

BIKE SHARES: PAST, PRESENT, FUTURE AND A BIKE SHARE FEASIBILITY
STUDY FOR ATHENS, GEORGIA

by

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(Under the Direction of Stephen Ramos)

ABSTRACT

This thesis sets out to examine the evolution of bike shares in the world, but particularly in the United States. Five case studies from various size cities across the United States are used to show the variety of components and planning of public bike shares. The advantages to bike shares are discussed to show how bike shares can offer an alternative public transportation option for municipalities to improve transportation, environmental, health, and quality of life issues. The second half of the thesis applies the lessons learned from the case studies and evolution of bike shares to apply a bike share feasibility study for Athens, Georgia.

INDEX WORDS: Bike share, Bike sharing, Public Bike share, Alternative transportation, Athens, Georgia, Athens-Clarke County

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CHAPTER 1

INTRODUCTION

Transportation is a problem in many cities in the United States. As populations grow, it is increasingly important for city planners to make accommodations using transit options alternative to the personal automobile. The dependency individuals have on the automobile has slowed the development of public transportation. With future oil reserves being limited, the need for more fuel-efficient public transportation is necessary. In addition, air quality and other environmental problems associated with automobile traffic increase the need for alternative forms of transit including car pools, vans, light rail, pedestrian, and bicycling. Bicycling in general and bike sharing in particular is an emerging alternative transportation option that has been used for many decades by European cities and is a viable option for some cities in the United States.

Bike Share: A collective of bikes, privately or publicly owned, with varying membership and renting options for users; designed in a way to allow users to make short trips without the need of their own bike.

The advantages of bike sharing include reducing traffic congestion in urban areas, improving air quality, and providing a healthy mode of transportation for citizens. In addition, bike sharing can connect other forms of transit for commuters. Bike sharing can provide 'green jobs', as well as promote an environmentally friendly image for the city. In the United States, bike shares are

found in Washington D.C., New York, Boston, Chicago, Louisville, Denver, Minneapolis, San Antonio, Miami, Madison, Boulder, Irvine, Omaha, Des Moines, as well as some smaller projects set on university campuses.¹

Table 1 Current United State Bike Share Systems

Location and Name	Date Launched	Number of Stations	Number of Bikes	Population 2010	Density Per Sq. Mi.
Boston, MA(New Balance Hubway)	28-Jul-11	61	600	617,594	12,752
Miami Beach, FL(DECOBIKE)	15-Mar-11	105	1000	399,452	12,140
Chicago, IL(B-cycle)	30-Jul-10	6	100	2,695,598	11,864
Washington, DC and Arlington (Capital Bikeshare)	20-Sep-10	140	1210	617,996	10,065
Minneapolis, MN(Nice Ride)	10-Jun-11	138	1200	382,578	7,019
Ft. Lauderdale, FL(B-cycle)	14-Dec-11		200	165,521	5,221
Atlanta, GA(Viacycle@GT)	14-Nov-11	4	35	420,003	4,020
Boulder, CO(B-cycle)	20-May-11	25	200	97,385	3,884
Denver, CO (B-cycle)	22-Apr-10	50	600	600,158	3,874
San Antonio, TX(B-cycle)	26-Mar-11	14	140	1,327,407	3,401
Omaha, NE(Omaha B-cycle)	15-Jun-11	5	35	408,958	3,371
Irvine, CA-UCI(ZotWheels)	9-Oct-09	4	25	212,375	3,196
Madison, WI(B-cycle)	22-May-11	27	265	233,209	3,030
Pullman, WA(WSU Green Bikes)	1-Sep-20	4	32	29,799	2,740
Des Moines, IA(B-cycle)	8-Sep-10	4	18	203,433	2,516
Spartanburg, SC(B-cycle)	7-Jul-11	2	14	37,013	2,066

With over 30 cities to launch bike shares in the following year

Source Cited: Russell Meddin, Simmons, Jesse Luca, and Paul DeMaio to The Bike-Sharing Blog, 2011

¹ Russell Meddin, Simmons, Jesse Luca, and Paul DeMaio to The Bike-Sharing Blog, 2011, <http://bike-sharing.blogspot.com/>.

The majority of cities that have bike shares are highly populated. Bike shares are successful in these large urban areas because of high density and lower rates of car ownership. As bike sharing becomes more popular, this concept can be expanded to include small cities and large towns. This thesis will explore the design and planning techniques that can encourage bike shares to thrive in the medium size urban populations in the United States. The case studies in chapter two will examine the specifics of these planning techniques.

This thesis sets out to examine planning and design techniques that encourage bike shares as an alternative transportation option to citizens of medium size urban centers. In the first chapter, the benefits, history, and scope of current bike shares will be reviewed. In the second chapter, case studies in the United States are examined to determine best practices and the common problems bike shares have experienced. The remainder of the thesis applies the information from the first two chapters in order to assess the feasibility and structure of a bike share in Athens, Georgia. This evaluation includes an analysis of the fundamental elements needed to launch a new system, such as infrastructure, technology, stakeholders, and funding.

Benefits of Bike Sharing

Bike sharing has the ability to solve transportation issues, improve the environmental integrity of the greater region, and enhance the health of the users. Typically, the primary goal of a bike share is to alleviate individual and public transportation issues. Many cities view bike sharing as a way to reduce traffic congestion. Bike sharing has the ability to offer alternative transportation

options that complement existing public transport. Bike shares also address commuters' need to travel to and from work and can assist in shorter commutes, those less than two miles in distance.² Some systems promote tourism and assist individuals in running errands. The overall goal of a bike share is to offer an alternative transportation option, reduce the number of cars being used, and assist in the connectivity of public transportation.

The need to reduce the number of cars exists because of the limited availability and cost of fossil fuels. Gas and oil prices are increasing and there are environmental problems associated with cars, such as air pollution, debris, and liquid chemical spills. The Environmental Protection Agency emphasizes the severity of the situation by saying:

American communities face serious health and environmental challenges from air pollution and the growing effects of climate change, both of which are intricately linked with current and future energy options...In addition, climate change has been shown to lead to a range of major and potentially adverse effects on the environment and public welfare.³

Climate change is directly related to the burning of fossil fuels and in the United States a large percentage of fossil fuels are burned by cars. Approximately 375 million gallons of gas are used daily in the United States, half

² Emily Blue, "The economic case for on-street bike parking," grist, <http://www.grist.org/biking/2011-04-11-the-economic-case-for-on-street-bike-parking>.

³ "Air, Climate, and Energy Research," ed. Environmental Protection Agency (2011).

of which is used for automobiles.⁴ At fifty thousand trips, 124,000 miles SmartBike of Washington D.C. estimated a total of 81,400 pounds of carbon emissions saved as a result of their bike share. In Paris, the Velib bike share saves an average of 126,984 pounds of carbon emission every day. As of 2009, the Canadian BIXI bike share has saved nearly two million pounds of carbon emissions.⁵

Table 2 Automobile compared to other modes of transportation and their environmental effects

	auto	bus	train	airplane	bicycle
space consumption	100%	10%	6%	1%	8%
primary energy consumption	100%	30%	34%	405%	0
CO ₂	100%	29%	30%	420%	0
Nox	100%	9%	4%	290%	0
hydrocarbons	100%	8%	2%	140%	0
CO	100%	2%	1%	93%	0
total atmospheric pollution	100%	9%	3%	250%	0
accident risk	100%	9%	3%	12%	2%

Source Cited: J. Dekoster and U. Schollaert, "Cycling: The Way Ahead for Towns and Cities," ed. European Commission (European Communities, 1999)

⁴ Emily Blue, "How the bicycle economy can help beat the energy crisis," no. April, 25, 2011, <http://www.grist.org/biking/2011-04-25-how-the-bicycle-economy-can-help-us-beat-the-energy-crisis>, 2.

⁵ Susan A. Shaheen, Stacey Guzman, and Hua Zhang, "Bikesharing in Europe, the Americas, and Asia Past, Present, and Future," *Transportation Research Record*, no. March 2010 (2009).

Bike shares increase the overall number of both new cyclists and private users in a city. According to Susan A. Shaheen, “although cycling growth and trends vary worldwide, bikesharing offers a transportation alternative to increase bicycle use by integrating cycling into the transportation system and making it more convenient and attractive to users.”⁶ Introducing a bike share in areas that have low bicycle ridership has shown to be an effective way to increase overall bicycle ridership. Paris and London are examples of cities with previous low bicycle ridership that was increased by the introduction of a bike share.⁷ In the months after opening a bike share in Paris and Barcelona, bicycle usage increased from 1.6 percent to 3.6 percent and one percent to two percent respectively.⁸ Of the bike share subscribers in Paris, ninety six percent had never biked in the city before the introduction of the system.⁹

Currently, a lack of detailed data related to bike share employment exists. However, bike shares provide ‘green jobs’ to the community. In a study of eleven cities across the nation, for every one million dollars spent on bicycle infrastructure there were 11.4 jobs created.¹⁰ These jobs include administration, maintenance, construction, architecture and engineering. Montreal’s bike share

⁶ Ibid.

⁷ "Bike Sharing Guide," ed. Transport Canada (Public Works and Government Services Canada, 2009).

⁸ Adam Cooper, "The UBC Public Bicycle System Feasibility Study" (The University of British Columbia, 2009).

⁹ Ibid.

¹⁰ H. Garrett-Peltier, "Pedestrian and Bicycle Infrastructure: A National Study of Employment Impacts," ed. Political Economy Research Institute (University of Massachusetts, 2011).

has over four hundred jobs associated with it.¹¹ Many cities are experiencing a high unemployment rate and the jobs created by a bike share could improve the situation.

Bike shares are able to produce economic benefits. A study at the Centre for Physical Activity and Nutrition Research at Auckland University of Technology on the economic benefits of active transportation modes has found that the average person can save themselves \$3.45 per mile cycled.¹² Above average bike infrastructure can add to a commercial area's financial stability and home values in the area. Bike share stations that are located near shopping areas increase visibility of stores and increase spending.¹³ In addition, studies in Toronto have shown there is a greater amount of spending in commercial areas by pedestrians and bikers than people driving and parking.¹⁴ Another study in Indianapolis has shown that homes near bike trails had eleven percent more resale value than other homes in the area without trail access, which also increases the tax revenue for the municipality.¹⁵ ¹⁶ Bicycle infrastructure is an amenity that should be provided by municipal governments, just as road

¹¹ "Bike Sharing in the United States," Bikes Belong, <http://www.bikesbelong.org/resources/stats-and-research/research/bike-sharing-in-the-united-states/>.

¹² J.A. Genter et al., "Valuing the health benefits of active transport modes," ed. Centre for Physical Activity and Nutrition Research (NZ Transport Agency 2008).

¹³ Corinne Kishner, "Integrating Bike Share Programs into a Sustainable Transportation System," (National League of Cities, 2004).

¹⁴ Rex Hodgson, "Potential of Bikesharing in the Town of Blacksburg and Virginia Tech" (Virginia Tech, 2011).

¹⁵ Ibid.

¹⁶ Kishner, "Integrating Bike Share Programs into a Sustainable Transportation System."

infrastructure is created for cars. The addition of bike lanes and bike trails will increase the quality of life for citizens in the community.

Bike sharing should not be viewed as a competing form of public transit, but as a complement to walking, driving cars, riding buses, and riding commuter trains. Bikes are easily used as an intermodal form of transportation. Bikes connect a user from a bus and to their destination, or can assist in areas where there is not enough public transportation for the demand. Planners have had some difficulty in designing bus and train stations so that the stations reach far enough that people are willing to walk. Generally, most people are willing to walk a fourth of a mile to a half of a mile distance. However, the bicycle, moving at about three times the speed the average person can walk, will expand these distances or make the distances traveled much quicker.¹⁷ Peter Midgley of the United Nations describes this concept nicely, “[Bike Sharing is] seen as a means to promote the viability of public transport by providing an ‘extension service for the ‘first/ last mile’ - the distance which many consider to be too far to walk between home and public transport and/or public transport and the workplace...”¹⁸

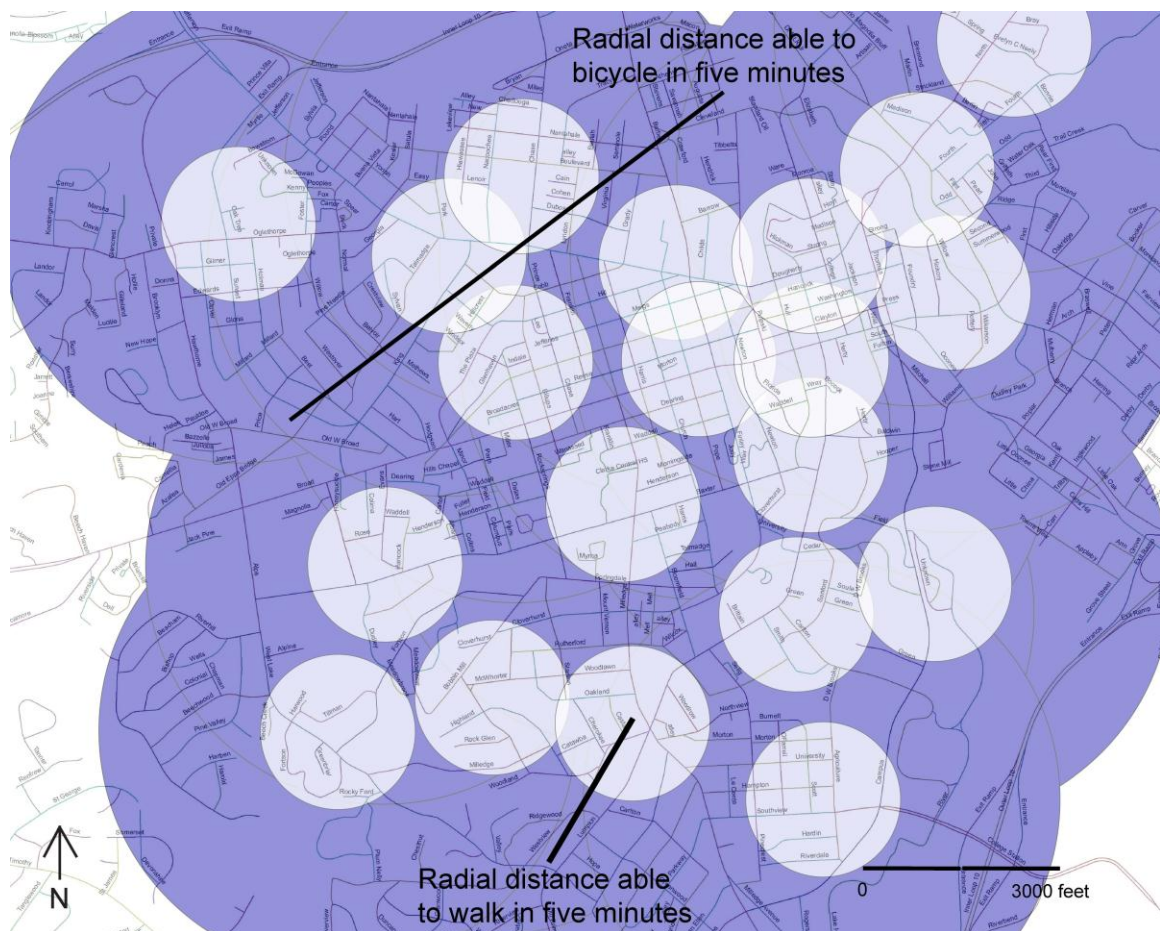
Bike infrastructure and bike share infrastructure is relatively inexpensive when compared to other public transportation infrastructure. Per mile, bike

¹⁷ Mike Lydon to Half-Mile Circles Blog, <http://reconnectingamerica.org/news-center/half-mile-circles/2010/the-role-of-the-bicycle-in-transit-oriented-development/>.

¹⁸ P. Midgley, "Bicycle-Sharing Schemes: Enhancing Sustainable Mobility in Urban Areas," ed. Department of Economic and Social Affairs (United Nations, 2011).

sharing cost less than any other public transportation mode.¹⁹ Much of the infrastructure is inexpensive due to the low-tech nature of a bike share system. It is disappointing that the percentage of funds allocated by federal and state governments to walking and bike infrastructure does not compare to other

Figure 1 Biking versus walking in five minutes at three mile per an hour pace for walking and a nine mile per hour pace for biking



Source Cited: By Author

¹⁹ Kishner, "Integrating Bike Share Programs into a Sustainable Transportation System."

transportation spending. In a study of all fifty states, the Alliance for Biking and Walking found out that of all transportation funding the federal government invested just 0.9 percent on biking.²⁰ Generally, the local government funds most bicycle infrastructure, but the federal government could send a stronger message to localities that cleaner, healthier, more efficient and cheaper modes of transportation are priorities.

Many cities around the United States desire an environmentally-friendly reputation, which can promote tourism, bring people to work and live in the city, and provide additional grants from the state and federal government. Bike shares help a city advertise their commitment to improve the environment and their city landscape. By decreasing the number of vehicle miles driven, bike shares can improve quality of life in terms of noise pollution and scenery. Someone on a bike can take in the subtle beauty of a city in a more interactive and engaging way. The architecture, vegetation, and parks are the things occupants take pride in and can be easily enjoyed on a bicycle.

Health impacts of cycling cannot be overlooked. According to the Center for Disease Control, adults need at least one hundred and fifty minutes of moderate-intensity aerobic activity every week, or about twenty minutes per day.²¹ Exercising helps people keep at a healthy weight, prevents obesity, diabetes, heart disease, and cancer, and can help improve mental health.²²

²⁰ Elena Schor to Streetsblog Los Angeles, <http://la.streetsblog.org/2010/01/28/a-bike-ped-state-of-the-union-9-6-of-trips-1-2-of-federal-funding/>.

²¹ "Physical Inactivity Estimates," Center for Disease Control and Prevention, <http://www.cdc.gov/Features/dsPhysicalInactivity/>.

²² Genter et al., "Valuing the health benefits of active transport modes."

Bicycling is a great form of aerobic exercise that can be made more accessible through bike shares.

There are some intangible benefits that bike shares can offer to the community. Bike shares can generate activity downtown by concentrated the network around the central business district of cities. With active streets and complete streets contributing to the needs of a pedestrian or biker can create traffic calming that can generate revenue for the downtown and make a more complete experience for the individual. Bike shares can encourage additional development of bike lanes across the city, which can add to home values and create additional recreation opportunities for citizens.

Bike shares have recently received national attention. The Secretary of Transportation, Ray LaHood, is a very strong supporter of bicycling and a proponent of bike sharing. He is quoted as saying, "through our programs, we have funded new bike lanes and paths and have supported the development of bike-sharing programs to improve opportunities for people to get around safely and conveniently on a bicycle."²³ With Mr. LaHood acknowledging the usefulness of bike shares and the growing number of systems in the United States and abroad, now is the time to invest in this alternative transportation. Taking into account all the benefits of a bike share, planners and municipal leaders should gain better understanding of bike shares to utilize these systems as a complement to municipal public transportation.

²³ Daniel Lippman, "Bike-Sharing gears up in the U.S. as gas prices soar," no. June 30, 2011, <http://www.mcclatchydc.com/2011/06/30/116799/bike-sharing-gears-up-in-us-as.html>.

The History of Bike Shares

The evolution of bike shares is described as first, second, and third generation. The differences between the three are in new technology and user renting/membership options. Most of the newer systems launching in the United States are considered to be third generation and are more technology driven and permanent.

First Generation Bike Shares

First generation bike shares are very simple. There is a small amount of bikes dedicated to the community by a non-profit or by the municipality. The users pick the bikes up at random locations without locking mechanisms. Many of the bikes are recycled or donated. These first generation systems are developed in good faith that the users will stay in the vicinity of the municipality and return the bikes unscathed. The first recorded system was developed in the Netherlands in the 1960s.²⁴ Similar programs in the United Kingdom and France existed later. In 1994, the United States had its first bike share, which was developed in Portland, Oregon by environmental and civic activists.²⁵ The problems with first generation bike shares include vandalism and theft. There is no accountability for the users to return the bikes due to the lack of locking mechanism or membership. Many of these systems failed shortly after they began.

²⁴ "Bike Share Program Investigation:Phase 1 Report: Best Practices Investigation Final Report," ed. METROLINX (2009).

²⁵ Panos Antoniadou, "European Best Practices in Bike Sharing Systems," *T.aT.-Students Today, Citizens Tomorrow*(2009), http://www.tat-project.eu/index.php?option=com_docman&task=doc_download&gid=266&Itemid=80',0,0,'no','no','no','no','no'.

Second Generation Bike Shares

The second generation of bike shares underwent some upgrades. Many of these systems use deposit machines for renting bikes.²⁶ The bikes come with a manual locking mechanism and the stations often have volunteers or paid employees to oversee the transaction.²⁷ These systems are funded by grants through municipalities or non-profit organizations. None of the second generation systems are self-sustaining. A few systems are the first to coordinate the bikes in similar colors and logos. Copenhagen, Denmark has the first successful system of this kind, which is still in operation today.²⁸ The concepts of stations, locking mechanisms, and coordination of bikes are all important improvements for bike shares.

Third Generation Bike Shares

Third generation bike shares are much more technology driven with the use of global position systems, smart cards or smart phones, digital kiosks, solar power, and other innovations. *The Best Practices Investigation Final Report* of Metrolinx, Toronto describes third generation bike shares as “considerably more technologically advanced than their predecessors and vastly improve user convenience, bike security and system tracking.”²⁹ Many of these systems allow for annual, monthly, daily and hourly membership options. Users’ credit cards are

²⁶ Hodgson, "Potential of Bikesharing in the Town of Blacksburg and Virginia Tech."

²⁷ "Bike Share Program Investigation:Phase 1 Report: Best Practices Investigation Final Report.",5

²⁸ Hodgson, "Potential of Bikesharing in the Town of Blacksburg and Virginia Tech.", 4

²⁹ "Bike Share Program Investigation:Phase 1 Report: Best Practices Investigation Final Report.". 6

linked to their membership to cut down on theft, as well as to add charges for usage beyond the minimum time frame. Users check in and out from docking stations at a kiosk with the use of a key or smart card. The operators typically manage the bikes with real time GPS technology and in some systems users can check availability of bikes at docking stations through smart phones. In some systems, docking stations are not necessary because users can unlock a bike with their smart phone. In the majority of these third generation systems, the locks for the bikes are on the docking stations; therefore the bikes must be picked up and dropped off at these locations. The most famous and first true third generation system is in Lyon, France. This program began with fifteen hundred bikes and is still growing today.³⁰ All of the systems in the United States that have had success in the last couple of years are of the third generation. There are still theft and vandalism issues, along with other problems, but the third generation bike shares have had huge success across Europe. Results in the United States are beginning to indicate bike sharing it is not just a trend, but a viable alternative transportation option.

Scope of Current Systems

As of 2010, there were approximately 375 bike share systems worldwide. The most popular region for bike shares is Europe, but systems in China, Japan, the Middle East, and in South and North America are becoming more prevalent. As of 2011, in Europe alone there were over four hundred bike shares. Currently, there appears to be about seventeen systems operating in the United States,

³⁰ Hodgson, "Potential of Bikesharing in the Town of Blacksburg and Virginia Tech."

with about thirty-two more in the construction or planning phases. Most of these projects will be in the planning phase for approximately one year. Subsequently,

Table 3 Evolution of Bike Shares

Bike Share Generations

Components: bicycles

Characteristics

First generation: white bike (or free bike) systems

1. Distinct bicycles (usually by color)
2. Bicycles unlocked
3. No charge for use

Second generation: coin-deposit systems

Components

1. Bicycles
2. Docking stations

Characteristics

1. Distinct bicycles (color or special design)
2. Bicycles located at specific docking stations
3. Bicycles with locks

Third generation: IT-based systems

Components

1. Bicycles
2. Docking stations
3. Kiosk or user interface technology

Characteristics

1. Bicycles are distinct (color, special design, or advertisements)
2. Bicycles are located at specific docking stations
3. Bicycles have locks
4. Smart technology is used for bicycle check-in and checkout (mobile phones, mag-strip cards, or smartcards).
5. Theft deterrents (program specific; members are required to provide ID, bankcard, or mobile phone number to identify users) are used. Failure to return bicycle incurs charges to recover bicycle cost and may also include high punitive cost. Non-members are generally required to pay a large deposit to ensure bike return, under risk of losing their deposit.
6. Programs are paid for as a membership service, typically free for the first specific time interval with gradually increasing cost enforced.

Source Cited: Shaheen, Guzman, and Zhang, "Bikesharing in Europe, the Americas, and Asia

Past, Present, and Future."

in just one year the United States will have nearly tripled its number of bike shares. Enough time has not past to thoroughly study these emerging systems in the United States to determine whether they become a success. In general, the information about bike sharing is limited, especially in the United States. Municipal leaders and planners need to research these systems further to determine best practices.

The Bikes

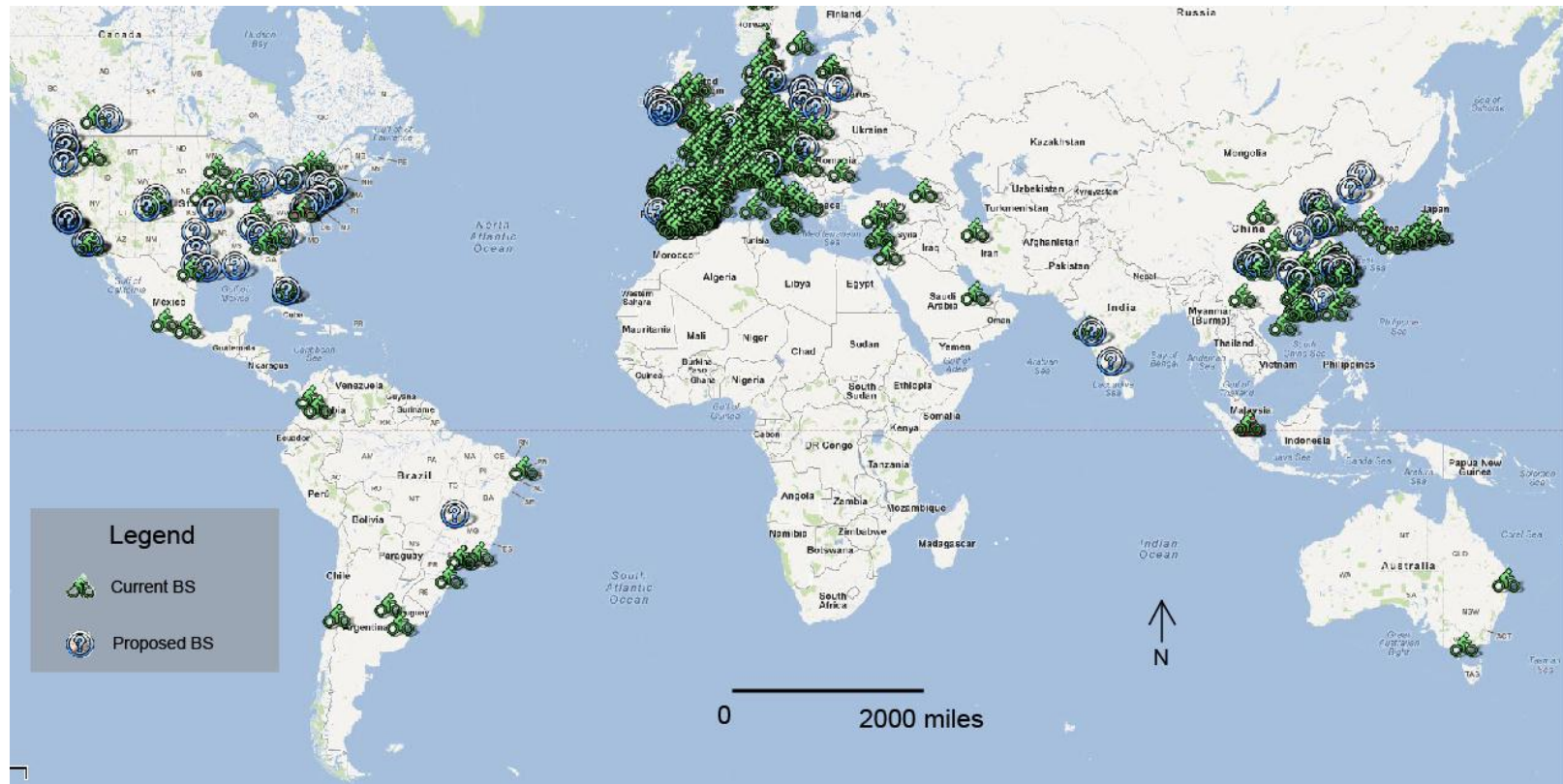
The bicycles used in a bike share may differ slightly depending on the system, but most have similarities. The bikes are usually a 'cruiser' style with three to seven gears. These bikes may have full fenders and an enclosed chain to prevent mud or water splashing for users on their way to work. The bikes are built to fit ninety percent of the population with easily adjustable seats. Most bike share bikes are built a bit heavier and sturdier than the average bike in order to hold up to high levels of use, ten to fifteen times a day. However, the weight of the bike should not be over forty-eight pounds and the center of gravity of bike frame should be lower than average. Hub gears and hub breaks are recommended. The gears, breaks, and chain are protected internally with a guard that helps prevent theft and vandalism, as well as the chain from falling off the gear. Another option for the bikes is a shaft driven mechanism that does not require a chain. Bikes with a shaft driven mechanism can be more efficient for riders than a chain driven mechanism. It can also decrease the number maintenance repairs needed and keep overall costs down for the bike share. Bikes used in a bike share should have more than the required safety measures

a personal bike would have, because many of the users are first time bikers. Wider than average tires should be on the bikes for greater stability. There should be reflective lights, a front light, internal hub brakes, wide tires, a bell, and basket or rack on the front or back of the bike.

The bikes are often outfitted with GPS in order to keep track of the location, so that users can check for availability on their phone or at a kiosk. The GPS is also helpful for operators when redistributing bikes at the stations. Sometimes, the bikes are built with a unique design or parts that may require special tools in order to prevent theft and to advertise the bike share system. In many cases, the bikes are painted with robust similar colors to decrease theft and to increase visibility of fleet colors.

Technology

User-access interface and locking mechanisms vary from one system to another. These components depend on the amount of money the municipality has to invest in a system, as well as the size of the bike share and the city. Radio-frequency identification tags can be used with a card or a phone. An individual can use a credit card or an operating card, like a hotel room key, to slide through a magnetic strip. The card based system is the most commonly used because of its efficient user interface, but they are often more expensive. Other options include code-based locking, which has an electronic lock mounted on the bike. The individual uses a phone to call a number in order to access the code to the locking mechanism on the bike. These systems are popular because



Bike Shares Worldwide

Source Cited:

Meddin, Russell, Simmons, Jesse Luca, and Paul DeMaio. ""Bike-Sharing World Map"." In The Bike-Sharing Blog: MetroBike, LLC, 2011



Figure 3 Example of Denver B-cycle bike

Source Cited: "Denver bike share registration opens," cyclelicious

little infrastructure is required. Unlike the smart card system, there is no need for dedicated docking post with power. Other systems use keys that are dispensed from a kiosk after user identification has been confirmed. Small-scale systems frequently include an employee who is in charge of the docking stations. This person acts like a valet, receiving and delivering bikes.

The Stations

The bike stations should fit in with the surrounding area and have an aesthetic appeal, while being very visible to users and future users. Systems that have unfixed stations can be moved from one location to another to meet demand. These stations use solar power for the user interface and locking mechanisms. The bike share systems using fixed locks do not require stations and therefore can be locked at almost any location. Most stations are referred to as fixed-

permanent stations and include fixed docking points for bikes. The general rule is to have twice as many docking points as bikes at each station. This allows users enough spaces to be able to drop a bike off at a convenient station. Stations should be fitted with a user interfaces or a kiosk. These are similar to parking kiosks. The kiosk should have maps explaining where the bike share stations are located and where safe routes from station to station exist, up to date information on availability of bikes, membership and pricing information, as well as directions on how to use the systems. Stations and kiosks can be used as advertising space, which helps supplement the cost of a bike share system.

User Membership

Registration and membership is different from system to system. Most bike shares offer annual membership, as well as by month, week, day, hour and the number of minutes used. Membership can be accessed online, but typically individuals rent bikes at the user interface or kiosk. Most bike shares are designed for short one-way trips. Accordingly, bike rentals with annual, monthly, weekly or daily user times offer unlimited trips with the first thirty minutes of each trip free. This allows for increased bike availability, because people are aware of the additional charges and know the bikes need to be returned to the docking stations.

Management

Bike share systems are run by private, government, private and government, or non-profit organizations. Many of the bike share systems in recent years are



Figure 4 Capital Bike station in Washington D.C.

Source Cited: Ben Schumin, "Capital Bikeshare station outside of the Eastern Market Metro station," Wikipedia

contracted by a municipality and operated by a private company with bike sharing expertise. In some cases, the municipality will be a part of the planning process and in other cases the private company has complete control. In rare cases the local government sets up and manages the system. In this case, the bike share may be operated through the public transportation department. Bike shares that are operated through a private business or transportation company are intended for larger schemes in larger cities.³¹ In smaller schemes and

³¹ al., "Optimising Bike Sharing in European Cities."

communities, the municipality or a cooperation of non-profits is more likely to control the system.³²

The planning that goes into a bike share can be intensive and varies depending on the local government and environmental conditions. After the planning and implementation of a bike share, the maintenance to the system and bikes is very important. Individual repair workers should exist for the bikes and the stations. These workers may be employed by the municipality, the private company or contracted through local bike shops. Simple maintenance, such as checking the gears and tire pressure, should be performed regularly. Stations need periodic maintenance for locking mechanisms, interfaces and power sources.³³

A very important system maintenance issue is the redistribution of bikes. It is unavoidable that there will be too many or too few bikes at certain stations. The shifts of bikes from one station to another will vary depending on the time of day and other factors. Therefore, employees need to manually redistribute the bikes. Some operators use vans or peddle power to move the bikes around. Some bike share systems offer incentives, such as free rides or credit, for users who move bikes from full stations to empty ones. The redistribution of bikes is of environmental concern if they are being trucked around the city. One positive aspect of bike shares is that they negate the burning of fossil fuels from shifting auto-commuters to bike-commuters. This is negated if there are many trucks and vans being used to redistribute bikes. This should be acknowledged by planners

³² Ibid.

³³ Antoniades, "European Best Practices in Bike Sharing Systems".

of systems and avoided by carefully designed station locations, the right number of bikes, and innovated ways to redistribute bikes to empty stations.

CHAPTER 2

CASE STUDIES

The goal in studying the following bike share examples is to pull successes and failures out of various systems launched across the United States. The oldest system has been in operation for less than four years, so the research and development of these systems is still in the beginning stages. The data are limited and the true potential of these systems is still to be determined. This study aims to gain basic understanding of how these systems operate, what are the successes, and what can be improved. The following five case studies were selected based on the different qualities of the cities they reside in, as well as their success and their similarity to Athens, Georgia. The most important factor in choosing the studies was the size of the city. One very large city, one medium size city, two relatively small cities and one college campus were included in the selection. All have had initial success. For each case study, the actual station locations are displayed in figures. There are figures all scaled at one mile to show the extent of the station layout. The border of the extents of the stations was drawn around each station to show how much area the system covered, as well as to give a comparable size to the case studies and Athens.

Madison, Wisconsin B-Cycle

The purpose of my thesis is to apply bike share systems to small cities or large towns. Bike share systems are more common in the largest of cities, but

perhaps if designed appropriately they can work in smaller places. There are obvious reasons for bike shares to be in the largest of cities. Generally, they are located in areas of high density and mixed-use development. The current trend for many cities, big and small, is for cities to revitalize their downtowns.



Figure 5 Madison B-cycle station placement

Source Cited: "Madison B-cycle," B-cycle, <http://madison.bcycle.com/>.

Encouraging high densities with many mixed forms of land use both laterally and vertically are high priorities for many cities across the United States. If other design and systematic improvements are made to bike shares, it may be possible for this concept to work in smaller cities.

Currently, there are not very many examples of bike shares in the medium to small size cities, especially in the United States. In some cases, bike shares are developing at universities. These university bike shares provide useful information that can be examined and applied to bike share systems in smaller cities. Finding an example of a bike share system of a small city, in the range of 75,000 to 250,000 people, is more challenging. One good example is in Madison, Wisconsin, which has a total population of approximately 230,000 residents.

The system in Madison is known as B-cycle. The bike share has twenty-seven active bike stations with 396 docking points and 265 bikes.³⁴ For the 2011 season, there were 464 annual memberships and 6,412 total users accounting for 17,940 trips. Annual passes cost sixty-five dollars and student annual memberships cost forty-five dollars, which includes an unlimited amount of thirty-minute trips. Weekly and monthly passes are also available. The majority of users are students and downtown employees who use B-cycle for commuting.³⁵ Recreational users who do not live in Madison and those who use the system infrequently use the twenty-four hour passes.

The stations use lock mechanisms that can be unlocked and checked out by the use of a membership card fixed with a radio-frequency identification chip. The bikes and docking points are fixed with RFID readers in order to correlate the bike to the user's membership card. A public website exists for maintenance,

³⁴ "Madison Bike Sharing Program," B-cycle, <http://madison.bcycle.com>.

³⁵ Jake Ayres, "Urban Bike-Sharing Program Debuts In Madison, WI," no. May 26, 2011 (2011), <http://www.alternativeconsumer.com/2011/05/26/urban-bike-sharing-program-debuts-in-madison-wi/>.

customer service, and keeping track of bike trips. A great deal of the station's electricity is generated by solar power.

Station location is determined by three main factors. The first factor is visibility. This is a common determinant for many station locations because of the need to advertise the relatively new concept of bike sharing, as well as the need for advertisement space to be used efficiently. Another factor B-cycle uses for station location is whether the point can be used as a connecting station. These are stations that reside along bike paths or other trails that are converted for bike use. The last main factor for station location is whether the point can be classified as a destination station. These areas include the center of downtown and where there are many employment or entertainment destinations.

In general, there is not much collaboration between universities and towns when it comes to bike shares, but Madison is the exception. Madison's B-cycle has four station locations on the University of Wisconsin's campus, with UW sponsoring these stations. B-cycle communicates with various University of Wisconsin departments in determining needs for the stations and the bike share. When considering Athens and its relationship to the University of Georgia, it is important to note the high population of students, as well as the student's population close proximity to downtown. For a bike share to be successful and efficient, there should be a strong relationship between the university and the town.

The geography of Madison is very unique. Two lakes surround the downtown, where most of the bike share system is located. Downtown Madison

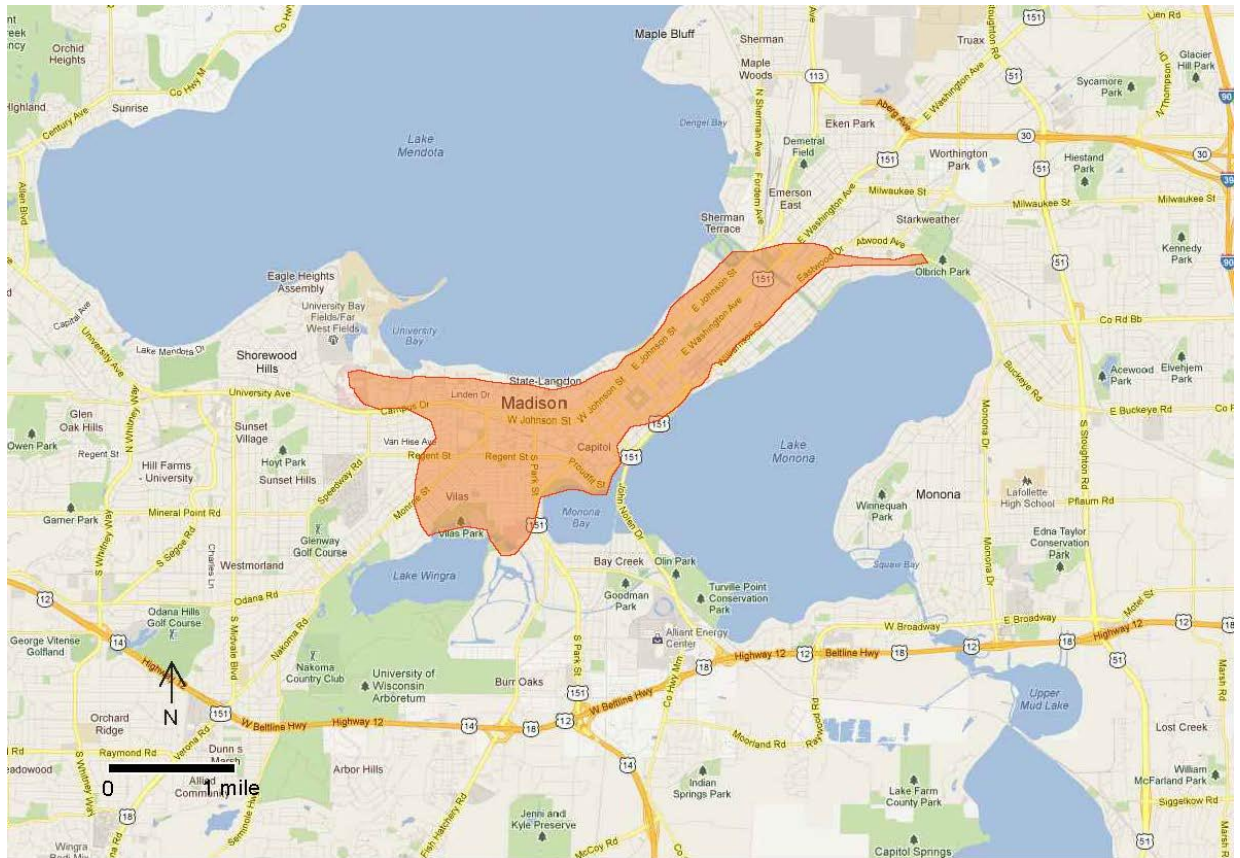


Figure 6 Extent of Madison's B-cycle stations

Source Cited: By Author

is an isthmus of land about two miles long and one half mile wide with the Mendota Lake on one side and the Monona Lake on the other. This area creates a natural funnel between the major land bodies in the north and south. Madison's downtown is a natural center, which probably contributes to its density. For the purposes of looking at the geographic functioning of a bike share system, this may make Madison unlike any other city. The entire area that the bike share system covers is roughly two square miles. For the size of the city, this is fairly typical. The streets and paths around Madison are constructed in a very defined grid pattern. For any sort of transportation, especially pedestrian and bike, this is

crucial for efficiency. Also, Madison has been praised for its bicycle network and is a model city in the United States for bicycle infrastructure.³⁶ It cannot be understated that in order for a city to consider a bike share, the bike infrastructure should be examined and updated to accommodate a greater bicycle use.

Madison is a good example to show how a bike share can work in a city that may not draw as many tourists as some of the other case studies. In Madison, the majority of users are commuters and are permanent residents.³⁷ Most bike share schemes are implemented for commuters and can enhance the public transportation scheme for tourists or day travelers in a city.³⁸

Denver B-Cycle

March of 2012 will mark the third year of existence of Denver's bike share. The Denver B-cycle program was "the first fully web-enabled credit card-operated bike share system based in the United States." There are fifty stations across the city with five hundred available bikes. Users of the bikes share must have a valid driver's license and be sixteen years of age. Many individuals in the Denver area use the bike share as a connector for light rail and bus rapid transit. Over twenty percent of riders use both public transport and bike share in the same day. The program shuts down for the winter months from December ninth

³⁶ Gena Kittner, "So Far, B-cycle bike-share program is glitchy," no. May 24, 2011 (2011), http://host.madison.com/wsj/news/local/article_88050bbe-8672-11e0-8055-001cc4c002e0.html.

³⁷ Claire Hurley, January 17, 2012.

³⁸ al., "Optimising Bike Sharing in European Cities."

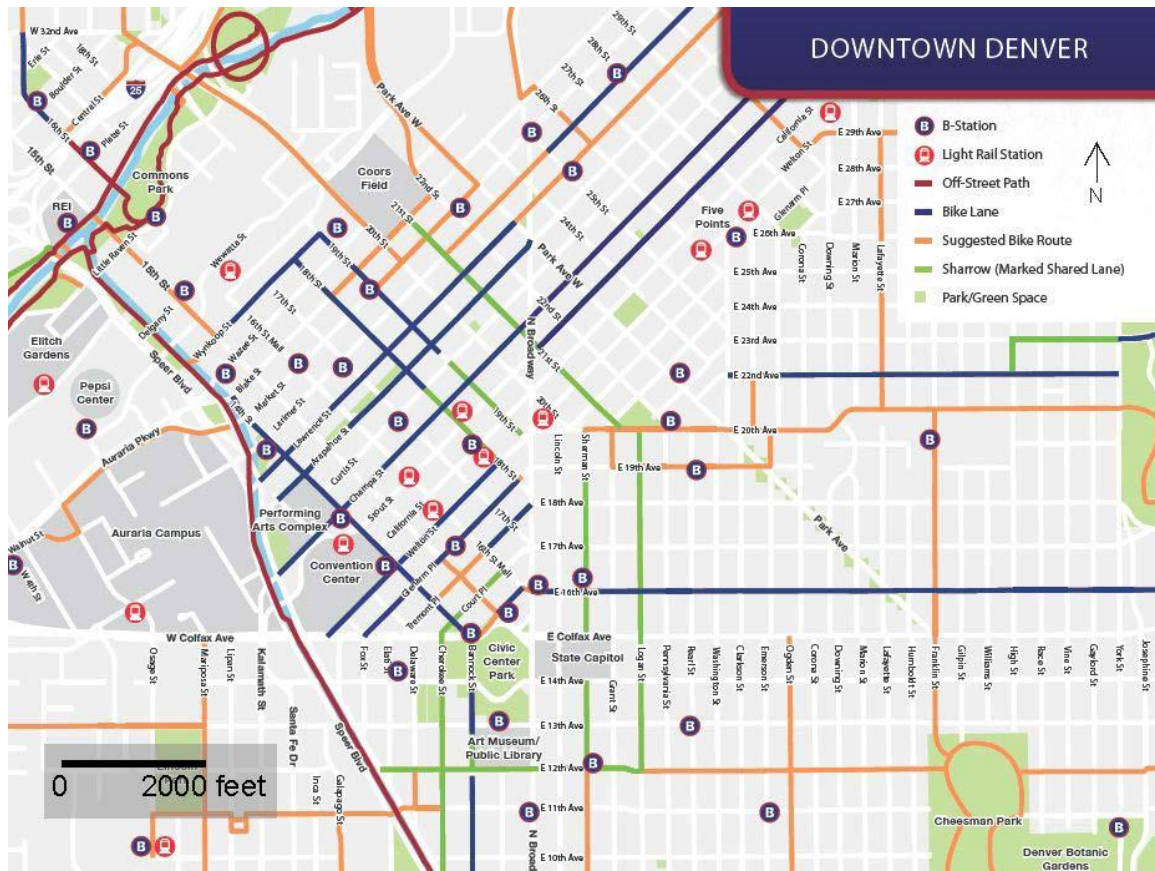


Figure 7 Denver's B-cycle station placement

Source Cited: "Denver B-cycle," B-cycle

through March twelfth. In the Denver B-Cycle's first season, the total number of rides was 102,981. The second season experienced a tremendous growth in use with some newer technology, but with the same size system. In 2011, the total number of rides for the second season was 202,731. There was close to thirty percent more memberships in the second season than the first season. First season members rode more often in the second season to raise the amount of rides by almost one hundred percent. The total number of miles ridden in the

second season was 431,817.³⁹ The average number of rides per day in the second season was well over one thousand.⁴⁰

The system allows for daily, weekly, monthly and annual membership. A credit card is required for membership and individuals may apply online or at any of the stations.

A survey was conducted over the course of the last calendar year to determine environmental and economic impacts, suggest that approximately

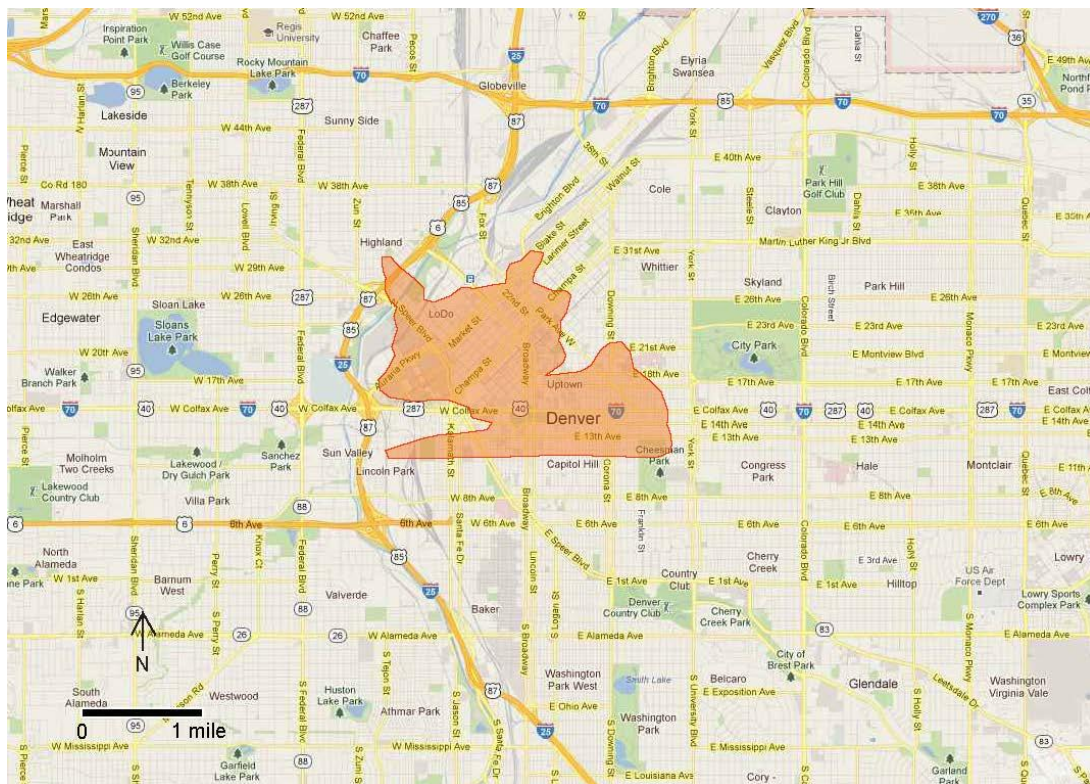


Figure 8 Extent of Denver station layout

Source Cited: By Author

³⁹ "Denver B-cycle," B-cycle, <http://denver.bcycle.com/News.aspx?itemid=185>.

⁴⁰ Sara Young, "Catching up with Denver's B-cycle," no. September 30, 2011, <http://momentumplanet.com/blogs/opinions/catching-up-with-denver-s-b-cycle>.

forty-three percent of users replaced car trips with bikes from the bike share. The total number of calories burned by users was nearly thirteen million with approximately 3,700 pounds shed. Approximately 31,500 gallons of gasoline was saved, amounting to \$104,000 in savings with an additional \$612,500 in car parking savings. It is estimated that there was 618,000 pounds of carbon emissions negated, as well as over nineteen thousand pounds of toxic air pollutants negated.

Groups called Humana and Bikes Belong were created in an effort to make Denver both a healthy and green city. These groups donated the first one thousand bikes. This initiated the creation of B-cycle LLC, which designed the Denver B-cycle program. The average cost of each Denver B-cycle station is fifty thousand dollars.⁴¹ In Denver, the operational costs are maintained by the membership charges and the system is managed and owned by a non-profit company.

Boulder B-cycle

The creators of Boulder's bike share had many goals when creating the system. They wanted a cheaper, more efficient, transportation option for all types of users that would improve the overall transportation infrastructure of Boulder. They wanted to improve the quality of health and life of the community. Improving the environment of the community, as well as offering a financially sustainable transportation option were also goals of the bike share. Another goal was to reach low-income individuals by offering an easily available and affordable

⁴¹ Ibid.

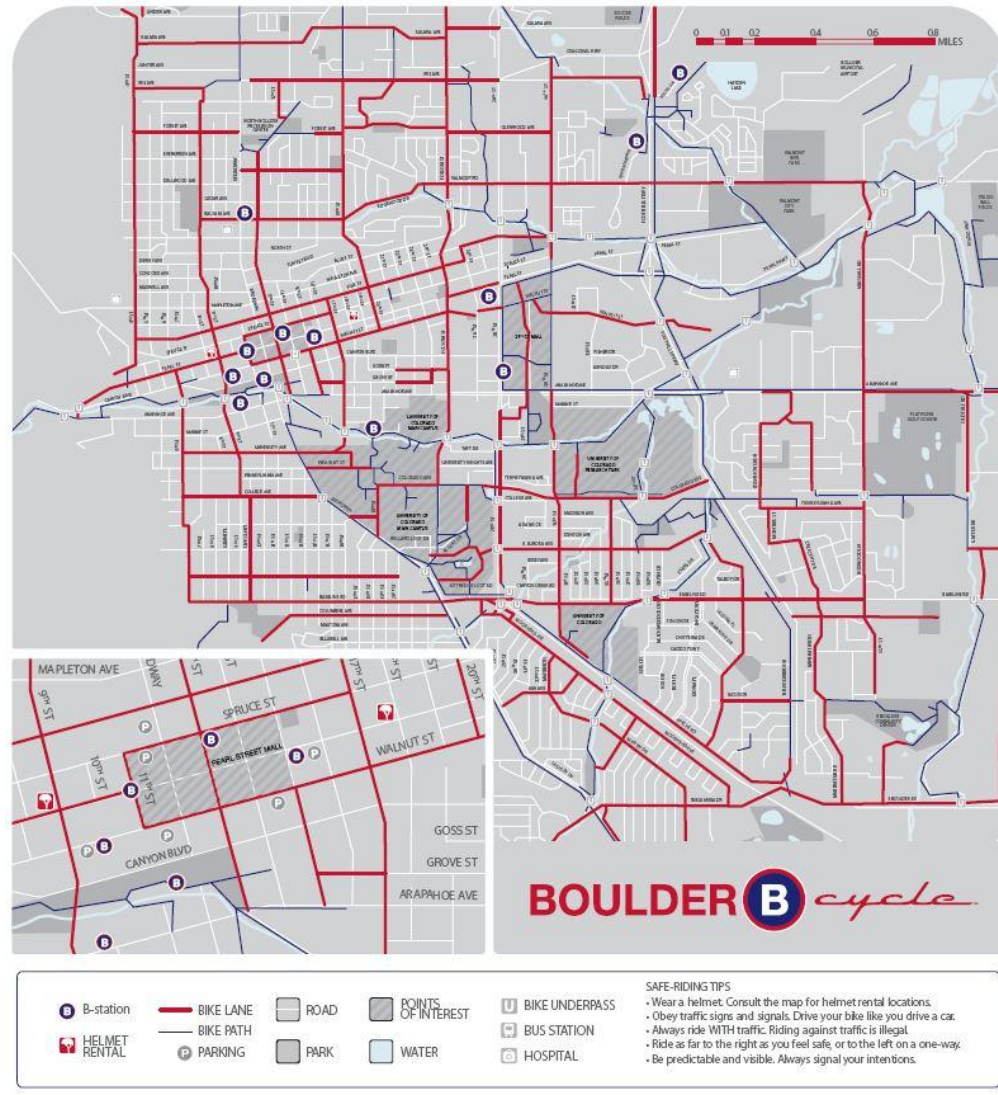


Figure 9 Boulder B-cycle station placement

Source Cited: "Boulder B-cycle," B-cycle, <http://boulder.bcycle.com/>.

means of transportation. The system began with twelve stations and then quickly expanded in the first few months to fifteen stations. There are currently a total of 110 bicycles.

Similar to Denver, Boulder has surveyed users for the preceding calendar year to determine the environmental, economic, and health impacts of the bike

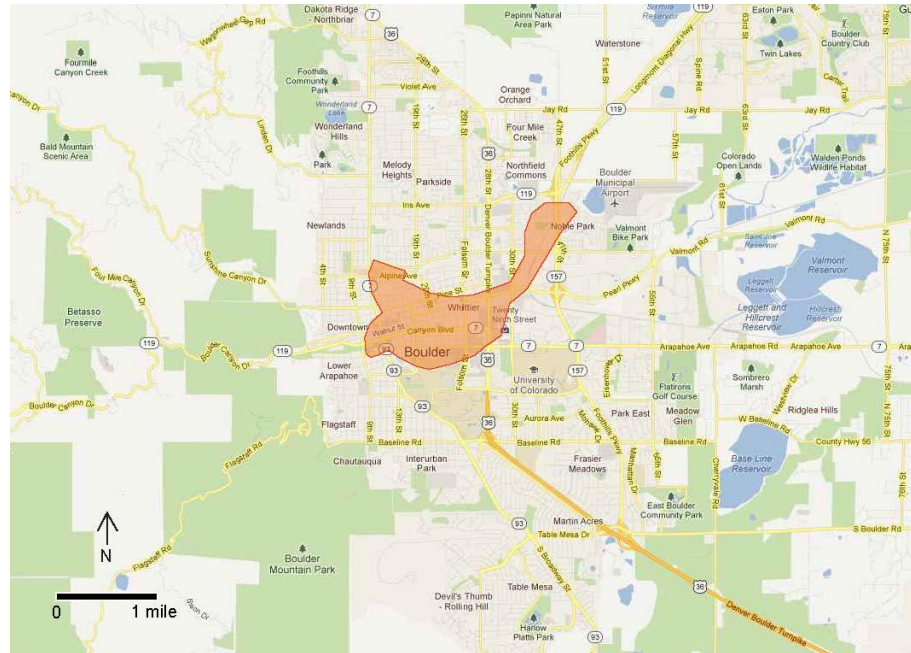


Figure 10 Extent of Boulder's B-cycle station layout

Source Cited: By Author

share. Approximately seven months after the system's launch, there have been twelve hundred annual memberships, six thousand daily users, and a total of 18,500 bike trips. It is estimated that there has been 104,000 pounds of carbon emissions negated and twenty seven thousand gallons of gasoline saved. It is also estimated that Boulder B-cycle users have burned forty-four million calories. There was an average of 120 checkouts each day and with each bike being checked out an average of a 127 times. The creators were pleased to find out that most of the trips uses were under the thirty-minute window. An interesting statistics is that one third of the trips were round trips, when a bike is checked out and returned to the same station. Most individuals are using B-cycle to run errands, attend meetings, travel to entertainment destinations, recreate, or to

commute to school and work. Approximately twenty percent of individuals are using B-cycle in addition to other forms of public transportation, mostly the bus.

B-cycle has been funded fifty six percent through grants, twenty two percent through sponsorships, twelve percent through membership and usage fees, and ten percent through gifts. Grants have been awarded by all levels of government, as well as by foundations. The sponsorships have come from various companies that benefit from advertising on the bikes, stations and cards used in the bike share. The membership and usage fees come from the daily, weekly, monthly, annually and corporate memberships. The gifts come from donations by community companies and individuals. Boulder has split up their financial cost of B-cycle into capital expenditures and operational expenditures. The capital investments were eighty five percent grants and fifteen percent gifts at the launch of the B-cycle. The operational costs were covered through sixty four percent sponsorships and thirty six percent membership and usage fees.⁴²

Washington D.C. Capital Bikeshare

The first phase of the Washington D.C. bike share began in the summer of 2010 with forty-nine stations and four hundred bikes. Today, Capital Bikeshare consists of twelve hundred bikes and 140 stations. The city plans to expand the system to between four thousand and five thousand bikes in the next few years, due to its early success. Capital Bikeshare is owned by the local government and the D.C. Department of Transportation. A private bike share company,

⁴² "Boulder B-cycle 2011 Annual Report," (2011), <http://boulder.bcycle.com/LinkClick.aspx?fileticket=wrnQ-L2GXgl%3D&tabid=429>.

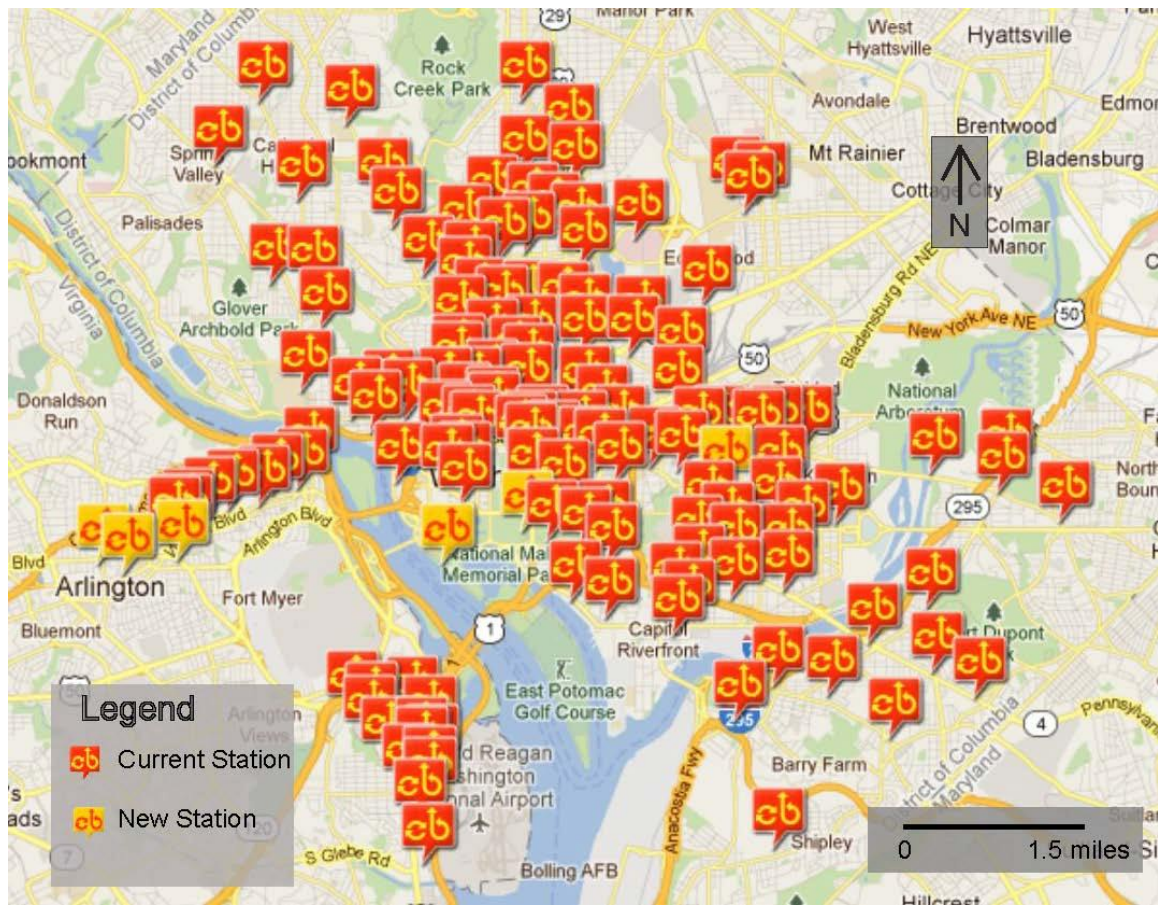


Figure 11 Washington D.C. Capital Bikeshare station layout

Source Cited: "Station Map," Capital Bikeshare, <http://www.capitalbikeshare.com/stations>.

'Alta Bike Share', operates it. Alta Bike Share is in charge of the bike and station construction, maintenance, and customer support.⁴³ Washington D.C. employs a full-time staff of bike and station repairers and workers who redistribute bikes both by van and pedal power.⁴⁴

⁴³ Melanie D.G. Kaplan, "D.C. unveils country's largest bike share program," no. November 15, 2010, <http://www.smartplanet.com/blog/pure-genius/dc-unveils-countrys-largest-bike-share-program/4940>.

⁴⁴ Ibid.

The stations are all solar powered and shut down automatically when not in use, which is a very energy efficient design. The stations are based on the stations used in the BIXI system in Montreal.⁴⁵ There are one third more docking points than the total number of bikes.

Membership can span one day, three days, by months or by years. The monthly and annual memberships require a credit card payment and a security deposit.⁴⁶ Station locations were selected based on population density, employer density, and locations of other public transit.⁴⁷

Other than the membership charges and usage fees the municipality has supplemented start up cost as well as running cost. The initial cost was supported through the U.S. Department of Transportation's Federal Highway Administration's Congestion, Mitigation and Air Quality fund.⁴⁸ The first 100 stations cost about five million dollars and operations have totaled about \$2.3 million each year.⁴⁹ In the initial phases, D.C. aims to pass more of the operational cost to membership fees and more advertising efforts. A special exception to the legislation of advertising on city owned property has been

⁴⁵ Christy Goodman, "Expanded bike-sharing program to link D.C., Arlington," no. May 23, 2010 (2010), <http://www.washingtonpost.com/wp-dyn/content/article/2010/05/21/AR2010052102745.html>.

⁴⁶ "Frequently Asked Questions Capital Bikeshare," Capital Bikeshare, http://capitalbikeshare.com/faq#how_do_i_member.

⁴⁷ "DDOT Releases District Bikesharing Locations, Maps," no. July 20, 2010, <http://www.myfoxdc.com/dpp/news/dc/ddot-releases-district-bikesharing-locations-maps-072010>.

⁴⁸ "Capital Bikeshare, Largest Bikeshare Program in the United States," The District of Columbia, <http://www.dc.gov/DC/DDOT/About+DDOT/News+Room/Capital+Bikeshare,+Largest+Bikeshare+Program+in+the+United+States>.

⁴⁹ Kaplan, "D.C. unveils country's largest bike share program".

passed to allow for advertising on bikes, kiosk and stations. The bike share spans two municipalities, the Washington D.C. side and a smaller area across the Potomac River in Arlington, Virginia. The Arlington start-up costs were just under one million dollars. They were funded through grants from the Virginia Department of Rail and Public Transportation and the Arlington County transportation as well as a few private sponsors.⁵⁰

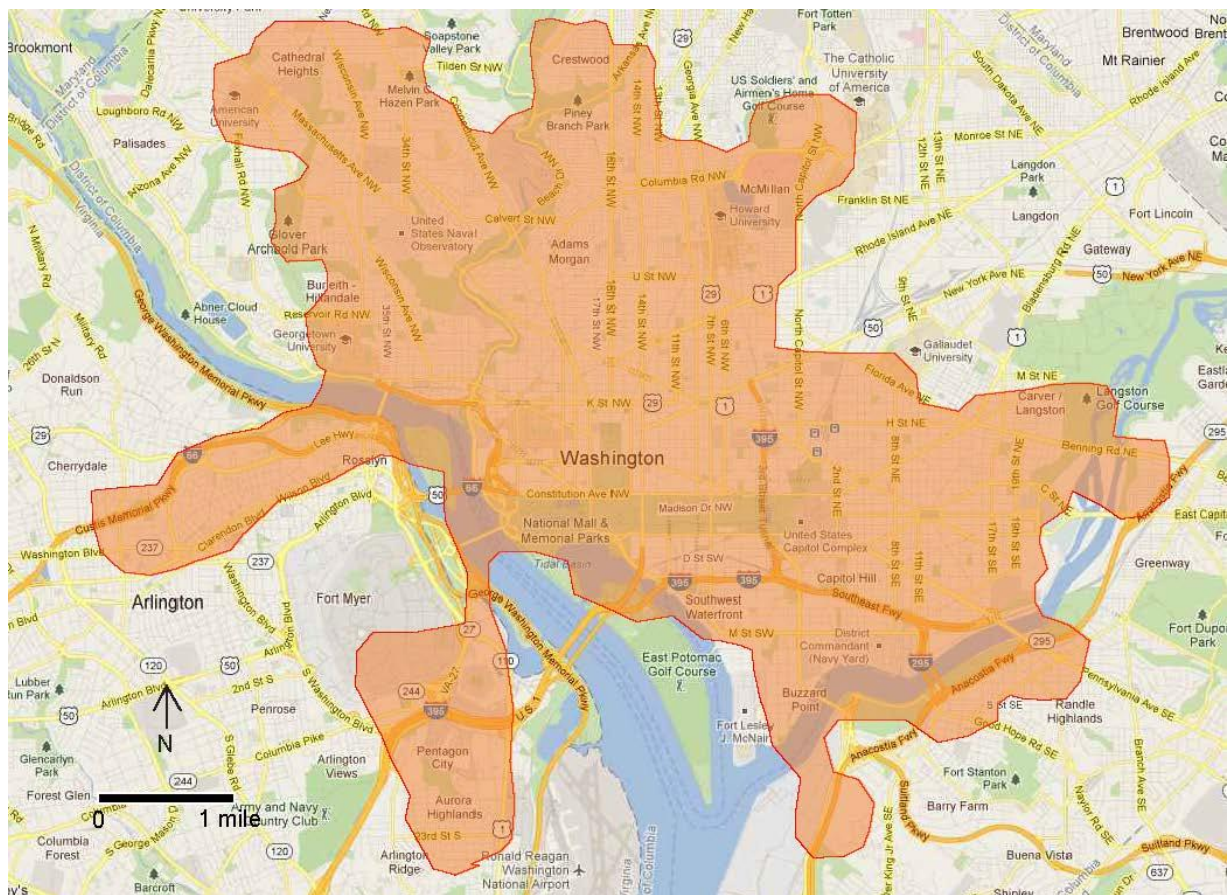


Figure 12 Extent of Washington D.C. Capital Bikeshare station layout

Source Cited: By Author

⁵⁰ "Capital Bikeshare, Largest Bikeshare Program in the United States".

One of the major problems encountered by the Capital Bikeshare is that stations become either too full or too empty. If the terminals are too full, then the user is given an extra fifteen minutes on the bike and told where the nearest terminals with empty slots are.

Theft and damage have not been major problems for the D.C. system. Generally, if a user files a police report when the bike is damaged or stolen and the user is found not to be at fault then there is no penalty.⁵¹

No major accidents have been reported as a result of the D.C. bike share. There is no helmet law for bikers above the age of 16. However, there are suggestions for user to wear a helmet located at the stations. There are discounts given for Capital Bikeshare pass holders on bike safety classes and on helmets sold by local bike companies.

University Bike Share Program at Washington State University

There have been bike shares launched at scales smaller to the municipal level and closer to a community size. Such successful systems have come about on college campuses. Among the first of this kind in the United States is the Green Bike Program at Washington State University. It began as a very simple system with only five bikes that were used by approximately 350 different students and staff. The bikes were lightly used, just over two times a day. In 2009, the Environmental Wellbeing Department requested the Student Activities fee provide more funds to expand the bike share. They were able to purchase forty trek mountain bikes and expand the system to cover the majority of the campus.

⁵¹ Kaplan, "D.C. unveils country's largest bike share program".



Figure 13 WSU Green Bike station placement

Source Cited: "Washington State University Greenbike," Washington State University

This type of system is fairly low tech and basic compared to most bike shares. Typical manual locks were used and normal bike racks were used throughout the campus.

Despite the simplicity of the bike share, the program had large number of users and the bikes were checked out 2,800 times, logging about twelve hundred total miles over the course of the preceding year. This initial success led to an additional request of funds that was granted through student activity fees. These funds were used to contract the company BIXI from Montreal to build automated stations and locking mechanisms. The campus now has nine stations and ninety-five bikes. There have been five thousand individual users with over ten

thousand bike checkouts from September 1, 2010 to September 1, 2011.⁵² The program is free for university employees and students.

The system uses RFID chips to check the bikes in and out and to monitor the bike's locations. The system is set up so that students can use their student I.D. cards for checking the bikes in and out.

The station locations were determined by several factors. The first had to do with the property that was owned and maintained by the University Recreation Department and other departments that maintained a regular relationship with the URD. Surveys were taken on campus in which students were asked what they believed would be the best locations for new stations. Accordingly, many of the stations were built near resident halls. Each station has approximately 10 bikes and costs \$35,000 to \$40,000. To date, WSU has spent approximately \$400,000 on the entire system, excluding operational cost. The cost of labor for the system totals approximately \$9,000 a year. Maintaining the entire system including software is approximately \$13,000. The wireless communication service is an additional \$3,300 per year. BIXI includes a 5-year warranty on software and equipment.

There are three members of the staff that are in charge of making bike repairs, working an average of twenty-four hours a week. There is one additional graduate student employee. The program is somewhat overwhelmed and will be hiring more full time employees. The five case studies have shown that bike

⁵² Ibid.



Figure 14 Extent of WSU Green Bike station layout

Source Cited: By Author

shares can exist successfully at varied scales and in cities with different population numbers. Based on this research density is more of an indicator for bike share success, where as population numbers may indicated the size of the bike share, such as how many bikes and stations would be appropriate for a given area.

All of the case studies use automated systems and in the four larger cities have private companies managing the systems for the municipality. Most of these systems have not met there full potential and are still growing by adding bikes and stations. For Boulder, Denver, Madison and Washington D.C., there

maximum bike share capacity is unknown and this should be taken into account when planning for another city and comparing potential size of these bike share programs.

CHAPTER 3

BIKE SHARE FEASIBILITY STUDY FOR ATHENS, GEORGIA

Unique Factors for Athens

There are many factors to consider when exploring the possibility of a bike share for a smaller city. Several fundamental elements are necessary for the bike share's success. The physical components, such as bikes, stations, and technology should be carefully examined. The initial analysis involves planning the system, performing a demographic analysis, exploring cost and funding options and deciding which people in the community to involve. Defining success for system is also an important first step. However, the most critical initial step to beginning a bike share system for a smaller city is to examine the unique features of the locality where the bike share will operate.

Municipal Factors

Athens-Clarke County covers 118 square miles and has a population of nearly 117,000 residents. There are two elements that make Athens a unique place for a bike share. The first factor is that the University of Georgia is located in the heart of Athens and has a very high concentration of students. The second factor is that Athens is a unified municipality with Clarke County.

The University of Georgia has a built up area of 615 acres, almost one square mile, has nearly 35,000 students, and is the most defining asset of Athens-Clarke County. A large percentage of employees in the community are directly or indirectly connected to the University of Georgia. Established in 1785,

the University of Georgia was the first chartered public universities in the country. The city of Athens and the University of Georgia have both grown for centuries and have defined each other in many ways.

Many challenges arise out of this type of symbiotic relationship. One such challenge is the phenomenon known as the 'town-gown effect'. Cooperation between universities and cities is generally in the best interest of both parties. Unfortunately, symbiotic relationship is not always the case. Locals may view students as transients that do not respect the town, because many of them will soon move away. Towns may feel like the university is in a privileged position to assist the town with research and development, including the sphere of planning. Characteristics of the town, such as a large population of low-income residents and high unemployment, may add pressure to the planning department of a university to study local areas and assist the city in philanthropic ways.

The assistance provided by universities will likely be different than that of private companies. When exploring the existence of a bike share in Athens, it is important to realize these relationships. Cooperation between the University of Georgia and the town of Athens will be critical in the creation of a public bike share. Both the university and the city have different types of zoning, regulation and property ownership. The maintenance of the university stations should be funded through the university, while still being managed and coordinated within the entire system.

The fact that approximately thirty percent of Athens' population is made up of students for most of the year should not be overlooked. The bike share can

offer much needed transportation to many students. Students without cars and those who prefer not to pay for a campus-parking pass can benefit greatly from a bike share. Seventy-three percent of students at the University of Georgia lived off campus for the 2010 year.⁵³ Therefore, the University of Georgia ranks in the upper third of the number of students living off campus at a public university. In this situation, a bike share system can provide assistance to students commuting to and from campus.

The high student population may pose some problems for a bike share. Students may have less respect to the bike share system than the average residents may possess. Higher vandalism and theft rates could occur in a college town. The bikes and stations are expensive and additional efforts may be needed to deter theft and vandalism of the bikes and stations. Limiting the hours of use, so that the bikes are not available during late night hours and early morning hours may provide deter theft and vandalism. Placing the stations in well lit, well-traveled areas are strategies that can ease these potential issues. Consideration of these strategies should be examined during the station design and implementation phases.

The merged municipality of Athens city and Clarke County, which occurred in 1991, makes for a unique approach to a bike share in Athens city proper. On one hand, the unified government may create more resources in terms of funding and expertise in various fields to assist with the implementation of a bike share program. It should be noted that the region consists of a

⁵³ "America's Best Graduate Schools," 2011.

moderately dense city at the center, with large areas of land around the outer edges towards the perimeter of Clarke County. Density is an important consideration in determining the number of bikes needed, the number of stations needed, and the stations' locations. Planning a bike share for the entire county is probably not feasible in terms of density and the bicycle infrastructure network. The density of Athens-Clarke County is approximately 852 residents per square mile.⁵⁴ This is extremely low compared to most cities. However, when looking at a bike share system for Athens proper, the boundaries of which will be discussed later in this thesis, this density estimate changes. The density is much higher when the rural area that was previously outside of the city limits is excluded.

Geographic Factors

Athens has specific geographic and topographical conditions that need to be taken into consideration. Situated in Northeast Georgia, Athens is in a humid subtropical climate zone. The summers are long and the winters are mild. Generally, bike shares in climates similar to Athens can operate year round.⁵⁵ This is a great advantage, because the system is always available for customers. Theoretically, there is less time spent taking down stations and moving bikes around for the off-season making the system more efficient and affordable.

The topography of Athens can be described as fairly hilly. This makes it slightly more difficult to ride the bicycles from one station to another. Generally people prefer to not ride up hills. Stations that are located downhill from other

⁵⁴ "Athens-Clarke County Unified Governemnt," <http://www.athensclarkecounty.com/index.aspx?NID=118>.

⁵⁵ al., "Optimising Blke Sharing in European Cities.", 32

stations will often have an influx of bikes, while stations located up hill from other stations may have empty docking points. Having some electric bikes added to the system at stations near the bottom of hills could help encourage users to get to the stations located at the higher elevations. This should be taken into account when designing the station locations and number of docking points available at these stations. For the case of this study, the topography will be an important factor in station placement. The stations will be placed at elevations of medium height to lower elevations and will not place stations at the highest elevations.

Bike Infrastructure

Another essential factor for any city planning a bike share is bicycle infrastructure. When starting a bike share, it should be mandatory to examine whether the city has the appropriate bike infrastructure to have a safe and efficient system. The United States is more car dependent and has a much weaker bike infrastructure when compared to Western European countries, where bike shares are much more common. However, local governments in the United States are becoming more aware of the need for additional bike infrastructure. One example is that the U.S. Federal Highway Administration recently legalized contraflow bike lanes.⁵⁶ These are bike lanes that flow against automobile traffic. This also allows for bike lanes to flow against traffic in one-way streets. It can be argued that this is safer than bike traffic flowing in the direction of automobile traffic.

⁵⁶ Itir Sonupariak, "Contraflow Bike Lanes Deemed Acceptable by the U.S. Federal Highway Administration," no. March 22, 2011 (2011), <http://thecityfix.com/blog/contraflow-bike-lanes-deemed-acceptable-by-fhwa/>.

Other movements encouraging improved bike infrastructure are made by organizations like the League of American Bicyclists. These organizations have given states and local municipalities concrete objectives to work on in order to improve the areas bicycle culture. These organizations give grades to local municipalities and states based on different aspects of bicycling, such as legislation; policy and programs; infrastructure; education and encouragement; evaluation and planning; and enforcement. The states are ranked from one to fifty. Exceptional municipalities are given a public reward in the form of a bronze, silver or gold ranking.⁵⁷ For local leaders, this initiative provides concrete goals and a plan to achieve them. At forty, Georgia does not rank well.⁵⁸ However, Athens-Clarke County is one out of only three municipalities in the state to get at least a bronze ranking.⁵⁹

Another initiative that has been highly publicized and is beneficial for bicycling is 'the complete streets movement', by the Complete Streets Coalition. This organization promotes streets as areas for different types of users and not just automobile users.⁶⁰ Some of the major concepts include encouraging mass transit and more available public transportation options, traffic calming, and improved pedestrian and bicycle infrastructure. In his article 'Are Complete Streets Incomplete?' Gary Toth describes a way to understand the improvements

⁵⁷ "Bike Friendly America," League of American Bicyclist, <http://www.bikeleague.org/programs/bicyclefriendlyamerica/>.

⁵⁸ Ibid.

⁵⁹ Ibid.

⁶⁰ "National Complete Streets Coalition," National Complete Streets Coalition, <http://www.completestreets.org/>.

as to “think of streets as public places.”⁶¹ In the United States, streets can take up nearly one-third of a municipalities land.⁶² This space could be used more efficiently for users of many types of transportation, not just automobiles. The Complete Streets Coalition offers guidelines and design concepts for street changes at the federal, state and local level. There are advocates in Athens who encourage local municipal leaders to join in this movement. As of now, the Complete Streets Coalition has not recognized Athens-Clark County as a role model municipality.

Cities across the United States are showing dramatic cycling and pedestrian improvements by replacing car trips with biking and walking. In the case of Minneapolis, these changes have occurred through the use of pedestrian and cycling initiatives and investment in progressive infrastructure. Some of the improvements have occurred through the Non-Motorized Transportation Pilot Program. This is a federally funded program aimed at making local improvements in alternative transportation systems and finding creative ways to improve transportation across the United States.⁶³ Since 2007, when this program was launched, biking has increased fifty-three percent in Minneapolis.⁶⁴ Since the launch of this initiative, Minneapolis is considered one of the best cities in the United States for biking and walking.

⁶¹ Gary Toth, "Are Complete Streets Incomplete?," no. November 17, 2011 (2011), <http://www.pps.org/blog/are-complete-streets-incomplete/>.

⁶² Ibid.

⁶³ Jay Walljasper, "How to Boost Biking and Walking Even Further in Your City," no. December 20, 2011 (2011), <http://www.shareable.net/blog/how-to-boost-biking-and-walking-even-further-in-your-city>.

⁶⁴ Ibid.

Whether or not a city has a bicycle master plan and how progressive a plan, is another way to determine whether it has solid bike infrastructure. A bike master plan is a planning document that addresses the plans the city has to improve the cycling infrastructure, typically over the course of the following a ten year span.⁶⁵

There are different ways to determine how bike friendly a city is. One way is to compare the miles of purely dedicated bike trails and bike lanes across the city with the total distance of roadway within the bike share study area. Another way is to compare the amount of money that is dedicated annually to bike infrastructure to the total amount of money dedicated to other transportation efforts.⁶⁶ If adequate infrastructure does not exist, a bike share may not be feasible or improvements may need to be made to the infrastructure before or during the implementation of a bike share.

Demographic Factors

In Athens, commuter biking should be a priority for a bike share, because the city is the county seat, has a high density of office, retail and residential buildings located downtown, and has the abundant student population. The type of people who use bicycling as commuter transportation are typically between the ages of eighteen and thirty-four and have higher levels of education.⁶⁷ Athens-Clarke County fits these categories. Athens is higher in level of education and

⁶⁵ Allisa Walker, "What L.A's New Bike Plan Means For Cyclist-and the City," no. March 2, 2011 (2011), <http://www.good.is/post/what-l-a-s-new-bike-plan-means-for-cyclists-and-the-city/>.

⁶⁶ al., "Optimising Bike Sharing in European Cities."

⁶⁷ Cooper, "The UBC Public Bicycle System Feasibility Study."

percent of the population between the ages of eighteen and thirty-four than the national average and the Georgia average.⁶⁸ Other potential users that should not be overlooked are residents that live near or in downtown. These residents may have chosen to live in downtown because they do not have a car. A bike share will allow individuals to travel places that are too far to walk. These factors are taken into account when planning the station placement.

Population Issues

The population of Athens is a unique factor to be examined, of importance penultimate to density. With a population of approximately 117,000, Athens is a small city compared to other cities in the United States that have launched bike shares. Only four other cities in the United States that have bike shares have smaller populations than Athens, two of them being on college campuses.⁶⁹ The city of Boulder is most similar to Athens, due to its university, population size and density. Des Moines and Madison are also similar to Athens, with higher populations of just over 200,000. Western Europe has countless systems in cities with populations under 100,000 people.⁷⁰ It is possible to have a successful system in a city with a smaller population. The design, technology and funding of the system needs to be tailored to a smaller city to make a system successful in Athens. All of the unique factors that apply to Athens should be acknowledged and compared to other cities that have had successful bike share systems in order to determine a specific recommendations to Athens.

⁶⁸ "U.S. Census State & County Quickfacts," U.S. Census Bureau, <http://quickfacts.census.gov/qfd/states/13000.html>.

⁶⁹ Meddin Title of Weblog.

⁷⁰ Ibid.

Defining Success

One of the first steps in starting a bike share is to define success.⁷¹ Bike share planners should define the positive benefits that can be gained from the bike share. These benefits should answer the initial problems that existed when the need of the bike share was determined. The city of Athens has problems due to a car-centric culture. Problems exist with the availability, connectivity and underused nature of public transit.

Some success indicators that can be monitored are: Does the bike share negate trips that would have otherwise been taken by car? Does the bike share system successfully connect other forms of public transportation? Does the bike share decrease carbon emissions and decrease the amount of gasoline used? Have users in the community experienced positive health related benefits from using the bike share? What is the calorie expenditure of users of the bike share? These success indicators can be measured by polling users to find out if they have transferred some of their car trips to bike trips and by tracking the total amount of mileage the bike share has totaled over a certain amount of time. Data regarding decreased pollution would be very hard to analyze on a local level because of the regional quality of air pollution.

Other success indicators pertain to the efficiency of the bike share's management. These indicators are: How many trips per day and per year have bikes been used? Has the number of bikes, station placement and number of docking points been sufficient for the system to efficiently operate? How many

⁷¹ al., "Optimising Bike Sharing in European Cities.", 32

reports of vandalism and theft are there? Is the bike share safe and have there been relatively low accident rates since the system was launched? Has the system reached diverse population types and/or has the system reached the intended demographic? This is particularly important in the pilot phase of the bike share, if there are multiple phases of implementation.

For the bike system to be successful, the managers of the bike share need to keep track of these success indicators in the beginning phases of development, as well as during the growth of the system. Having global positioning systems connected to bikes and stations can be a useful tool for managers to keep track of these success indicators.

CHAPTER 4

SUGGESTED GUIDELINES FOR AN ATHENS BIKE SHARE

The purpose of this final chapter is to determine the best practices and suggestions for Athens, Georgia if a bike share is implemented. This section is also useful for other cities that have similar characteristics to Athens. The suggestions made come from the conclusions about the information presented in previous chapters. The B-cycle systems in Boulder, Colorado and Madison, Wisconsin are particularly referenced as best examples for Athens, because of the similarities between these two cities and Athens. Technology, types and numbers of bikes, number and location of stations, system management, who should be involved in planning the system, cost and funding, and a timeline of for the implementation phase are discussed for a bike share in Athens.

System and Technology

The first consideration is whether to use a manual or automated locking system. Both have benefits. The manual style requires individual locks on each bike and uses a traditional key or code lock. Bikes can be dropped off at any location where the bike can be easily locked. The major advantage to this system is that it is inexpensive. All that is required is the bike and the lock. The disadvantages are that the bikes are very hard to track and there are no stations, so the users have to stumble upon an available bike. There is no proof of the

users renting the bike, so it is impossible to hold an individual accountability for a lost or damaged bike.

Manual systems are not used frequently in the United States. These systems are more common in very small communities, where it is not very hard to locate a bike because of the small geographic scale. The manual system is considered a second-generation system because first generation systems are more primitive.

Automated systems are classified as third or fourth generation bike shares depending on the specific technology. Automated systems are the most commonly used locking system and is used by all the case studies. The components of an automated locking system include electronic locking mechanisms, usually on the docking points at dedicated stations with an electronic kiosk. The advantages of this type of system are that the bikes are very easy to track, there are dedicated station locations, and easy user interfaces are very efficient and reliable. The disadvantage is that they are relatively expensive, because planning is required, in addition to the cost of capital infrastructure and managing and maintaining the system. The permanence of the station locations and the expensive nature of these systems means the municipality investing in the system needs to be very committed to the system and the system needs to be initially planned for ultimate efficiency.

If Athens plans a large-scale bike share with forty or more bikes, the automated system would be the better choice. In the manual 'Bicycle-Sharing Schemes: Enhancing Sustainable Mobility in Urban Areas' published by the

United Nations Department of Economic and Social Affairs, Peter Midgley advises “that both automated and manual systems would be appropriate for smaller towns” (50,000 – 200,000).⁷² If Athens or separately the University of Georgia wanted a small-scale system with twenty to forty bikes, then a manual system might be a better choice. Athens has the potential to mimic the size of B-cycle in Boulder, somewhere in the vicinity of two hundred bikes and twenty-five stations, because of the size and density of population. An automated system for the city of Athens and the University of Georgia would be the most appropriate bike share system.

The stations in Athens should include a kiosk so that users can check out and return bikes efficiently. The station size should be approximately three and half feet wide per bike plus about six and half feet in length.⁷³ There should be at least a third extra docking points per bike available at the station. A station intended to fit ten bikes should be at least fifty feet by six and half feet.

A website should be dedicated to the bike share system. The site should include up to date information on the location of bikes and stations. The site should have subscription information, membership options and other relevant information for the bike share. Other additional infrastructure should include way finding. Routes with the most bike infrastructure should be designated and shown at the kiosk, on the website and on signage throughout Athens.⁷⁴

⁷² Midgley, "Bicycle-Sharing Schemes: Enhancing Sustainable Mobility in Urban Areas."

⁷³ German Dector-Vega, Charles Snead, and Alex Phillips, "Feasibility study for a central London cycle hire scheme," ed. Transport of London (2008).

⁷⁴ Ibid.

Number of Stations and Bikes

The implementation of the stations and number of bikes can be determined in a couple of ways. Station placement can occur in a pilot phase of implementation. In this case, at least half of the number of stations and bikes, if not more, should be placed in the community. The first phase should place the majority of stations in downtown Athens. The pilot system allows the operator to work out the details of the system and fix potential problems for future stations.⁷⁵ However, pilot systems can be detrimental to the success of the system. Without the correct number of bikes or stations gaps can occur when the stations are not placed close enough together.⁷⁶ If the ideal number of total bikes and stations is determined to best suit the population then having less than that amount initially could result in an inefficient system and detour users.

The amount of stations depends on how many bikes will most efficiently support a bike share in the community and depends on population totals and population density. The population of Athens-Clarke County is about 117,000 people, a very similar size to Boulder and approximately half the size of Madison. These systems have had great success. Aiming for proportionally similar numbers of bikes and stations should provide an accurate gauge for Athens. However, because Athens municipality is combined with a county government, determining population density numbers that will compare to Boulder and Madison is difficult. An imaginary boundary can be drawn that is the target area

⁷⁵ "Translink Public Bike System Feasibility Study," ed. Translink South Coast British Columbia Transportation Authority (2008).

⁷⁶ Dector-Vega, Snead, and Phillips, "Feasibility study for a central London cycle hire scheme."

for a bike share in Athens. The population density will be determined inside of this boundary. This area was determined by a three-mile radius starting from downtown Athens, at the intersection of Hull Street and Broad Street. This intersection was chosen because it was the best point that centered near downtown and the surrounding populations. A three mile radius was used because this appears to be the approximately the right size for a bike share and it was the radius used by a bike study conducted in 2003 by the town of Athens-Clarke County.⁷⁷ To determine a more correct population density for Athens, all tracts that have areas mostly inside of this three-mile radius were taken into consideration. Census tracts 1, 4, 6, 9, 12, 17, 18, 19, 20, 21, 22, 301, 302, 1503 and 1506 were the tracts used. The total area of these tracts is approximately 16.4 square miles with a total population of 51,872. That is a population density of approximately 3119 persons per square mile. This density is similar to other systems currently in place. This density is under Boulder's density by approximately seven hundred people and is approximately one hundred more than the Madison's density. Comparing the total number of bikes in the Boulder and Madison systems, along with Athens' total population and recommended practices from the Metrolinx' Bike share program investigation, which is an appropriate guide for municipalities in the United States, will give an accurate number of bikes and stations for Athens.⁷⁸

⁷⁷ Inc. Gray-Calhoun & Associates, "Bicycle Master Plan Report," ed. Athens-Clarke County Transportation Department (2003).

⁷⁸ "Bike Share Program Investigation:Phase 1 Report: Best Practices Investigation Final Report."

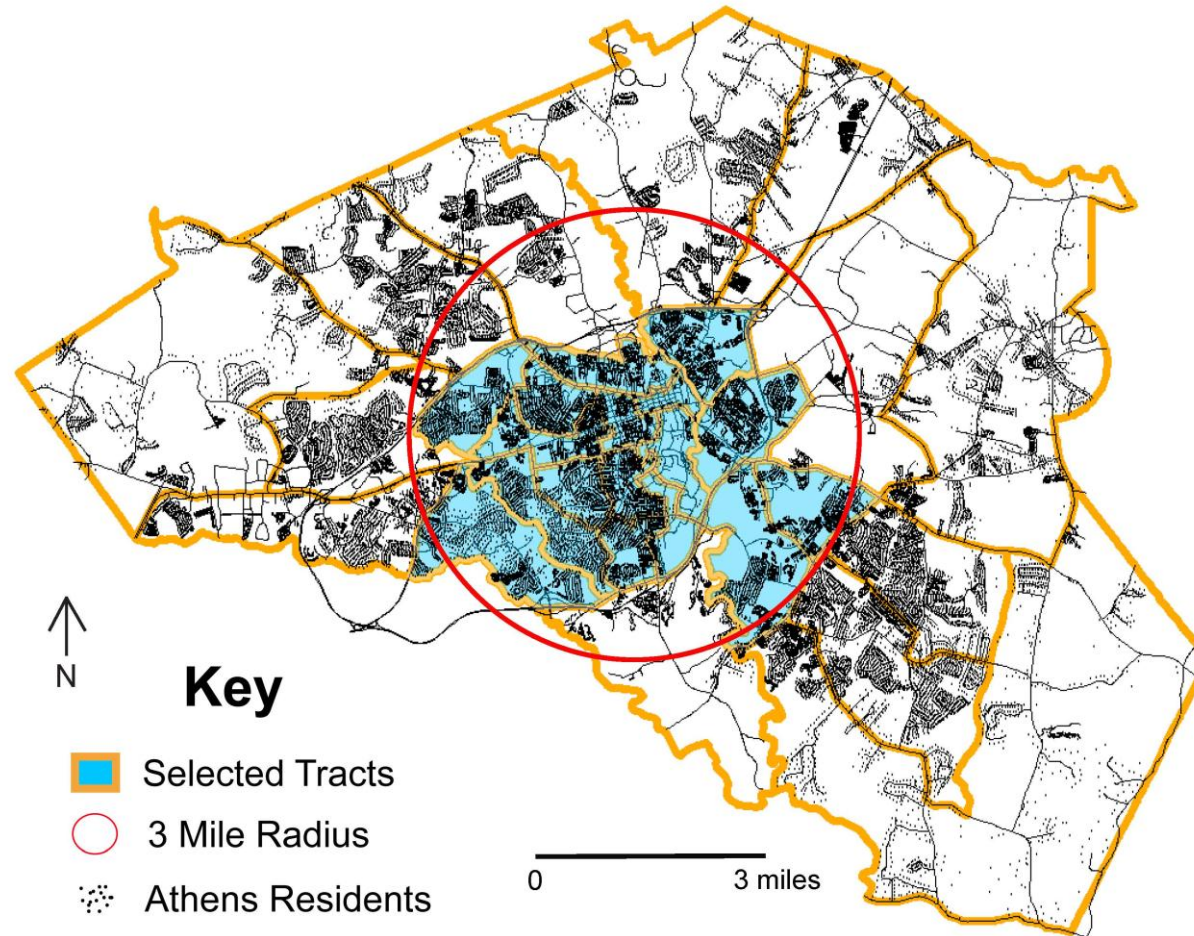


Figure 15 Selected census tracts with three mile radius

Source Cited: By Author

Comparing Athens total population of 117,000 and the density from the selected census tracts to Boulders total population of 97,385 with two hundred total bikes and Madison's total population of 233,209 with three hundred total bikes, a combined average of one bike per 632 people is determined. The European models suggest approximately one bike per sixty-seven people.⁷⁹ The Metrolinx guide to best practices suggests that there should be one bike per 175 people.⁸⁰ The Metrolinx guide is accurate for considering Athens, because their guidelines are based for Canada and the United States. Taking the average of 175 plus 632 should give an average that will be most efficient for Athens at one bike per 403 people. Since determining the density of Athens required taking the central census tracts in order to rule out the rural outer areas of Athens, taking the average number of Athens total population (116,000) and the selected census tract population (51,872) to determine a closer number of people who would be considered for the bike share. That is a total number of 83,936 people, which would account for about two hundred bikes.

Generally, the number of stations should be proportional to the total number of bikes in the system at about ten bikes per station. The average of Boulder's and Madison's stations per bike ratio is about nine bikes per station and the recommended number of bikes per station ratio is about ten to one. Ten bikes per station is appropriate for Athens. The total number of stations for Athens should be approximately twenty stations.

⁷⁹ al., "Optimising Bike Sharing in European Cities."

⁸⁰ "Bike Share Program Investigation:Phase 1 Report: Best Practices Investigation Final Report."

Station Locations

Determining station placement relies on many factors. The factors that had the most significant impact on this study were residential density, bike lanes, important cultural landmarks, grocery stores, vicinity to bus stops, popular destination points, slope, and governmentally owned property. The cultural landmarks included parks, shopping centers, schools and hospitals. The governmentally owned property included property owned by the State of Georgia, Athens-Clarke County or the University of Georgia. None of the station locations were determined by any one of these factors and all were weighted at differing scales. Residential density, bike lanes, important cultural landmarks, grocery stores, slope and popular destination points were all used in ArcGIS. The tool weighted overlay was used to proportionally rate in order of importance to determine best locations for station location. This overlay was then manually overlaid with bus stop locations and governmentally owned property. The station locations were then decided by initially starting at the best location according to the overlay nearest to the center of downtown and the rest of the station locations were spaced as evenly possible around the first station attempting to retain an average distance in between stations at about two thousand feet and in locations where the GIS overlay indicated. The stations at the outermost rings of the system were spaced with more distance than at the center to allow residents from surrounding areas to use the system to commute to the downtown stations.

Other considerations of station placement in the implementation phase are

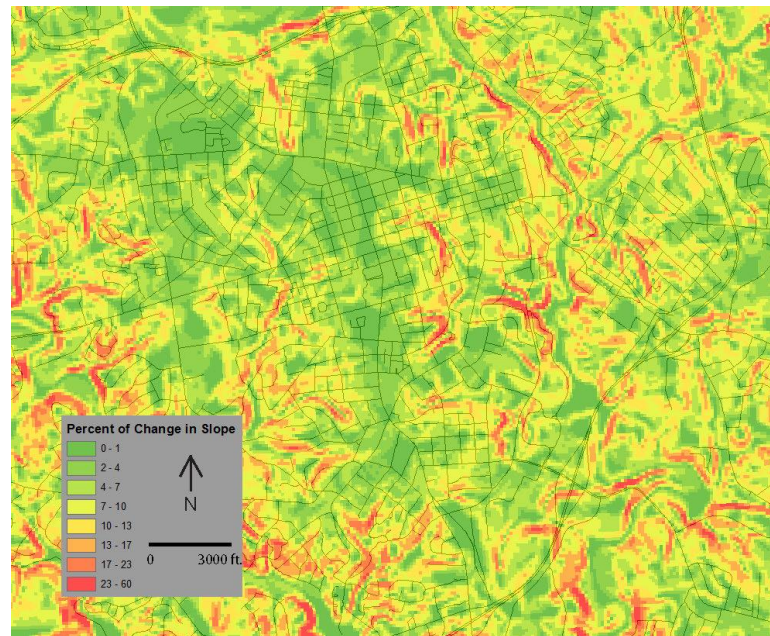


Figure 16 Percent of Change in Slope

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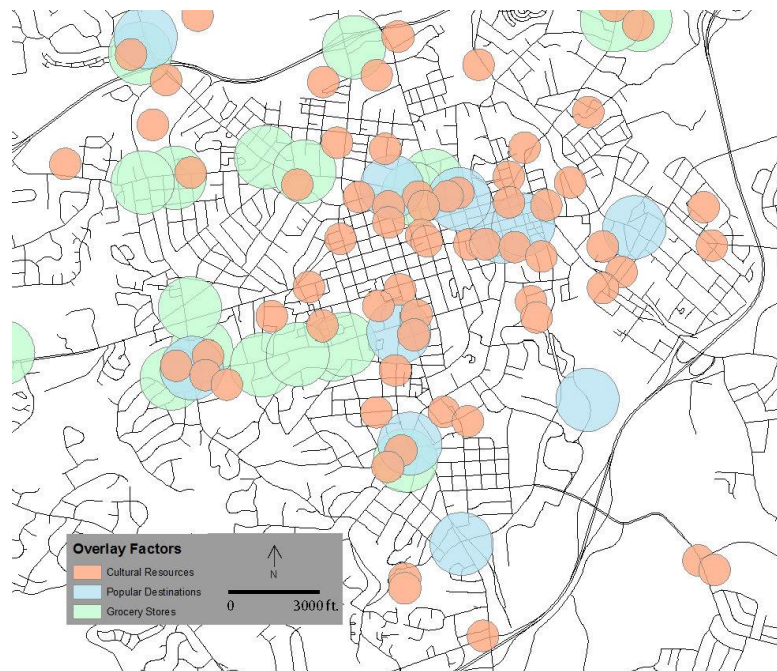


Figure 17 GIS Cultural Resources, Popular Destinations, and Grocery Stores

Source Cited: By Author



Figure 18 Residences, Property Owned by Government, and Bike Lanes

Source Cited: By Author

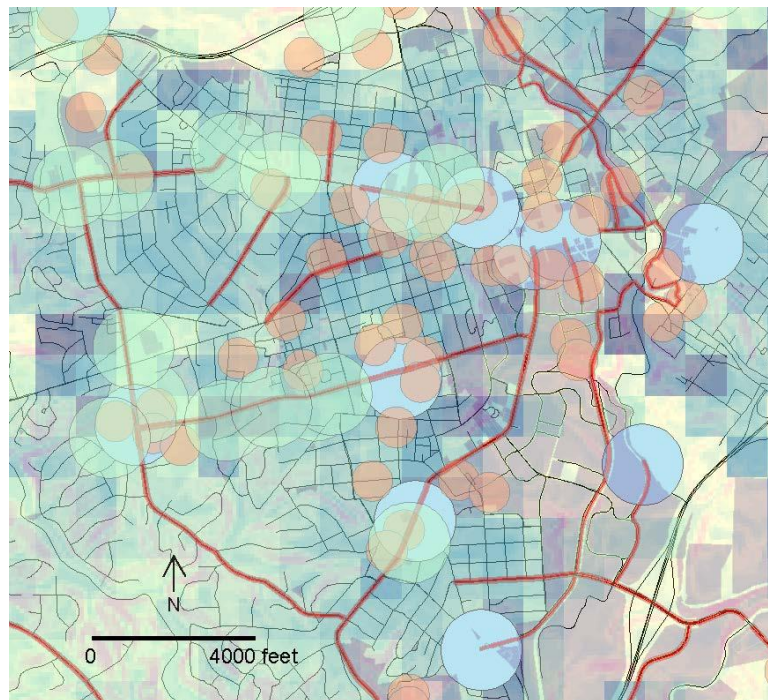


Figure 19 Entire GIS overlay

Source Cited: By Author

various factors include residential density, bike network, slope, significant cultural points, grocery stores, popular destination points, governmentally owned property and that the stations are located in areas where they can be easily seen, in order to advertise the product and encourage users to try out the system. Generally, the categories that were taken into consideration will put these stations in major intersections. Stations should be placed on the street in areas where they can take the place of parking spaces.⁸¹ Stations that hold ten bikes with five additional docking points would require just over fifty feet length, taking up about three parking spaces.

Additional Considerations

Preventing theft and Vandalism

In many bike shares, the theft and vandalism experienced is due to users not docking the bikes correctly and locking them down. Having better education for first time users and having better directions on the kiosk or docking points for the bikes can prevent this. It has been shown that when the bike share is first introduced, the theft rate is high because of user error, however as the system evolves and users become more knowledgeable about the system the theft rate decreases.⁸² Making the police department aware of these issues can help decrease theft and vandalism. Placing the stations in well lit areas and areas that have high traffic can prevent theft and vandalism as well. Limiting the hours of

⁸¹ "Bike Sharing Guide."

⁸² Dector-Vega, Snead, and Phillips, "Feasibility study for a central London cycle hire scheme."

operation of the bike share can help prevent these issues by shutting the system down in the late night hours.

Safety

Some people worry that accident rates will go up with additional bikers on the road. The number of accidents will be higher, but it is important to look at the accident rate and not the total number of accidents. Evidence shows that accident rates have gone down in cities that have introduced bike shares, because the higher amount of bikers make drivers more accustomed and aware of cyclists. The safety of bikers depends largely on the bike infrastructure and encouraging the city to continue to have more dedicated lanes for bikers. Helmet requirements are a major issue in public bike shares. In most cities, helmets are not required. This issue should be decided by the municipality and relevant experts.

Who should be involved in planning the bike share?

When planning a successful bike share, it is valuable for the municipality to have many people from a variety of backgrounds involved in the planning process. It may be helpful to set up an advisory board that includes individuals from different departments of Athens-Clarke County. Departments that could offer beneficial advice to planning the bike share includes the planning, transportation, public works, finance and leisure services. Having the Transit Department involved in the planning or operating can be beneficial to a bike share. The coordination between the two modes of transportation will create an overall more efficient commuting system for Athens-Clarke County. Having

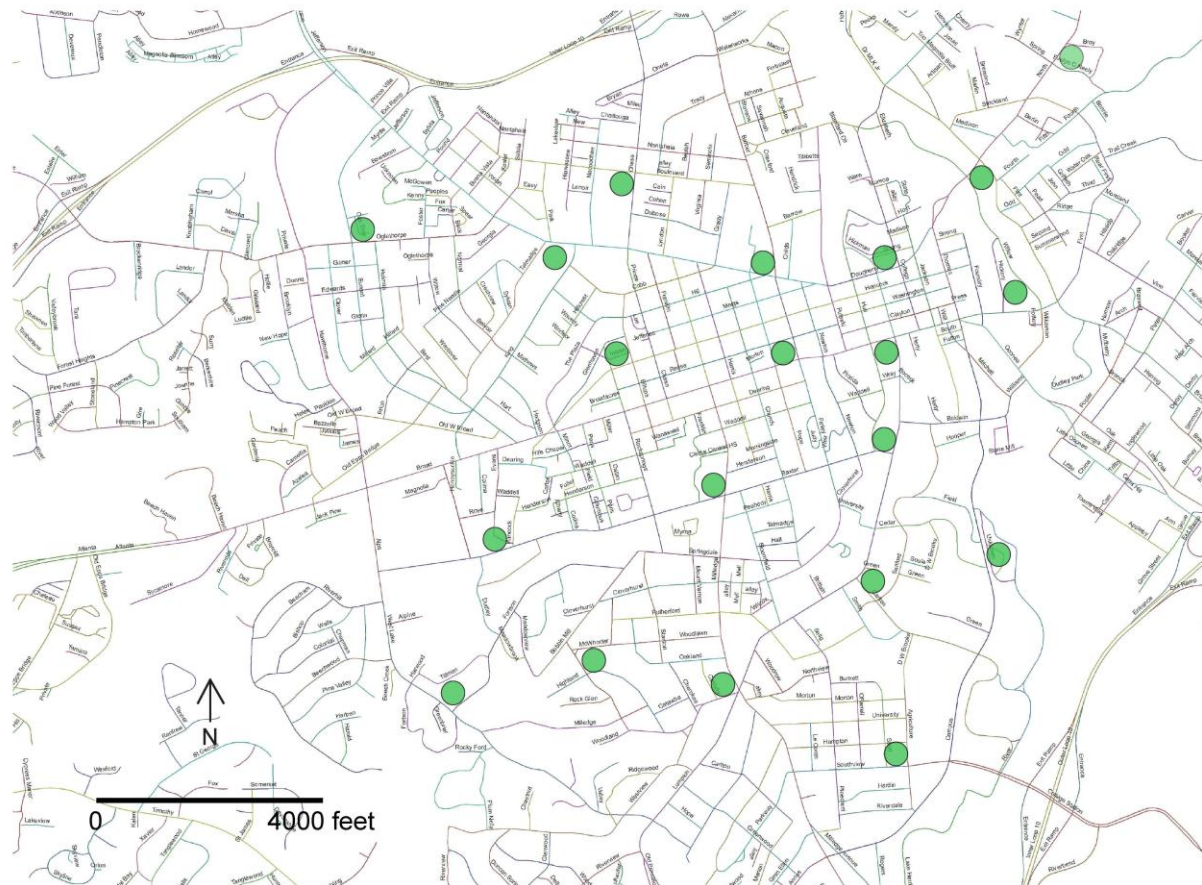


Figure 20 Proposed station placement

Source Cited: By Author

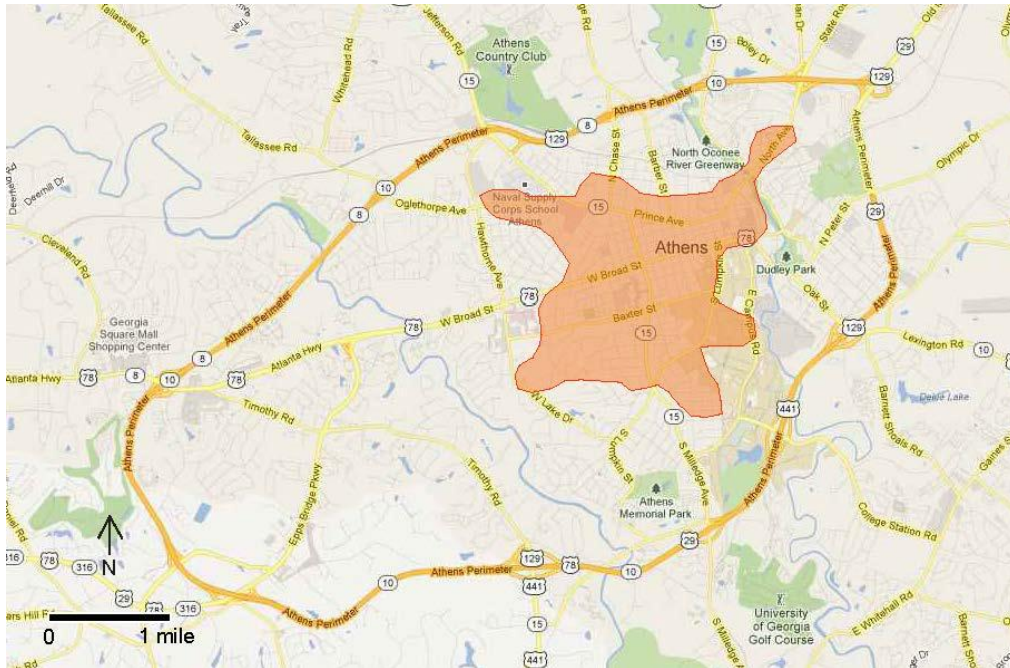


Figure 21 Extent of Athens' bike share station layout

Source Cited: By Author

members on the advisory board that do not directly represent the municipality could be members of Bike Athens or other non-profit bike advocacy groups, owners or workers of local bike shops in Athens, and students or professors at the University of Georgia. Other offices at the University of Georgia should be involved like the Office of Sustainability. Athens-Clarke County should work with the University of Georgia in determining collateral planning of the bike share system. It would make the most sense for the University of Georgia to pay for the stations that are on campus and bikes proportionally, as well as continued maintenance on bikes and stations.

Business owners that will be near the heart of the bike share system should be involved as well. They may be able to promote the system and allow for stations to be placed in front of their shops. They also may provide sponsorship or donations to assist in funding the system. Having the police department aware of the system can assist in the future with enforcing traffic laws and preventing theft and vandalism to the system.

The goal of this advisory committee is to make final recommendations for a bike share system that would include all the parameters in this document and anything else that is necessary to include in the program. They also can dictate a time frame for implementation of the bike share and the necessary stages of development, along with capital and operating costs and financing options. From most estimates, from the planning phase to the opening of a bike share takes approximately six months to a year. When deciding on an appropriate day to launch the bike share, the day should fall on the same day as on another important event to help publicize the bike share. If possible, the time of the launch should be sometime in the spring or early summer.

Having politicians informed and excited about the bike share can have a great effect on getting the bike share launched. These leaders can assist in making the necessary resources available and can involve the management of various departments in the process. If the mayor of the city is in favor of the bike share, then the chances of success will improve.

How much will the system cost?

Generally, the capital cost of a bike share is approximately \$3,750 per bike or about \$50,000 per station. The capital cost includes bikes, stations, and software. An estimate for the capital cost for Athens–Clarke County bike share program with twenty stations and two hundred bikes is \$750,000 to about one million dollars. The operating cost, which includes management of the system, maintenance to bikes and stations, redistribution of bikes, electricity, insurance and a website is estimated to be \$1,250 - \$1,800 per bike, per year. (BC 37) This estimate was taken from several sources and then averaged. That makes the total operating cost of the bike share to be estimated at \$300,000. Replacement of bikes and stations will generally has to occur every five years for bikes and ten to twenty years for stations and station parts.

Financing Options and Partnerships

Even though the bike share appears to be a costly addition to the overall transportation system of a municipality, there are ways to offset the cost. Bike shares are usually not a profitable business for a municipality, but the revenue generated by the bike share can offset much of the cost. Generally, the membership cost accounts for over two-thirds of the operating cost. Having annual, monthly, weekly and daily membership options for users is a common revenue generator. Other partnerships exist to keep the cost low. Partnerships with local bike shops and bike companies can assist in lowering the cost of bikes and maintenance on the bikes. Advertising is an important source of funding for bike shares. Advertising should be placed on the stations, bikes and membership

cards.

Government grants should be considered when financing a bike share. Grants aimed at improving public health or environmentally qualities of an area by using alternative transportation should be considered.

Grants:

There are many grants available at the national and local level for purposes of improved transportation, health and environment. National grants related to bicycle infrastructure include funds from the Federal Highway Program. Contacting the state representative for the Transportation Enhancement Activities Grants, where ten percent of all TEA funding is applied, is one possibility. All bicycle related infrastructure is applicable. Other federal grants available for bike infrastructure include, Congestion Mitigation and Air Quality Improvement Program, Recreational Trails Program High Priority Projects and Designated Transportation Activities, Urbanized Area Grants, Capital Investment Grants and Loans, Formula Program for Other than Urbanized Area, the Transit Enhancement Activity, and the Transit and Community and System Preservation Program.⁸³ The Governor's Office of Highway Safety Grants Programs provides state grants.⁸⁴ These grants are for bike safety and awareness.

Non-profit grants can be awarded through different bike advocacy groups such as Georgia Bikes and Bikes Belong.

⁸³ "Bicycle and Pedestrian Provisions of the Federal-aid Program," United States Department of Transportation,
<http://www.fhwa.dot.gov/environment/bikeped/bp-broch.htm>.

⁸⁴ "Governor's Office of Highway Safety in Georgia," Georgia,
<http://www.gahighwaysafety.org/>.

Private Companies set up programs that offer grants. Coca-Cola has a Healthy and Active Lifestyle Grant that could be applicable to bike sharing and promoting a healthy community.

It is rare that all the capital cost and operating cost are covered without municipal investment, but this should not detour a municipality from such investment, because, most public transportation operations are heavily subsidized.

Marketing

Marketing the bike share is important in the months leading up to and after the launch of the bike share. Promoting the bike share to the local media and advertisements in local papers and magazines are ways to reach the public. Advertising should convey information about the system and that the network is safe to use.⁸⁵ The safety messages should provide information reminding automobile drivers of the increased number of cyclists on the road and proper etiquette and laws regarding cyclists.⁸⁶ This includes branding the system with a unique name and having the bikes in similar colors. Interesting station design is encouraged. A naming contest for the bike share that citizens can participate in is a great way to get citizens involved in the planning of the bike share.⁸⁷ This allows for positive advertising to the interested public.

⁸⁵ "Bike Sharing Guide."

⁸⁶ "Translink Public Bike System Feasibility Study."

⁸⁷ "Bike Sharing Guide."

CHAPTER 5

CONCLUSION

Bike sharing has recently moved on to what experts call the fourth generation model. These systems have improved the planning and locking mechanism of bike shares, as well as the business models in order to be more profitable. The overall system has become more efficient with the use of better technologies, such as solar power and mobile phone applications.⁸⁸ Some fourth generation programs are offering electric bikes, as well as human powered bikes. These systems often have kiosks with touch screen technology and the membership cards are often simultaneously used with other public transportation options like bus or commuter rail.⁸⁹

Bike share systems will continue to improve with better technology and planning. Since it is a relatively new phenomenon, planners and municipal leaders should be studying these systems to continue to evolve bike shares. According to Midgely in his article 'Bike Sharing Schemes, "[t]here is an urgent need for guidelines and manuals. They could be generic in nature but also geared to the specific needs of cities in different regions."⁹⁰

⁸⁸ Cooper, "The UBC Public Bicycle System Feasibility Study."

⁸⁹ Shaheen, Guzman, and Zhang, "Bikesharing in Europe, the Americas, and Asia Past, Present, and Future."

⁹⁰ Midgley, "Bicycle-Sharing Schemes: Enhancing Sustainable Mobility in Urban Areas."

Bike shares across the world are becoming increasingly popular and have shown to be efficient modes of public transportation. First and second generation models of bike shares experienced moderate success. The third and fourth generation models are proving to be successful in adding an efficient alternative public transportation mode for cities, as well as being self-sustaining and profitable in many cases. In recent years, cities across the United States have successfully implemented their own bike share systems and in the next calendar year at least three times as many systems as exist today in the United States will be launched. More cities with lower population levels, but still high population density levels are launching their own systems. Many cities like Athens, particularly in large college towns, will have the opportunity in the following years to advance their public transportation modes in coordination with bike shares.

Athens has an opportunity for the city to showcase itself as a progressive town in terms of transportation alternatives that have environmental and health benefits for the community. The factors for a successful bike share are present in Athens. The project would be expensive, however there are ways to mitigate many of the cost and the benefits outweigh the negatives. Further investigation of a potential bike share in Athens by municipal leaders and bike advocates should take place. A bike share is an opportunity for Athens and other similar cities to continue the quest for alternative forms of transportation that will alleviate transportation congestion, environmental degradation, unhealthy communities and the United States dependence on fossil fuels.

Table 4 Recommended Guidelines

Recommendations when planning a bike share

1. Define the problem and how a bike share will improve these problems
 - a. Will a bike share relieve transportation?
 - b. Will a bike share better connect other forms of public transportation?
 - c. Are there environmental benefits that are associated with the addition of a bike share?
 - d. Are there health benefits that are associated with the addition of a bike share?
 - e. Are there other intangible factors the community can benefit from the addition of a bike share?
2. Define Unique factors of the city that are positive and negative indicators of success of a bike share
 - a. Density and population
 - b. Slope
 - c. Climate
 - d. Demographics
3. Organize a committee to plan an adequate system
 - a. Members representing the municipality
 - i. Planning, transportation, public works, finance, leisure services, etc.
 - ii. Local universities, professors, students, other offices like the office of sustainability
 - iii. Local bike shop operators, local business owners
 - iv. Non-profits bike advocacy groups
 - v. Police department
 - vi. Politicians and mayor
4. Determine adequate number of bikes and stations
5. Determine station locations
6. What type of technology is right for the city?
 - a. Automated system – more technology, more expensive, better fit for high density and large systems

Dedicated stations, automated locks, docking points, electronic kiosk, website, etc.
 - b. Manual system- less expensive, better for smaller systems
7. Managing the systems
 - a. Private company
 - b. Municipality
 - c. Non-profit
8. Funding and Cost
 - a. Figure out what the systems capital and operating cost would be
 - b. Financing the system
 - i. Local partnerships with businesses for advertising
 - ii. Membership and user fees
 - iii. Grants
 - iv. Subsidizing

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