

# **Visioning the Allen Creek Greenway:**

## **Designing a Path, Creating a Place**

by

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## **Abstract**

This report describes background, analysis, layout and design for the Allen Creek Greenway in Ann Arbor, Michigan. The authors define the greenway land use form as a linear park which fits within a large network of regional green infrastructure; examine the history of greenways and their strong public appeal; and describe the significant ecological, social, and economic benefits which the Allen Creek Greenway could bring to Ann Arbor. The report describes the preliminary layout and design for the Allen Creek Greenway along the Ann Arbor Railroad as well as conceptual open space designs for three city-owned parcels that occur along its length: the parcels at First St. and William St., 415 W. Washington St., and 721 N. Main St. GIS software was used to analyze existing site conditions so that the designs take into account the full complexity of the context including current land use, topography, and water movement. The proposed route is almost entirely within the Ann Arbor Railroad ROW, running from just south of the University of Michigan stadium to the Huron River, where it will connect to Washtenaw County's Border to Border trail, giving residents better access to regional greenspace. The greenway approximately follows the historic path of Allen Creek; the creek is now buried in a pipe. Because of this, most of the greenway is within the floodplain and a significant portion is within the floodway of the creek. There are federal restrictions on development within this designated flood area and thus the greenway is ideal because it is one of the few permitted uses. Because of the complexity of the greenway project, this report details a phased implementation plan, beginning with the creation of designated on-street routes. The Allen Creek Greenway, mentioned by name increasingly in city plans, has the capacity to serve as an anchor and a green amenity to the downtown core and provide a catalyst for economic and sustainable development in the surrounding area along its entire length.

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## Introduction

Ann Arbor, Michigan, is a remarkable city and is widely recognized as a jewel of livable urban space and a desirable home for people of all ages (Ann Arbor Downtown Development Authority (DDA), 2010). Known for its abundance of trees, its world-class university, and its friendly residents, it inspires pride in its citizens to continually improve and imagine Ann Arbor as the best it can be. One group of citizens, the



Figure 1: Dining on Main Street, Ann Arbor, Michigan

Allen Creek Greenway Conservancy, united several years ago around the vision of a green space stretching through Ann Arbor's core, a beautiful walking path and linear park running from the stadium to the downtown to the Huron River. The Allen Creek Greenway has been discussed for decades in city plans and the members of the Conservancy decided it was time this dream was brought to fruition. Many different people throughout the city have contributed their time and energy to the project, of which this practicum is the most recent effort.

The Allen Creek Greenway will connect the city along a green "spine" which takes advantage of the open space along the Ann Arbor Railroad right-of-way, following the historic path of the Allen Creek and sitting within its existing floodplain. This underdeveloped corridor is a remarkable opportunity for the city to establish a greenway: because federal floodplain regulations severely limit new growth along the floodway and even encourage the reduction of buildings which may impede floodwater flow, the greenway is one of very few encouraged uses for the space (City of Ann Arbor, 2007, p.67). Installation of the greenway would bring much needed green space into the downtown core, create a stronger connection between key parts of the community, help to address flooding and water quality issues within the Allen Creek valley, and provide other significant economic, ecological, and health benefits to the citizens of Ann Arbor.

## History and Theory of Greenways

### Definition

With the rise in public demand for greenways in the latter half of the 20th century, scholars have turned their attention to discussing what drives their appeal, analyzing their variety of structures, benefits, and challenges to their implementation. A variety of descriptions have been put forward to distinguish greenways from both city parks and greenbelts (Searns, 1995, p.68). Greenways are more linear in nature when compared with city parks, encouraging people to move within it and along it; whereas a greenbelt is a land use tool used to preserve open space, prime agricultural land, or control the growth patterns of an urban area by limiting sprawl on the outskirts of the city.

Ahern's definition anticipates much of what 21st century greenways have become, characterizing them as "networks of land containing linear elements that are planned, designed, and managed for multiple purposes including ecological, recreational, cultural, aesthetic, or other purposes compatible with the concept of sustainable land use" (p. 134). Inclusion of terms such as "planned", "designed", "managed", and "sustainable land use" all suggest that this vision of greenways is meant for land use professionals and academics, focusing on relatively high level, abstract concepts. However, the use of "network" and "linear" conjure the vision of a corridor of space running alongside or connecting cultural or natural assets. This addresses the idea of movement, which is central to greenways, but Ahern's definition does not make explicit the role of nature in the increasing demand for community greenways.

Searns gets to the heart of the matter in his definition, breaking the term down into its separate pieces and stating:

'Green' suggests areas that are left vegetated and in most cases appear—or at least strive to be—natural. The word 'way' implies movement, getting from here to there, from point to point. This is the important distinguishing feature of greenways—they are routes of movement—for people, for animals, for seeds, and, often, for water (p. 66).

This definition, more than Ahern's, speaks to the common person's experience of a greenway as a linear "natural" space, while still implying the deeper ecological characteristics that make this spatial form so profound. It is the hope of this paper that the theoretical background, analysis, and series of conceptual designs presented by the practicum team will provide inspiration and momentum for the establishment of a greenway that is true to the spirit of Ann Arbor.

## History

Over the past 40 years, greenways have been built in hundreds of cities across the country, ranging in context and size from rural path systems to urban river corridors but always offering a wide range of benefits to users, residents, and visitors (Searns, 1995). Urban networks of greenspace have been advocated for much longer, however. Searns discusses three generations of greenways in his 1995 paper *The evolution of greenways as an adaptive urban landscape form*. He calls the first generation the “ancestral” generation, from the Roman streets that formed strong axes in their city planning to the wide, sweeping boulevards of Haussmann’s Paris (p. 67). At the same time, in the 19th and early 20th century, Frederick Law Olmsted began to push linking green spaces within the United States, saying that, “no single park, no matter how large and how well designed, would provide the citizens with the beneficial influences of nature” (Benedict & McMahon, 2002, p. 13). When designing landscape plans for the University of California, Berkeley campus, he created a parkway between Berkeley and Oakland, which some scholars believe to be the prototype for greenways in the United States greenway (Bischoff, 1995, p. 318). Olmsted believed in the power of parks to improve the human condition and refine the common man; since that time, his conviction about the power of green space has been vindicated through numerous studies showing positive psychological effects from “nearby nature” (Kaplan, Ivancich, & De Young, 2007) (Groenewegen, van den Berg, de Vries, & Verheij, 2006) (Gobster & Westphal, 2004) (Rybczynski, 1999).

Searns points out, however, that much of the parkway system established by Olmsted still focused on using roads and main thoroughfares as the skeleton of the greenspace (p. 69). The second generation of greenways dates to between 1960 and 1985, differentiated by the shift to “trail-oriented, primarily recreational” projects which still pursued connection between city, suburban, and rural green spaces but with a strong emphasis on non-motorized travel (p. 67). In the 1930s, San Antonio, Texas created the Paseo Del Rio riverwalk, a project which continues to be a major tourist attraction. Though it utilizes the successful forms of previous parkways and boulevards, it is pedestrian oriented, paving the way for a conception of urban corridors such as rivers and railroads as new community amenities (Searns, 1995, p.68). Several decades later, Santa Clara County, CA, used the term “greenway” to describe a linear park plan, but the first modern greenway to be built was probably the Platte River Greenway, in Denver, Colorado (Searns, 1995, p.69). Championed by local leaders, it took from 1974—1982 to raise the funds and construct the 10 miles of non-motorized pathway and amenities along the river.





Figure 2: Paseo Del Rio riverwalk, San Antonio, Texas

Based on its overwhelming success as a community asset, the trail system has been expanded to stretch more than 160 miles around the city and is credited with inspiring the widespread greenway movement in the 1980s (Searns, 1995 p. 69-70).

Americans had come to see the value of bringing non-motorized trails out of the wilderness and into the urban realm, and public demand caused many second generation greenways to be installed across the country over the next 10 years.

Once these greenways were constructed, it became clear that they had much more to offer the public than simply recreation opportunities. Writing in 1995, Searns posits the recent emergence of a third generation of “multi-objective” greenways, a vision that has since proven quite accurate (p. 72). These 21st century linear parks continue to provide green space for passive human activities such as socialization and contemplation, as well as more active engagement like walking, biking, and jogging. However, they also strive to address issues such as water quality, flood control, the movement of animals and plants, outdoor education, historic and cultural preservation, and even sustainable economic development (Searns, 1995, p. 72; ) (Ahern, 1995, p 134).

## Current Trends

Many of the human and natural benefits of greenways are needed in response to the lack of green space within America’s increasingly large urban areas (Searns, 1995) (Kaplan, Ivancich, & De Young, 2007). As American cities have grown in the past 60 years, their planning and zoning has been driven by a reliance on automobile travel and the lower cost of developing new land (greenfields) rather than reusing existing developed spaces, resulting in sprawling land use throughout the country (US Environmental Protection Agency, 2011). This sprawl serves to either eliminate or fragment natural areas surrounding cities, as well as increasing the amount that people drive in their day-to-day lives. Both of these effects lead to a decrease in the quality of life for residents, as well as decreased water quality and an increase in air pollution (Benedict & McMahon, 2002).

Twenty-first century land use professionals have begun to embrace a type of land use planning called “smart growth” which attempts to tackle sprawl and its associated ills by encouraging re-use of vacant properties within a city as opposed to development of new land, promoting urban forms where people can “live, work, and play” in close proximity (Smart Growth America, 2010) (Shafer, Lee, & Turner, 2000, p. 164). The goal is reduced vehicle miles traveled (VMT), resulting in reduced greenhouse gas emissions, as well as increased vitality of natural areas. This would also save municipal governments significant money, as new development demands extension of infrastructure services, paid for in tax dollars, whereas in-fill development happens in areas where water, electricity, and sewers already exist (Benedict & McMahon, 2002). Greenfield development can actually serve to drive up taxes in order to pay for the new infrastructure installation, essentially causing tax payers to fund sprawling development which is against their best interests (Benedict & McMahon, 2002).

One tactic associated with smart growth is the planned inclusion of green spaces into urban areas as re-use of land is encouraged, ensuring access to the important green amenities for urban residents. Much work has been done to show the relationship of accessible green space to the quality of urban life. Herzele and Wiedemann note that use of (and therefore primary benefit from) greenspace is strongly correlated to its distance from people’s homes, suggesting that 400 meters (approximately ¼ mile) is the maximum distance greenspaces should be located from residences (2002). This accessibility of greenspace is particularly important in areas which wish to remain vibrant, attractive places to live for families or young professionals; couples with children are usually the first to leave an urban area for the suburbs, often seeking better access to parks and play spaces (Van Herzele & Wiedemann, 2003, p. 109). This desire for suburban homes is part of the driver of the sprawling land use seen today. Addressing the need for greenspace in urban areas can therefore serve to encourage continued residence in downtown cores, decreasing sprawl and vehicle miles traveled (De Ridder, et al., 2004).

While planning for parks is an essential role of every city planner, and particularly the twenty-first century smart growth planner, the public thinks of open space in a more broad sense, including “[r]iversides, waste places and scrubby bits, farmland, woodland, golf courses, cemeteries and squares in shopping centres [sic]” in their definition of open space (Van Herzele & Wiedemann, 2003, p. 112). These may be the reasons why modern greenways have been so successful: not only does their length place them in easy reach of a wide range of residents within a city, but their adoption of liminal spaces such as railroad corridors and urban riverbanks allows the exploration

of mysterious “in-between” places which capture the imagination. Returning to Searns’ conception of a greenway as its fundamental parts, the “green” and the “way”, one can see the driving attraction of the linear corridor is the “human fascination with following a path, be it a road, a trail, or even a story line. This is especially true if there is a sense of change, even mystery, and new experiences, perspectives and information are revealed sequentially along the way” (Searns, 1995, p. 66). Greenways are appealing because they draw the visitor along a path, inciting exploration, especially when it is a path through these marginal spaces created between other land uses. This gives designers and planners an opportunity to weave an ecological and historical narrative around these spaces, strengthening the greenway by tapping in to old community stories and creating new visions around the greenway.

### National Examples

As shown by successful parks such as Central and Prospect Park in New York City, NY, the Emerald Necklace in Boston, MA, Cherokee Park and Park System in Louisville, KY, and Marquette, Jackson, and Washington Parks in Chicago, IL,, planning for open and green spaces has positive effects on the continued growth of urban areas. This same sustainable growth is desired by Ann Arbor and the implementation of an improved park system will help achieve this.

The 1987 President’s Commission on the American Outdoors recommended the creation of “a living network of greenways” throughout the United States (Fabos, 1995). Trails are designed and built now because they serve as



Figure 3: Eastern Parkway, Brooklyn, New York.  
Designed by Frederick Law Olmsted

recreation and tourist attractions in the same way parks do. The need for routes of non-motorized transportation is becoming an increasing necessity and greenways provide a safe alternative to shared rights-of-way with vehicles. Cities all across America have been continuing to implement trail and greenway systems over the past several decades. Some of these successful trail systems include:



- St. Johns County Greenway, St. Johns County, FL
- Floyds Fork Greenway, Louisville, KY
- The Schuylkill River Trail, PA
- Little Miami Scenic Trail, Southwest, OH (Fig. 4)
- The Monon Trail, Indianapolis, IN
- Chattanooga River Walk, Chattanooga, TN
- Midtown Greenway, Minneapolis, MN
- Fanno Creek Greenway Trail, Portland, OR
- Springwater Corridor Trail, Portland & Boring, OR
- Cardinal Greenway, Eastern, IN

The support and desire for parks, greenways and active open spaces continues to grow with each passing day. In a study conducted by the National Sporting Goods Association (NSGA), the most popular recreational activity is exercise walking. Bicycle riding, hiking, running and jogging are also in the top 20 activities (WCPARC, 2010). Providing space for these activities in growing cities will continue to be important.



Figure 4: Little Miami Scenic Trail, Southwest Ohio

## Benefits of Greenways

Up to this point, many large-scale effects of greenways have been discussed. Greenways also provide a multitude of specific benefits to their communities. For the past 40 years, greenways have sought to deliver significant social and cultural amenities, and in the past twenty years much work has been done to quantify the increases in well-being derived from greenway and greenspace use (Kaplan & Kaplan, 1989). Humans also benefit from the variety of “ecosystem services” which greenways provide, including significant potential stormwater and flood management services (Benedict & McMahon, 2002). Finally, society as a whole sees gains from the sustainable economic development frequently spurred by greenway installation in urban areas (Bole, di Cristino, Glover, & Kurath, 2005) (Gregor, 2010).

### Social Benefits

Most successful greenway projects are started on a local level with grassroots support, projects that are by and for the people, underlining the importance of the Allen Creek Greenway Conservancy in current greenway planning efforts (Ahern, 1995, p. 133). The motivation behind such support is often the social benefits that such a trail would bring to local residents; Bischoff quotes L.H. Weir’s mid-20th century classification of these into separate categories, including: “physical activities; constructive and creative interests; interests in learning about the natural world; [and] social interest to get together and mingle” (Bischoff, 1995, p. 318-319). Phrased another way, Bischoff sees greenways used for “Five E’s”: “environment, ecology, education, exercise, and expression” (Bischoff, 1995, p. 317). The concepts of “expression” and of social “mingling” are hard to quantify and often marginalized in academic study of greenways, but people’s day-to-day experience of the greenway is what shapes their perception of it, and this experience is going to be primarily their aesthetic and social interaction within the trail space (Gobster & Westphal, 2004) (Shafer, Lee, & Turner, 2000). It has, however, been observed that greenway paths seem to “foster better personal, social exchanges” than other types of urban greenspaces (Bischoff, 1995, p. 320). This seems to be tied to the linear form of the space, encouraging movement along a path that brings people into contact on a regular basis. A study in the Netherlands found that people with less access to greenspace in their living environments tended feel lonelier, suggesting that for urban residents, green space can play a key role in the formation of social contacts and support networks (Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006).

The aesthetic impact of environments is also significant in terms of people’s

reaction to them, and there has been a great deal of study examining what aspects of aesthetics make an impact on personal perception. Gobster and Westphal analyzed stakeholder reactions to the Chicago River corridor and found six interdependent dimensions by which greenways are judged by their users: cleanliness, naturalness, aesthetics, safety, access, and appropriateness of development (p. 148). Arguably, cleanliness and naturalness are part of the aesthetic experience for trail users, contributing to their perception of how attractive the space is and influencing their feelings of safety and appropriateness as well. There are ways of designing urban greenspace so that it is appealing to users, making it “neat” and contextually appropriate, while still maintaining a sense of “naturalness” and safety. This concept has been codified by Nassauer as “cues to care...[which] make the novel familiar and associate ecosystems that may look messy with unmistakable indications that the landscape is part of a larger intended pattern” (Nassauer, 1995, p. 167). Maintaining an urban greenway with these cultural cues in mind will ensure that the space is well-used and welcoming, allowing its social and physical benefits to be fully realized by its users.

As evidenced by the strong federal push encouraging physical exercise in both adults and children, Americans have a serious lack of options for physical activity in their everyday lives (Centers for Disease Control and Prevention, 2011). Obesity is on the rise in all age groups, perhaps related to the time people spend in their cars because of the sprawling structure of suburban American metropolitan areas (Centers for Disease Control and Prevention, 2011). As noted previously, people are most likely to use greenspace if it is within 400 meters of their homes; for children, this distance is even less because of modern safety concerns (Van Herzele & Wiedemann, 2003, p. 113). It is particularly important for children to have access to these opportunities for two reasons. First, the occurrence of childhood obesity is increasing at an alarming rate: the number of overweight children in the US has doubled since 1980, potentially caused in part by increasing time spent in passive, indoor play rather than active, outdoor play (Gill, 2011) (Coalition for Healthy Children). Much of the government campaign focused on getting active is centered around children, including the slogan “Get up and play an hour a day!” (Coalition for Healthy Children) (Let’s Move!, 2012). Michigan has its own coalition to increase physical activity in children and adults, the Michigan Healthy Communities Initiative. This program advocates for a number of actions, including smart growth land use planning, that will allow Michiganders to become more active around their homes (Michigan Healthy Communities, 2010).

The second reason to emphasize children’s need for greenspace access is the associated “nature deficit disorder” which comes with decreased play outside the

home (Gill, 2011) (Moss, 2012). Not a technical disorder, it is nonetheless a serious and growing concern in developed nations across the world as children lose touch with nature and the related joys and challenges which it presents to them. A lengthy report commissioned by the London Sustainable Development Commission summarizes the significant research to date on the implications of outdoor play and finds six major areas in which children benefit from exposure to urban greenspace: “improve[d] concentration, boost[ed] motor development, improve[d] mood, boost[ed] physical activity, [and] childhood visits to natural places are linked to positive adult views of the outdoors, [while] hands-on gardening activities improve nutritional attitudes and knowledge” (Gill, 2011, p. 20). Not only are these characteristics that will make children healthier, but they are qualities which will make them more likely to succeed and be productive and happy adults. Society benefits both from the decreased health costs associated with a healthier public and increased number of industrious and valuable community members. Greenways can play an important role in bringing these benefits to a wide variety of communities in urban areas through their linear reach and the networks of greenspace which they can create.

For all age groups, exposure to urban green spaces has been strongly correlated with improved well-being, stress reduction, and general perceptions of good health and quality of life, as well as the afore-mentioned physical health benefits (Maas, van Dillen, Verheij, & Groenewegen, 2009) (Shafer, Lee, & Turner, 2000). Many studies have shown that “urban open green spaces play an important part in offering town-dwellers a more stress-free environment, irrespective of sex, age or socioeconomic background. The results indicate that the more time people spend outdoors in urban open green spaces, the less they are affected by stress” (Grahn & Stigsdotter, 2003, p. 16) (Woo, Tang, Suen, Leung, & Wong, 2009). Studies have examined both day-to-day stressors as well as larger stress events and found noticeable reduction in both cases (van den Berg, Maas, Verheij, & Groenewegen, 2010). The results in some studies even indicate that visual experience of greenspace appreciably reduces stress levels, and these reduced stress levels in urban residents can lead to reduced crime levels in higher risk areas, providing another strong reason to significantly invest in accessible urban greenspaces such as greenways (Gobster & Westphal, 2004, p. 157) (Moss, 2012, p. 10). Kaplan and Kaplan have done foundational research on the topic of psychological benefits of “nearby nature” for the past twenty-some years supporting these claims; further discussion can be found in their book *The experience of nature: A psychological perspective* as well as ongoing publications (1989).

## Ecological Benefits

### Ecosystem Services

Wide recognition is now being given to the concept of “ecosystem services”, contributions which natural areas make to the daily well-being of human society (The World Bank Group, 2009). These can come in many forms, some able to be valued monetarily and others less so; notable ones include “cleansing water, absorbing or processing carbon dioxide and other pollutants, producing oxygen and other beneficial compounds, controlling erosion, creating food, storing water, providing recreation, maintaining balance between competing systems” and many others, including the benefits listed in the previous section (Brown & Kellenberg, 2009, p. 59). Benedict and McMahon call ecosystem services “our nation’s natural life support system,” underlining how important these are to life around the globe (p. 12).

While greenways cannot provide all of these ecosystem services simultaneously, particularly if they are narrow corridors within an urban area, they do produce certain services beyond the social which are valuable contributions to their communities. Context often determines which services the greenway is able to contribute; the Allen Creek Greenway will primarily provide ecological ecosystem services such as improved species flows and water flows to Ann Arbor, but there are certainly others that may be added as the greenway is developed.

### Landscape Ecology

Because of the inherently linear nature of greenways, they function as corridors which facilitate flows within a larger landscape matrix of land use types. This is conceptualized based on the landscape typology of Foreman’s patch, corridor, and matrix landscape model from 1995 (as quoted in Opdam & Steingröver, 2008). Opdam and Steingröver give a succinct description of the “ecosystem network” concept which serves to define the ecological basis for many greenway benefits:

An ecosystem network can be understood as a set of ecosystem patches... functionally linked by flows of organisms and by interaction with the landscape matrix in which it is embedded. Structural elements in the matrix, such as roads... may affect the density as well as the direction of flow... A network can function at a variety of spatial scales, depending on the scales at which the various species act (p. 71).

Greenways can provide more accessible movement opportunities for animal species but can also form habitat corridors which may aid the



movement of plant species. On a smaller scale, they can create micro-habitat patches within the urban core as well as important educational opportunities for residents and visitors regarding regional ecosystems.

## Stormwater and Flood Water

Greenways also positively affect the flow of water within urban spaces, particularly stormwater and flood water. These will be discussed in more detail further on in relation to the specific greenway sites, as well. Traditional stormwater management techniques used by cities move stormwater across impervious surfaces and into storm drains where it is conveyed via pipe to the nearest body of water; this system, over time, has proven to have serious flaws (PlaNYC, 2008). The water collects contaminants and particulates as it moves across the impervious surfaces of streets and driveways; it picks up speed as it rushes towards the drains; it collects so quickly that it increases flooding potential in nearby water bodies (Hunter, 2010). New stormwater tactics, sometimes called Low Impact Development (LID), emphasize use of a distributed system of stormwater structures which allow the water to infiltrate through pervious groundcover close to where it falls as rain, often allowing plants to filter out and removing any contaminants it might have accumulated (Searns, 1995, p. 73). In addition, slowing down runoff increases the time to peak discharge of stormwater systems into nearby waterways which reduces stream bank erosion, channelization, and the risk of flooding (Hunter, 2010). Greenways give planners an excellent chance to engage in LID technology, both for stormwater treatment and for community education about ecosystem services (Searns, 1995, p. 73).

Another opportunity for water management provided by some greenways, including the Allen Creek Greenway, is the ability to impact flood control measures. Searns summarizes FEMA's policy succinctly: "Ideally, all land in the 100 year floodplain (area with a 1% chance of flooding in a given year) should be left undeveloped. This would leave room for ...uses that can tolerate periodic flooding" (p. 74). This is obviously not the case in most major cities; however, as redevelopment plans are pursued, greenways present an ideal land use for areas prone to flooding because they can provide significant amenities while reducing built area and allowing floodwaters to flow unimpeded away from inhabited space (Benedict & McMahon, 2002) (Searns, 1995). See the analytical discussion in following sections regarding the specifics of this strategy for the Allen Creek Greenway.

## **Economic Benefits**

Greenways are aesthetically, socially, psychologically, and ecologically attractive. These characteristics unify to turn them into prominent community amenities, increasing adjacent property values and spurring new development along the corridor (Searns, 1995, p. 77). In order to be consistent with the definitions put forth by Ahern and Searns, however, greenway planning must always balance the economic benefits with the social and ecological ones, ensuring that new greenway projects are “consistent with the concept of sustainable development, in that it is based on an assumed complimentary between nature protection and economic development” (Ahern, 1995, p. 134) (Searns, 1995). Certainly the increased marketability of adjacent properties can be important leverage when attempting to get a greenway project off the ground, but for truly sustainable (re)development, the focus should be on its use in community revitalization (Benedict & McMahon, 2002). Given Ann Arbor’s pride in its vibrant downtown and local character, the Allen Creek Greenway will assuredly be implemented with this community commitment at its core.

Notably, an initial study has already been completed regarding the economic benefit the Allen Creek Greenway can bring to the city. Examining the proposed greenway route and future city land use plans as well as other major factors, the study found “a long-term benefit of about \$37 million in 2005 dollars” (Bole, di Cristino, Glover, & Kurath, 2005). This benefit is based almost entirely on a “large predicted influx of property tax revenue from the redeployment of 13 major areas along the edge of the greenway” (Bole, di Cristino, Glover, & Kurath, 2005, p. 6). It concludes that the greenway must be planned comprehensively, taking into account adjacent context and other factors in order to generate these benefits (Bole, di Cristino, Glover, & Kurath, 2005). While this study does not value the ecosystem services and social benefits which the greenway will bring to the downtown, it is significant to note that ultimately, the project has the opportunity to generate revenue for the city rather than increasing spending. This, then, is the theoretical framework within which the Allen Creek Greenway situates itself.

## Introducing the Greenway

The City of Ann Arbor already has strong support for the implementation of a greenway system. The City of Ann Arbor Parks and Recreation Open Space (PROS) Plan conducted community studies on what environmental issues should be the priority. The need for a greenway was listed high on the priorities list, with almost 80% of the survey participants feeling that a parks and recreation system was “extremely important” to one’s quality of life (City of Ann Arbor Parks and Recreation, 2011). The

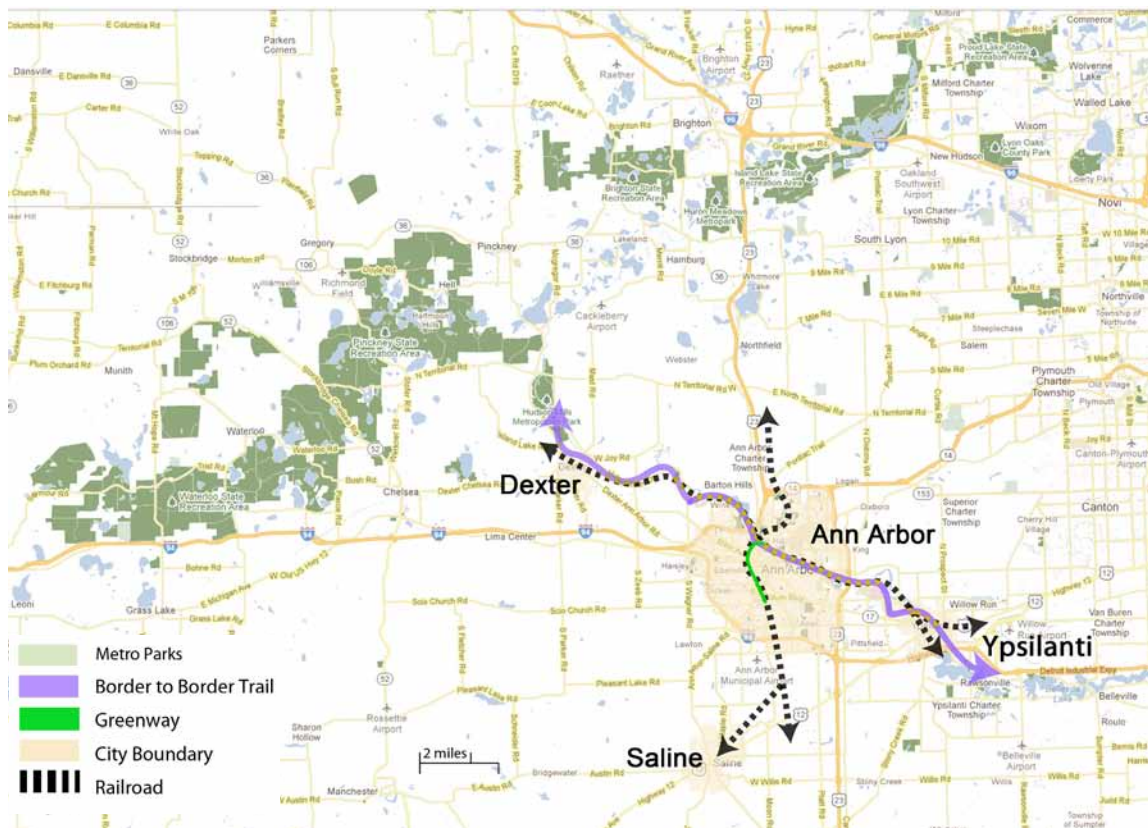


Figure 5: Connectivity of Allen Creek Greenway to neighboring communities and regional green space.

National Recreation and Park Association also conducted a study that shows that MI residents are more likely to participate in in-line skating than the national average. Again, this is an activity that would be well served by a paved path separated from the road. In another survey on the Border to Border trail in Washtenaw County conducted by Michigan State University, there were an estimated 114,000 users every spring and fall. This survey also showed that most of the users were adults, with the highest



percentage being between 41 and 60 years old. Of the users surveyed, 36% bicycled, 62% walked on the trail. Interestingly, 66% of the users did not use a vehicle to get to the trail. This means they either used some sort of public transit or they walked. This also means that many of the users are most likely local residents; this can be seen in the fact that 91% of the participants are Washtenaw- area residents and 44% of them live within 1 mile of the trail (WCPARC 2010). The high usage rates for this trail should help support the desired goal of a greenway being developed through Ann Arbor.

### Allen Creek Greenway Task Force

In 2005 a task force was created by the city to develop recommendations for a greenway that would “roughly follow” the Ann Arbor Railroad right-of-way (Fig. 6). This greenway would connect to the Border-to-Border trail and include three city-owned parcels: the lot at the corner of First St. and William St., 415 W. Washington St., and 721 N. Main St. The Greenway Task Force did an extensive examination of the current conditions of each site and presented recommendations, which acted as guiding points for this project’s goals and were the basis for many of the design alternatives presented. Major points from the report are summarized below.

### Current Site Conditions

The First and William parcel (Fig. 7) is currently a parking lot. The soil underneath this parking lot is believed to be contaminated



Figure 6: (enlarged in Appendix VI) Route of the greenway overlaid on the Ann Arbor Railroad right-of-way



by arsenic and benzene. This means that if the asphalt is removed the soil will need remediation (p. 33). This site also has a piece of land that extends east, up the hill toward Ashley St.. There is significant grade change to get to this area and it was expressed as a possible scenic overlook (p. 33). This site is also within the floodway, so development would be restricted by federal regulations (p. 33).

The second parcel is located at the corner of First St. and W. Washington St., diagonally across Liberty St. from the First and William site (Fig. 8). The 415 W. Washington site is currently operating as a surface parking lot and was at one time a city maintenance facility that was supposed to be vacated in 2007; however, it appears to remain in use (p. 41). This site had past contamination from



Figure 7: Boundary of first parcel at First St. and William St.

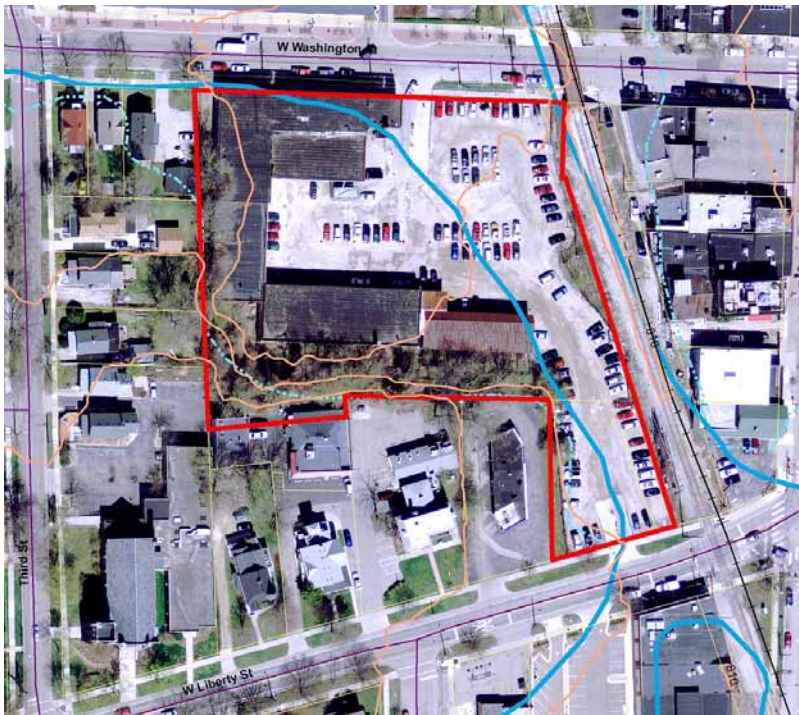


Figure 8: Boundary of second parcel at 415 W. Washington St.

underground gasoline storage tanks but has been partially remediated (p. 41). However, it was not remediated to residential cleanup standards and would need to have further investigation done before extensive public use of the site occurred. The site currently has three existing older buildings; the building along Washington St. is believed to be the most intact. This property also has some significant



Figure 9: Boundary of third parcel at 721 N. Main St.

elevation change to the southwest where there is approximately 25 feet of drop. Like the First and William property, this site is also within the floodway and any new development would be restricted.

The third parcel of interest is located at 721 N. Main St. (Fig. 9). The site was previously a city maintenance garage and was also supposed to be vacated in 2007 (p. 57). It is still used for parking of city vehicles but the buildings are no longer inhabited. There are four main

buildings on site and are all in poor condition. This site has been remediated and currently meets standards for unrestricted residential use (p. 57). This is the largest of the 3 sites and roughly half of the site is within the floodway, which means that the other half of the site could be redeveloped with structures with significantly fewer restrictions (p. 57).

### Allen Creek & Flooding

The taskforce concluded that storing volumes of water beyond the bankfull event on the three City sites could interfere with flooding patterns and is not recommended by City staff. Controlling the bankfull storm event for the runoff from each site would provide water quality benefits without significantly exacerbating flood risks (p. 92-93).

### Greenspace

The task force also addressed the issue of a lack of greenspace in the downtown area of Ann Arbor. Within the 270 acre Central Business District, the ratio of park and open space to people is lowest in the city (p. 18). The Allen Creek Greenway would address this by providing active recreation / non-motorized transportation greenspace, as discussed in the benefits section above.



## Economic Impact

The economic impact of a greenway is and will be of great concern to many, especially if the three parcels are developed as park space instead of generating revenue for the city as paid parking lots. According to the task force's evaluation, edge properties to the Allen Creek Greenway could experience a rise in value if the Greenway is viewed as an amenity (p. 21). Greater density on these fringe properties could result in higher property values and TIF and property tax revenues. The task force also mentioned the Bole et al 2005 study which showed that the greenway could generate a \$37 million return for the city over 30 years.

## Ann Arbor Railroad & Rails With Trails

The siting of the Allen Creek Greenway along the railroad corridor was pre-determined by city planners and the Allen Creek Greenway Taskforce for several reasons, including best use of floodway land, but another important factor in this choice is the open land located along the railroad right-of-way. This provides an excellent corridor with strong linkages running from the south stadium area through the downtown to the river. However, this also proves to be somewhat challenging by bringing on an additional stakeholder, the Ann Arbor Railroad, which has less to gain from the greenway than the city and public. This type of project is called a "rail-with-trail" (RWT), which "describes any shared use path or trail located on or directly adjacent to an active railroad corridor" (Alta Planning + Design, 2002, p. i). According to the foundational study *Rails-with-Trails: Lessons Learned* funded by the US Department of Transportation in coalition with other federal agencies and conducted by the Alta Planning + Design group, there were around 65 RWTs across 30 states when the study occurred (2002). These provide valuable precedents for the Allen Creek Greenway, both in navigating the collaboration with the railroad as well as showing that these trails are not highly dangerous to trail users: the study was unable to find any claims or reports of accidents on the existing RWT across the country (Alta Planning + Design, 2002, p. VI).

Railroads nonetheless have serious and real concerns regarding installation of trails within their right-of-ways. Aside from lack of motivation to



Figure 10: Pedestrians utilizing Ann Arbor Railroad right-of-way as a path

pursue these projects because they do not usually generate revenue for the company, they are also concerned with preserving right-of-way space for future expansions and track maintenance needs, increasing trespassing potential which can cause injuries and increase liability for the railroad, and finally, “significant new populations of pedestrians close to the active track structure may result in additional stress on train crews seeking to ensure the safety of train movements,” something which is already a concern in densely populated downtown Ann Arbor (Alta Planning + Design, 2002, p. I). In order to get the railroad as a partner or at least a supporter for the Allen Creek Greenway, it is important to address these concerns early in the public design process.

One of the ways to get the railroad on board is to present them with benefits they will gain from the trail; there are many, ranging from RWT agreements which reduce liability costs, financial compensation in some form which might include funded maintenance or property improvements, increased observation of the track area by trail users which leads to reduced petty crime, and reduced trespassing through the provision of a legitimate path (Alta Planning + Design, 2002, p. IV). This last point is key for the Allen Creek Greenway, because there are hundreds of trespassers on the tracks during football season and other times. It is in the best interest of the Ann Arbor Railroad to reduce this repeated trespassing by the provision of well-designed, appealing trail along the railroad tracks (Alta Planning + Design, 2002, p. 10, 98).

One of the concerns repeatedly raised by railroads in regards to RWT projects is that a trail would “invite” the public into the right-of-way, potentially limiting the ability of railroads to consider them trespassers even if they deviate from the accepted path space (Alta Planning + Design, 2002, p. V). Railroads already pay significantly for liability insurance and with increasing use of the right-of-way, there are chances



Figure 11: Separation of a greenway from railroad tracks by fence

that trail users might be accidentally injured; therefore, it is important that any agreement made between railroad and trail group include “easement and license agreements that indemnify the railroad owner against certain or all potential claims...[as well as] the trail management entity provid[ing] or purchas[ing] comprehensive liability insurance” (Alta Planning + Design, 2002, p. V, VI). Purchasing insurance may involve considerable cost for the



trail group but it is possible that a strong legal agreement along with city participation in the trail project can reduce the need for this cost (Alta Planning + Design, 2002).

While there are no national standards for RWT design, there are accepted guidelines based on other projects which can provide guidance for the Allen Creek Greenway. One of the major factors in designing a rail-with-trail is the train's speed and frequency of trips; this determines the setback distance of the trail away from the active tracks that must be maintained for safety purposes (Alta Planning + Design, 2002, p. 62). This has been a major consideration of the design team and will be discussed in the design section of this paper. Other factors that must be taken into account when designing a RWT include: separation techniques between the trail and railroad, from walls to fences to vegetation; topography of the right-of-way; sight distance for trains and trail users; and maintenance requirements of track and trail (Alta Planning + Design, 2002, p. 64).

Drawing specifically on this study in the conceptual designs for the Allen Creek Greenway, an important standard that drove the trail placement was the setback synthesized by the DOT study from precedent projects and regulations. According to the study,

An RWT in a constrained area along a low frequency and speed train could be located as close as 3m (10ft) from the track centerline assuming that (a) the agency indemnifies the railroad for all RWT-related incidents, (b) separation (e.g., fencing or a solid barrier) is provided, (c) the railroad has no plans for additional tracks or sidings that would be impacted by the RWT, and (d) the RWT is available to the railroad for routine and emergency access (Alta Planning + Design, 2002, p. VII).

The practicum client organization, the Allen Creek Greenway Conservancy, was informed by the Ann Arbor Railroad that these tracks carry two trains a day, both constrained to travel more slowly than the 30 mph indicated by the RWT study because of the large number of road crossings in the downtown area (O'Neal, 2011). The right-of-way varies between 50' to 155', leaving a narrow but usable width in the downtown core. Therefore, the practicum team relied on these standards in the design of the trail, and encourages the public design process to do the same. Additionally, it will be essential to develop liability and insurance agreements to bring the railroad on board the project, as well as an education and outreach plan, maintenance plan, and security plan to ensure the success of the trail from both public and railroad points of view.

# Government Support for the Allen Creek Greenway

## WCPARC Master Plan Summary

The Washtenaw County Parks and Recreation Commission (WCPARC) is one of the key stakeholders and potential supporters of the Allen Creek Greenway. One of WCPARC's main goals is to support local efforts to improve non-motorized transportation within the county; this is achieved through their Connecting Communities Initiative which provides funding to projects that align with their mission and have high use potential (Washtenaw County Parks and Recreation Commission, 2010, appendix D, p.38). The greenway serves many of the functions outlined by the mission statement of the WCPARC, which is:

to enhance the quality of life in the County by promoting a healthy lifestyle, efficiently providing high quality facilities and programs reflective of current and anticipated recreational needs of County residents and visitors – with particular emphasis on preserving fragile lands, water quality, wildlife habitat, creating pedestrian and greenway connections, and providing high quality services to those of all backgrounds (Washtenaw County Parks and Recreation Commission, 2010, p.8).

The Allen Creek Greenway will restore wildlife habitat within the city and also improve the water quality in Allen Creek, an urban tributary to the Huron River. Additionally, the greenway promotes healthy lifestyles and improves regional connectivity through access to WCPARC's Border to Border Trail (B2B) network. The B2B is a 35 mile, planned non-motorized trail network (now over halfway completed) that is designed to connect the communities of the county and provide recreational opportunities (Washtenaw County Parks and Recreation Commission, 2010, appendix D p.38-39). The B2B trail will connect to the greenway at the greenway's northern terminus, Argo Dam. This will effectively create a "green spur" from the B2B into the heart of Ann Arbor and significantly improve safe, non-motorized connectivity along the Huron River corridor. Additionally, there is the possibility of future connections between the B2B and the Pickney and Waterloo state recreation areas, two of the largest greenspaces in the lower peninsula of Michigan (Fig. 5). The greenway will provide non-motorized access to these unique green spaces directly from Ann Arbor's downtown core.

## City Master Plans

The largest stakeholder and potential beneficiary of the Allen Creek Greenway is the City of Ann Arbor. The City is working to encourage concentrated activity

centers, mixed-use development, infill and densification in the downtown, as well as the creation of pedestrian- and bicycle-friendly environments (City of Ann Arbor, 2009b, p.18). The Allen Creek Greenway will be a major step towards activating the western edge of downtown, enhancing the pedestrian and bicycle orientation of the community, and will help facilitate mixed-use development, infill, and densification, as outlined in the discussion of smart growth in the Current Trends section. The City defines its mission in its main master plan:

The City of Ann Arbor will be a dynamic community, providing a safe and healthy place to live, work and recreate. It will be a place where planning decisions are based, in part, on the interconnectedness of natural, transportation and land use systems. Natural systems, including air and water, natural features, native flora and wildlife habitats, will be improved and protected. It will be a place where the Huron River is a cherished part of the community and a focal point for recreation. Downtown will continue to be a vibrant part of the community that ties all parts of the city together. Transportation systems will include enhanced opportunities for public transit, extensive opportunities for alternative modes of travel and improved management techniques to reduce the impact of traffic on existing streets and neighborhoods. Land use systems will be compatible and complementary, and will include residential, recreational, commercial, office, educational, institutional and industrial uses, which will provide extensive choices in housing (including low cost housing), shopping, employment and recreational activities. Historically significant buildings and neighborhoods will be preserved. The quality of life in Ann Arbor will be characterized by its diversity, beauty, vibrancy and livability and ultimately will depend upon the positive interaction of these systems (City of Ann Arbor, 2009b, p.5).

The greenway would fulfill nearly all of these objectives, making it a key part of the future vision of Ann Arbor. To further elaborate on specific aspects of the City's goals and objectives for Ann Arbor, each area of focus has a master plan to guide development. The greenway's location, goals, and details are aligned with the goals and recommendations of multiple City of Ann Arbor master plans; in fact, some of the plans mention the Allen Creek Greenway by name.

### Downtown Design (DDA)

Downtown Ann Arbor already has a strong image, identity, and pedestrian orientation, but the City is continuing to improve its image as "green and sustainable" (City of Ann Arbor, 2009a, p.20, 43). The Allen Creek Greenway is an opportunity to create a defining "green" feature of Ann Arbor that enhances its image, identity and pedestrian friendliness. The three underutilized, city-owned parcels in the downtown

area mentioned in the Allen Creek Greenway Taskforce document, the parking lot at First St. and William St., 415. W. Washington St., and 721 N. Main St., should be dedicated to the Allen Creek Greenway, particularly the portions of these sites in the floodway.

The Downtown Development Authority (DDA) is charged with promoting business, development, and regulating parking in a large area of downtown, and much of their regulatory area overlaps with the downtown segment of the greenway. One of the critical intersections between the greenway and DDA plans lays in the future land use plan, a zoning overlay district called the “downtown interface”. The purpose of this zone is to create a smooth transition between the residential area to the west and the downtown core (Fig. 53) (City of Ann Arbor, 2009a, p.29, 52). The centrality of the Allen Creek Greenway in the downtown interface zone creates potential for the greenway to serve as the “green” anchor and defining feature for the transition area.

### Downtown District Character

The area surrounding the Allen Creek Greenway is defined by the City of Ann Arbor as the First Street Character District. The downtown plan describes it as follows:

The First Street character area lies to the west of the Main Street and Kerrytown districts, and forms the eastern edge of the Old West Side Historic District. The topography forming the Allen Creek Valley with its flood plain, the buried/piped Allen Creek, the Ann Arbor Rail Road track with its historic, turn-of-the-century industrial architecture, and the proposed future Allen Creek Greenway, are distinct aspects of this district needing recognition during any First Street District proposed project design. The mixture of historic and non-historic residential and industrial architecture, and the valley land form, gives this area a distinct difference from other downtown character districts.

The area is a mixed use linear district (north to south) that follows the railroad tracks’ older industrial railroad buildings, some of which have been converted into occupied industrial, construction, and other office uses, occasional art and dance studio activities, bars and nightclubs. The district also includes residential frame two and three story structures. The relatively quiet mixed-use neighborhood streets are highlighted by elevated train tracks with trestle bridges above east-west crossing streets from Washington Street north to Miller, and with wooden warehouse-like structures along the tracks, some of which are currently empty. The presence of the Allen Creek Flood Plain and the railroad track and its trestles are unique attributes worthy of design consideration.

The district’s urban landscape largely consists of tree lined streets with relatively consistent lot spacing, and an occasionally vacant parcel. At times, a triangular shaped parcel caused by the orientation/alignment

of the tracks is in contrast with the local streets. The future Allen Creek Greenway should be given design consideration as a potential element of all First Street Character District proposals (City of Ann Arbor 2011a, 41).

The First Street Character District is generally less developed than other portions of the City; the practicum team believes that this is mainly because of Allen Creek's extensive floodplain and floodway in the area, lack of railroad-centric light industry, and lack of green space. In addition, the Allen Creek Valley to the west of downtown is not as pedestrian friendly as it should be; the railroad currently creates a barrier that fragments the walkable street grid of the downtown area and the neighborhoods to the west. Creation of the Allen Creek Greenway addresses many of the issues surrounding the floodplain and floodway, can spur economic investment and development, and improves walkability and the existing non-motorized transportation network in Ann Arbor and beyond.

## Transportation

Ann Arbor is working towards developing a transportation network that promotes the future land-use goals of the City. Providing a range of transportation options improves the ability of the system to meet the needs of all transportation users, from pedestrians, bicyclists, transit users, commercial truckers and motorists (City of Ann Arbor, 2009c, p.2-1). By integrating a variety of transportation options into the urban fabric, the City hopes to reduce greenhouse gas emissions, incorporate Low Impact Development (LID) into projects to help manage stormwater, and better facilitate the growth of Ann Arbor into the future (City of Ann Arbor, 2009c, p.2-7).

The Allen Creek Greenway is an example of a non-motorized transportation facility which, according to the City of Ann Arbor (2009c, p.4-20), are "vital to the transportation network as witnessed by the 18% of commuters (compared to 1-2% nationally) that bike and walk to work or school within the city". Connecting to the B2B trail at Argo Dam will provide an additional layer of regional connectivity for city residents. According to the City of Ann Arbor (2007b, p.2), some of the specific benefits to the City and its residents that come from having a well-developed non-motorized transportation network include:

- Improved access to daily needs for those without a driver's license (young, elderly, and those with physical limitations)
- Enhanced economic viability of a community (vibrant and active communities attract businesses)
- Promotes healthy lifestyles and active living, reducing health care costs from inactivity

- Lessens the need for downtown parking spaces
- Strengthens the social fabric of the city by fostering pedestrian, social interactions between community members
- Reduces dependence of fossil fuels and foreign oil
- Improves quality of life by increasing air and water quality, and reducing noise pollution and greenhouse gas emissions

Ann Arbor has developed short and long term plans to improve the non-motorized transportation network; the plans range from adding new bike lanes and sidewalks to adding pedestrian-car crossing safety signals and improving transit service (Appendix II) (City of Ann Arbor, 2009c, p.4-2). The Allen Creek Greenway will represent a major step forward in non-auto-centric design that facilitates mixed-use infill development for the city while promoting connectivity between the region's green spaces.

## Parks and Recreation

According to the City of Ann Arbor (2011b, p.3), residents who live in the Central Planning Area have significantly less access to parkland and open space than other residents of the city (Fig. 18). The greenway will greatly improve resident access to open space within the Central Planning Area because of its linear form that travels along the edge between residential areas and the downtown core. The Parks Department in Ann Arbor has stated that improving the connectivity of non-motorized transportation through urban areas, neighborhoods, and along creeks and the Huron River are given priority for development (City of Ann Arbor, 2011b, p.59, 92-93, 107)—these goals are some of the main goals of the Allen Creek greenway as well.

Anticipating the needs of the future is very important to the city (City of Ann Arbor, 2011b, p.60) and connectivity and access to open space will likely increase in importance as development continues, land becomes less available, and the population increases.

A survey was conducted in 2010 by the City Parks Department which indicated that respondents were interested in improving connectivity between parks within the city and the Border to Border trail (B2B) (City of Ann Arbor, 2011b, p.81). Additionally, “almost 80% of the survey participants felt the parks and recreation system was “extremely important” to one’s quality of life”; approximately the remaining 20% felt that they were “somewhat important” (City of Ann Arbor, 2011b, p.86). The survey also indicated that walking, hiking, and bicycling along with the Huron River Greenway (B2B trail) were amongst the most popular and important activities for city residents (City of Ann Arbor, 2011b, p.118).



## Natural Features

A vital component of vibrant cities is strong environmental stewardship; healthy natural systems promote high quality human life (City of Ann Arbor, 2004, p.4). The Allen Creek Greenway represents a collaborative effort that improves environmental quality, utilizes the landscape as infrastructure and highlights ecosystem services within the city. This point is underscored by the City's Natural Features Plan, which states:

Sustaining the ecological health of the City and region requires cooperation between citizens and many other partners: governmental bodies, educational and other community institutions, businesses, media, volunteers, and environmental and other civic organizations (City of Ann Arbor, 2004, p. 4).

According to the City of Ann Arbor, woodlands were the primary pre-settlement land cover of the area (2004, p.26). The secondary land cover was oak savannas; prairies did exist but were less in this area. Areas along riparian corridors and in floodplain zones were typically wooded, wet meadows, or marshes (City of Ann Arbor, 2004, p.18). The greenway exclusively utilizes native plants to restore and support local ecologies between other flora and fauna—one of the key goals of the City of Ann Arbor (2004, p.6, 10). Another goal of the Natural Features Plan that the greenway supports is “fostering stewardship through education and outreach” (City of Ann Arbor, 2004, p.10). The greenway provides educational opportunities and highlights ecosystem services by providing interpretive signage at key locations, such as areas of brownfield re-development (phytoremediation), stormwater management (bioswales and rain gardens), and vegetation restoration.

## Water Quality and Flooding

According to the City of Ann Arbor's Flood Mitigation Plan (2007, p.10), FEMA (Federal Emergency Management Agency) first began to map floodplains in 1974 and the first flood insurance rate maps were given to City Officials in 1982. The City of Ann Arbor has had three similarly sized major flooding events since the turn of the 20th century: 1902, 1947, and the most recent in 1968 (Fig. 15) (City of Ann Arbor, 2007, p.10). Much of Ann Arbor was developed prior to floodplain mapping and therefore has many properties that are at risk of flooding. In 2001, the City Planning Commission began to create official policies about how the City could reduce potential flooding and reduce potential flood damage (City of Ann Arbor, 2007, p.10). The main goals outlined by the report are as follows: minimize life endangerment, minimize property damage and loss, preserve market value of existing properties, improve water

### FMAP Vulnerability Assessment: Allen Creek Parcels and Buildings

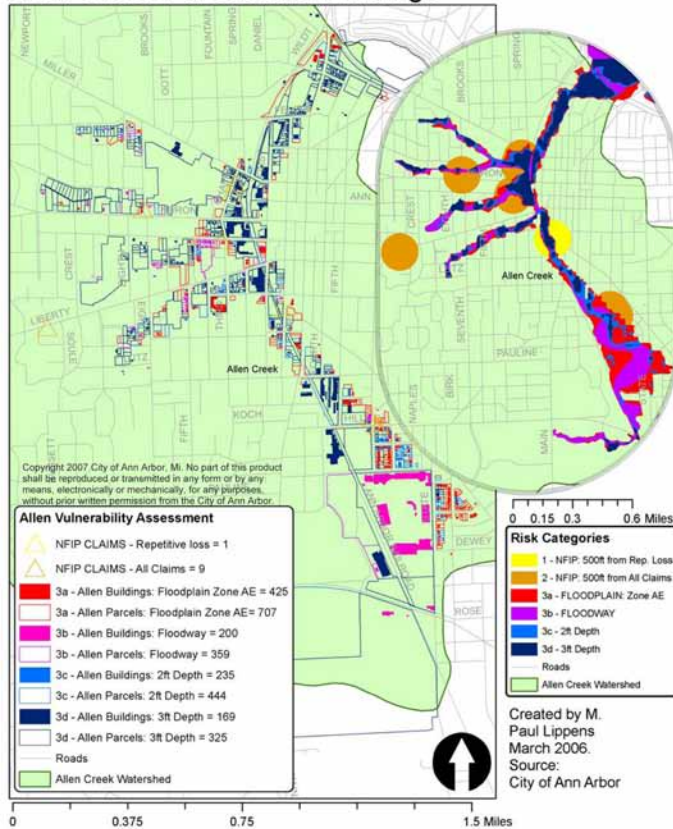


Figure 12: (enlarged in Appendix VI) Vulnerability to flooding for properties within the Allen Creek watershed (City of Ann Arbor, 2007a, p.25)

quality and ecological health of the creeksheds of Ann Arbor, reduce contamination in the Allen Creek Drain (a designated County Drain under the authority of the County Water Resources Commissioner's Office), create the Allen Creek Greenway in the floodplain, preserve neighborhood character, and limit development in the floodplain (City of Ann Arbor, 2007, p.10-11).

The defining water feature of the Ann Arbor area is the Huron River. Ann Arbor is divided into seven creeksheds that all eventually drain into the Huron River: Traver, Mallets, Miller, Allen, Honey, Swift Run, and Flemming (City of Ann Arbor, 2007, p.13). Each of these creeksheds (referred to as a watershed in this report) has an associated floodplain

and floodway. The extent of flooding is often greater in urban areas because typical construction practices produce large amounts of impervious surface. When it rains, impervious surfaces make water "run off" more quickly than over natural surfaces, preventing the water from absorbing into the soils (City of Ann Arbor, 2007, p.13). This lack of absorption can cause pooling and, in a large rain storm, flooding. The more impervious surfaces in the area, the faster the stormwater moves into the floodplain and, on average, the greater the frequency of flooding (City of Ann Arbor, 2007, p.13).

The Allen Creek Greenway is located within the Allen Creek watershed. The Allen Creek watershed has the highest risk of the seven Ann Arbor watersheds for flooding (City of Ann Arbor, 2007, p.24). In fact, it has 60% of the parcels at highest risk for flooding within the city and has 84% of the structures within the floodplain (City of Ann Arbor, 2007, p.26). Allen Creek has a history of both flooding and water quality



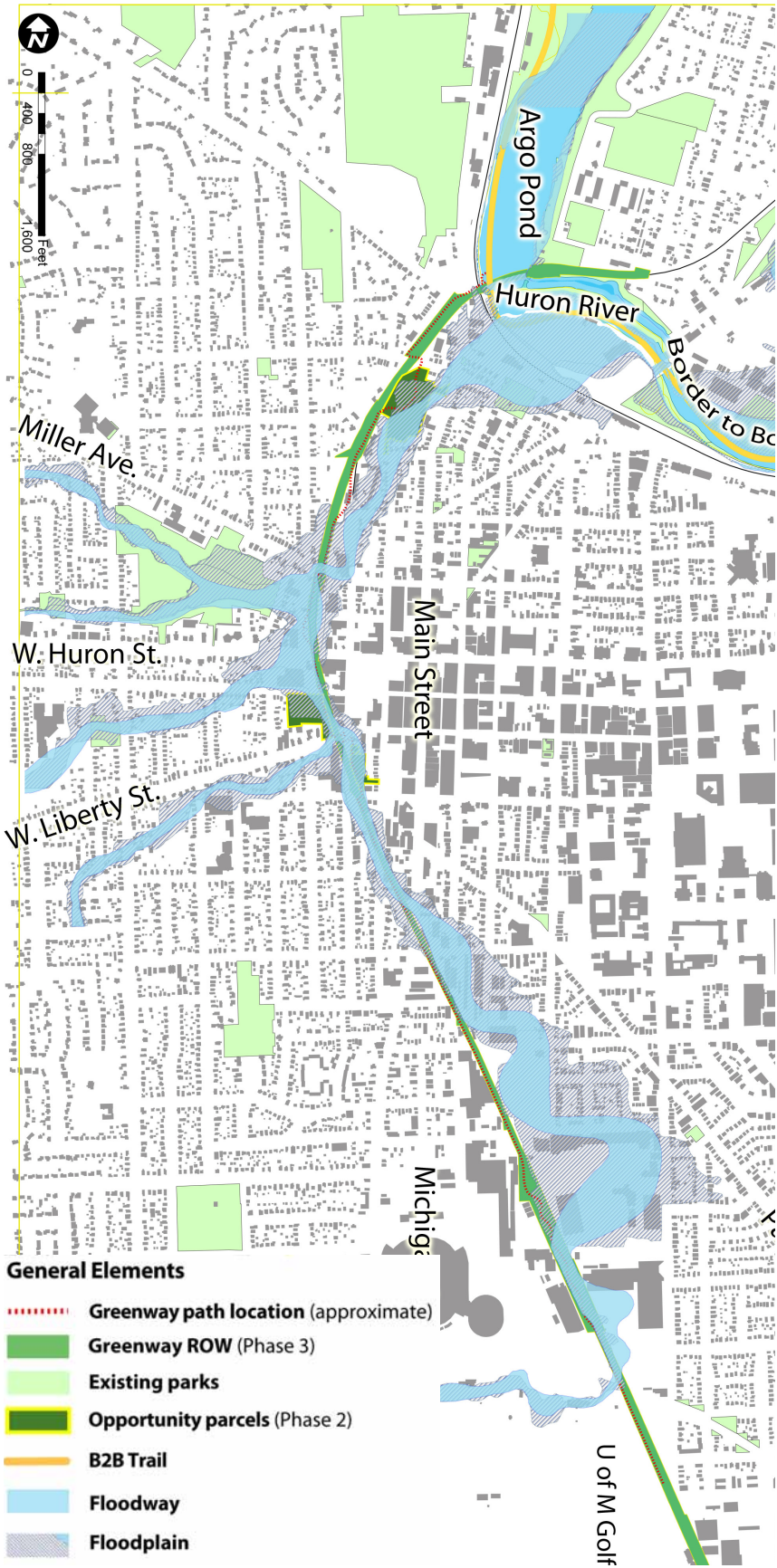


Figure 13: Floodplain and floodway location within the Allen Creek watershed; overlaid on greenway location.

## Ann Arbor Watersheds

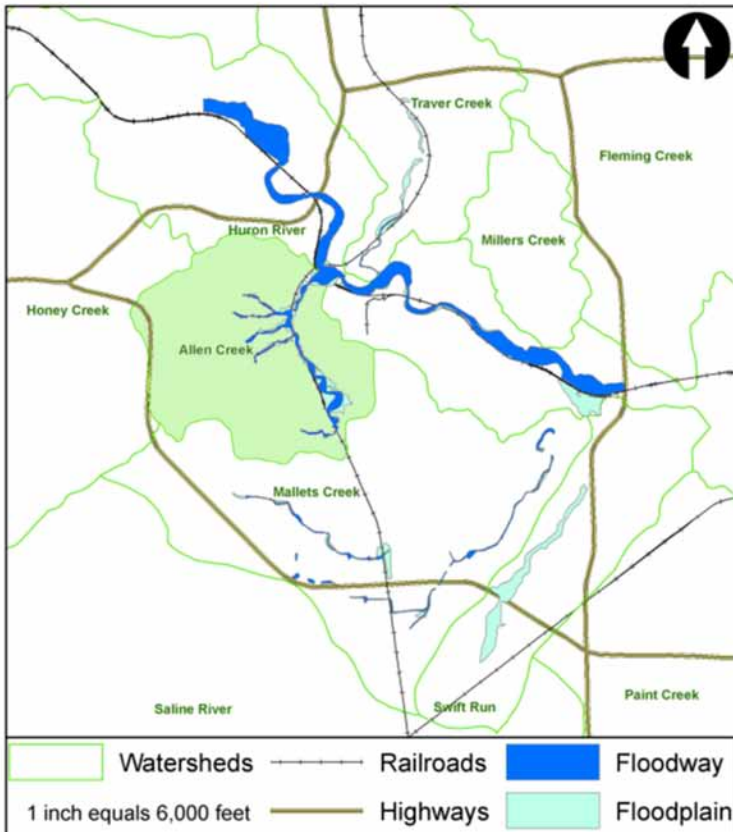


Figure 14: (enlarged in Appendix VI) Location of Allen Creek watershed within Ann Arbor city limits (City of Ann Arbor, 2007a, p.32)

issues; flooding became an issue because of increased development (increased impervious surfaces) and reduced vegetation to slow stormwater. Over time, the increase in development also washed contaminants into the Creek, impairing its water quality. According to the City of Ann Arbor, Allen Creek was buried in a pipe in the 1920's because it had essentially become an open sewer, filled with the waste of households and industry (tanneries, factories, breweries) and was prone to flooding (2007, p.14). Putting the creek in a pipe solved the flooding problem in the short term, but as development continued,

flooding and water quality degradation actually became exacerbated (City of Ann Arbor, 2007, p.14). As was previously mentioned, there were major flooding events in the Allen Creek watershed: one in 1902 (before the creek was buried), and two more in 1947 and 1968 (after the creek was buried).

One of the key strategies for improving water quality within Allen Creek is to create a zoning overlay district for the floodplain that would regulate land use within the floodplain (City of Ann Arbor, 2007, p.46). Another strategy to alleviate



Figure 15: Washed-out bridge from 1968 Allen Creek flood

flooding and improve water quality is to utilize the landscape as infrastructure; according to the City of Ann Arbor, protecting or creating natural features within the floodplain can provide stormwater conveyance and improve water quality (2007, p.53-54). These areas should include natural vegetation (trees, shrubs, grasses, etc.), and if space allows, swales, rain gardens, and other quantity and quality control structures, all of which the Allen Creek Greenway will provide.

Another option that could help facilitate both the development of the Allen Creek Greenway and mitigate flood hazards is the use of a TDR (Transfer of Development Rights) program. Typically used for open space and agricultural preservation on the outskirts of urban areas, the development rights are purchased from a “sending zone” and then transferred to a different area of the city, the “receiving zone” (City of Ann Arbor, 2007, p.58). One of the major advantages of a TDR program is that it can be used in combination with the aforementioned strategies and does not eliminate tax base from the City. For example, if the floodplain is zoned as a type of residential development and the floodplain zoning overlay district limits development type, a developer could transfer the development rights outside of the floodplain to allow for greater than normal development densities (increased FAR, or Floor Area Ratio) on a parcel in the receiving zone (to be determined by the City). One of the main challenges of using a TDR program is that it is not specifically enabled by the State statute and therefore faces the challenges associated with pioneering a land-use program in the State of Michigan (Machemer, P., et al., 2000, 0-2).

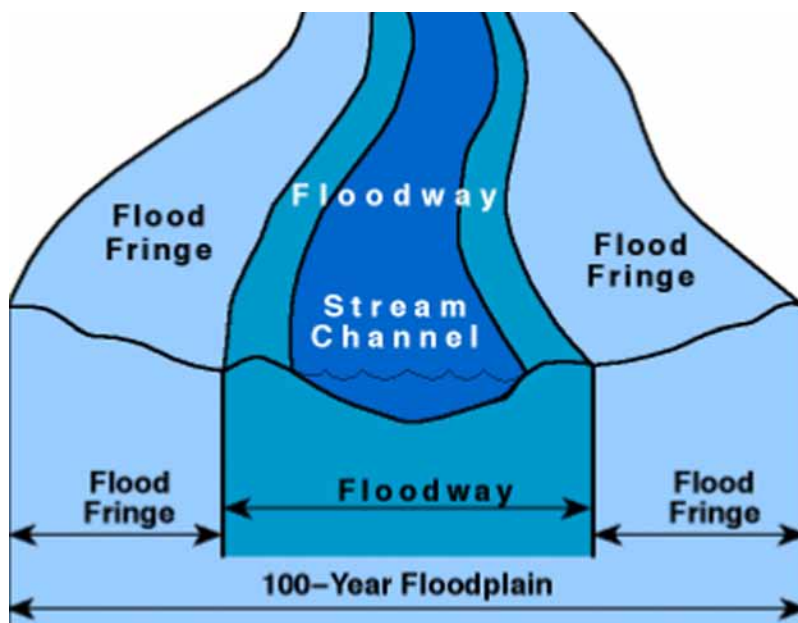


Figure 16: Cross-sectional diagram of FEMA flood terms  
(City of Ann Arbor, 2007a, p.11)