Recreating the Kessler Plan:

A Proposal for a Modern Urban Green Network

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Abstract

Civic green space is in greater demand in cities globally. In particular populations moving back to the urban core in the Midwestern United States are increasingly demanding quality green spaces. Many of these spaces are largely aesthetic and fall short of providing ecological services for cities.

Traditional landscape architecture praised the notion of cities that emulated the features of the surrounding countryside and those designs are echoed through modern cities in the existing park systems. The visions of these designs wove urbanity and nature into one another. Designers in the late 19th and early 20th century envisioned and created regional greenway systems to envelope the entire city in park space. These systems were designed to improve mobility, create connectivity, and impact public health throughout the city.

Unfortunately, many of these plans never came to full fruition, but the fingerprints of these plans are left in many of these cities. Cincinnati is one such city. In 1907, George Kessler created a regional greenways system to join existing and proposed parks. The plan was never fully completed, but the vision of a green city lives on in Cincinnati.

Using modern mapping tools (ArcGIS and AutoCAD) this thesis investigates the possibility of reviving the 1907 Parks Plan proposed by Kessler in a pragmatic and modern approach via capitalizing on the hidden assists of a post-industrial city (vacant land, existing green space, and underutilized spaces). Based on the availability of these spaces, possible design solutions are offered that could be implemented across the context of these spaces to enhance the overall green footprint of the city. This solution is ideal for the modern American city as it makes effective use of undervalued spaces in a decentralized method that innovative and progressive.

Overview

This thesis is broken into five chapters. Chapters 1-3 are a literature review of relevant work for the study. Chapter 1 explores the Kessler Plan in Cincinnati and the footprint it has had on the city through the past century. It also explores the initial intentions of the plan for the city, where the plan has fallen short, where the city has failed to implement the plan even in a modern context.

Chapter 2 is an introduction to green infrastructure, the necessity of connectivity for green infrastructure to truly impact a city, and where elements of green infrastructure exist in the city currently. While looking at how green infrastructure works it also looks at how spatiality plays a roll in the function of green infrastructure. Lastly, it looks briefly at the city's recent green space plans and where they have addressed regional connectivity.

Chapter 3 is an in depth view of ecological planning, a school of thought that a modern Kessler Plan would certainly require. Using ecology, urban planning, traditional landscape architecture, and modern landscape architecture as guiding principles, a visualization of ecological planning's values is created. This section considers the works of people from each of these fields of study and then synthesizes a generalization of the values an ecological planner holds. These values are then used to guide the methods and analysis sections.

Chapters 4 and 5 are the methods and analysis sections respectively. These chapters outline the data collection and assessment carried out in this thesis to visually analyze the spaces in Cincinnati that could reasonably be converted to green space. The analysis section takes the maps generated in the methods section further explores the possibilities of individual sites in the city. Each of these cites represents a space that could be found in many other places in the city and thus serves as a strong template for changes in other places across the city.

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Chapter 1 – The Kessler Plan

In 1907, the City of Cincinnati hired George Kessler, a landscape architect and planner to create a comprehensive plan for Cincinnati Parks to connect the city's green space and improve overall access and connectivity for the city. Kessler was famous for his work in St Louis (just a few years prior to the 1907 Parks Plan); he was one of a handful of designers for the World Fair exhibit in 1904 (Missouri Historical Society 2004). Cincinnati asked him to create a viable park plan for the city that would mimic designs that were occurring in other American cities at the time (Kessler 1907).

Around the same time, other great landscape architects such as Fredrick Law Olmsted, Warren H. Manning, and Andrew Jackson Downing were designing urban parks and parkways as a means of alleviating congested urban centers and roads. Public health was a significant focus of these practices, largely due to poor living conditions of the urban core, where most industry was located. Providing access to green spaces and open recreational spaces was pivotal to this concept. Many people in the working poor lived in crowded inner city slums with very little access to green space and fresh air. Designers emphasized the importance of connectivity of parks, greenways, and parkways as methods of alleviating the health problems associated with these slums.

The time period also promoted the beauty of natural spaces that were manicured to blend in with the surrounding city. This thinking was a product of the City Beautiful movement, which was at its height in the middle to late 1800s. This ideology was also compounded with the concept of the Garden City, which occurred earlier in the 1800s and the romantic movements in literature, music, and philosophy in the early to middle 1800s (Cincinnati Parks 2007).

The confluence of these cultural ideologies was at a time period of relative growth and prosperity. The culture of this time period was ideal for Kessler to address the need of green space in Cincinnati. At no other time in American history were American city centers as unhealthy as they were

during the industrial revolution and at no other time was nature so idealized as the remedy to the ailments of city living (Comer 2013; Lemaster 2008).

Kessler's document for Cincinnati is innovative and incredibly progressive. It outlines, in great detail, the need for a network of parks and parkways to create connections between all of Cincinnati's parks. These features were then developed as spaces for east-west and north-south movement through out the city. His rational is a simple one; parks and recreational spaces are good for people, great for the health of communities, reduce congestion of urban living, and improve the overall property value of adjacent land. In order for these sorts of improvements to be felt throughout the city, a decentralized network of parkways and greenways were to be created. These networks would connect to the central hubs of different parks within the system. A few of these parks already existed, but many were recommended sites of new parks. The system provided access to parks for all residents at the time and encouraged roadways to blur the line between the street and the park. Below is a list of some of the features that Kessler envisioned with his plan along with the principles he proposed:

- Following and activating the spaces along topography lines is important, as hillsides are sparse in development. These spaces were largely undeveloped because of limitations created by inclines or the existence of streetcar lines.
- Addressing vehicular traffic and pedestrian congestion before it is problematic is key to healthy city growth. Alleviating overall congestion of the urban core and promoting the movement of people into the surrounding country land was of great importance.
- The canal (now Central Parkway) had to be repurposed, ideally into a mall that would then connect to Central Parkway along the eastern border of the Mill Creek Valley.
- A "central greenway" was desperately needed in Cincinnati.

- Western Hills needed to be connected to the rest of the city, especially the downtown business district. It was incredibly isolated upon a hill and had few connections to the lower area of the city center.
- Walnut Hills needed a connection to the city center that followed the contour of the hillside. Eden Park and the parkways connected to it became that, but were never completely realized in the manner Kessler had envisioned. There still are not any pedestrian connections to the city center and this neighborhood.
- Easy recreational access for all was an absolute must regardless of residence within the city. Grand malls were envisioned for larger population densities while smaller parks that interrupted the hill top streets created small oases along pathways to major parks such as Burnet Woods or Eden Park.
- Valley lands needed to be preserved, especially the hillsides. Hillside tree canopy had not been altered all that much at the time Kessler crafted his plan. He envisioned the preservation of these spaces through parkways that followed the contours of the regions topography. In these designs flat roadways were built into the hillside with the canopy preserved on either side of the parkway. This created a form linear connection that followed the hillsides and valley contours.
- The riverfront was in desperate need of public parks space and greenway, which would also serve as a barrier during a major flood. Little of his plan actually addressed this because, at the time, the riverfront was dominated by shipping yards. It was identified, however, a solution was not proposed.
- The plan was designed to pay for itself (in part or in whole, neither is clear) through increased property values, which would in turn have an overall increase in property tax revenues for the city.

- Park planning and parkways could make ideal usage of neglected, underutilized, and derelict property.
- A city wide green system would ideally join into a larger regional system for the county, and from there, likely the state as well. This scale was loosely defined and Kessler proposed no designs for it.
- The Little Miami River Valley was of high consequence to the plan. One of the single largest green spaces in the plan is designed for the confluence of the Little Miami River and the Ohio River (where Lunken Airport is now).
- Parkways were, by design, essentially parks, which means adequate space was needed on both sides of the physical road to allow for non-automotive users to feel safe and as if they were entitled to the space as well.
- Connections, junctions, passages, corridors, and pathways needed to be clear, identifiable, and intentional; a user would have easily identify them and also identify them as a larger part of the whole network. Understanding that each feature was part of a larger system was critical to the health of the overall system. The cognitive recognition would bring the city together under a unifying entity.

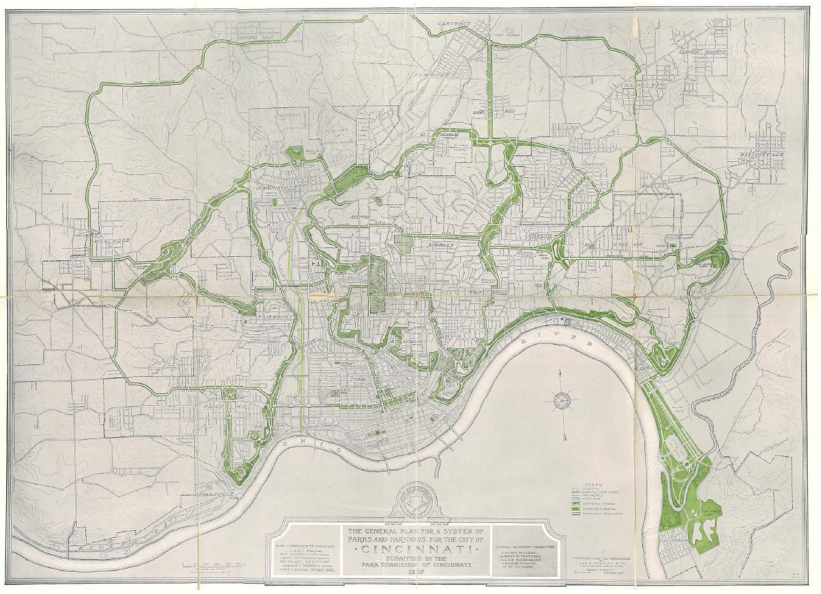


Figure 1: The Original Kessler Plan from 1907

Kessler's vision was predicated on three central functions of the system: enhance and utilize the beauty of the valleys and hillsides of Cincinnati; create cohesive and concrete connections between the east and west sides of Cincinnati (especially from Eden Park through the urban core to Western Hills): and enhance the entire system's functionality as a system of movement (Kessler 1907). Movement would later become nearly the entire focus of urban planning for half a century (1940s through 1990s) for the city, but void of the natural components of Kessler's original designs, catering to the needs of highways instead. Cincinnati's 1925 Comprehensive Plan was the first comprehensive plan for an American city, and set the tone for planning in the coming generations and set a slight departure from the romantic and artistic work of Kessler to a more engineering and analytical focus for planning and landscape design. The value of physical connection that roads and highways provided became central to the discussion of regional networking. The plan had a strong focus on development, growth, economic well-being and a general sense of orderly design (City of Cincinnati 1925; Cincinnati Parks 2014).

Kessler's visions were largely tabled following the Great Depression, although much had been done to establish the parks of the system; many of the greenways and parkways were left unconstructed or developed without the desired park-like attributes Kessler had envisioned (Comer 2013). The City still benefited from the park expansions all the same. Currently Cincinnati boasts 6,821 acres of park space between Cincinnati Park Board (4,909), Cincinnati Recreation Commission (1,444), Great Parks of Hamilton County (within Cincinnati) (465), and National Park Service (within Cincinnati) (3). That gives Cincinnati a per capita acre of green space ratio of 0.023, over a total landmass of 49,883 acres within the city. This is considerably more space when you compare the ratios of similar cities in the region (Harnik, Martin and O'Grady 2014; Metro Parks 2011; Watcher 2013).

City	Total Land Area	Total Population	Total Park Space (acres)	Per Cap Acres of Green Space (ratio acres/people)
Cincinnati	49,883	296,550	6,821	0.023
Cleveland	49,726	390,928	3,068	0.008
Columbus	138,988	809,798	10,861	0.013

Figure 2: Data from 2014 City Park Facts, authored by The Trust for Public Land

Cincinnati Parks revisited the 1907 parks plan in 2007. The 2007 plan was built on reviving the original plan with modernized methods and design. Many of the original spaces identified in the 1907 plan were now developed, or physically altered, which made need for changes. The main initiatives surrounded reviving and reactivating some blighted and underutilized parks in the region and rejoining the riverfront to the city core. In reviving this plan, there were four primary scopes identified for the plan, Over the Rhine (OTR), Uptown, Downtown, and the Mill Creek. These areas were to receive the greatest attention then followed by the surrounding hillsides and city, with focus also given to neighborhood revival in a few locations. Below are some of the features that Cincinnati Parks envisioned (Cincinnati Parks 2007):

- Riverfront parks are to be some of the first established, as this area was of greatest value to the city as a lost resource
- Urban core parks are in desperate need of repair and envisioning
- Goals of improved access to parks, improved quality of life for all, increased awareness of our parks and their value, and increased partnership power for Cincinnati Parks and other stakeholders
- The plan would enhance neighborhoods and improve programming of the parks

- Existing parks would receive upgrades and additional programming
- Sustainability and environmental stewardship are to become key components of all work and designs of Cincinnati Parks
- A solid timeline was set for the work to be done, though work has deviated from the original timeline
- A massive theoretical capital improvements plan has been developed for Uptown, Millcreek, Downtown and OTR
- Mill Creek has been identified as a massive potential corridor / parkway / park option for the city
- All Uptown parks have detailed park plans for redevelopment
- Several existing parks are to receive expansions
- Hillside parks and parkways are still a top priority, despite many having never been built

This plan projects out to the year 2026, though the strength of detail diminishes for much later years, as is to be expected. We are 8 years into the process and stand 11 years from completion of the task. Since, other ideas have come to fuller fruition than others. OTR's Washington Park has taken a strong root in the heart of the city and is now one of, if not *the* favorite gathering space of Cincinnati's for large events. Wasson Way bike trail is being discussed as a viable transit option with provision for a light-rail system. The Cincinnati streetcar narrowly survived death as city council and the mayor debated whether to follow through with it. These issues have undoubtedly altered some of the trajectory of the plan that was envisioned in 2007. The same can be said of Kessler's plan in 1907. The plan is now quite dated and geographically challenged due to development and changes in land use and roadways. Looking at the commonalities seen in the 2007 plan and the 1907 plan though proves useful. Priorities

that were devised by Kessler in 1907 still hold value today. Questions of access, hillside landscaping, revival of the Millcreek and riverfront, and public health are still incredibly relevant.

Following the footsteps of the original 1907 plan, connectivity takes shape as a defining characteristic of the 2007 plan. Rather than connecting the system with physically contiguous green spaces, sightlines and perceived connectivity (spurred by relative vicinity rather than physically touching) create these connections. This reduction in physical connection is more acceptable in the 2007 plan because automobiles are ubiquitous, slums have been largely cleared, public health has drastically increased, and urban form limits the total amount of available space for green spaces. These shortcomings are understandable, but solution may exist for overcoming the limitation of overall space for conversion or partial conversion to green space. A modern version of the Kessler Plan may not emphasize all of components he originally envisioned for the city, but it most centrally should include the aforementioned pinnacles of hillside beautification and preservation, cohesive spaces, east-west and north-south fluidity of pedestrian movement, regional connections that foster a functioning green network, and waterway enhancements / preservations.

Chapter 2 – The Value of Green Space

Green space is valuable to the survival of a city. It is well documented that green space cleans natural water systems, cleans the air, reduces the impact of urban heat island effect (a phenomenon caused by large quantities of dark pavement within the city, which causes urban temperatures to climb much higher that the surrounding rural spaces), reduces noise pollution, controls wind patterns, impedes floodwaters and ocean surges, preserves valuable local flora and fauna, and provides climate stabilization (warmer winters and cooler summers) (Benedict and McMahon, Green Infrastructure: Linking Landscapes and Communities 2006; Benedict and McMahon, Green Infrastructure: Smart Conservation for the 21st Century 2002; Millennium Ecosystem Assessment 2005; Holling and Goldberg 1971; Scott, et al. 2013). These services that green space provides is referred to as *ecological services*. These same features also provide great visual and aesthetic value for the city, deliver integrated public spaces, offer equitable spaces, and create breaks in the urban core that are valuable for the mind. Unfortunately, these benefits require more attention than simply planting a few trees. While natural systems manage many of these tasks without human curating, in an urban context, it requires intentional engineering. Human cultivation is required, thus dubbing this sort of ecological technology as *green infrastructure* and the orchestration of it is considered as *ecological planning.* (It is worth mentioning that this is not environmental planning, which is a much broader in scope and deals less directly with green design, civil engineering, and landscape architecture and much more with economics and policy).

Most simply, green infrastructure replaces traditional gray infrastructure (roadways, pipes, storm water systems, etc.) with a biological or semi-biological alternative. Benedict and McMahon suggest, "… green infrastructure is defined as an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations. In our

view, green infrastructure is the ecological framework needed for environmental, social and economic sustainability—in short it is our nation's natural life sustaining system." Following their model, green infrastructure is a general life support for a city. If a city's pipelines or roadways ceased to function everything would grind to a halt. In a similar manner, if a city's green space were to vanish, humans would struggle to find the space very livable. Returning to a smaller scale, green infrastructure is designed to provide the same services of gray infrastructure with fewer of the drawbacks of gray infrastructure. A pipe, for example, is gray infrastructure, and it supplies its function, but nothing else; a pipe stays underground until it must be repaired, moved, or replaced. The pipe also offers no utility beyond conveying water or sewage from one point to another. These are valuable processes, but green infrastructure seeks to offer an expanded vision beyond providing a single service. That same pipe can become a bioswale or man-made wetland. Both of these features offer many of the aforementioned benefits of green infrastructure in addition to becoming habitat to wildlife.

It is important to note that parks are not green infrastructure, but can and sometimes do contain elements of green infrastructure. As previously stated, green infrastructure is highly technical and intentionally designed. Ideally, future cities would take full advantage of both amenities in tandem to maximize the impact of parks with pockets of green infrastructure built into them. Decentralizing these elements across a cityscape further expands the overall impact of the system. The wonderful design of green infrastructure is its general flexibility. Green infrastructure can be placed on steep grades, narrow pathways, highway medians, building setbacks, rooftops, alleyways, and even vertical surfaces. For this reason, it can act as a strong linking component to other green spaces.

Much like gray infrastructure, green infrastructure is generally predicated on being connected. A street system has to have junctions and flow in order to work as does a stream system. Nature and ecosystems provide a variety of services, but requires interconnectedness to reach the pinnacle of this usefulness (Eisenman 2013).

Green infrastructure and the ecosystem services that it provides a city have to be central to a modern regional green network. The city is already connected from a modal prospective (roadways and highways), but has poor habitat connection and ecological connection. Green infrastructure uniquely provides services that humans benefit from while also creating ecosystems and habitat for wildlife. These provisions are essential to a city's overall ecosystem health as well as the resilience of the physical city.

Conceptually, these connective designs are seen in some of the oldest landscape designs in the United States. Frederick Law Olmsted integrated connectivity into Boston's park system, which is now called the Emerald Necklace because of the way it hangs in a looping fashion around the city. The Kessler Plan follows a similar design around Cincinnati by creating concentric rings and sub rings by following the topography of the hillsides. The same can be said of the far newer Buffalo Bayou Promenade in Houston, which creates a long linear strip of green along Houston's downtown river. The Louisville Loop is a massive green integration project that seeks to take advantage of existing Olmsted parks within the city core that are used as spokes to a larger greenbelt loop around the county. All of these examples exhibit the strengths of a connected system; they are designed to be easily navigated, they allow for multi-modal transit options, and they provided desperately needed green space within a dense urban core. None of these spaces are explicitly green infrastructure yet they do contain these elements dispersed throughout their network. In such a case, a classic English forest design may not retain rainwater as well as a modern rain garden system, but it certainly has more ecological value than a parking lot or flat rooftop.

Eisenman further explains this concept of connectivity with the idea of *Hubs* and *Links.* While this idea is partially borrowed from the study of ecology and has various interchangeable terms (Eisenman is not the only ecological planner to identify and build off of this topic), centrally the themes are the same. Hubs provide the bulk of the ecological impact of green infrastructure. Links become vital

to the success of the hub however (Eisenman 2013). Ecologically speaking, links allow for flora and fauna to pass from hub to hub. This ensures stronger ecological systems (gene pool, predator-prey ratios, habitat preservation, etc.) for the region (MacArthur and Wilson 1967). Robert MacArthur and Edward Wilson developed the theories that have driven this concept within green infrastructure design. Through researching islands they discovered that isolated spaces tend to have lower overall ecological species richness. This in turn created fragile environments that easily collapsed due to diseases, habitat changes, or the introduction of an invasive species.

This concept was generated decades after Olmstead's work; yet, his regional park designs follow these principles. From a planning level, links and hubs ensure that water systems are cleaner by filtering them through wetlands or spending a longer time in a stream network before discharging into a major water body. Links can guide wind patterns into larger green areas, therefore maximizing the amount of green space air circulates through. This further purifies air in cities. Links break up hardscapes and dense urban areas, allowing for the heat island effect to also be broken up.

Cincinnati already has ideal building blocks of these spaces within the city limits. All told, Cincinnati parks consists of 5 regional parks, 70 neighborhood parks, 34 nature preserves, 1,000 miles of street trees. 10% of the total landmass of the city is dedicated to parks of sorts (Cincinnati Parks 2014). Mt. Airy Forest is an urban forest of 1,459 acres on the west side of Cincinnati. It is the largest park in the city and likely the strongest hub (hub strength is dictated not only by size but many other factors) for the city (Cincinnati Parks 2014). It is unfortunately divided by I-74 (seen in figure 3). A stronger connection between the two halves of this park would desirable. The Mill Creek Corridor (seen in Figure 4) that divides the *East* and *West* cultural sides of Cincinnati is another great example of a potential link. The Mill Creek has multiple stream junctions as it runs south to the Ohio River. There are several projects and interest groups currently working on plans to daylight (the technical process of restoring a stream system) sections of the paved and channelized stream and other attached streams in an effort to

reduce Cincinnati's CSO (Combined Sewer Overflow). Project Groundwork, the umbrella under which MSD is addressing the stream systems in the area, is the group heading up much of this work. One such site, Lick Run (seen in Figure 5), has been under development for the past several years in a direct response to CSO problems in the city and innovative solution for slowing the flow of water through the city's steam systems. The project has been renovating ancient storm sewer systems, repurposing underutilized, abandoned and often dilapidated structures along the streambed, and daylighting the physical stream banks (Project Ground Work n.d.).

The riverfront has a park system that is continuing to expand along the banks of the Ohio River; however it is absolutely isolated on 3 sides by the Central Business District of Cincinnati (Cincinnati Parks 2014). The park ideally serves as a connection between the rest of the city and the stadiums while also serving as a barrier from floodwaters; however, much of this power is limited by the small fraction of total surface area along the banks that it truly covers.

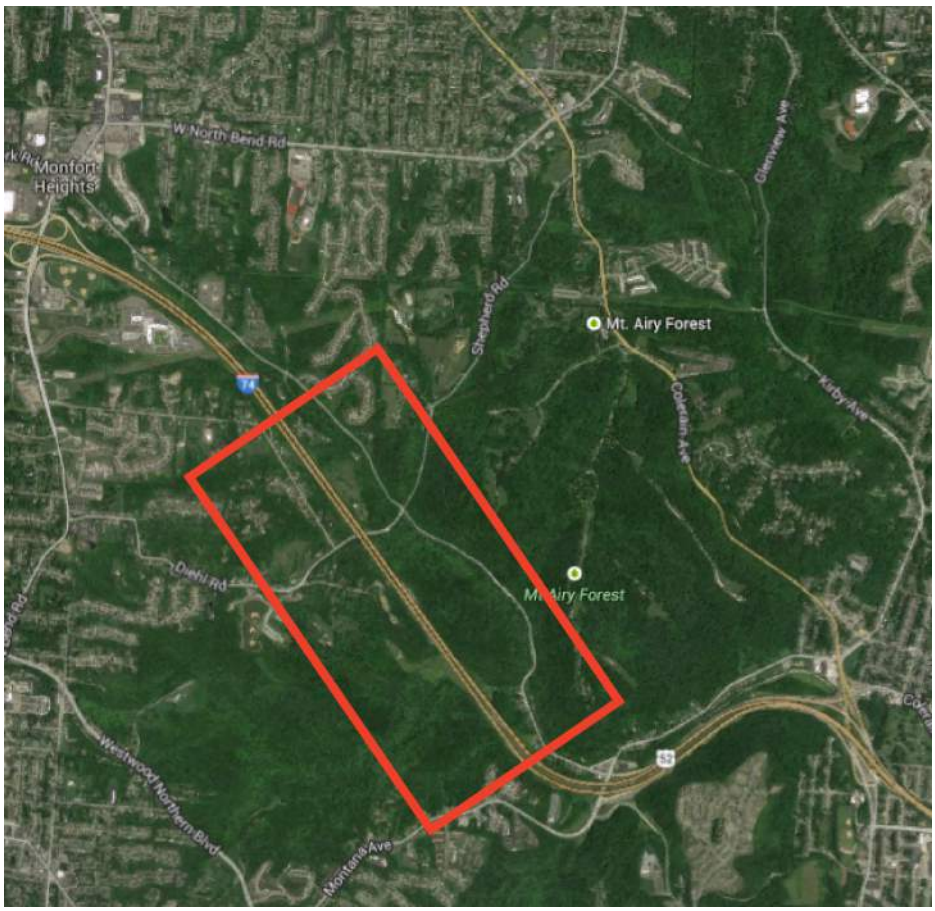


Figure 3: The division of Mt. Airy Forest by I-74 (Google Maps)

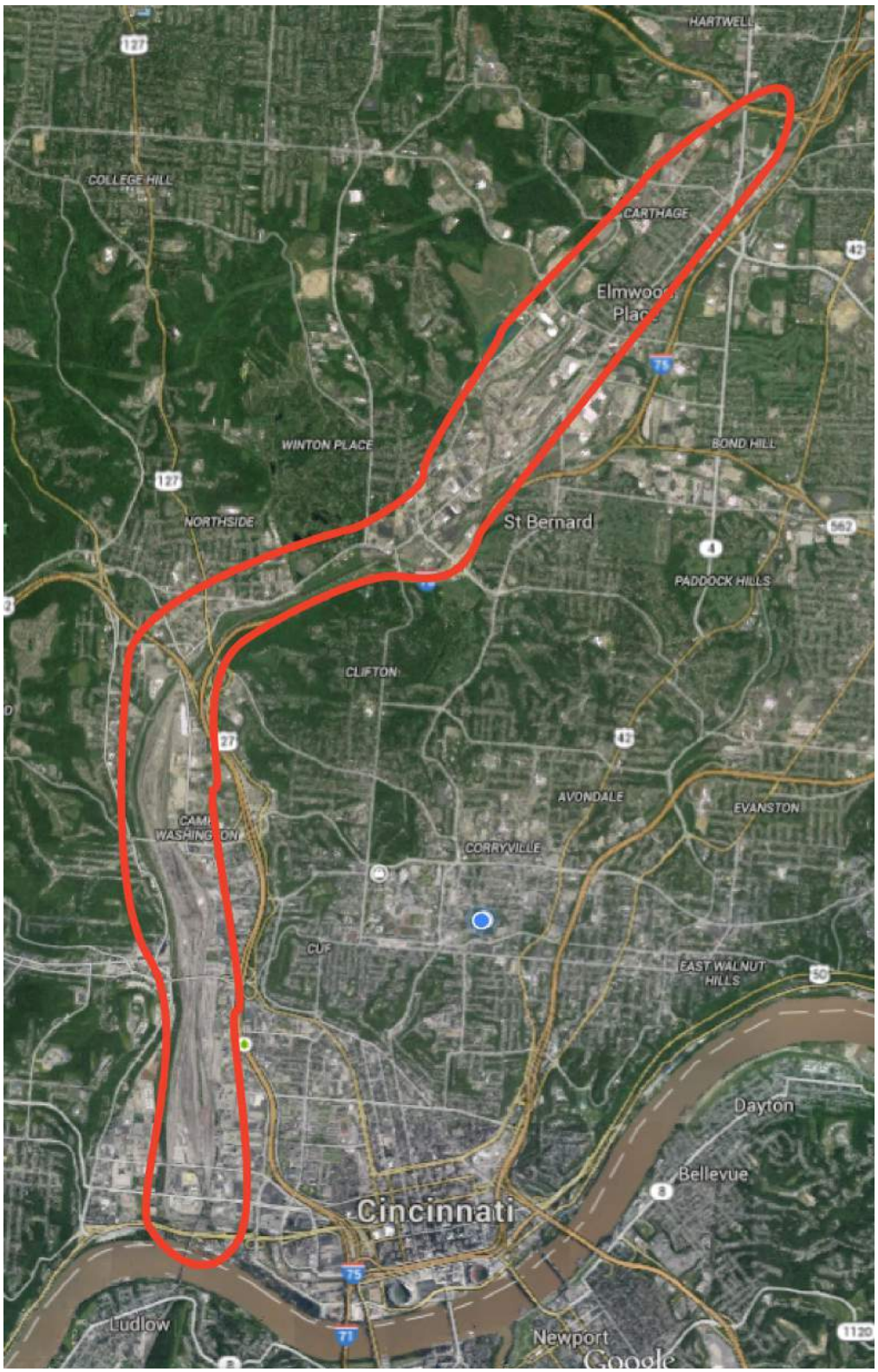


Figure 4: The Mill Creek riverbed and surrounding development (Google Maps)

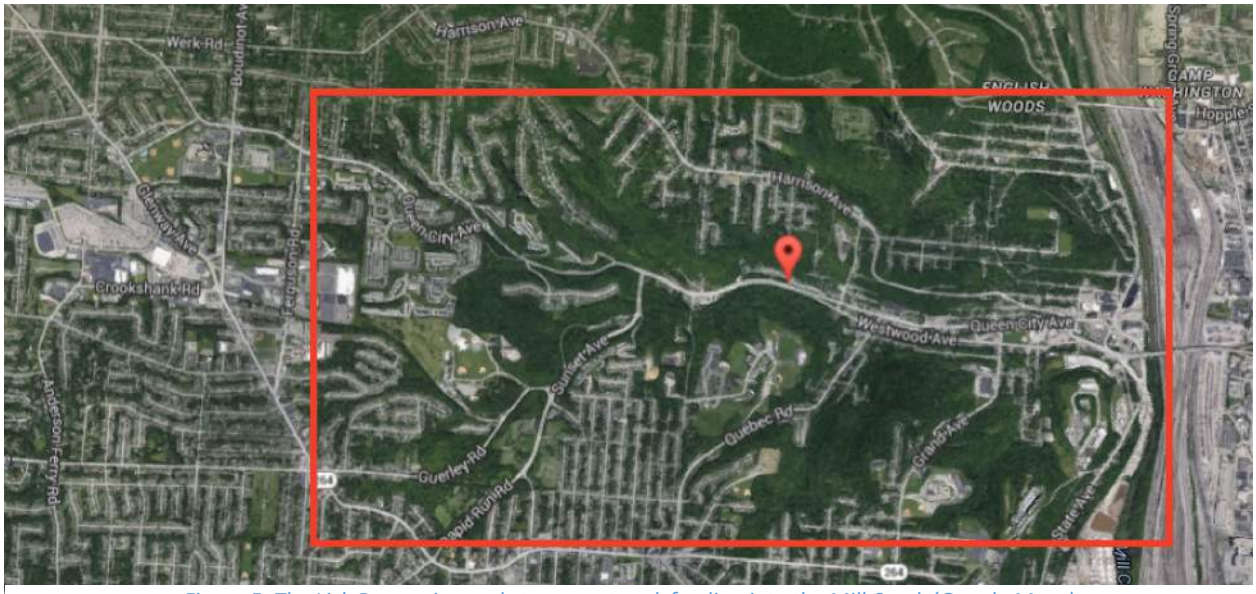


Figure 5: The Lick Run region and stream network feeding into the Mill Creek (Google Maps)

All these pieces are unique and certainly strong green spaces, but they largely function in some form of isolation. Looking at the 1907 Kessler plan and then comparing it to a map of Cincinnati's current park network tells this story clearly (seen in figure 6 and 7). It begs the question: how could a modern city like Cincinnati achieve the level of connection seen in the Kessler Plan under the modern constraints of Cincinnati? A collection of green infrastructure advocates in recent years has begun to recommend that green infrastructure be used to replace vacant or dilapidated spaces and brownfields in postindustrial cities (Schilling and Logan 2008; Burkholder 2012; Haase 2013). Schilling, Logan, Burkholder, and Haase all address the use of green spaces as viable options for vacant land in shrinking cities. This is a phenomenon in many post-industrial cities, especially in American culture. Cities have traditionally been understood as centers of growth and dense populations, however, this changed for many American cities in the middle the century. From the late 1950s through the 2000s industrial, primarily Midwestern, cities, have experienced huge population losses often leaving an empty city core. The impact of the doughnut hole effect – an empty city center with heavy suburban developments outside the city limits and surrounding the area – has crippled tax bases and drastically reduced services that cities can offer for job creation and utilities maintenance. Detroit is currently the most visible case

in the United States, but other cities like Cincinnati, Cleveland, Pittsburgh, Toledo, Buffalo, Milwaukee, and Akron have all seen the same effect. The debate continues in many political arenas, but few viable solutions have come to full fruition.

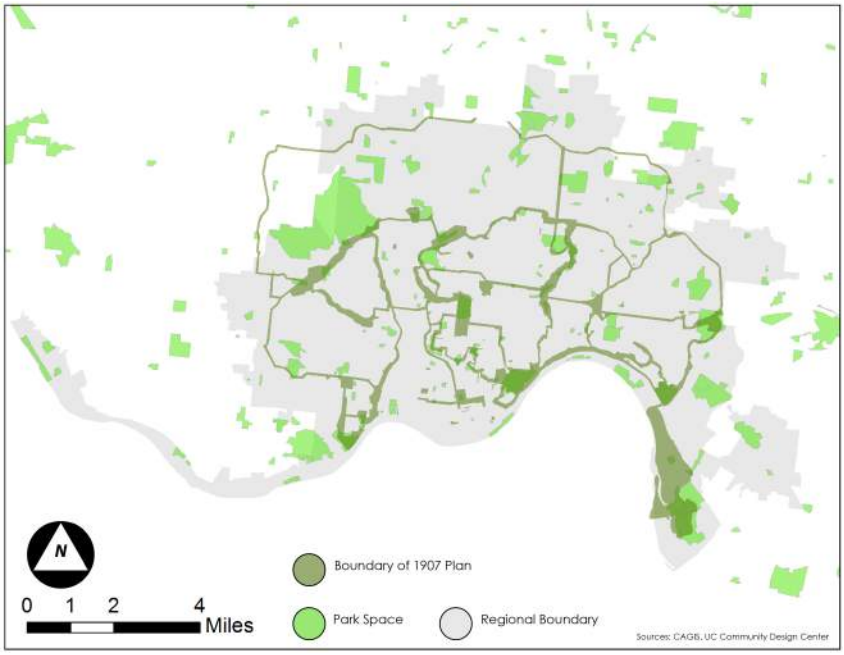


Figure 6: Existing Parks in Cincinnati (CAGIS)

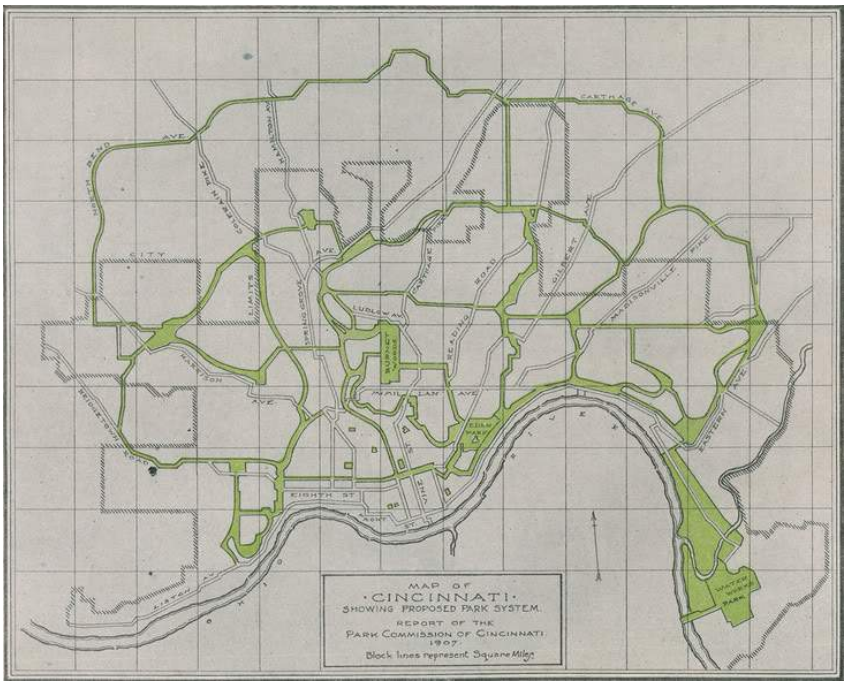


Figure 7: A digital copy of the 1907 Kessler Plan

Fundamentally, reviving American city centers and regional connectivity would revolve around replacing brownfields with green space, repurposing dilapidated housing or rehabbing it, and blending these spaces together. As these choices are made, many neighborhoods where vacancy is high are purchased above market rate value to encourage holdouts to relocate and then are converted. In more radical models, forests repurpose entire city blocks to eliminate the strains on tax base for the city and consolidate housing. Land ownership within that context is tenuous; asking people to leave communities that are experiencing such vacancy is challenging and often met with opposition (Ackerman 2011; Yglesias 2013).

Cincinnati does not have near the level of vacancy or the level of mass migration of most rustbelt cities (Census 2015). Cincinnati also benefits from recent growth in the central business district and one of its highly urban neighborhoods Over the Rhine (OTR). The growth is slowly starting to spill into other neighborhoods surrounding the urban core. Following the green infrastructure and infill methods previously stated within the city limits would be more centrally focused on using vacant space for sustainable initiatives, healthier neighborhood growth, and open land preservation. These spaces offer viable locations for green infrastructure and landscape repurposing which could be joined to existing green space hubs to create a more connected system.

Cincinnati has been thriving in doing such planning in the past 15 years. Cincinnati has a wealth of impressive green design documents to its name such as: the Eastern Corridor Green Infrastructure Concept Master Plan (2005), the Lick Run Watershed Master Plan (2012), the Revive Cincinnati: Neighborhoods of the Mill Creek Valley (2010), the Central Riverfront Urban Design Master Plan (2000), The Redevelopment of Ohio's Southern Gateway (also known as the Banks Project) (2008), the 2007 Parks Master Plan (2007), and The Cincinnati Highways Green Space Master Plan Strategy (2001), amongst many others (Cincinnati Parks 2007; The Banks Partnership 2008; Hamilton County / Cincinnati 2000; Urban Design Associates 2010; Metropolitan Sewer District 2012; Green Infrastructure Planning

Committee 2005; Human Nature Inc 2001). Excluding the 2007 Parks Master Plan, the Cincinnati Highways Green Space Master Plan Strategy, and the Revive Cincinnati: Neighborhoods of the Mill Creek Valley plan, no other plans in this collection fully address the issue of connectivity in Cincinnati's parks. Oddly enough, these connectivity plans are the plans slowly materialized or have been altogether mothballed. As other development occurs across the city, many of these plans are rarely given the cadence required to preserve the space needed for such expansive green corridors.

Unfortunately, many of these plans have slowly materialized or have drastically reduced the overall scale of impact originally designed. Redeveloping vacant lots does not solve the issue of connectivity across the region nor do many of the individual site plans. Using existing linear components such as roads, highways, rivers, and hillsides in conjunction with these features may be the key to developing stronger regional connection for these green spaces and the integration of large-scale green infrastructure in Cincinnati.

Envisioning these features as a circulatory system in the human body may serve to better uncover a direction for developing this plan. Hubs act as the *heart* or *hearts* of the system as they are pumping ecological richness, resilience and services into the surrounding landscapes. Major links become *arteries* and *veins* by which these resources are conveyed to the city and other smaller green spaces. Individual parkways, gardens, bio-swales, wetlands, green roofs, and other small green features take on the role of *capillaries* and convey the services in from the larger elements of the system to small features of the network.

Chapter 3 – Principles of Ecological Planning

Planning that incorporates green infrastructure and green design is increasingly emerging in global city planning. Integrated green systems, networks, and ecological services are becoming more commonplace an encouraged within urban development (Norwegian University of Science and Technology 2015; S. M. Wheeler 2004; Chicago Wilderness 2012). One of the terms used to define this type of planning is *Ecological Planning*. This type of planning views nature and humanity on level playing fields; it recognizes the necessity of nature for the survival of man, cities, and sustainable progress. Specifically, this type of planner seeks to carry out typical planning procedures in a sustainable, ecological, and progressive manner. While Peter Calthorpe does not directly use the term ecological planner, he does suggest in The Next American Metropolis, "Nature should provide the order and underlying structure of the metropolis," (Cathorpe 1995). He suggests that the division of man and nature is only a recent phenomenon, which has been leveraged by technology. Through this departure from nature man has placed additional stress on the ecological services that nature provides for our cities and on our civic utilities (Cathorpe 1995). Other planners have seen similar trends over the past several decades (S. M. Wheeler 2004; Wheeler and Beatley 2009; McHarg 1995; Eckbo, The Landscape We See 1969; Eckbo, People in a Landscape 1997).

Many of the plans for Cincinnati that were mentioned in Chapter 2 see green space as glue that brings spaces together. As mentioned in Chapter 1, Kessler had a vision of citywide connection through a unified green network. A system that carries out the functions of green infrastructure, urban green space, public utility, and civic life support needs to be carefully planned. Ideally, ecological planning brings together the strengths of environmentalism and modern urban planning with the design capacities of landscape architecture. Values of ecological planning thus reflect the key works of these

worldviews and vocations. Figure 9 visualizes various contributors to these fields and how they apply to an ecological plan in the City of Cincinnati.

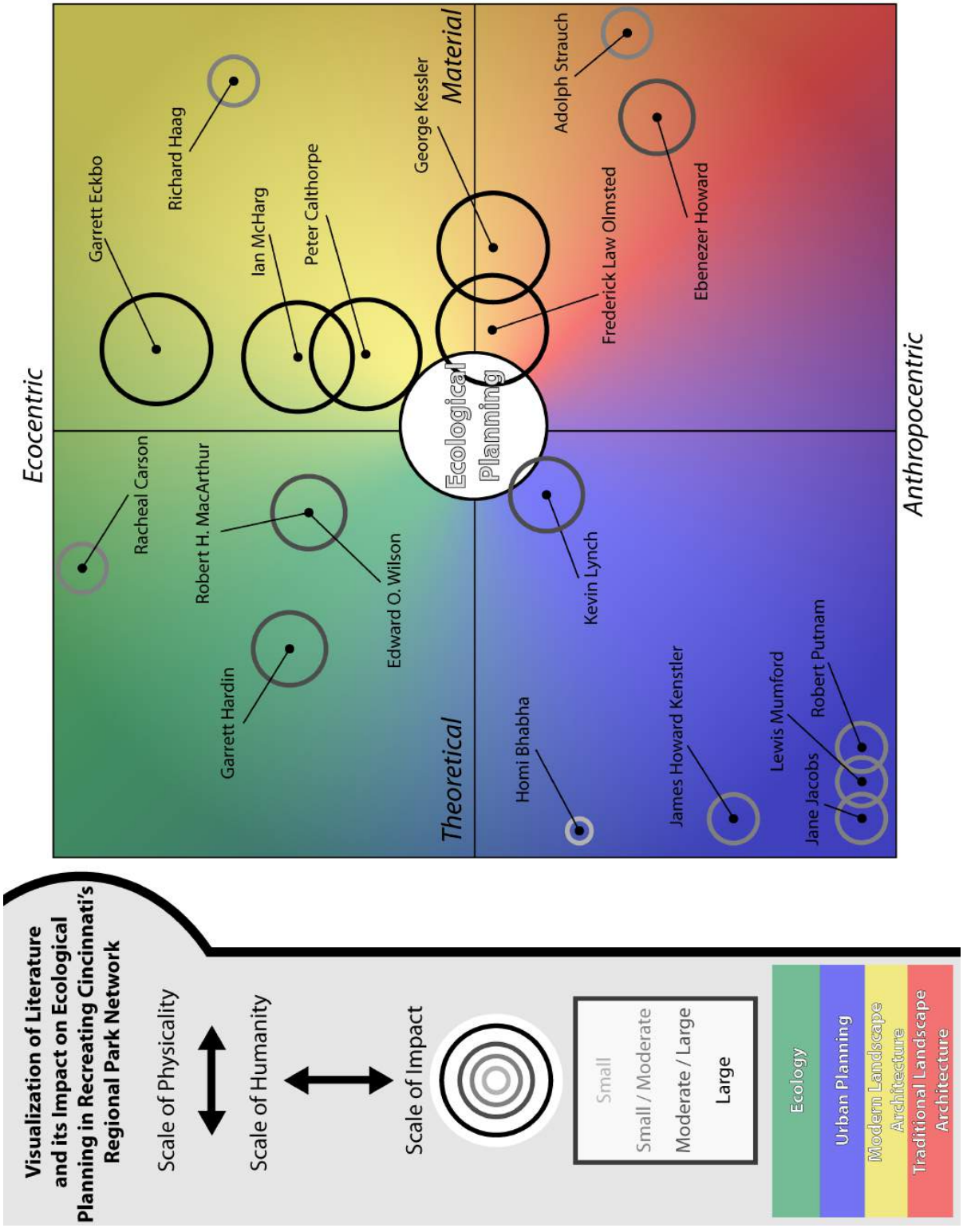


Figure 8: A theoretical visualization of contribution of literature to an ecological plan in Cincinnati. This model visualizes multiple variables through the use of an X, Y, Z, Za format.

This model visualizes, subjectively, the theoretical impact of an individual's body of work or select bodies of work to a plan. This information is scaled in an X, Y, Z, Za model where X is the level of physicality of the contribution, Y is the level of humanity of the contribution, Z is the total impact of the contribution, and Za visualizes the various fields of study at play. The point (0,0) is theoretically the ideal ecological plan. The far corners are thus the extremes of each field of study while area that is closer to the center better reflects an ecological plan.

There are a few caveats to be considered with this visualization. First, this model is subjective and serves less as a definitive quantitative tool and more as a theoretical framework of influential works in developing an ecological plan. Secondly, the extremes of this model are still highly influential to an ecological plan. Those that fall into the outer limits of the model generally bring extremely valuable individual concepts and ideals where as contributors near the center tend to serve as guiding principles. Thirdly, the scaling of Z (the size of impact) is not a measurement of the total impact of their work, but rather, the level of impact an individual's canon contributes toward an ecological plan for Cincinnati.

Using this tool, a set of parameters, goals, standards, metrics, designs, and ethics can begin to take shape for an ecological plan. Once this is paired with the works in Chapters 1 and 2, a strong guiding vision begins to take shape. The following is a justification for the location of each individual and the scaling of their level of impact. This material will then serve to guide the principles of an ecological plan.

The green section identifies significant contributors to the environmental movement. These thinkers expound upon the value of the environment to not only mankind, but also to the planet at large. Nature holds an intrinsic value to those within the darker green area. Thinkers in the lighter green area find themselves more concerned with practical elements of nature. The understanding of human

survival and the progressive longevity of the earth and its resources is manifest in these thinkers. More concrete expressions of environmentalism are seen here.

The blue section recognizes progressives within the planning field. Dark Blue represents deeply philosophical contributors to the planning field, usually concerned with social discourse, equitable use of space, and grounding the humanity of cities in the practice of planning. The lighter blue section embodies critiques of design forms and functions within society. These thinkers and designers seek to enrich the human experience of design and uncover the metaphysical and psychological elements found within physical space. The more physical manifestations of this are found closer to the center while the more theoretical are found further to the left.

The entire right side of the graph embodies various designers, most of whom are landscape architects. These thinkers and designers primarily focus on physical design, but their approach and ethos under which they approach these designs is very different.

The red section represents a very traditionalist approach to landscape architecture. These designers see landscape as a pallet through which designers can express themselves. The darker red space is the strongest expression of this sort of design, often seen in royal gardens, courtyards, and other spaces that are generally highly curated and hardly pass as natural. These spaces hold plenty of value, but much of that is a derivative of the designer imprinting a humanistic worldview on the landscape. Lighter red embodies a change in mindset about landscape. Landscape is less a canvas for design and more a space that can be enhanced.

The yellow section contains landscape architects from the past 60 years. Many of these designers have been heavily impacted by the environmental movement of the 70s and sought to embrace natural systems in their designs. The darker green space embodies designers who view their craft as environmental curators, sometimes opting to favor nature over human needs. These designers

use nature to reclaim human space, in some cases allowing nature to reclaim it completely. The lighter yellow area visualizes designers who seek to build society around nature. Ian McHarg's Design With Nature most obviously guides the principles of this space as these designers seek to find equilibrium between man and nature in the built form of the city and civic space.

The center circle, which is in white, represents the ideal location of where an ecological planner would fall. This space balances the needs of mankind within the scope of sound and sustainable practices and equitable preservation of natural spaces. This area also embodies the need for the pairing of strong theoretical understanding of history, ethics, psychology, statistics, environmentally driven science, and sociology with the capacity to build and design captivating spaces, manage the natural and built environment, and cultivate provocative city development.

Color gradients also signify the transition from one extreme to another and the variability seen along moderate areas. Along the X-axis and Y-axis, colors blend together to identify with relationships between these fields. Depth of color, as previously stated also provides understanding of strength of relationship to an extreme. The ideal center is therefore not impotent due to lack of association with one specific side, but rather concerned for both viewpoints and capable of empathizing and weighing the pros and cons of polarized viewpoints.

The scaling of bubble size is the next most important component of this model. The larger the size of the bubble, the more impactful the work from this contributor is to ecological planning in Cincinnati's regional park network. It is important to note that if this model were built for another city, a different type of ecological plan, a different culture, or different climate, these bubbles would shift in size. As the physical location of each contributor plays an integral role in solidifying where other pieces of work might fall or providing a scope of vision and scale, the scaling of these bubbles assist in further filtering valuable design concepts and ideology that is particularly impactful for a regional ecological

network in Cincinnati. The largest bubbles establish a set of guiding principles by which this plan can be most strongly executed.

The location of a contributor on this XY scatter plot was assigned in a subjective manner. Obviously, the closer a contributor falls to the middle of the plot, the more ecological planning values they exhibit. This doesn't ensure that a contributor is an ecological planner (in the literal sense); many of these planners, designers, and thinkers are limited by time, hence ecological values or the entire field of ecology may not have yet existed. In such cases, these individuals exhibit strong contributions to the ideals that now exist in ecological planning. Below is a brief description of the contribution each individual provides to the ecological planning of a green network in Cincinnati and a justification for their location in the XY scatter plot and their Z bubble scale.

Urban Planning

Jane Jacobs – Jacobs contributed several written works to the planning world regarding the values of neighborhoods, pedestrian activity, and civic safety. Her focus on people and the need for relationship in the human experience was impactful for New York in the 60s through the 80s. Jacobs' work is less impactful on ecological planning, especially anything at a regional scale, largely due to her focus on neighborhoods and built environments. Her attention to human interaction and social constructs also contributes little to ecological design. Jacobs does provide a stepping off point for discussing the need for vibrant and walkable neighborhoods and streets; under this umbrella, Jacobs and ecological planning come together. These values serve to inform design choices and values.

Lewis Mumford – Mumford contributed the values of an anthropologist to planning in the 30s through the 70s. He related the rise of civilization to the modern metropolis and gave stronger cadence to the origins of designs, values, social norms, and commerce that shaped them. Lewis, much like Jacobs, hardly focused on parks, ecology, or regional designs, but rather on people and their habits,

tendencies, and their societies. For this reason, he too is far removed ecological planning, but adds ideals to the practice. Mumford's drive to understand the origins of spaces and society are pivotal for redeveloping a park design that is over 100 years of age.

Robert Putnam – In 2001 Putnam wrote Bowling Alone, a book predicated on the notion that Americans were bowling more in 2001 than they were 50 years before, however, bowling leagues had declined over the same time period. This was not simply because bowling leagues had become unpopular; this trend correlated with dozens of other civic activities. Church attendance, parental activity in schools, and participation in town hall meetings all followed similar trends as these bowling leagues, which led to Putnam asking, "Why?" Getting America to engage in civic duties and participate in social activities is fundamental the survival of urban spaces. Similar to Jacobs and Mumford, human activity was the primary focus of this work from Putnam and doesn't directly impact ecological planning. Parks and civic spaces enrich civic engagement however, thus the values of Putnam still translate to the desired outcome of this regional park network.

James Howard Kunstler – Kunstler investigates the need to move beyond the American suburban model of city design. He suggests that these spaces lack intention, character, and definition. As the American suburban model has continued to dominate the landscape of nearly every city in North America it has also increasingly created homogenous storefronts, businesses, homes, streets, and other spaces. Kunstler calls for a change in the mindset of developers, planners and designers to investigate development with long-term vision and unique characteristics that enhance the immediate geography and societal constraints of a city. While Kunstler is not exclusively referencing parks or regional green networks, he is advocated for better use of city spaces with innovative and invigorating solutions and designs.

Homi Bhabha – Bhabha is a post-colonialism writer and primarily focuses on how space and cultures are affected by invading forces of other cultures. Bhabha is well known for is his contribution to the idea of hybridity, or the creation of entirely new cultures from the culmination of many other cultures inhabiting a single space. Rather than one culture adopting the practices, languages, and beliefs of another, a hybrid is formed (in most cases several). Hybridity contributes to one of Bhabha's fields of study, Third Space. Third Space is a theoretical space where cultures mix within physical space. Much like the concept of cyber space, a literal transaction and movement is occurring without a truly physical container or definable geography. These transcendent metaphysical spaces translate well to ecological design, especially within the view of classic landscape architecture where a sublime experience with nature was highly valued. Bhabha obviously focuses on contested spaces and cultures within post-colonialism, but Third Space easily contributes to civic space as it allows for the mixing of culture and people. A regional park network should encourage the connections of spaces in new ways and allow for the exchange of culture through different classes, races, ethnicities, and geographies.

Kevin Lynch – Image of the City and Good City Form are Lynch's two most well known texts. He expanded the planner's vision of a city to see a hierarchy of features, movements, and flows that people can literally sense, even if they are not readily labeled. Lynch generated a classification of city form that is widely used in preliminary assessments by designers and planners today. Paths, edges, districts, nodes, and landmarks became the features by which Lynch classified the cognitive maps (maps drawn by pedestrians from memory with no visual reference) generated by individuals surveyed in a few cities. Paths are regular network components of a city that people use to move from various points. Paths are not always Euclidian in form; they can scale in importance, and also vary with season and model preference. Edges are physical or perceived barriers that define the end of one space and the beginning of another. Paths can often create barriers, however, this is more a product of automobile use, than the actual nature of a path. Edges tend to signify some level of transformation, transition, or cultural change

in their perceived form. Physically, they take the form of retaining walls, large buildings, highways, forests and so forth. Districts are the macro spaces that edges create. Districts are a general classification of an agglomerated space such as neighborhoods, school districts, zip codes, or communities. Districts can be officially recognized as an entity or a manifestation of a cultural outcome such as Chinatown, the Westside of Cincinnati, or the Midwest. Nodes are strong junctions of paths, usually created by the intersection of multiple paths, districts, or edges. Nodes tend to have a draw to them beyond simply being a busy intersection such as a popular commerce space or cultural relevance. Landmarks are widely known elements of a city by which one draws spatial orientation. The Eiffel Tower, baseball fields, skyscrapers, and rivers can all act as landmarks. Landmarks are physically formative for a city; in some cases the city is physically built around a geographic feature, which dictates development and transit.

Park networks, especially in the modern context, have to be shaped by the principles of Lynch. Because movement, connection, vitality, character, image, and definition are all buried in the built form of a regional green network, it is essential to understand these five cognitive entities of a landscape within a city. A regional green network will fail if it does not bridge gaps created by edges, create new identities and spaces, preserve existing landmarks, and capitalize on existing paths and edges.

Ecology

Rachel Carson – Carson was one of the first female voices of nature in the early environmental movement of the 60s and 70s. Carson's work to reveal the dangers of toxic compounds on the environment became the bedrock of the reevaluation of uses of industrial compounds to control insect pests and waste dumping from manufacturing. DDT, Agent Orange and other pest control compounds were banned for use within the United States and other nations thanks to her dedication to enlightening the public with her writing.

While pest control and chemistry are not entirely a direct link to Cincinnati's regional park network, Carson does raise the question of how sterile an environment can be and still be called nature. The title of Carson's book Silent Spring is predicated on the notion of mankind wiping the planet clean of life, thus creating a "silent spring" – a time that is generally known for growth and life. This regional network has to be a pairing of natural landscapes, urban landscapes, mixing zones for the two, and other design options. It may be tempting for a designer to simply create countless manicured and tamed gardens and parks, which are good in their own right, but lack true natural and ecological values. A space that isn't entirely controlled by humans whether that be in the form of chemicals, design, or access stands to benefit a city in many ways. The network will need to incorporate both.

Garrett Hardin – Hardin exposed the issue of explosive population growth and resource management with his classic essay *The Tragedy of the Commons*. In principle people acting rationally and in their own interest devours the commons. Without limits and policy surrounding a free resource, it is rational to consume as much of this resource as possible before someone else in order to maximize personal utility.

Cincinnati's public space and vacant space is a commodity. Traditional wisdom suggests that this land should be developed to its highest and best use. These developments mean larger tax bases and in some cases increased surrounding property values, which further increases the tax base. This is, of course, only one use. The entire city cannot be developments in the same way that a town cannot be exclusive roadways, pipe, one story ranch houses, or strip malls. Diverse uses, to the chagrin of some developers, create vibrant landscapes. Public spaces, especially parks and nature preserves are a public good that benefit the community at large at the sacrifice of some. Balancing the need to maximize personal utility and immediate economic return with long-term vision for wise land management is ideal for Cincinnati and a healthy urban core and metropolitan ring.

Robert H. MacArthur & Edward O. Wilson – MacArthur and Wilson published The Theory of Island Biogeography in 1967. At the time, this piece was written to investigate how isolated ecosystems (islands) functioned in terms of overall species richness. Species richness, or the total density and diversity of flora and fauna, prevents ecosystem collapses in the event of species extinction, a habitat disturbance, or introduction of foreign species. Richness acts a safety net and helps an ecosystem rebound from one of these events and maintain flexibility. An inflexible ecosystem can buckle and collapse from a small disturbance, where as the opposite is true of a diverse and dense ecosystem. Isolation of a space makes it increasingly more susceptible to collapse because richness is limited to a closed bubble.

MacArthur and Wilson initially researched literal islands for such outcomes and how stable their ecosystems were. In the following decades, their work was expanded to understand spaces that behaved as islands, even if they were landlocked. Spaces like valleys, enclosed urban green spaces, and isolated forests. This work gave birth to the study of *landscape ecology*, which seeks to understand diversity, habitat, and space as they influence one another. This field of study is one of the driving forces behind the theories of hubs and links within modern ecology and green infrastructure design. The spatial connection of habitat is extremely vital to the overall wellness of an ecosystem. Whether it is obvious or not, mankind is incredibly dependent on the overall health of our adjacent ecosystems and ensuring that they are protected, connected, and preserved is extremely important.

Traditional Landscape Architecture

Adolph Strauch – Strauch was a landscape designer in Cincinnati in the mid 1800s. Strauch is responsible for, most famously, Spring Grove Cemetery, closely followed by the estate of Robert Bowler, which later became Mt Storm Park (Vernon, Ranney and Culbertson 2000). The values of the designs Strauch envisioned were not entirely unique to Cincinnati as much as they were progressive and

formative for Cincinnati as a city that consider green spaces and parks of high priority. Struach shared similar values with Olmsted and Kessler, however, is less well documented as either of these designers. It would be remiss to not acknowledge the father of Cincinnati parks and early developer of Eden Park, however.

Ebenezer Howard – The Garden City movement is often attributed (in part) to Howard. The concept around the garden city was extremely regimented, calling for very specific spaces for tasks such as industry, cultivation, housing, trades, and recreation. The designations of distances between uses, structures, pastures, and other cities are all detailed in this original city, which was made to serve as a manuscript for other such cities. At the center of the city was a large garden city, which then allowed for green spokes to radiate out from the center, often lining streets or pathways for pedestrians. The idea was fantasy and entirely too strict to accommodate population growths. Much like the greenbelt cities of the 50s and 60s in the United States, they were good ideas in principle, but practically made for challenging design flaws, land use conflicts, topographic roadblocks, and socialistic planning goals.

Howard's design did, however, influence the way that landscape architects and planners think about space, regional design, scaling of city for a population, land uses, and integration of green spaces and main plazas into city centers.

George Kessler –Kessler contributes the 1907 Parks Plan to the Cincinnati regional park system. Understanding that he not only generated a plan for this design, but also a template for reengineering it is key. As stated previously, water, topography, and roadways were his highest priority. Understanding that he was looking to improve circulation, create avenues that led to centralized parks, and preserve the water and hillsides of Cincinnati is crucial to visualizing a revival of this plan over a century later.

Kessler also contributed by highlighting the need for spaces that transition between uses easily. Parkways were never meant to be exclusively for vehicular transportation. Plazas and gathering spaces

were meant to serve multiple civic functions and contribute to the circulation of roadways and pathways. The plurality of these spaces is vital to their uses. In a modern context, isolated uses limit the human experience of space. Loss of undefined or loosely defined spaces has been detrimental to the urban aesthetic of city living and even more so in the suburban setting. Even if a parkway with a bike trail down the center is still fairly rigid in use, it presents a unique duality of space; one that is enticing to citizens.

Frederick Law Olmsted – Olmsted is possibly the most well recognized and respected landscape architect in American history. It is challenging to find a city in which an Olmsted park or design isn't present. His crown jewel is Central Park in New York City; equally impressive is his park network in Boston (now known as the Emerald Necklace). The Emerald Necklace is a feat of modern engineering, landscape sculpting, and urban design. The park network appears to "hang" from the neck of Boston, hence the name "necklace." The park system was developed for the city in a time where people lacked access to green space, especially those who lived in the dense urban core. The long linear components of the park system allowed for pedestrians to walk from the city center to the peripheral of the urban center. In a time where fresh air and quite was challenging to find, this park system provided an invaluable service to the citizens of Boston. The concept has obvious parallels to the Garden City of Howard; however, it took further steps in regards to addressing issues of drainage and resource preservation (the Back Bay fens and Boston Common). Olmsted respected the existing nature of a place and used it as a template of further improvement (Karson 2014).

Modern Landscape Architecture

Richard Haag – Richard Haag is a landscape architect from the pacific west coast and the designer of Gasworks Park in Seattle. The park is built out into the confluence of the river system connecting the bay and Lake Washington on the northern side of Seattle. The park is an abandoned oil

refinery, which was slated for cleanup and redevelopment in the 60s. It was converted to a park in the 70s, however Haag kept many of the refinery pieces in the park. Being that the park is just less than 20 acres, it was a very bold decision to keep parks of the refinery. What he ultimately created was a park that beautifully juxtaposes industrial complexes, pipes, and silos with green meadows and tree plantings. Portions of the refinery have been repurposed for a playground and have been painted vibrant colors that brightly contrast the rusted metal of other portions of the refinery.

Haag has a far grander collection of works than just Gasworks Park; yet this park stands as a testament to utilizing the materials of a given space and repurposing an uncomfortable past reality. His park design embodies the once rampant animosity that nature and urban man had for one another and now visualizes a dedication that man has to rebuilding our connection to nature. Cincinnati's regional park system will undoubtedly encounter similar landmarks and has the opportunity to reject the past identity of an industrial nation or can capitalize on sustainably reusing materials and inviting nature into the built environment in a cooperative manner.

Garrett Eckbo – Eckbo is the backbone of modern ecological design. Other planners with strong affinity with sustainability and green design owe Eckbo for the progression of the field. It is hard to believe how progressive The Landscape We See is for the year 1969; Eckbo was incredibly progressive when compared to other planners of his time. He saw the environment (land, plants, water, air, and so forth) and the built environment as a singular form. The idea that everything is connected, nothing operates within a vacuum, and that man is irrevocably tied to nature led to a strong principle of conscious development. Eckbo also possessed a complete pallet of planning skills; he easily navigates photography, design, quantitative analysis and critical synthesis in a written format. Through these he vividly depicts the void between man and nature and instances where man and nature are becoming rejoined in harmony.

Ian McHarg – McHarg is well known for his quantitative methods of land assessment. He designed these methods with the broad understanding that planners and geographers could use the technique to objectively survey a suit of spatial data in a method that could best determine development and conservation outcomes.

While these methods are not employed in this body of work, McHarg does introduce the need for mapping and analytics (whether analytical and objective or visual and subjective) to selecting space for a regional park network. Using GIS (Geographic Information Systems) and other software packages, similar methods can be employed, even to simply visually scan sights for possible design opportunities or preservation options. Overhead assessment options provide levels of detail and decision-making that many of the aforementioned designers could never have imagined.

Peter Calthorpe – Calthorpe is a modern environmental planner and designer. As previously mentioned, he envisions cities where nature and the environment meld together. Calthorpe is more concerned with the future of American cities and development rather than current cities in The Next American Metropolis. His solutions are broad in scope and span many different climate, contexts, and civic settings, but one factor remains consistent, cities must be designed with long-term intention and ecological integration. America is increasingly designing spaces that are not conducive to human life; automobiles, strip malls, low density housing developments, unauthentic spaces, mass produced goods, and aesthetically bland architecture is slowly killing modern cities. While some of this may be hyperbole, there is a very real threat to the mental and physical health of America and it certainly posses a threat to the sustainability of the lifestyles all people globally.

Calthorpe does not outwardly express the need for parks or park networks as much as he simply supports smart growth, intelligent development and design and alternatives to the suburban model and the automobile. Creating innovative spaces in the context of automobile alternatives is key to

Cincinnati's regional park network. Enhancing neighborhoods, especially those with high housing densities and more complete economies is also critical. Creating spaces that easily compete with suburban models and offer amenities that housing on the peripheral of the metro district does not have will improve the overall draw to Cincinnati as a more livable city.

Chapter 4 – Methodology

As citied previously, George Kessler developed the 1907 park plan. Based on a series of observations Kessler recognized the hillside structures of Cincinnati, the road networks, and physical divide that existed between the eastern and western portions of the city and their prominence. His plan was very detailed in trying to address problems associated with these observations, but also saw these features as assets and capitalized on them as best as possible.

The city has changed a lot in a century. Some of the observations and critiques that Kessler proposed have gone to the wayside, while some still stand the test of time. Below is a list of assets that the city could take advantage of to expand the regions green space. Many of these spaces are underutilized, undervalued, or lack definition. Some of these spaces are abandoned, many are neglected, and all are not used to their fullest potential.

- Large stretches of pavement, much of which is of poor quality and often simply occupying space
- Physical division of the city and the riverfront, largely due to old industrial facilities
- Vacancy of properties and structures
- A geographic divide of the east and west sides of the city created by I-75, the Mill Creek, and the Mill Creek Industrial Corridor
- Large holes within the urban fabric, especially downtown, created by demolished buildings, parking lots, roadways, and highways
- Two linear highway systems and multiple parkways
- A strong collection of existing parks
- A strong tree canopy across the city, much of which is on private property

- Combine sewer overflow episodes pollute the waterways several times a year
- The Ohio river
- Brownfields

This list is not exhaustive; however, a trend of equitable land use practices begins to emerge. Using GIS (geographic information systems) many of these features can be visualized on a map. It would be nearly impossible to map all of these features manually, but fortunately, Hamilton County (the county Cincinnati falls within) has a GIS service known as CAGIS (Cincinnati Area Geographic Information Systems). CAGIS makes various geographic data available to the public. This data can be visualized in space in the form of layers (sometimes referred to as *shapefiles*). These layers can be categorized in color, scales, sizes, shapes etc. to visualize data that is held within a layer.

For this study, various layers were placed on top of one another to assess general trends within space. ArcGIS 10.2 was utilized for this study (a commonly used GIS software package). For reference, Cincinnati's geographic footprint is visualized in the background of each map in gray. To further investigate these spaces, the 1907 Parks Plan is also included in many of these maps. A digital version of the map was used to create a shapefile of the plan. The process used to create this shapefile is a practice within ArcGIS called *digitizing*. Digitizing involves tracing a map digitally and then using existing data (which has innate geographic coordinates associated with it already) to reference the tracing. These reference points then place the traced map in space. This is a common practice for reviving old maps, especially those that might have used different geographic coordinate systems.

Each dataset visualized in these maps was collected by CAGIS. In some cases, datasets had to be clipped to fit the desired geographic space of Cincinnati. In such cases, the *clipping* function of ArcGIS was used. This function allows for data to be clipped based on a given spatial reference. For this study,

Cincinnati was consistently used as the reference space. In maps where data is intentionally allowed outside of the reference of Cincinnati's geographic boundary, it is to preserve the connective character of the layer (i.e. the Kessler plan, a river, or a park feature).

The following datasets were selected for this study:

- Vacant Lots
- Regional Tree Canopy
- Topography
- Bodies of Water
- Cincinnati's Geographic Boundary
- Impervious Surfaces
- Existing Cincinnati / Hamilton County Parks
- Roadways
- Building Footprints

There are a few limitations to these datasets. The methods of collection for these datasets are not published, thus, it has to be assumed that they are correct. Some GSI data can easily be verified, for instance, if this study were dealing with demographics by zip code, the US Census data could be checked online. It is more challenging to verify shapes that are derivative of satellite imaging. Similarly, many of these datasets have not been updated in a few years. This is generally acceptable, for example, Cincinnati's geographic boundary hasn't changed recently. This is even ok with a file that visualizes tree canopy, as the overall tree coverage of the city likely has not changed significantly in the past few years. The data file that contains vacant lots in the city is from 2011. While many of these properties may still

be vacant, it can be assumed that several have been purchased and developed. Similarly, several properties likely need to be added to this file.

There are also data holes to be conscious of. These can be most clearly visualized in the impervious surfaces files. These spaces were only mapped for the City of Cincinnati. The city has several enclaves (territories surrounded by another territory on all sides) however, which create gaps in the map. These enclaves have been added to this study, as Kessler also added them to his plan in 1907. It is easy to recognize these holes, as they usually follow the geographic boundaries of these territories. These holes do not harm the credibility of this study, but rather limit the full capacity to assess the city and surrounding territories to the fullest extent.

Some data files had to be modified to best visualize the data they provide. The impervious surfaces file includes all of the surfaces in the entire city that water cannot readily pass through, most of which is pavement or structures. Roads and buildings in other datasets thus present redundancies. Using these same features to remove redundant data thus makes the impervious surfaces visualization more robust. In such a case, the visualization now showcases impervious surfaces that are neither roads nor buildings, as these layers were changed to reflect the color of the background. This leaves only miscellaneous pavement, which are spaces much more suitable for expansions of green space as they could allow for more flexible green designs.

The tree canopy file is the least useful of the surveyed layers. Tree canopy has depth and is not solid. This cannot be visualized in a two dimensional format. The quality of a tree is also highly important to this file; generalizing trees as a flat and homogenous surface is limited in usefulness. Because of this limitation, the file has the power to only simply inform where the serious absence of trees is. Below are the visualizations of this data in different maps in conjunction with other layers that are applicable.

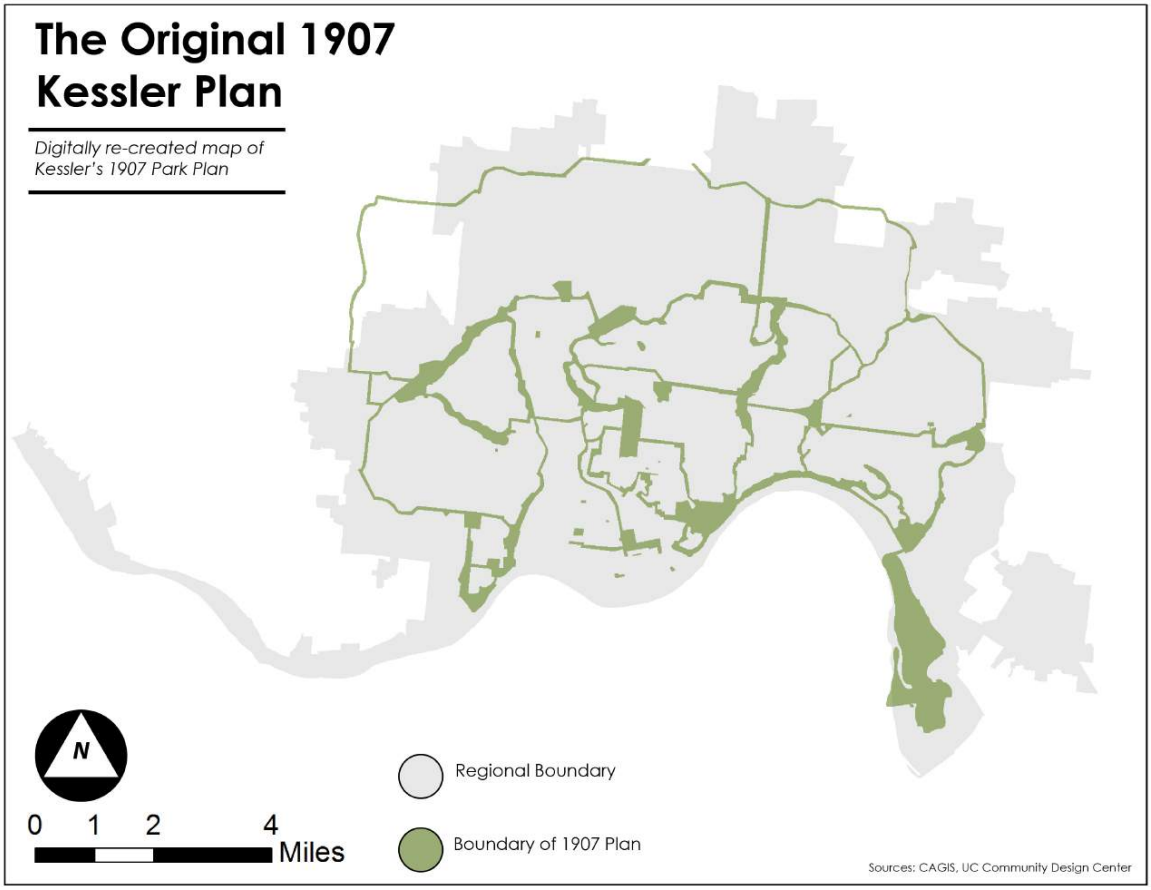
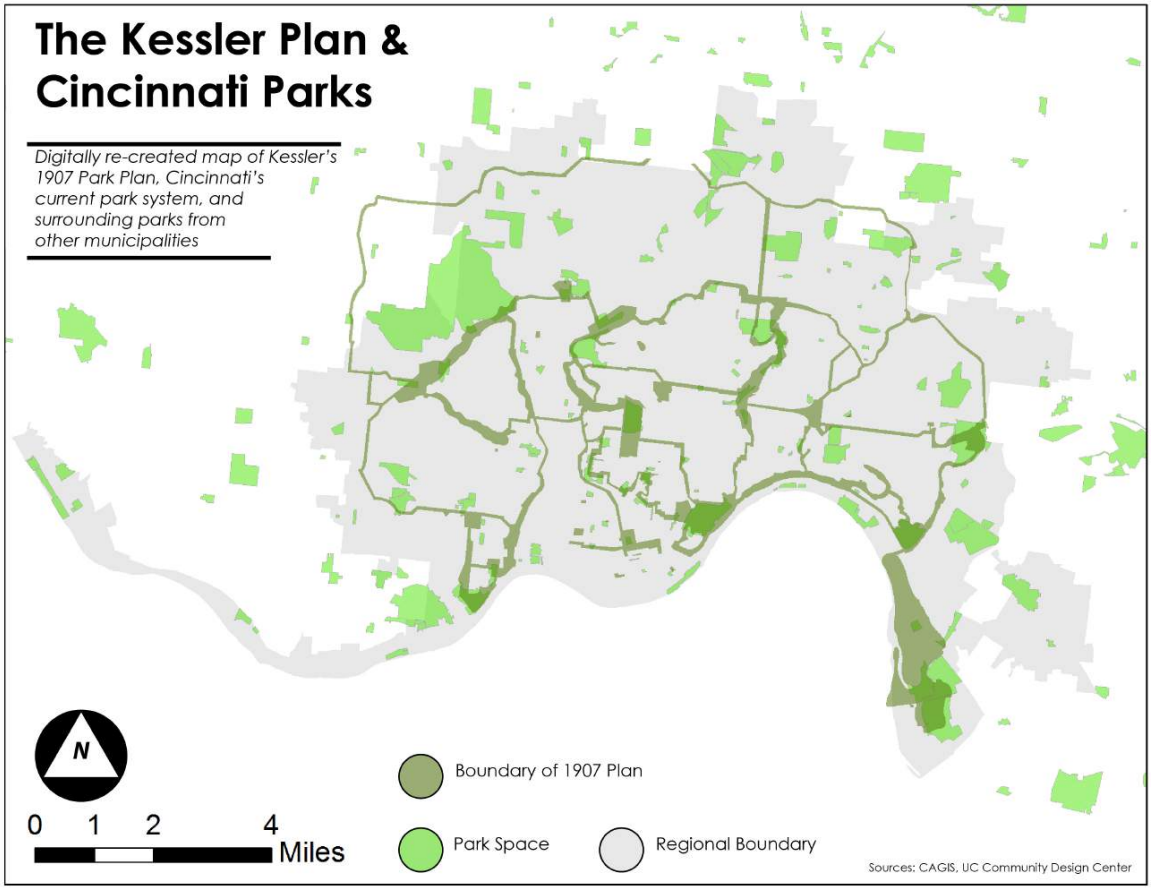


Figure 9: The 1907 Park Plan overtop of the current city boundary of Cincinnati (Cincinnati's enclaves included)



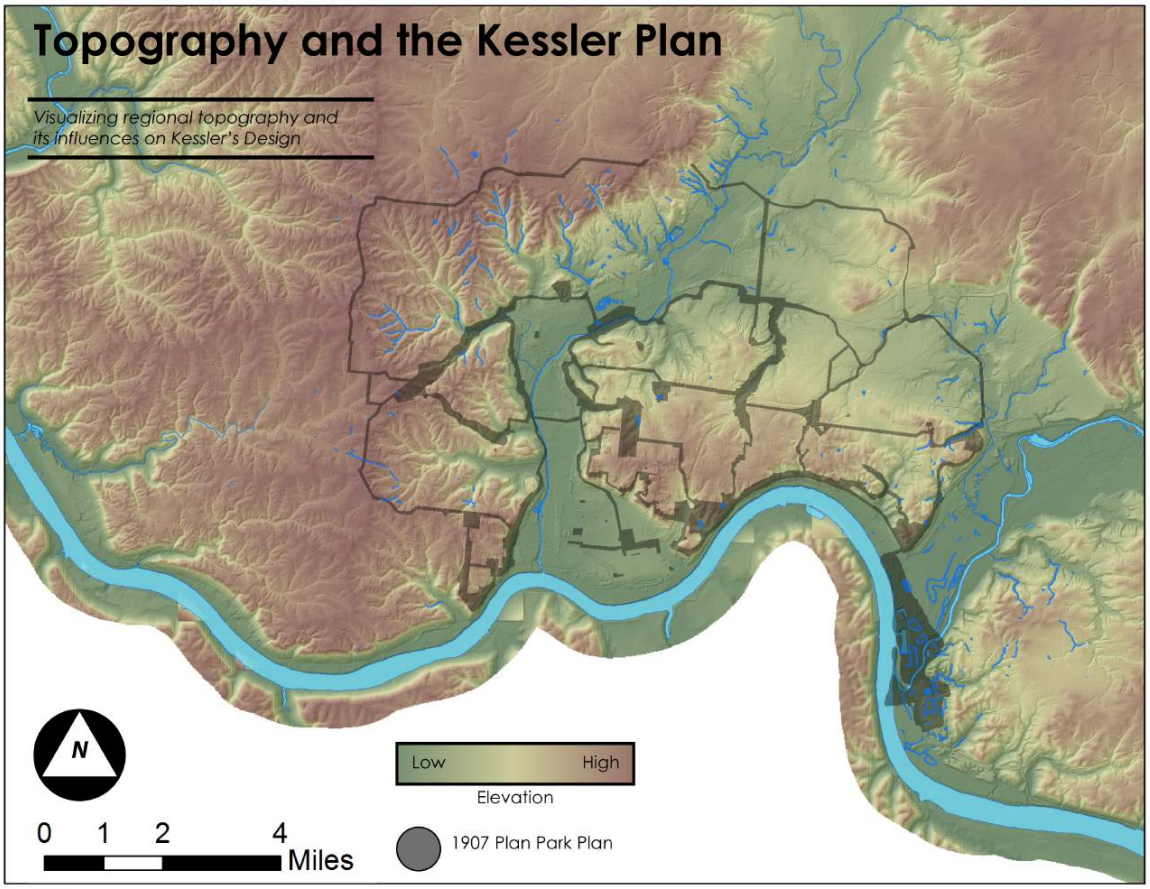


Figure 11: The 1907 Park Plan overtop of Cincinnati's current topography

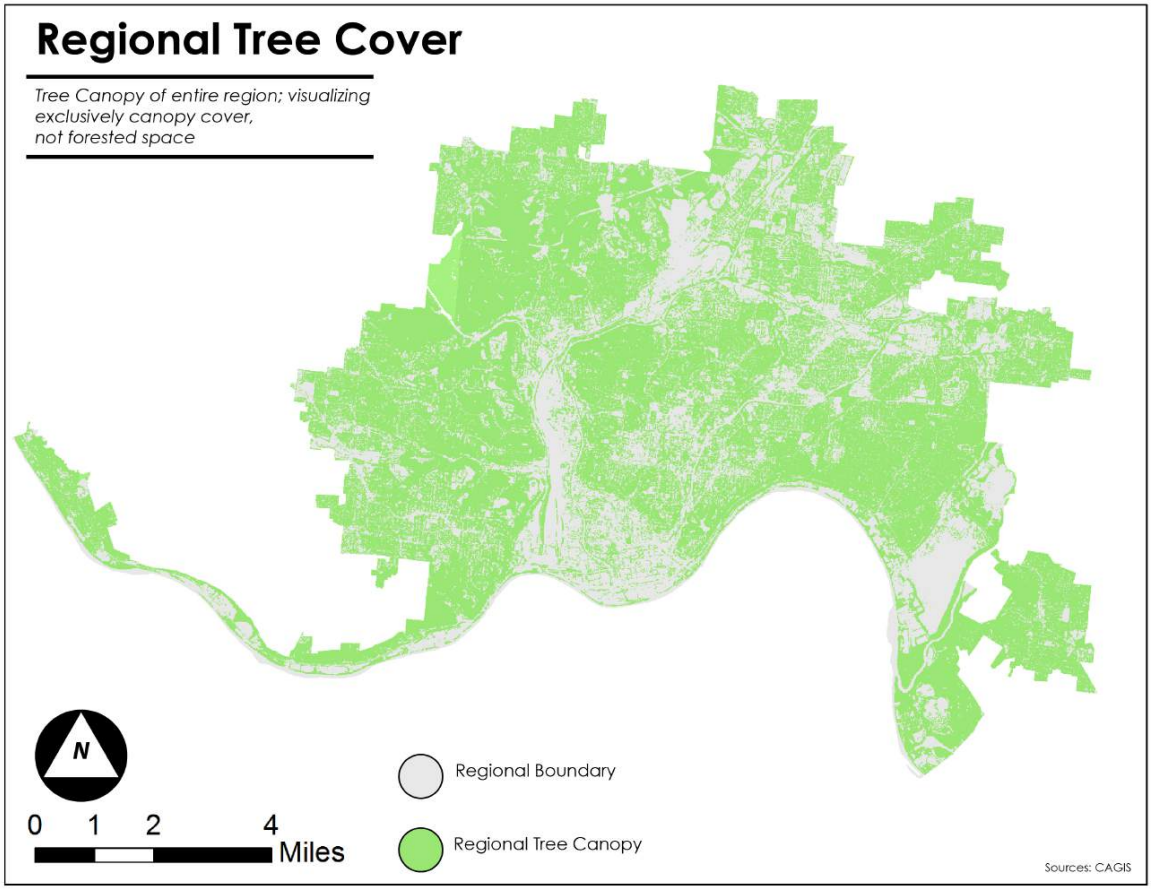


Figure 12: The tree canopy in Cincinnati

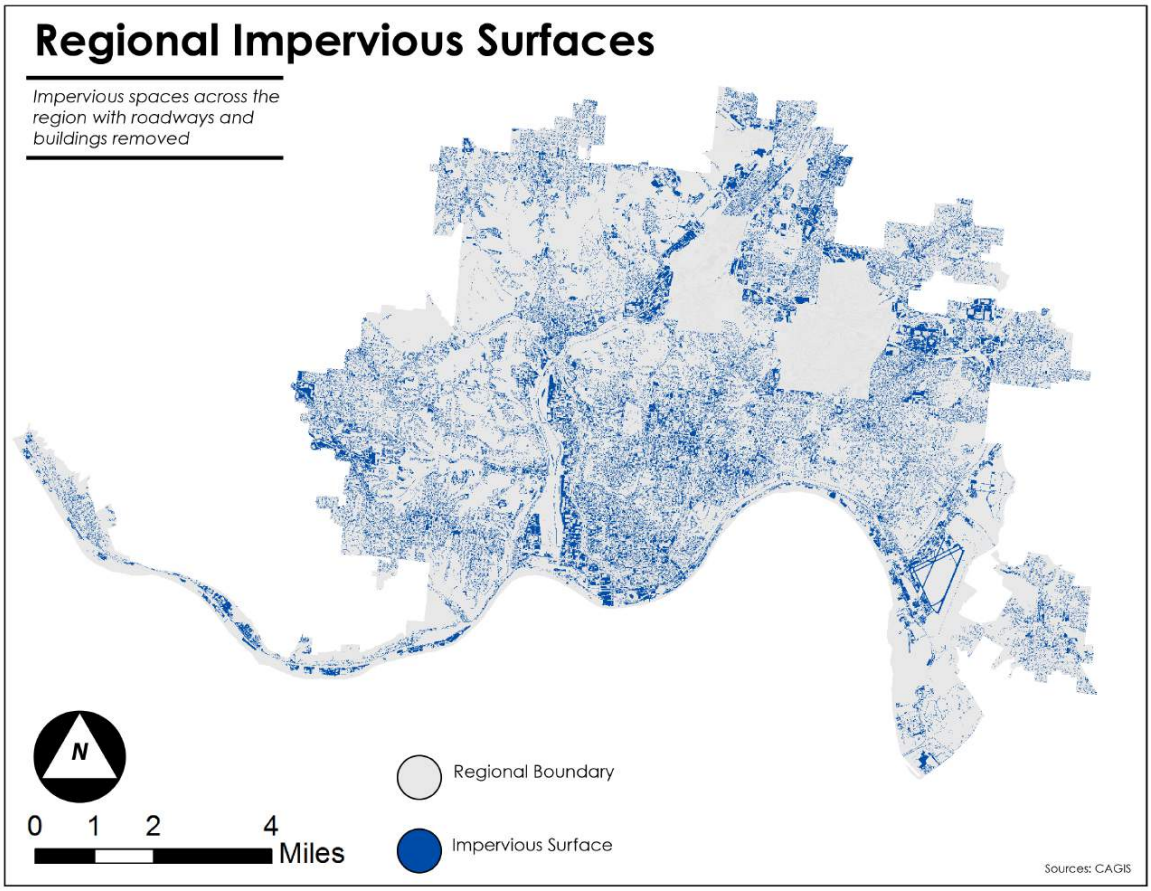


Figure 13: Impervious surfaces in Cincinnati (excluding roadways and buildings)

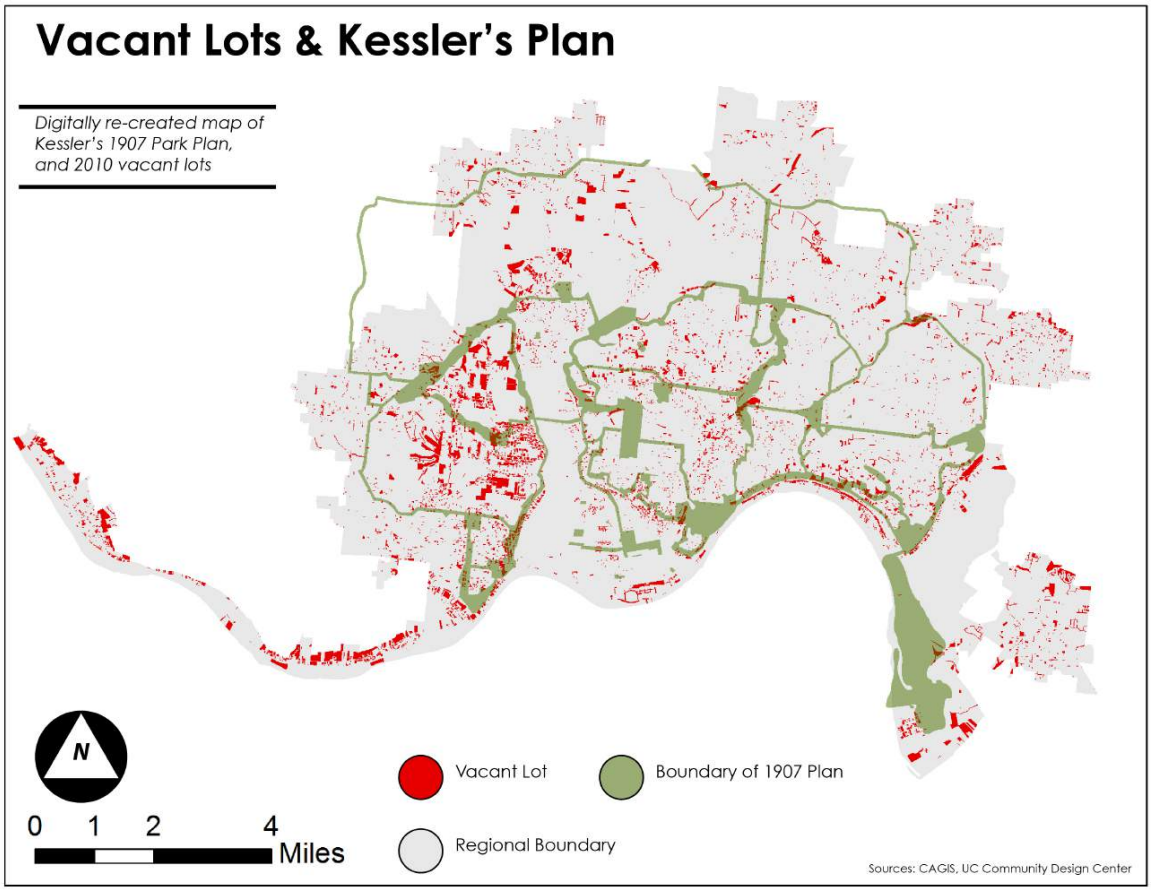


Figure 14: Vacant lots in Cincinnati and the 1907 Park Plan

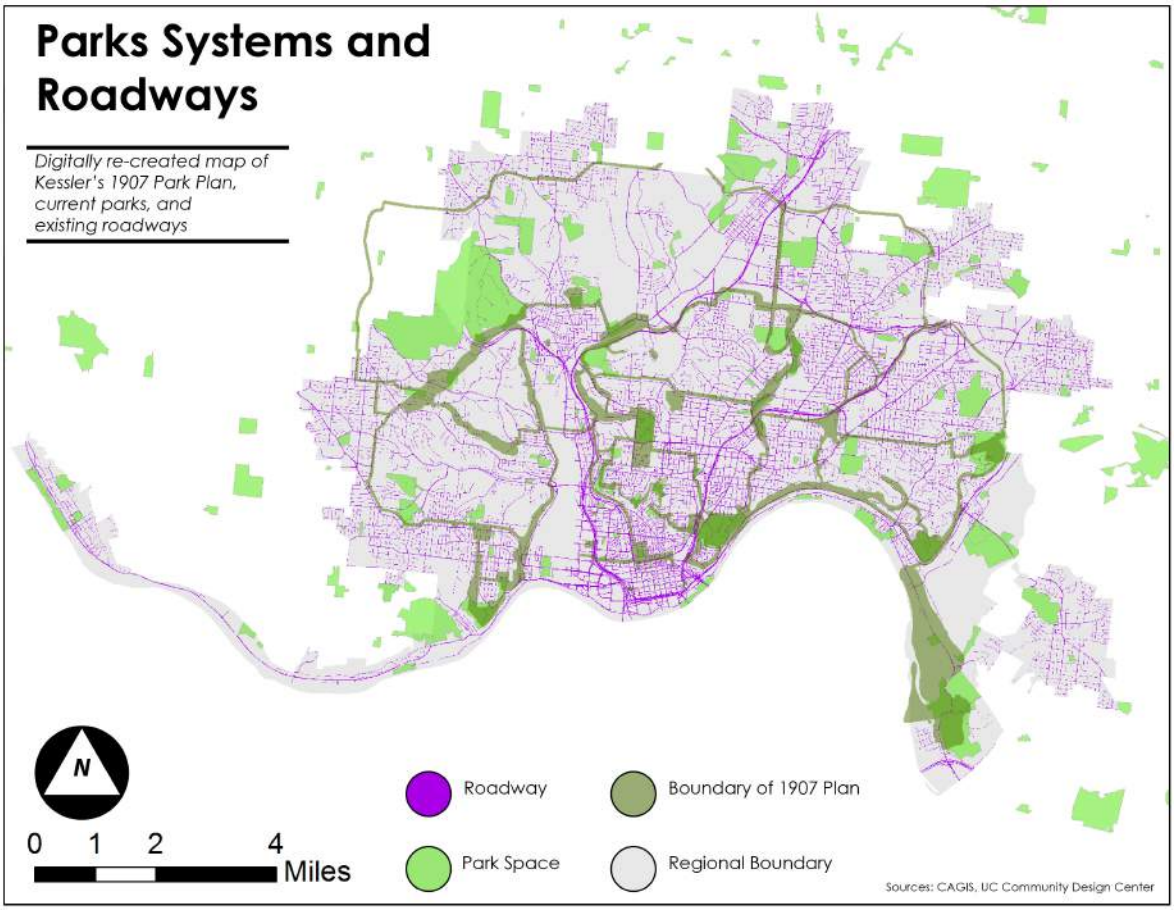


Figure 15: The 1907 Parks Plan and the current Road system of Cincinnati (Highways have greater line width)

These maps help to better visualize the clustering of these features in space. For instance, there is an obvious absence of tree cover in the valley, especially surrounding the Mill Creek. There is also a lack of impervious surfaces along this corridor, likely due to the railways that dominate the southern portion of the Mill Creek Valley. Vacant lots seem to cluster in high amounts on the west side of the city, especially around the riverbank, much of which appears to be industrial (large parcels in high concentration).

It also appears that the Kessler Plan very accurately follows the original topography of the city. This bit of information is valuable; however, it is less impactful for green space development as many of these spaces are now occupied or developed. It can be noted that there is a high level of vacancy along the riverfront and immediate hillside on the eastern portion of the city, especially near the bend in the river.

Using the data collected in these maps, a composition of all available features can be created. By combining these features into a single two-dimensional shape a visualization of all ideal spaces for development of a green network emerges. This is a great method for visualizing the opportunity to make use of underutilized spaces within the city. Below is a map of these features combined. The map combined waterways, current park spaces, unspecified pavement (excluding roads and building footprints), and vacant lots.

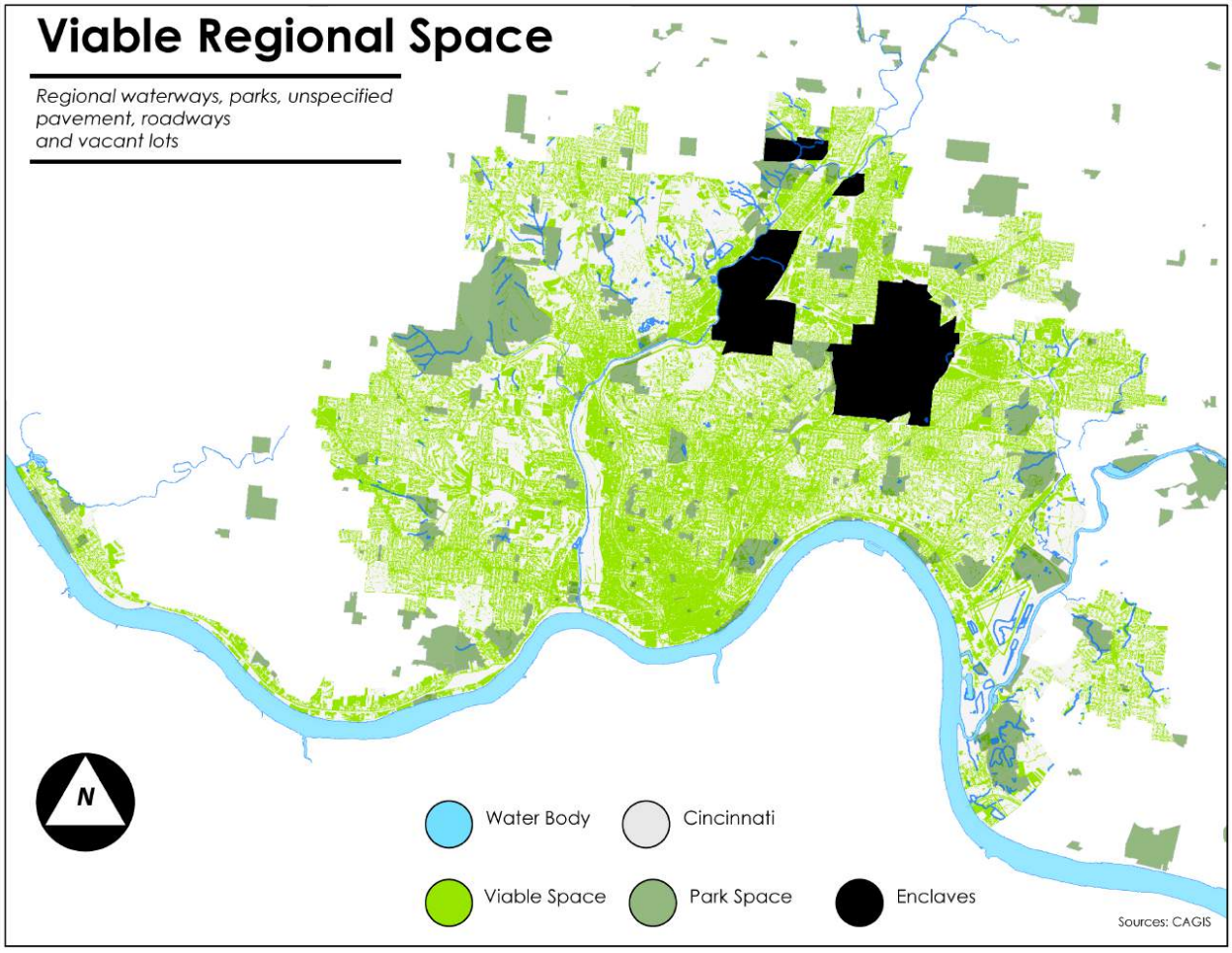


Figure 16: All viable spaces for green space in Cincinnati

As noted previously, the Mill Creek valley lacks viable spaces in this visualization. The spaces of Cincinnati's enclaves can also be very easily seen in this map (St. Bernard, Norwood etc.) because of the gaps they create. Waterways present an interesting opportunity for a regional network plan because they are generally linear. In a similar manner, roadways are useful because multi-lane roads tend to travel long distances and provide a relatively linear pathway. Highways provide a great opportunity as they follow the same principles of large roadways, but have very large right-of-ways surrounding them. This land is not visualized in this graphic (CAGIS does not contain highway right of ways); however, it would likely expand a very large buffer around most highways. For this reason, Highways are arguably the most ideal space to contribute to a green network.

Visually, downtown Cincinnati appears to have the greatest amount of viable space in it. This likely is attributable to the fact that the urban core is more dense, hence, more overall parcels. There is also a denser collection of undefined pavement spaces. There is a similarly dense collection of viable spaces along the eastern portion of the Mill Creek, north of the city core. It seems this is largely due to undefined pavement, which can be seen by looking at the impervious surfaces map.

Lastly, it is worth noting where there are significant "bald" spots across the city. Excluding the areas created by the enclaves, Cincinnati's western half appears to have less viable space than the east. Most of these blank spaces appear to cluster along the Mill Creek Valley, especially along some of the stream systems to the north. The eastern portion of Cincinnati has some challenging spaces, many of which appear along the Little Miami River (the river on the eastern edge of the city).

Chapter 5 – Analysis and Findings

Cincinnati's viable spaces for cultivating a green network are fairly well dispersed across the entire footprint of the city. This is favorable for a network and allows for flexible choices in terms of selecting spaces to cultivate. However, selecting these spaces may prove to be a bit challenging. Questions such as, "What qualifies a space?" or, "What sort of spaces are *most* ideal?" begins to surface in such a discussion.

Based on the analysis done in the previous chapter there is an obvious obstacle that has to be scaled: the Mill Creek Valley. The valley clearly lacks viable spaces for any form of east-west movement, which is critical to connecting both the eastern and western halves of the city. This fact has to be of the upmost importance to the plan and a major goal in connecting the eastern and western portions of the city.

Waterways offer incredible value in terms of linear systems. The Mill Creek, Ohio River and Little Miami are all large bodies of water that have to be integrated into this system. The total area that these bodies of water cover is substantial and they physically touch several of Cincinnati's existing park systems.

Highways offer a unique opportunity for green spaces development. Their large right-of-way and general degradation of land value that immediately buffers them provide vacant space that is generally underused. Similar to Cincinnati's major waterways, I-74, I-75, I-71, Ohio St. Rt. 562 and US Rt. 50 all offer incredibly linear spaces with high ecological development potential immediately surrounding them.

Vacant lots, miscellaneous pavement, and street networks are evenly distributed over the large majority of the city. This makes these spaces ideal for moving from one major park feature to another.

Using the model introduced by Eisenman in chapter 2 these spaces are ideal for small links between larger corridors and hubs. It may be possible to use high concentrations of these types of spaces to create hubs out of urban neighborhoods or residential spaces by simply repurposing these spaces.

Each of these features has to cooperate within a framework to achieve a regional network. In the case of all of these features, integration of green space into the existing urban framework is key. Vacant land may be the only exception to this rule. The following figures expand on the potential options available to the city to expand this network in a way to integrate smoothly with the built environment of the city. These sites are specific to a particular location; however, they represent fairly common issues that can be found across the entire city. They are to serve as design models for other such spaces.

Each site has a *present* image and an *assessment* image. The assessment investigates available space for expansions of green designs and spaces. Below is a key for these assessments seen in Figure 17. *Green Roadways* are spaces where a significant green space could be installed into a roadway as a park feature. These spaces require enough right-of-way to allow for a large space to be built into them. *Green Parking Lots* are parking lots with forest elements built into them, rainwater reclamation technology, and/or alternative pavement options. *Dense Green Space* visualizes spaces where a dense forest is put in place. These spaces differ from parks and other green spaces, as they are not designed with pedestrian movement prioritized, but rather ecologically rich and valuable tree canopy. *Park Space* is land that could be converted to a park or public gathering space. These spaces are not inherently green infrastructure, however, they are used to reclaim spaces for the city and convert underutilized land. Lastly, *Connectivity* indicates passages and corridors of movement, whether that is physical movement, perceived visual connection, or proximal association in space. Connectivity is incredibly subjective and derivative of Lynch's work in Image of the City. Recognizing paths, edges, districts, nodes,

and landmarks provides a window into understanding movement in space, thus connectivity is a visualization of this perception (the scale of the arrow is irrelevant to the scale of connectivity).

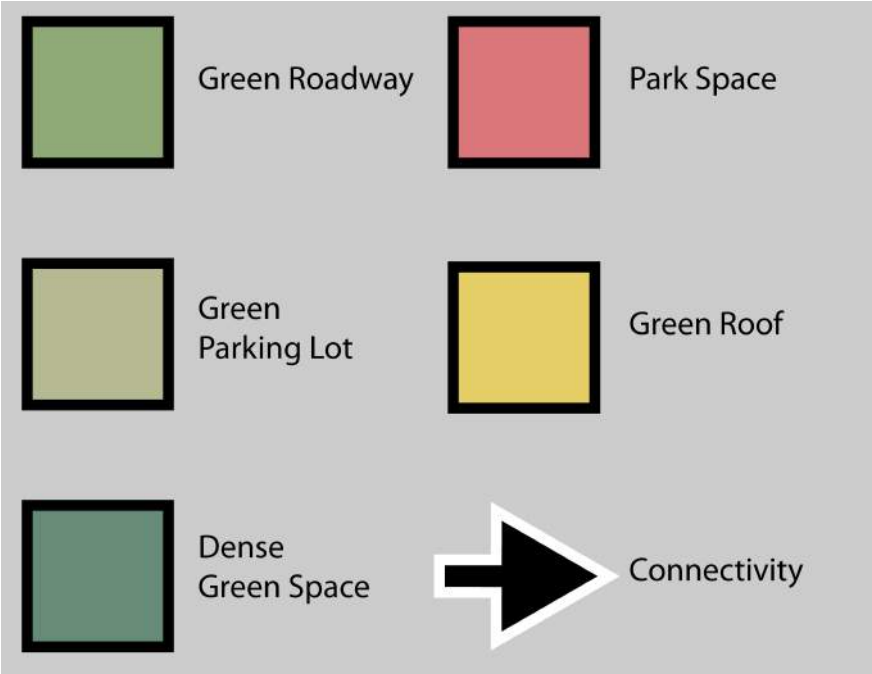


Figure 17: Key for the assessment maps that follow. Each feature is a transparency placed overtop of the existing image of the space.

Figure 18: Pendleton is a neighborhood in downtown Cincinnati just northeast of the central business district. Notice the number of surface parking lots.

Figure 19: An assessment of the viable space for green designs and connectivity in Pendleton.

Site #1: Urban Infill

Site #1 is located in Pendleton. Pendleton borders on Over the Rhine (OTR) and Cincinnati's CBD. It is a neighborhood with a beautiful housing stock, most of which are well over 100 years old. Unfortunately, it is also a neighborhood full of surface parking lots, most of which are occupying entire city blocks where buildings once stood. The missing structures create significant holes in the urban tapestry of this neighborhood. Using park designs that integrate with the existing housing stock creates a more cohesive urban experience.

This assessment capitalizes on the low value of surface parking lots. Most of these plots lack any sort of structure beyond the pavement that makes up a surface lot. The design also places an old Cincinnati Public School, SCPA (School of Creative and Performing Arts) as a centerpiece of the diagram (visualized as the large green roof structure in Figure 19). The school is currently scheduled for

conversion to condos. Ziegler Park, which is located just west of SCPA is connected to a far larger green space with this design and experiences a renovation as well.

Ideally, much of this space would be converted to park space and green roofs. The visual connection of these spaces within the dense urban core of Pendleton is of most importance, and this would primarily be achieved by increasing tree canopy. Because these spaces take up vacant lots and parking lots, visual connectivity and physical connectivity diffuses from the area, rather than following a linear pathway.

This urban infill design creates hubs out of urban neighborhoods. This design works with the density of an urban neighborhood to create an eco-district or a neighborhood focused on lessening its environmental footprint. Ideally, a design such as this reduces the total amount of impervious surfaces in the area, reduces the impact of the urban heat island effect, and traps greenhouse gasses created by automobiles in the area.

A similar concept could be expanded to many other neighborhoods in Cincinnati beyond Pendleton. Neighborhoods like Northside, Avondale, The West End and the East End all contain a considerable housing density, some level of vacancy, and significant level of miscellaneous pavement. This plan could also encompass street-planting concepts and green medians to further expand the overall impact and provide links to other hubs. These designs might appear small in size, but what they lack in size, they make up in flexibility. These sort of spaces could be placed almost anywhere within the city.

Figure 20: The Cincinnati riverfront of the Ohio River, west of downtown Cincinnati is divided by a highway, an interchange, topography, and industrial development.

Figure 21: An assessment of the viable space for green designs and connectivity in along the western riverfront of the Ohio River.

Site #2: Riverfront Redevelopment

Site #2 is on located on the banks of the Ohio River on the edge of Lower Price Hill. This location is an industrial zone. For decades, the Ohio River has served as a vessel of fuel and manufacturing transportation, hence the banks have long been dominated by industrial freight, coal, and other raw materials. These sites have been slowly dissipating in use and have left behind brownfields and barren landscapes.

This redevelopment is predicated on reconnecting the banks of the river with the city. Currently, a highway and the industrial zones along the bank prevent access to the river and make for an undesirable space. The riverfront stands to benefit from a connection to a larger green network on primarily two fronts. First, placing a barrier of foliage between the river and the city creates a buffer between the city and floodwaters. This buffer would serve to protect homes located near the river's edge. A park feature could easily be built into this design, which would make it a duel green infrastructure installation. Tree canopy could also be used to block the highway from this space and from surrounding residents. This reduction in pollution (noise, visual, and air) would greatly benefit the property value of these homes.

If this design were to be extended along the entire riverfront, then pedestrians and cyclists could also freely move east and west of the city center without an automobile. Connections a green corridor along the Mill Creek and the I-71 corridor with further enforce this movement in a north-south direction.

This design and other variations of it would serve the entirety of the Ohio River that borders Cincinnati. As noted in the vacant lots assessment and the compounded viable spaces assessment the

riverfront offers a lot of space in a linear format that can span the eastern and western portions of the city. The connection to the Mill Creek is also vital as it then allows for a northern connection to the Ohio River.

The flood resistant design of this plan would benefit the entire city in a significant manner. Having a buffer to minor floodwaters is a great practice for preserving real estate. Neighborhoods like Lower Price Hill and The East End stand to benefit from this design as these places regularly experience floods, especially as winter snows melt and spring rains begin.

Figure 22: The east-west connection of West 8th (the major roadway seen above) is extremely important to western Cincinnati residents. Reinventing this connection and integrating it with a north-south Mill Creek corridor is desirable.

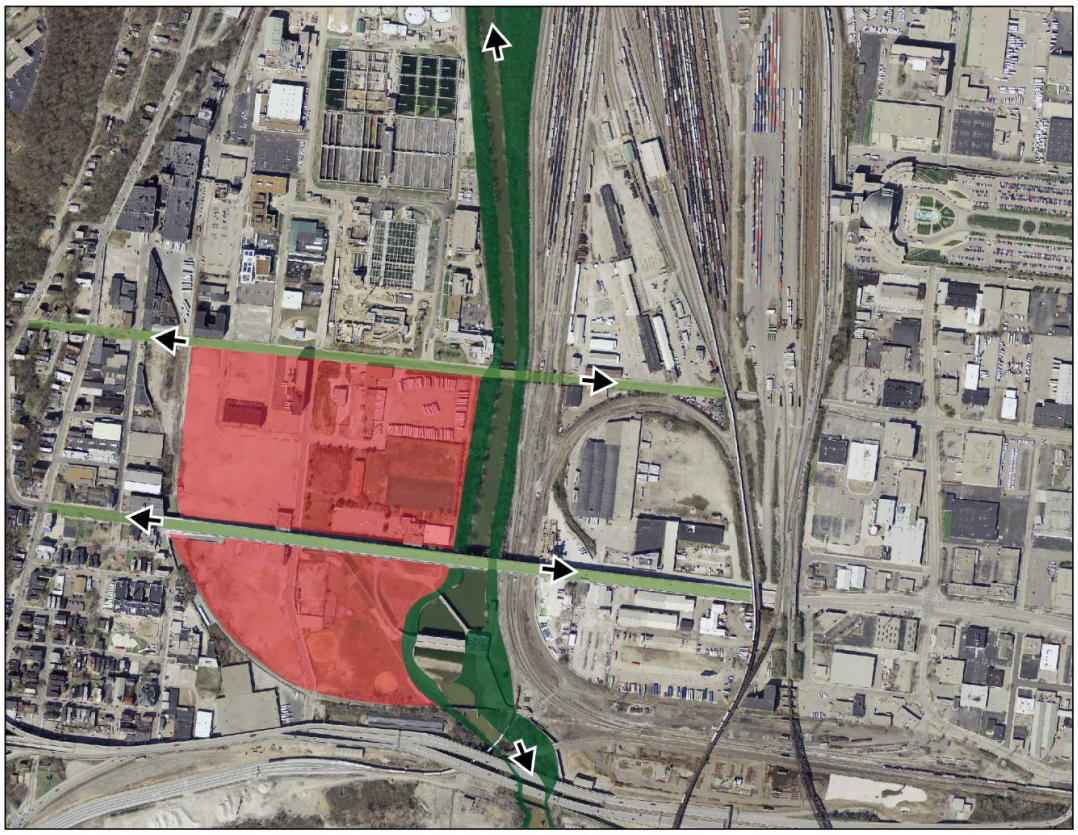


Figure 23: An assessment of the viable space for green designs and connectivity in the Mill Creek Valley.

Site #3: Industrial Redevelopment

The Mill Creek Valley is characterized by heavy industrial development. For decades, this valley was the backbone of Cincinnati's economy. Heavy industry is no longer the primary economic practice of Cincinnati and is increasingly decreasing in importance for the city at large. This is easily visualized in the vacant lots assessment from the previous chapter.

Reclaiming much of this vacant land for an ecological purpose is important to a regional network. The Mill Creek Valley contains I-75 (a north-south highway connection that runs through Cincinnati) and I-74 (an east-west highway that begins in the Mill Creek Valley and runs through Mt. Airy

Forrest). Both of these highway systems offer vital connection potential especially for joining a major east-west route with a north-south route.

This design would seek to foster these connections along the Mill Creek. Daylighting the stream and restoring a more natural flow and stream bank would foster a valuable spine that traverses the entirety of the center of the city. Along the route, vacant lots could be repurposed for green space, eco-districts, office space, or other development opportunities. Integrating these redevelopments with ecological features is key. Through the conversion of vacant spaces and empty lots to green space, the environmental burden of old industrial facilities would be removed and local property values would be increased. For the neighborhoods that border these features (Lower Price Hill the case of the design in Figure 23) this could act as a form of economic development for property owners.

Allowing for a design like this to follow I-74 creates a connection to Mt. Airy Forest, which was mentioned in chapter 2. Making the visual and physical connection of this forest to the rest of the city dramatically increases the ecological services of the system at large and increases the ecological richness of smaller hubs. The added acreage of the Mill Creek to the system is valuable, but the connection to such an ecologically rich space is paramount to the health of the city's park system on a whole is even more desirable.

Connectivity in this area is created by the movement of highways and large streets moving east-west and the Mill Creek running north-south. These connections are fairly physical as these spaces are limited by the physical topography, but the visual aid of green space within these features would further enhance the visual connection between Cincinnati's urban core and these spaces on the western side of the city. Ideally, these spaces would connect to the core of the city, which would then make a connection space on the eastern border of the urban core. This would create a strong visual link that passes through the city.

Figure 24: Oakley Station is a collection of suburban model big box stores. Until recently it also had a collection of abandoned rail yards and industrial facilities. It is being converted to a suburban neighborhood with a movie theater, large apartment complexes, and office spaces.

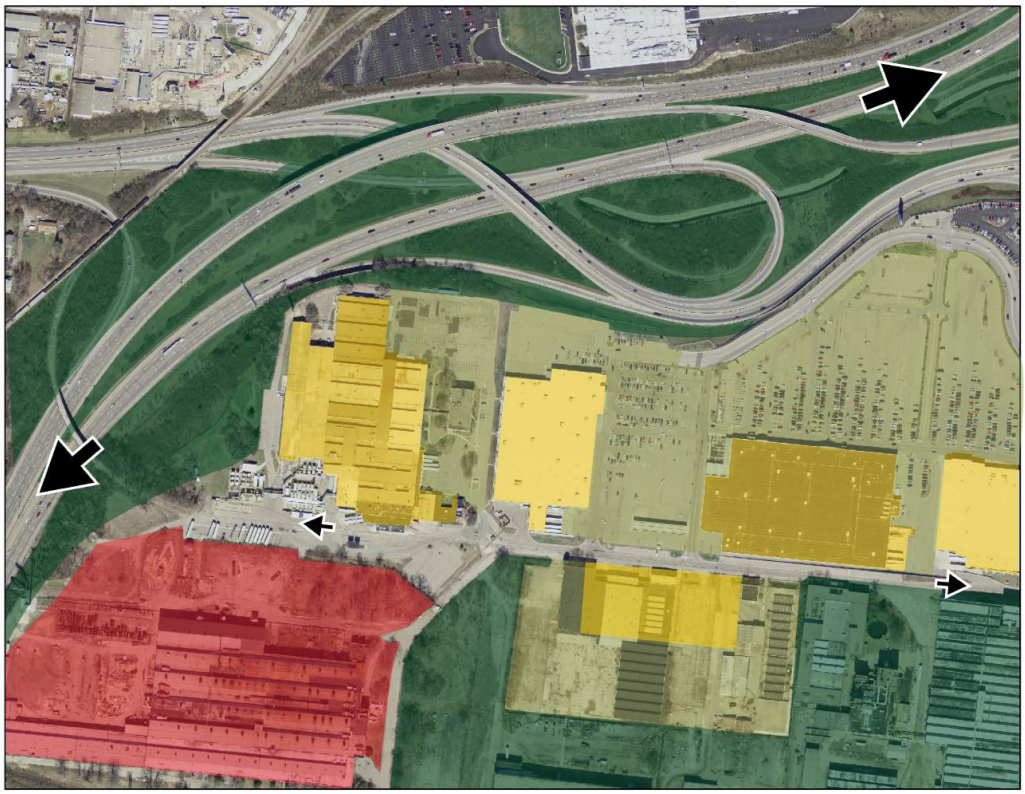


Figure 25: An assessment of the viable space for green designs and connectivity in Oakley Station and the I-71 Interchange at Oakley.

Site #4: Suburban Infill

The American suburban model of shopping complexes creates large seas of asphalt and pavement. This is a product of large parking lots with capacities designed around accommodating holiday shoppers and the collection of wide roadways made to accommodate the vehicles driving to these spaces. The collection of roadways, parking lots, overall building surface space, and highway surface area leaves very small and fragmented green spaces in complete isolation from one another. These designs have led to spaces that are impassible to anyone but motorists, and massive spaces of impervious surfaces.

In the assessment seen in Figure 25 this model has been flipped. The parking lots in this space could be retrofitted with a system of swales that integrated into tree canopy. Adding tree canopy to these spaces would reduce the heat produced by these spaces in the summer sun and also slow movement of rainwater over these lots in storms. These swales could be connected to an overflow (during hard rains) that releases into the forest system to the west to reduce the impact of these lots of Cincinnati's storm water system. Ideally, these trees could expand to cover most of these lots to allow for little direct light to reach the blacktop.

As with the other sites, I-71ideally would be surrounded by a dense forest that would connect to other highways and forest system in the region. This particular interchange is important to a citywide system because it heads north out of the city limits and connects to Ohio St. Rt. 562, otherwise known as the Norwood Lateral. This particular junction thus could join a neighborhood southeast of the site (not visualized) to a green space / shopping center and the I-71 greenway system. This system then could connect to I-75 via the Norwood Lateral. All of these features create strong physical connectivity to other areas of the city.

Major roadways within this suburban shopping network would benefit from visual connectivity that could be created by integrating street trees, street planters, and even small storm water retention swales. The street would become more visually appealing and create connections where there are currently barriers created by exclusively concrete and asphalt streetscapes.

This concept is incredibly applicable to multiple locations across the city, region, and even nation. Suburban automobile focused design has reduced green space across American cities dramatically and contributed to lack of pedestrian mobility. Integrating such systems into the Rookwood shopping complex, Norwood's business district, and other such suburban style shopping centers can contribute to more walkable spaces and reduce the impact they have on storm sewer systems.

Concluding Observations

Each of these designs visualizes a major component that could be integrated into dozens of spaces across the city. Under this model, urban and suburban infill models create hubs and small linkages between existing green spaces and parks while industrial and riverfront redevelopment create the arteries of this system. Through utilization of existing networks ecological components are effectively grafted onto them.

Ideally, the plan would operate on four primary corridors, I-71, I-75, the Mill Creek and the Ohio River. I-74 and the Norwood Lateral could function as two additional sub corridors. These macro corridors would then operate off of subcategorized corridors and links throughout the city in varying sizes. These corridors would range from major roadways to smaller water systems to natural topographic features. These links would then join eco-districts, neighborhood parks, regional parks,

forested spaces, and other green spaces. Under this plan, every piece of land in the city is seen as part of a larger plan, serving the innate built function of a designer and ecological benefit for the region at large.

Unlike the Kessler Plan, spaces aren't as easily identified in the form of a map for this plan. As seen before, there is a lot of viable space throughout the city, but not all of it is readily available or easily obtained. The city has the obvious power to do add such a plan into its highways master plan, but would have a much harder time imposing design regulations on suburban parking lots, riverfront property owners, or even vacant lots throughout the city. The issues of land ownership start to challenge these concepts. Obtain large collections of space that are contiguous is also challenging. While vacant lots might tend to cluster, the likelihood of all these properties being obtained cheaply or in relatively quick timeframe is slim. For this reason, this plan cannot function on the notion of amassing large spaces (anything more than a few acres) and converting them to green space.

Fortunately, this plan is not limited to a singular space like the Kessler Plan was. The viable spaces assessment made it clear that a large majority of the city does indeed contain space that could be converted to green space. If Cincinnati had the political authority or developers had the longer-term vision needed, it would not be out of the question to see the city convert to a far more ecocentric design within the current design of the city. This plan would effectively blend the urban landscape with the natural in many dense urban spaces and convert roadways to spaces of mixed urban and natural features.

The time scale of this level of development is likely a very long one. The overall cost of obtaining spaces, converting them, and maintaining them is likely fair beyond what the city could financially manage at the moment. Private and public partnerships on roadway designs, residential designs, and industrial conversions could possibly alleviate some of the fiscal burden from the city. Similarly, such a

plan can be marketed as a form of infrastructure development, so Cincinnati's Municipal Sewer District and Department of Transportation could also shoulder some of the overall costs of the plan

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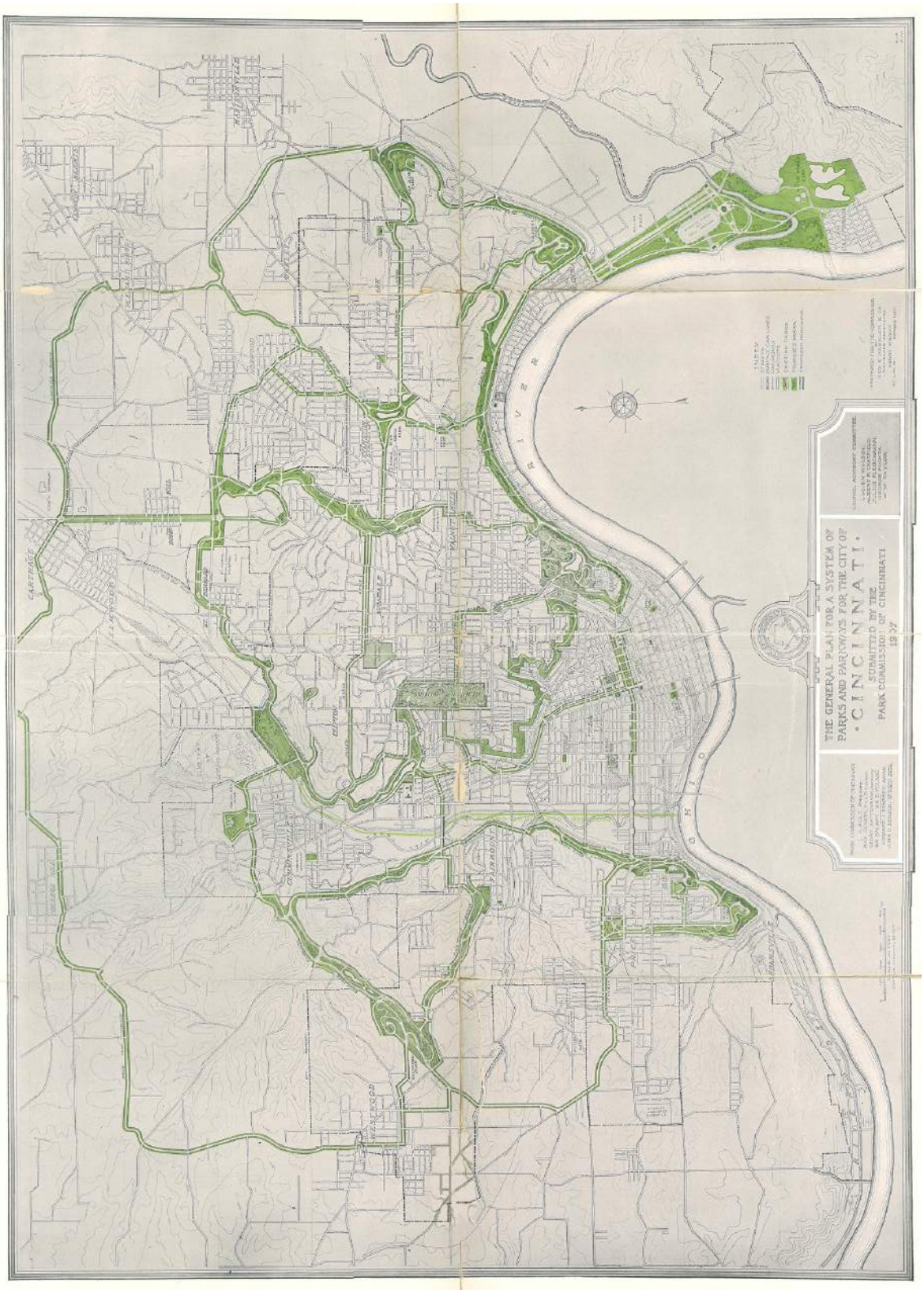
Addendum


THE GENERAL PLAN FOR A SYSTEM OF
PARKS AND PARKWAYS FOR THE CITY OF
·CINCINNATI·
SUBMITTED BY THE
PARK COMMISSION OF CINCINNATI
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RIVER
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Visualization of Literature and its Impact on Ecological Planning in Recreating Cincinnati's Regional Park Network

Scale of Physicality

Scale of Humanity

Scale of Impact

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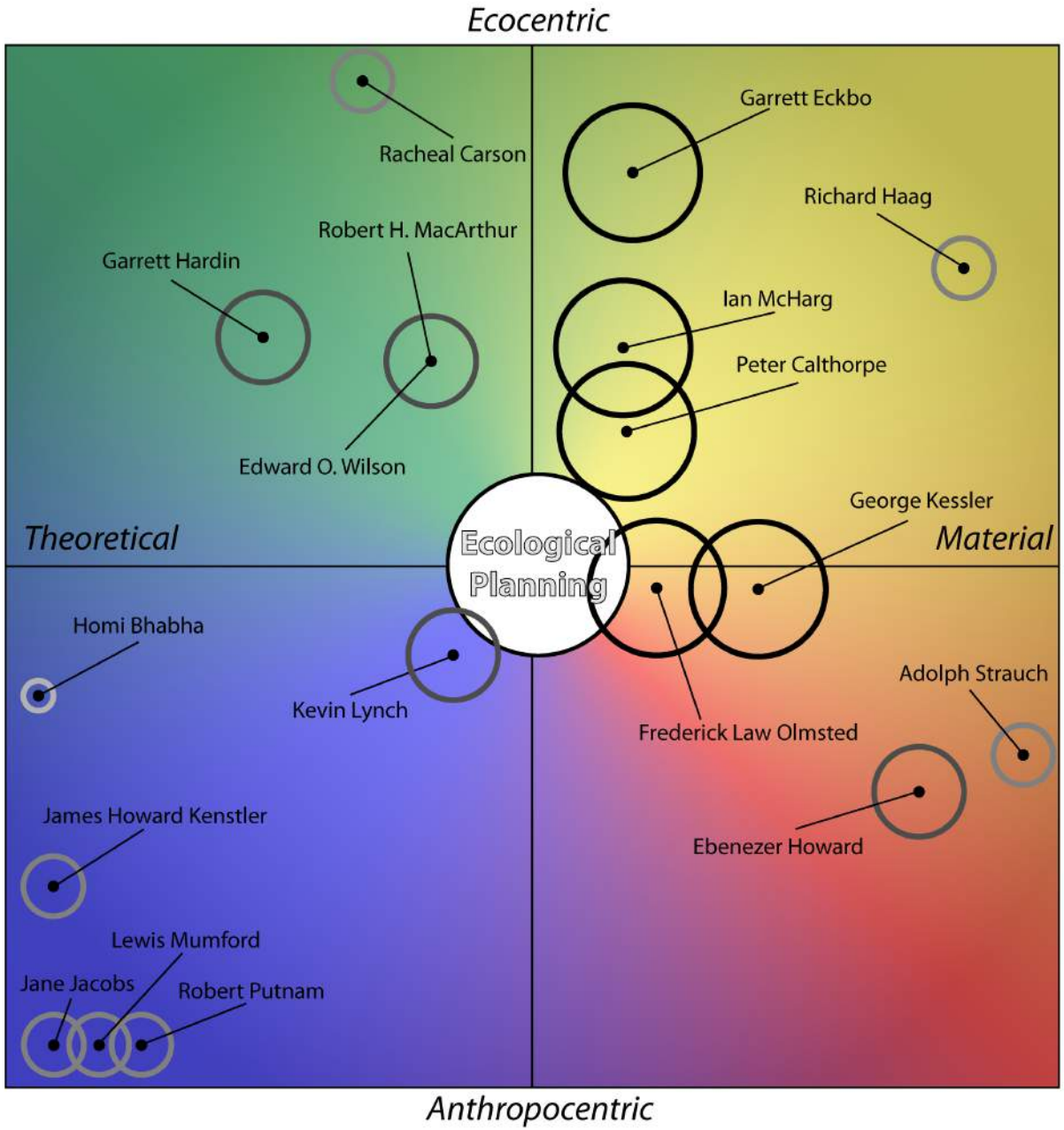
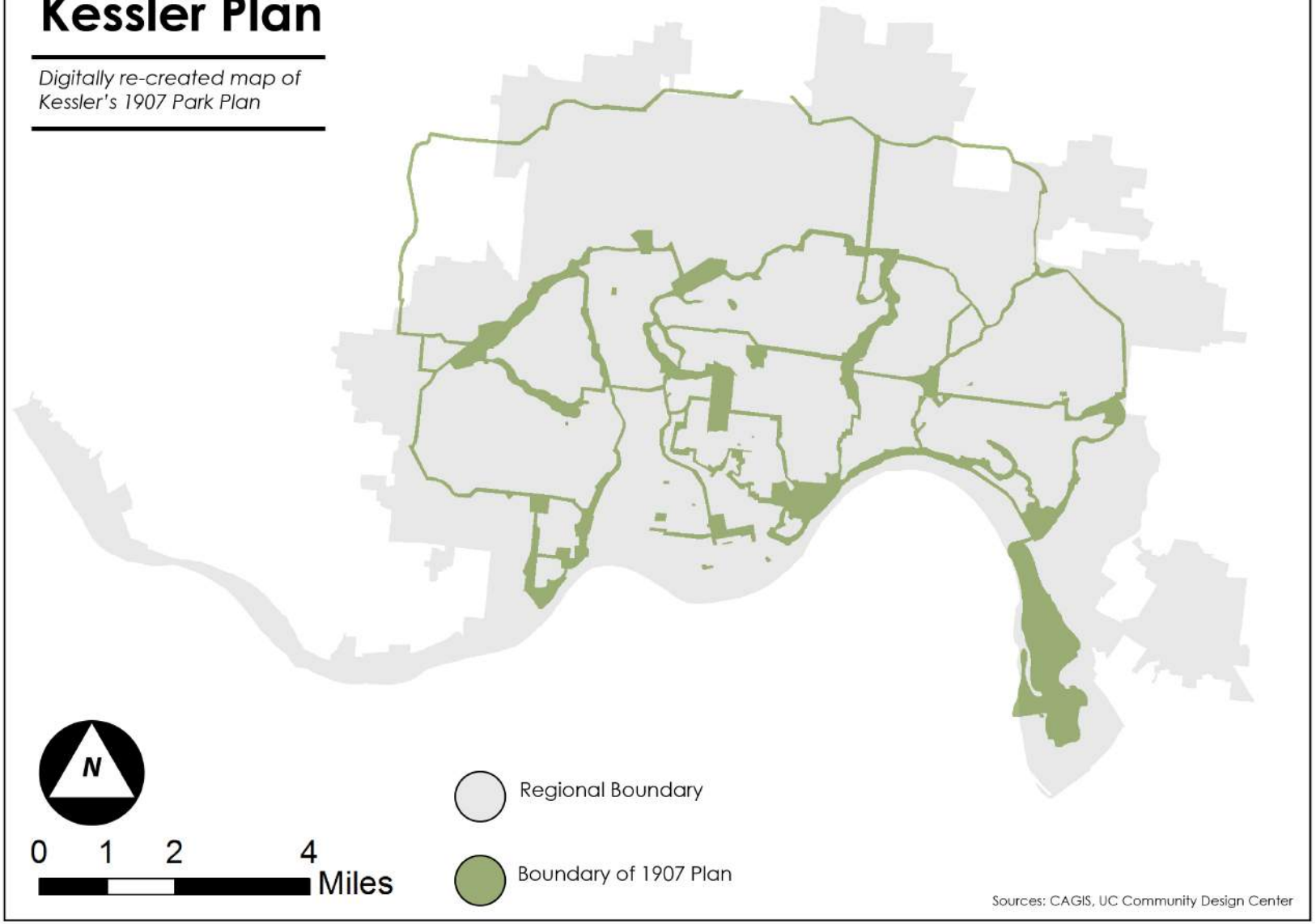
Modern Landscape Architecture

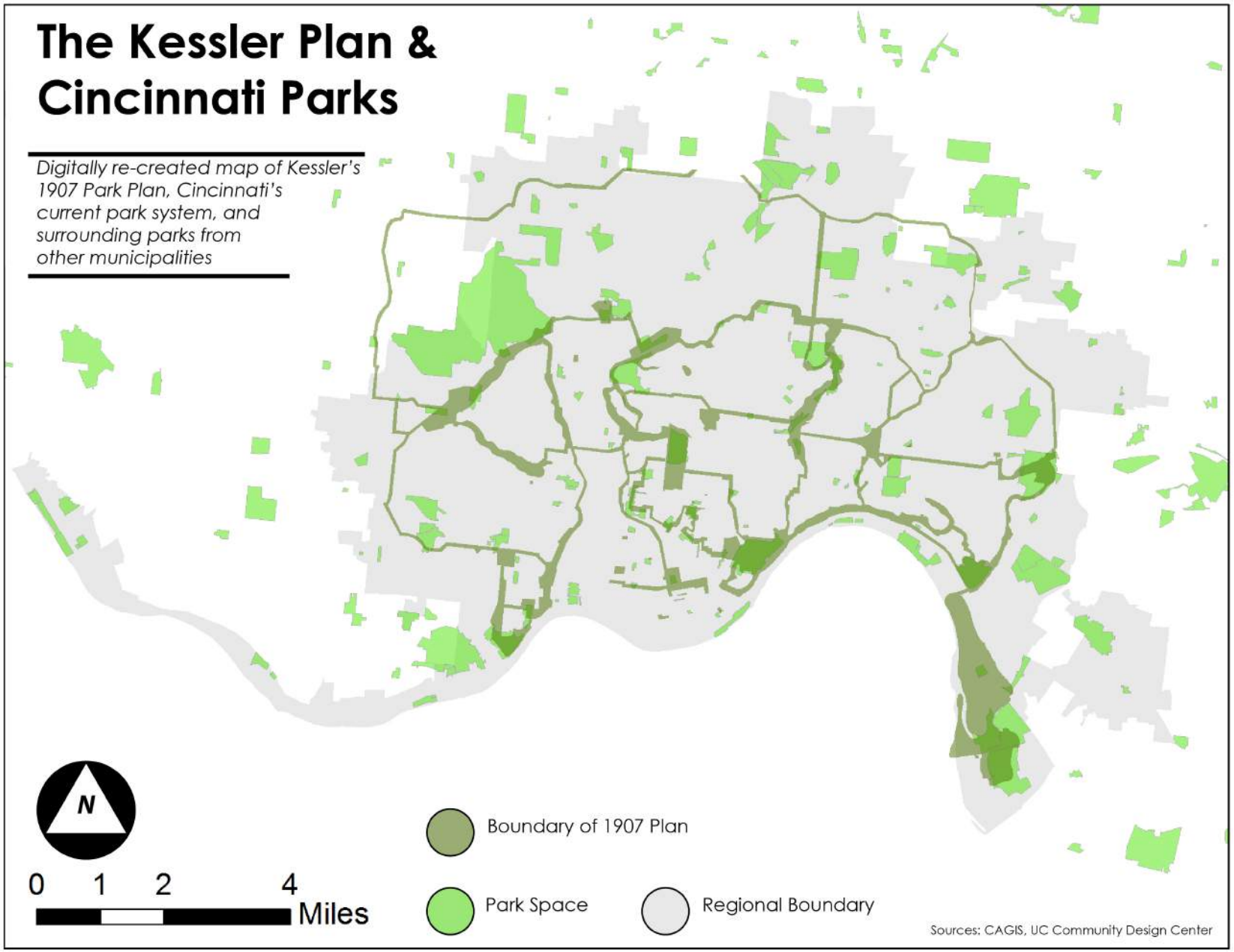
Traditional Landscape Architecture



The Original 1907 Kessler Plan

Digitally re-created map of Kessler's 1907 Park Plan




The Kessler Plan &
Cincinnati Parks
Digitally re-created map of Kessler's 1907 Park Plan, Cincinnati's current park system, and surrounding parks from other municipalities
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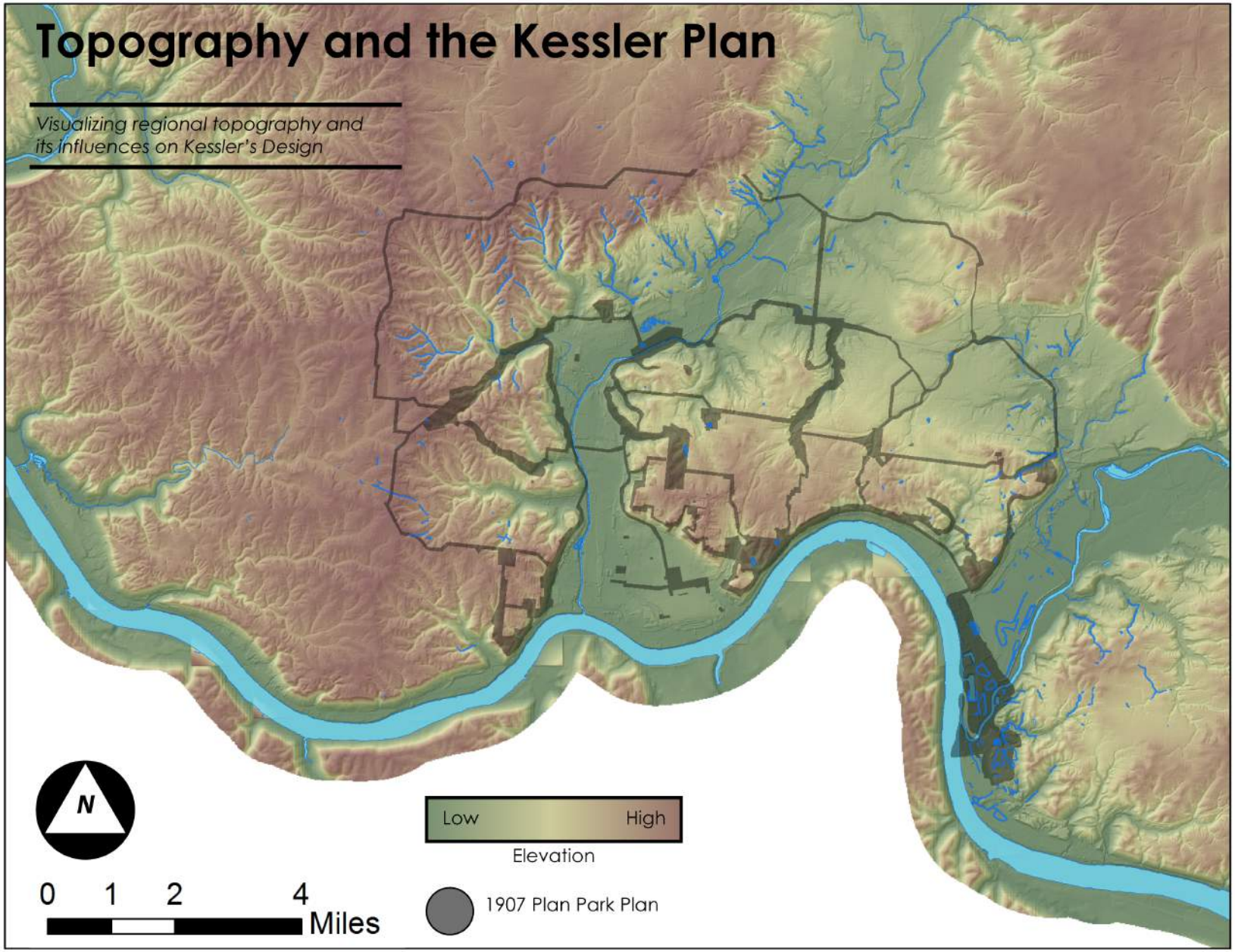
Topography and the Kessler Plan
Visualizing regional topography and its influences on Kessler's Design
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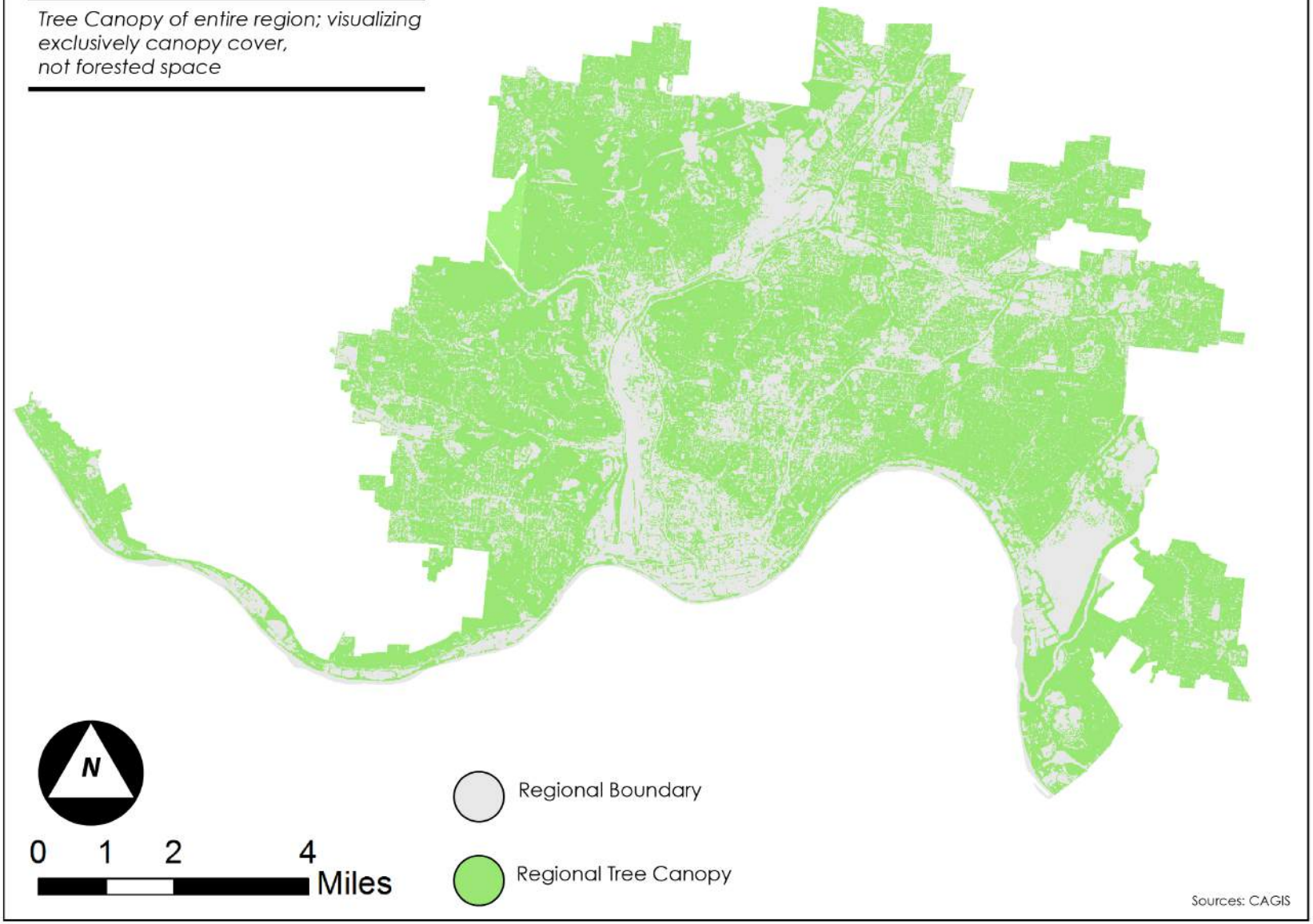
Low
High
Elevation
1907 Plan Park Plan

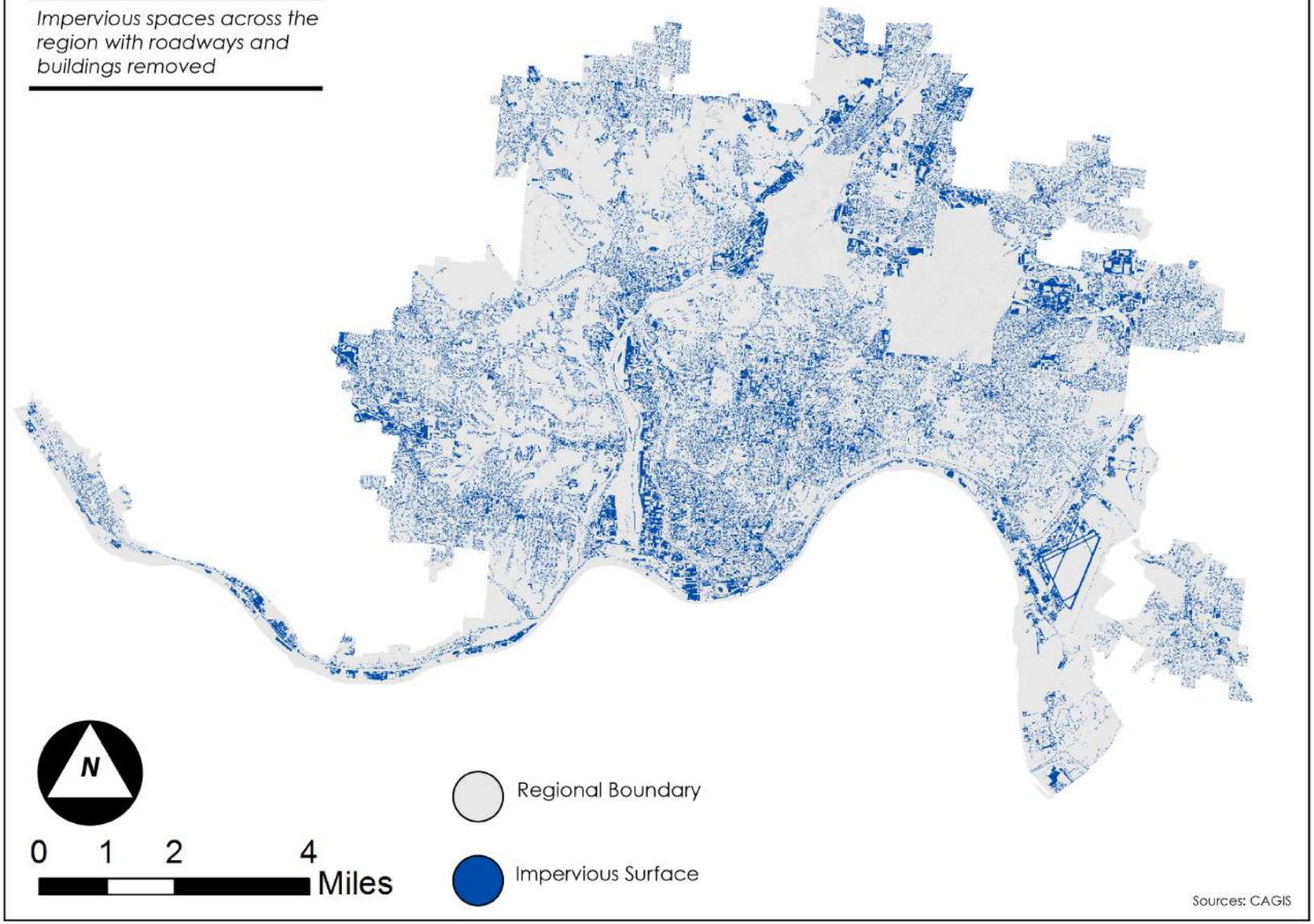
Regional Tree Cover

Tree Canopy of entire region; visualizing exclusively canopy cover, not forested space



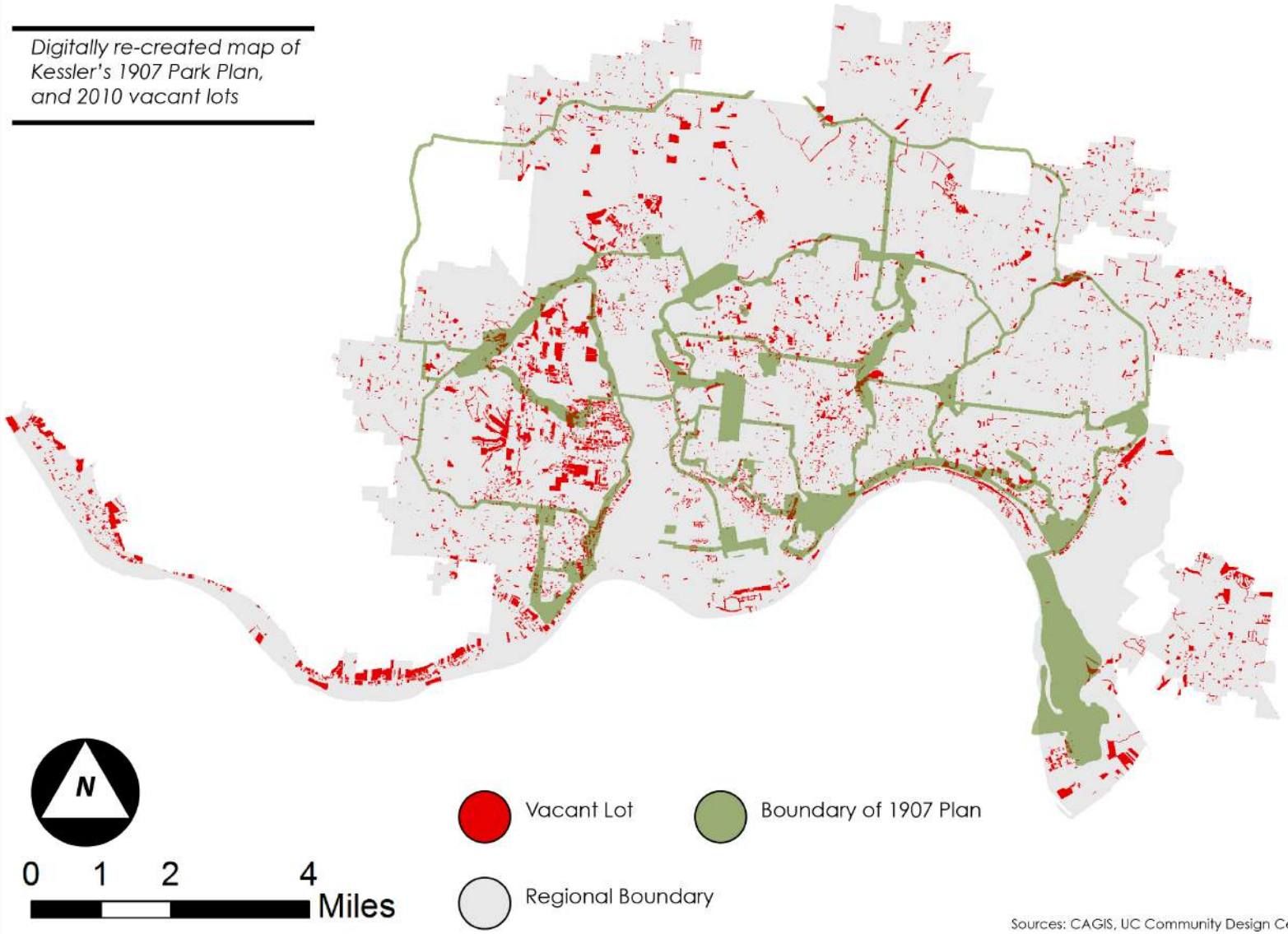
Regional Impervious Surfaces

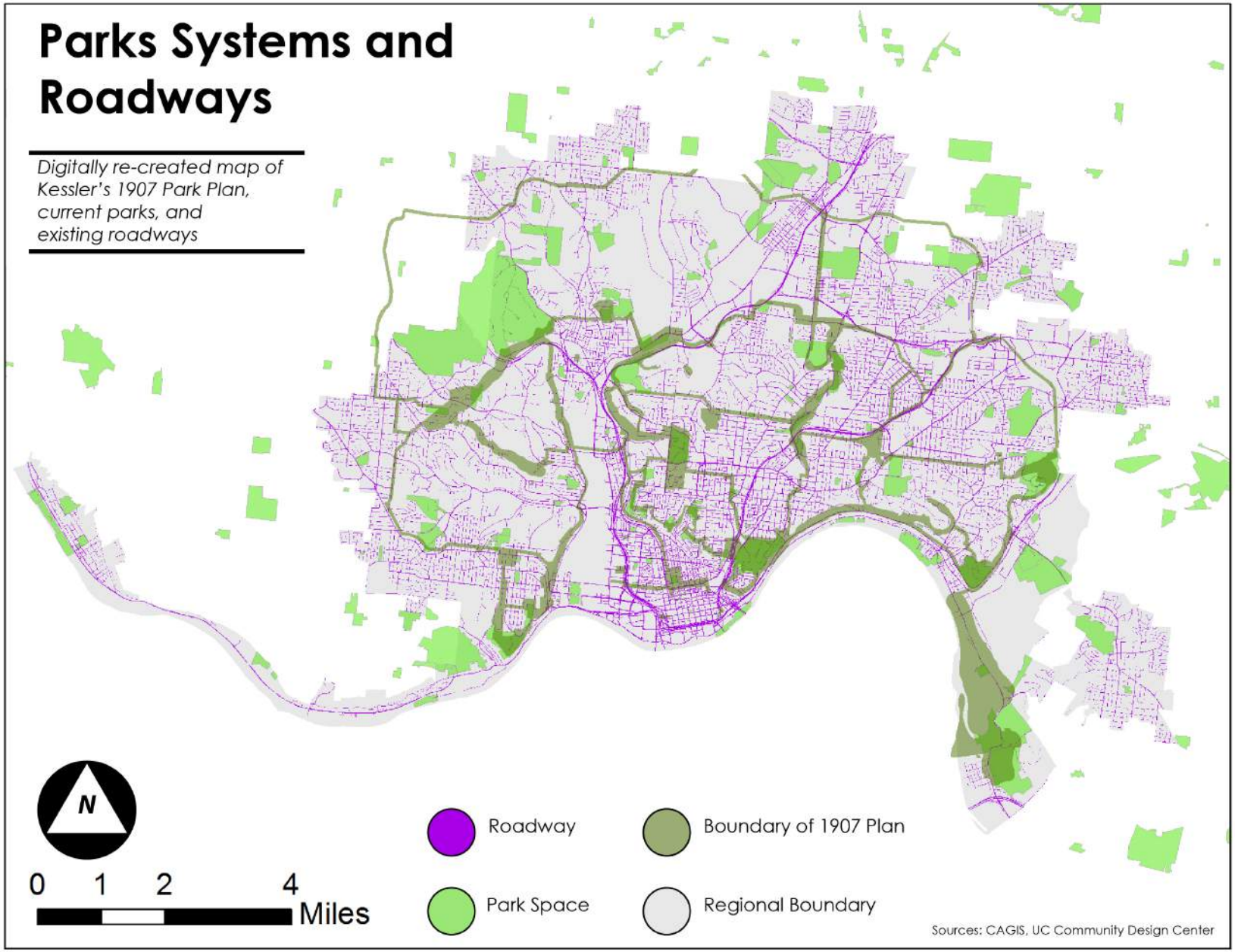
Impervious spaces across the region with roadways and buildings removed

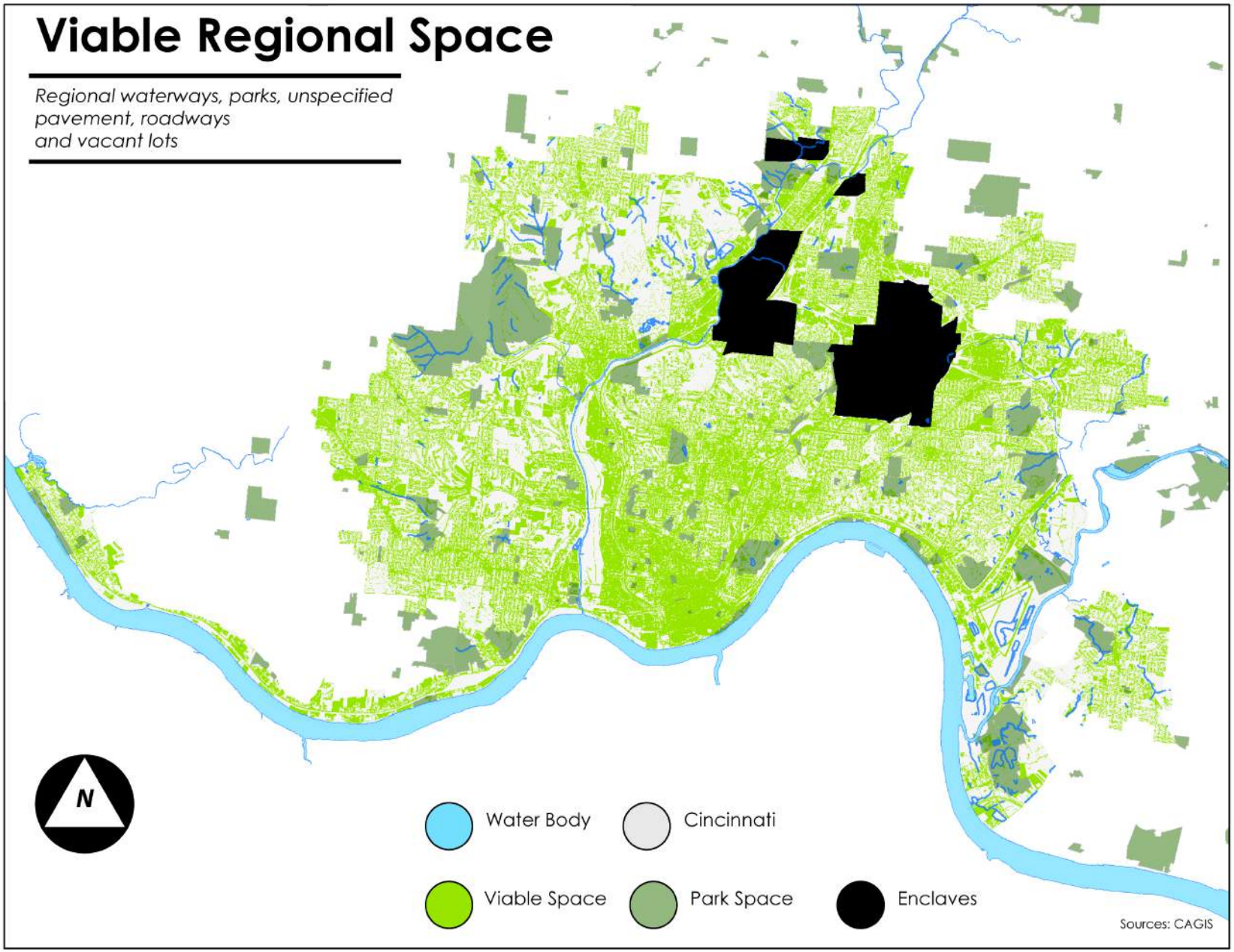


Vacant Lots & Kessler's Plan

Digitally re-created map of Kessler's 1907 Park Plan, and 2010 vacant lots




Parks Systems and Roadways
Digitally re-created map of Kessler's 1907 Park Plan, current parks, and existing roadways
N
0 1 2 4
Miles
Roadway
Boundary of 1907 Plan
Park Space
Regional Boundary
Sources: CAGIS, UC Community Design Center


Viable Regional Space
Regional waterways, parks, unspecified pavement, roadways and vacant lots
N
Water Body
Cincinnati
Viable Space
Park Space
Enclaves
Sources: CAGIS