serves as a unique method to trap floodwaters while still providing recreation in times of high water. Finally, the Educational and Gateway parks at the south point of the Greenway will encourage students and visitors alike to engage in the educational properties of the parks. The improved conditions of the stream along with the direct connection to downtown will help the community embrace the natural flora and fauna of the Yellow Creek.

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Wayfinding

Chapter Six



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6.1: Wayfinding Background



Figure 6.1.1 Various signs along Cumberland Avenue in Middlesboro, KY

Introduction

Middlesboro has the potential to become a regional destination with an easily navigated system of trails. Wayfinding can be defined as, “signs, maps, and other graphic or audible methods used to convey location and directions to travelers” (“*Wayfinding*”, n.d.). The future of Middlesboro as a regional trail hub, tourist destination, or successful system of trails is highly dependent on an effective wayfinding system. Such systems include well planned sensory cues; are clearly connected and aesthetically pleasing; and create a sense of security, comfort, and well-being in users. Successful wayfinding involves memory and a learning process so that the information given may be understood, organized, and remembered by those who interact with the spaces (Passini, 1992).

The proposed trail system discussed in Chapters 3-5 can be easily navigated by residents and tourists if there is effective signage along the way. More recent trail projects have put effort into developing engaging and creative wayfinding systems that ensure the paths can be followed and different locations easily accessed. The Louisville Loop project included the sign text and construction details which have helped make the Loop a highly used trail and a destination for tourists. The benefits of a wayfinding system are that the trails can be used by locals and visitors alike without issues finding different locations along the trails (*Louisville Loop Overview*, n.d.).

Goals

The goals for Middlesboro are to create a navigable trail with a unique identity so that residents and visitors can associate their immediate surroundings with a location in the larger-scale space. This concept speaks most directly to the first criterion for navigability: the ability to recover position and orientation (Gibson, 2009). This principle indicates that every place should function as a landmark; in this project, a recognizable point of reference in Middlesboro.

Goals for effective wayfinding for the Middlesboro trail system include:

- Create an identity at each location, different from all others trails
- Use landmarks to provide orientation cues and memorable locations
- Create well-structured paths around the city
- Create regions of differing visual character (e.g., Downtown, Canal Walk, and Greenway)
- Provide a range of routes for users to navigate along the trails
- Provide signs at decision points to guide wayfinding

Analysis

Challenges/Issues

There are many different types of signs in and around Middlesboro, varying in color, size, and form that create an unorganized appearance. Also, there is currently no consistency in the spelling of the city's name; it is shown as both Middlesboro and Middlesborough. This inconsistent spelling of the town's name not only can illicit confusion among visitors but discourage return visits due to the lack of a repeatedly re-enforced name that visitors will remember. A number of the existing signs are in derelict condition, being rusty, dirty, chipped, damaged from vandalism, or bent (Figure 6.1.3).

There are many areas along the Downtown, Greenway, and Canal Walk trails that need clearer or more noticable wayfinding elements and some currently may not have any at all. Some areas are in need of larger signs with destinations, distances, and directions shown, while other areas simply need increased maintenance of existing signs because they are blocked from

view by vegetation (Figure 6.1.2). These signs must be more visible so that users may be better directed around town and the proposed trail system of Middlesboro.



Figure 6.1.2 Middlesboro sign blocked from view by plantings and vegetation

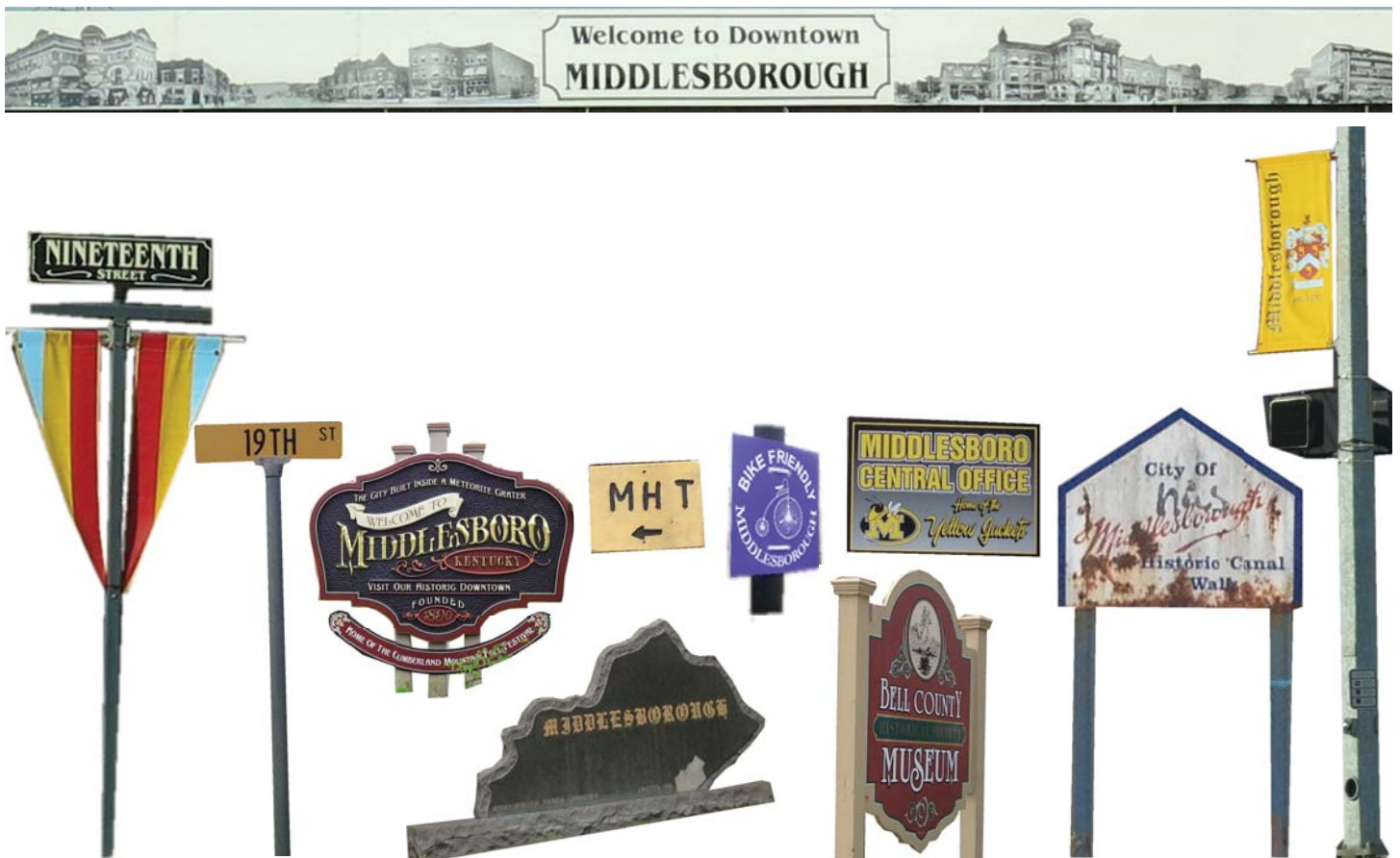


Figure 6.1.3 Existing signage demonstrates inconsistency around Middlesboro

Wayfinding Existing Conditions

At a site-specific level, the wayfinding could become consistent enough to transform the town into an easily navigated place. As of now, an individual walking through the Canal Walk will experience vast differences in the signage. The signs vary in shape, size, content, color schemes, programs, symbols, and height (Figure 6.1.4).

The first sign walking along the Canal Walk in downtown Middlesboro is located on Cumberland Avenue between N. 24th Street and N. 22nd Street. This sign welcomes visitors to the Canal Walk, briefly explains the origin of the trail, and informs users of the trail rules. This sign acts as the trailhead for the Canal Walk and is in Good Condition (A, 6.1.4). Another sign sits just before the N. 22nd Street bridge. It communicates to visitors that they are on the Middlesboro Canal Walk. This sign, compared to similar signs, is in good condition and conveys a clear message (B, 6.1.4). A stormwater sign was placed along the Canal Walk, advertising great fishing. Although this sign is in good condition, it conveys false information. The canal receives a large amount of the city's stormwater runoff, diminishing the quality of the canal and the surrounding ecosystem. This discourages the fish population from inhabiting here (C, 6.1.4). Further along at location D on the map is a sign like the one at location B which serves as a reminder to patrons that they are on the Canal Walk. However, unlike the previously mentioned sign, this one appears to be in disrepair. Faded paint, rust marks, and dirt on the sign, poorly represent the trail (D, 6.1.4). Although there is a sign that indicates an appropriate route for bikes, the concrete path abruptly ends after this sign, forcing bikers to cycle through grass and gravel. The sign is constructed of low quality material and is not uniform with the other signs along the Canal Walk (E, 6.1.4). There is a sign towards the end of the Canal Walk that matches the one located at Cumberland Avenue. It serves as a trailhead to visitors enjoying the Canal Walk. The sign is in good condition and repeats the same information provided in the aforementioned sign. This sign is located on the corner of Fitzpatrick Avenue and Ashbury Avenue (F, 6.1.4). One of the signs towards the end of the canal walk follows the uniformity of those found at prior locations. However, the sign is so dilapidated that it does not serve any purpose to the Canal Walk. The severe rusting and paint make the sign nearly illegible. Signage like this needs to be replaced in order to restore its original purpose (G, 6.1.4).

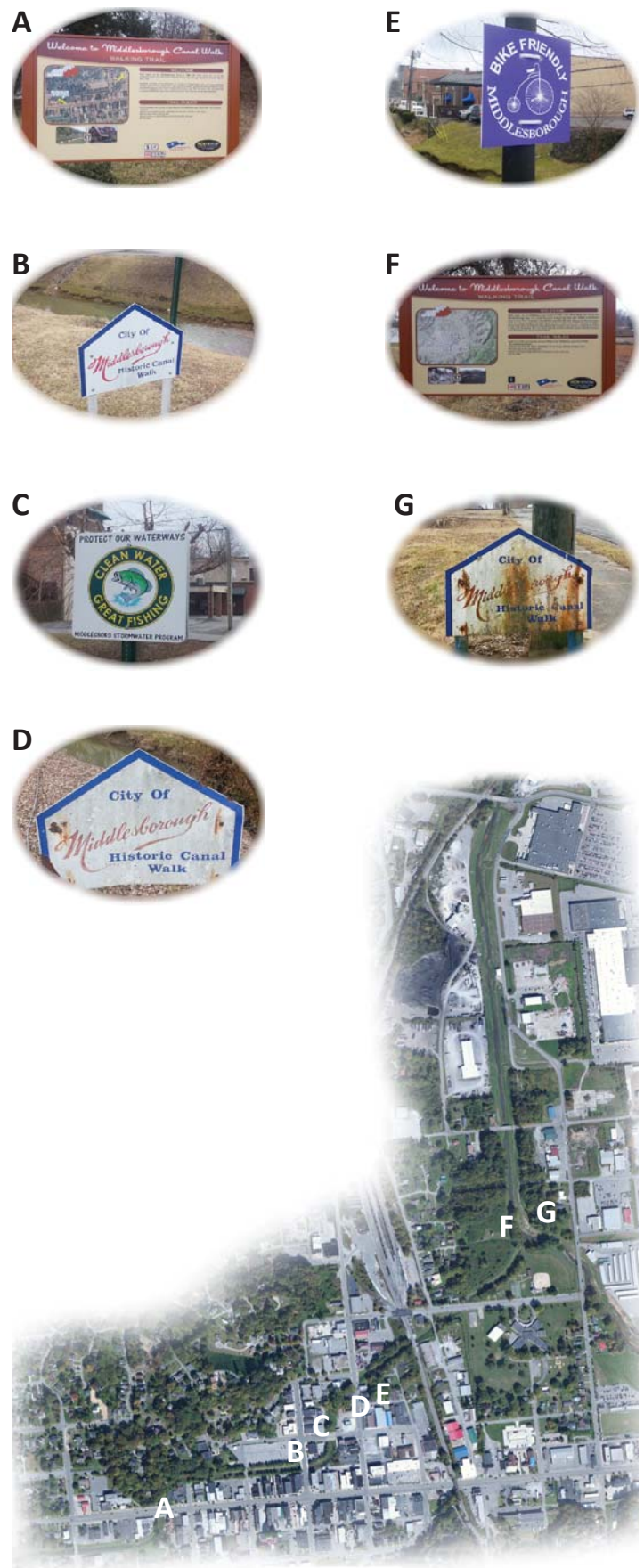


Figure 6.1.4 Existing signs throughout the Canal Walk

Boone Trace Inconsistency

Daniel Boone traversing the Cumberland Gap region is historically significant. The National Park Service recognizes the importance and has a portion of its trails named “Boone Trail” in the Virginia side of the Cumberland Gap National Historical Park. The Daniel Boone Visitor Information Center is also located just outside of Cumberland Gap, TN. However, the names of the trails vary along different sections, such as Wilderness Road Trail, Object Lesson Road Trail, Thomas Walker Trail, Fitness Trail and Bicycle Trail, as the trail comes closer to Middlesboro (Figure 6.1.5).

Middlesboro, Kentucky, is an important place that Daniel Boone traveled through while on his journey westward. The trails within the national park could better inform Daniel Boone’s footsteps as it gets closer to Middlesboro. Currently, from the point of the Daniel Boone Visitor Center, visitors are not made aware that the Boone Trace goes over and further into Kentucky and eventually to Fort Boonesborough, KY. There should be more information visually displayed throughout the national park and in Middlesboro that reflects the Boone Trace systematically.



Figure 6.1.5 Inconsistent naming of Boone Trace after Daniel Boone Visitor Center. Highlighted area shows a trail going into Middlesboro. (Map Source: Department of Interior, National Park Service, 2014)

Wayfinding Focus

Trailhead Plan

A well designed and effective trailhead sign can enhance the experience of residents and tourists interacting with the proposed trail system as well as the existing natural amenities within Middlesboro such as the Canal Walk, Cumberland Gap National Historical Park, and the Army Corps of Engineers canal and levees project. The proposed trail system creates an opportunity for trailhead signage to be placed strategically around Middlesboro to encourage trail use. Signs placed at existing trail and road intersection points and places where the proposed trail system meets roads and other points of interest within Middlesboro can help the ease with which users travel along the trail system (Figure 6.1.6).

Inner and Outer Loops

The proposed trail system consists of an inner loop and an outer loop. These loops connect to create a holistic trail system

by which a resident or tourist can explore over seven miles of Middlesboro all while remaining on a clear, paved pathway. The inner loop of the trail system passes through downtown Middlesboro and travels along Cumberland Avenue, Yellow Creek as part of the Canal Walk, and meets with the proposed Greenway trail at the split of Yellow Creek and Little Yellow Creek (Proposed Inner Loop, Figure 6.1.6). The intersection of Little Yellow Creek and Cumberland Avenue is also a point of connection with the proposed entrance trail to CGNHP (A, 6.1.6). The outer loop connects to the inner loop at the split of Yellow Creek (B, 6.1.6), follows the creek north to another split of Yellow Creek (C, 6.1.6), then west around Middlesboro intersecting with Cumberland Avenue at Airport Road (D, 6.1.6), and finally following Cumberland Avenue east to reconnect with the inner loop at the intersection of Yellow Creek and Cumberland Avenue (E, 6.1.6).

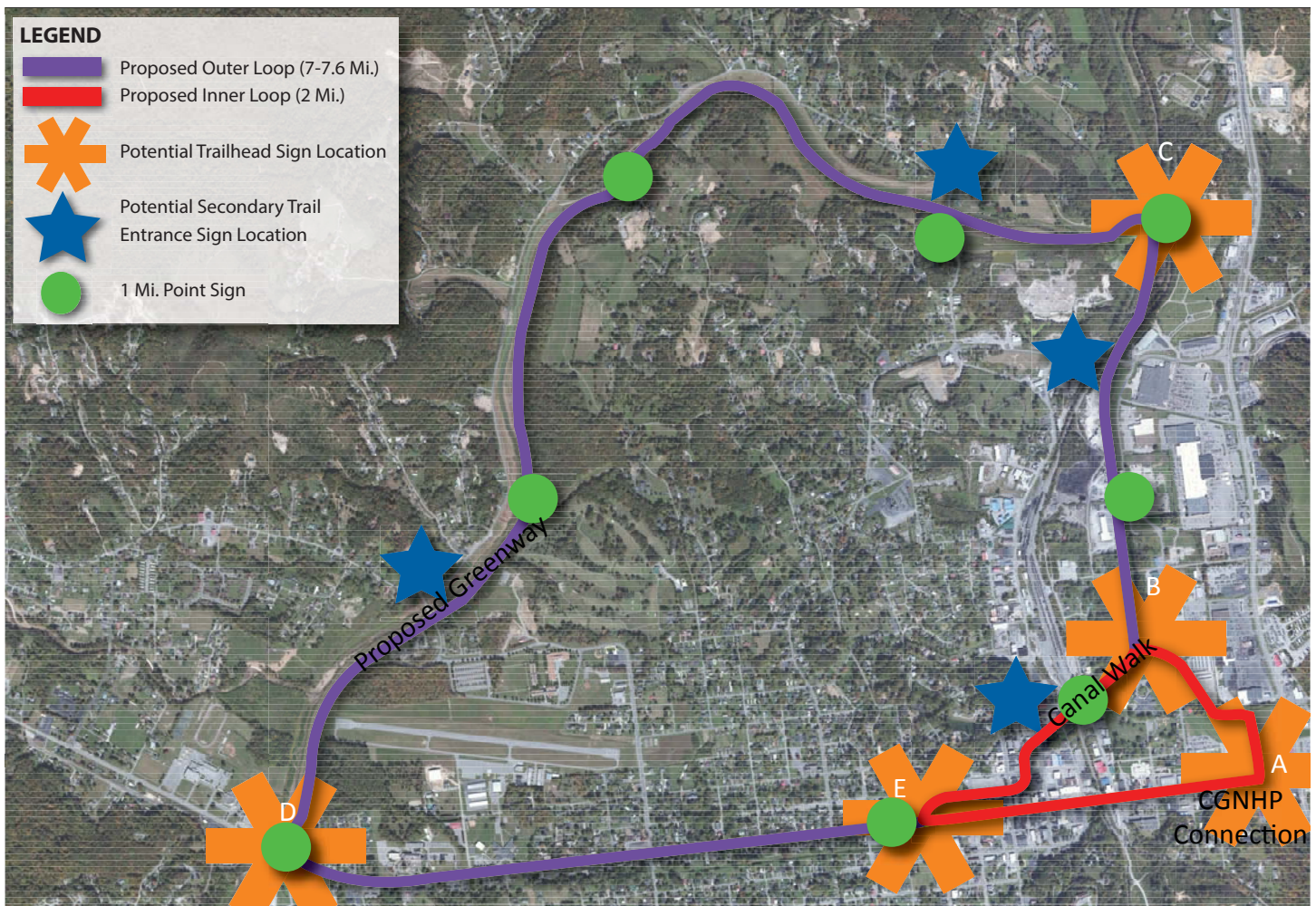


Figure 6.1.6 Trailhead Sign Location Recommendations to Connect Proposed Trails

6.2: Wayfinding Recommendations

Wayfinding System Recommendations

A signage system for Middlesboro with different sizes, shapes, and colors can be effective for enhancing the proposed and existing trails if designed with a uniform, cohesive theme (Figure 6.2.1). Coordinated colors, fonts, and sizes on signs with different site-specific backgrounds can help unify signage. The information layout on signs should also be coordinated. For example, the top portion can display the intended audience (people, cyclists, or cars) and the main panel area can show destination information with accompanying symbols as visual cues as users watch for future signs. The bottom section can show information such as available services, a closing time, and the city's logo and slogan. The city's name should be spelled consistently on all signage.

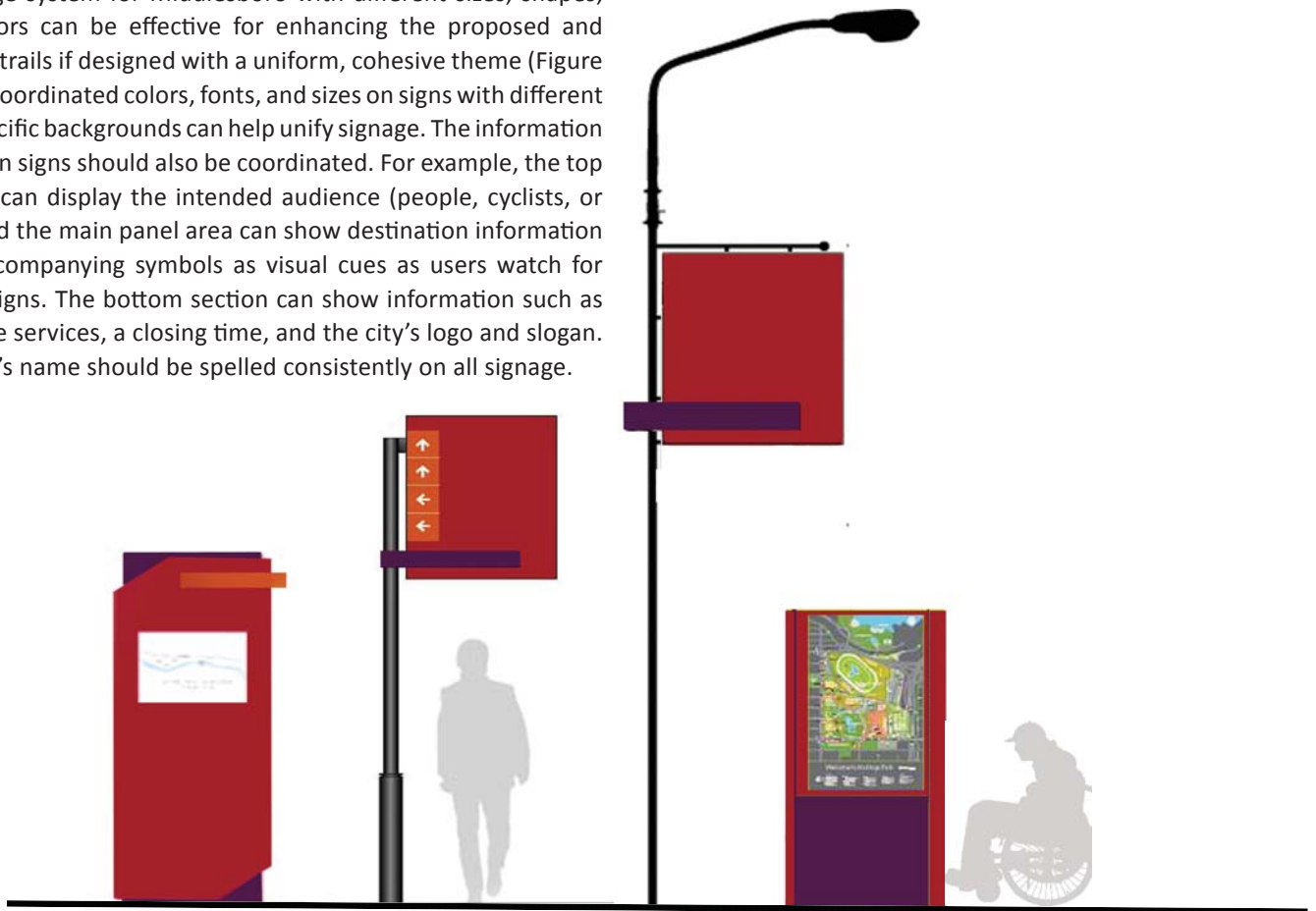


Figure 6.2.1: Potential wayfinding around town (Adaptated from: Adams, 2008; City of Madison, n.d.; Van Dam, 2011)

Wayfinding Symbol Recommendation

The proposed symbols for wayfinding in Middlesboro consist of extracted pieces of the various trails' site designs (Figure 6.2.2) These symbols provide a shorthand pictorial that represents a place, service, or action. Symbols also communicate visually to people who do not read or speak English. Symbols present information at a glance; maps are more complex visual images that tell stories about the location. The integration of these two signage methods will yield a comprehensive wayfinding system for Middlesboro (Gibson, 2009).



Figure 6.2.2: Potential sign design elements for the Middlesboro Trail System

Summary of Wayfinding

A good wayfinding strategy underlies the design of a successful signage program. Having looked at the different constituencies and their trails, we developed a series of wayfinding elements that highlight the different pathways. The wayfinding system is important because it links different people together, even if they do not share a common language, origin, or destination. This is accomplished by guiding them through the same space with one clear and effective system of communication. The unifying language of wayfinding creates a public narrative of how people move through the trail system (Gibson, 2009).

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Project Conclusion

The City of Middlesboro, Kentucky, is a unique town with delightful natural features and local amenities. It also possesses many opportunities for development as a trail town and regional hub. Community members of Middlesboro provided great encouragement and inspiration for the proposed trail system. The town's people share mutual goals for the long-term improvement of Middlesboro as a home and destination. Our proposed trail system attempts to portray the characteristics of the community by illustrating a strong sense of place, clear connectivity, regional uniqueness, and a desire to respect the environment.

The design suggestions elaborated in previous chapters were based on site visits, research, community engagement and creative ideas. Within the trail system, a sense of place was emphasized. This sense of place is welcoming to visitors and attracts viable tourism while recognizing historic attributes in an effort to promote regional identity. By designing a system of trails that clearly designates public space, the community can capitalize on underutilized space and help build upon the idea of Middlesboro as a tourism destination. The proposed community gardens, public parks, event spaces, and comprehensive trail network are the ideas that set the groundwork which can help the community of Middlesboro better develop and connect the town, people and environment.

The Middlesboro Trail System includes inner and outer loops that connect the city and eventually bring the Cumberland Gap National Historical Park closer to its users. The community can start in smaller areas with ideas such as the Downtown Connection or Canal Walk trails and work their way to the larger capital projects in a longer time frame. While the Greenway is the backbone of the city trail system, it may take longer to implement such an idea due to the nature and function of the existing infrastructure in place. In the end, the "Gateway to the Gap" is a comprehensive vision that will increase connectivity throughout the town and the Cumberland Gap National Historical Park National Park which will benefit both residents and visitors inclusively.

Primary Authors

Executive Summary

Andy Ciammaichella

Chapter One - Middlesboro Trail System

Andy Filcik, Scott Stokes

Chapter Two - Site Inventory & Analysis

2.1 Location	Curtis Mucci
2.2 History	Andy Filcik
2.3 Current Conditions	Clay Crum
2.4 Biophysical Resource	Hillary Barron, A.J. Bridges
2.5 Demographics	Charlie Hunt
2.5 Economics	Liwei Han
2.6 Land Use	Maureen Dreckman
2.7 Tourism	Ben Craven
8.9 Extended Trail System	Kara O'Connor

Chapter Three - **Downtown Connection**

Design Focus:

Downtown Canal Walk	Curtis Mucci
Pocket Park	Kara O'Connor
Community Garden	Kara O'Connor
Vendor Park	Clay Crum
Boone Trace	Rachel Cunningham
Cumberland Avenue Intersection	Rachel Cunningham
Complete Streets	Clay Crum

Case Studies:

City of Davis Greenway	Curtis Mucci
Indianapolis Cultural Trail	Rachel Cunningham
Peru , Indiana - Complete Street Policy	Clay Crum
Flagstaff Urban Trail System	Kara O'Connor

Primary Authors

Chapter Four - Canal Walk

Design Focus:

The Entrance to the Canal Walk	
Canal Walk - Option 1	Matt Clark
Canal Walk - Option 2	Liwei Han
The Link	Andy Filcik
The Sports Park	Charlie Hunt
The Daniel Boone Connection	Hillary Barron

Case Studies:

Little Sugar Creek	Charlie Hunt
McHenry River Walk	Andy Filcik
San Antonio River Improvement Project	Liwei Han
Welland Canal	Hillary Barron

Chapter Five - Greenway

Design Focus:

The North Park	Scott Stokes
The Armored Channel	Andy Ciammaichella
The Wetlands Park	A.J. Bridges, Ben Craven
The Gateway and Educational Parks	Maureen Dreckman

Case Studies:

Mill Creek	Andy Ciammaichella
Atlanta Beltline	Maureen Dreckman
Legacy Trail	Ben Craven
Logan Aluminum Wetlands	Scott Stokes
Beargrass Creek Restoration Project	A.J. Bridges

Chapter Six - Wayfinding

Matt Clark, Rachel Cunningham

Project Conclusion

Rachel Cunningham

Covers

A.J. Bridges

community change education recreation growth go landscape opportunity open space infrastructure presentation innovation neighborhoods involvement people history hydrology ecology infill value tourism landscape process national park outer loop inner signage trails cumberland avenue 25 gardening organic complete streets biking hiking horses equestrian ddm consistency trailhead wetlands residential community change education recreation growth golf landscape opportunity open space infrastructure presentation innovation neighborhoods involvement people history hydrology ecology infill value tourism landscape process national park outer loop connecting inner signage trails avenue 25 gardening organic complete streets biking hiking horses cumberland gape equestrian ddm consistency trailhead wetlands residential quality nature fun stream creation benefit & resiliency concept middlesboro refined progress team develop rehabilitation via the meteor crater connections middlesboro boone trace canal walk home yellow creek downtown revitalization wayfinding community change education recreation growth golf landscape opportunity open space infrastructure presentation innovation neighborhoods involvement people history hydrology ecology infill value tourism landscape process national park outer loop inner signage trails cumberland avenue 25 gardening organic complete streets biking hiking horses equestrian ddm consistency trailhead wetlands residential quality nature fun stream creation benefit resiliency concept refined progress team develop design rehabilitation gateway meteor crater connections middlesboro boone trace canal

