

2013

Dayton Bike Share Feasibility Study



Conducted by Bike Miami Valley

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EXECUTIVE SUMMARY

In the past few years in the United States, eighteen cities of various sizes have launched modern bike share transportation systems. Thus far, the demonstrated benefits of these systems are numerous, including several economic, transportation, environmental, and health advantages for the communities that have made a bike sharing investment. Data from these systems is pouring in, providing urban planners a guide for how bike share transportation can be optimized. With eighteen additional systems coming online this year, bikeshare.com has proclaimed 2013 the "year of the bike share."

In the Dayton region, cycling has significant momentum. In 2010 the League of American Bicyclists named Dayton a bronze level Bicycle Friendly Community, making Dayton only the second Ohio city at the time to earn this distinction. Additionally, a number of cycling infrastructure improvements have been completed in the past five years, and new bike rental programs have made cycling accessible to those without bikes. Despite these advances in making Dayton more bicycle-friendly, bike sharing has not yet gained traction because of perceptions that Dayton cannot sustain such a system. Quantitative data to support or contradict these perceptions has been lacking. Bike Miami Valley has completed a bike share feasibility study to answer two questions with respect to bike sharing in the Dayton region:

- **What part of the Miami Valley is most suitable for a bike share?**
- **Is the Dayton region "ready" to sustain a bike share?**

A major investment on the scale of a bike share requires sufficient research and planning. This feasibility study is composed of two major research elements:

- **A survey** measuring the interest and support for a bike share in the Dayton community.
- **A bike share demand analysis** that identifies the geographic area most suitable for a bike share in the Miami Valley based on the factors that correlate to a bike share's success. Once identified, this bike share service area is benchmarked against other communities that have successfully implemented a bike share to determine whether our community is bike share ready.

FEASIBILITY STUDY RESULTS

Bike Share Support. Survey results show strong support for a bike share in the Miami Valley. Across all respondents, 85% support bike sharing. When narrowed to the 18-40 demographic so sought after by policy makers, support climbs to 98%. Implementing a bike share could be a part of the region's young talent attraction and retention strategy.

Potential Bike Share Usage. A majority of respondents (63%) indicated interest in using a bike share. Among the 18-40 crowd, interest in use is 74%. Additionally, more than three fourths of respondents expressed willingness to pay membership rates consistent with existing bike shares in the U.S. Most



EXECUTIVE SUMMARY

desired trips for survey respondents were short in nature (shopping, errand and appointments, last-mile transportation) or recreational, and centered in and around downtown Dayton.

Bike Share Suitability. The area deemed most suitable for a bike share in the Miami Valley is an approximate four square mile area that encompasses downtown. This area has many assets in its favor for bike sharing, including high population and job densities, an abundance of university students who are likely to use the system, access to bike infrastructure, synergy with existing public transit, and a relatively flat topography.

Is Dayton Bike Share Ready? Yes. When benchmarked against other cities that have successfully launched and sustained bike shares, this four square mile area compares favorably. In fact, bike share demand in Dayton is actually higher than in cities like San Antonio and Chattanooga that have successful bike share systems.

BIKE SHARE RECOMMENDATIONS

Using industry standards for bike share design, a system consisting of 22 to 30 stations with 202 to 268 bikes is recommended for this four square mile area. Annual bike share trip estimates range from approximately 50,000 to 70,000 trips for the first year of operation depending on the number of stations. Preliminary cost estimates for both capital and operational expenses, along with revenue estimates show a bike share could approach self-sustainment as early as five years after the bike share launch. However, existing public transit systems that are much more mature than bike sharing are still not close to self-sustaining, so this should not be the measure of success for a Dayton bike share system. The bike share design recommended in this report is preliminary – finalizing the bike share size, station layout, operational model, and funding plan will require extensive coordination with community stakeholders.



DAYTON BIKE SHARING OVERVIEW

INTRODUCTION

The Dayton region has experienced tremendous growth in bicycling planning, programming, and infrastructure in the last five years. Great efforts throughout Dayton are underway to help the city achieve a higher status as a Bicycle Friendly Community. A bike sharing program would complement Dayton's current aims to expand bicycle usage. Bike sharing would offer a highly visible, affordable, and accessible mobility option for diverse groups, which include downtown residents, employees, students, and visitors. In addition, the type of bike sharing technology presented in this report would guarantee a secure, reliable, and sustainable method of implementation and long-term usage. Highly successful bike share programs have been established in the United States. This study was developed to understand the characteristics that make bike share transportation in comparable cities successful, and determine if a bike share program is feasible in Dayton.

The objectives of this study are to:

- Gauge the Dayton region's support for a bike share program through collection of community input from a bike share survey.
- Determine the portion of the Miami Valley most suitable for a bike share program by examining the factors that have proven to correlate to a bike share's success based on data from other cities.
- Answer the question of whether the Dayton region is "ready" to sustain a bike share.

This study examined the combined geographic areas of Montgomery and Greene County with respect to bike share suitability. Although the multi-county region was examined and considered, this report focuses most on the densely populated and mixed use environments in downtown Dayton, which was guided by the results of the feasibility study. The area in and around downtown is most likely to have near-term success sustaining a bike share; in the long-term, this may enable expansion of the bike share system into nearby communities.

WHAT IS BIKE SHARING?

Bike sharing is an emerging urban transportation option based on collective paid use of public bicycles available at distributed stations. The bike share concept began in Europe and is now being designed, applied, and/or researched in many North American cities. A bike share transportation system includes strategically located "stations," each consisting of six to twenty or more bikes with a centralized payment and control kiosk. Customers—who range from one-day users to annual subscribers—"unlock" a bicycle with a credit card, university ID, or smartcard. Once in possession of the bike, users can ride to any other station in the city or back to the same station where they can return the bike concluding their trip. Bike share pricing structures are designed to encourage short trips. For example, most bike share programs feature a thirty minute period within which there is no additional usage fee to ride the bike. The number of unique "rentals" or bike check-outs within the membership period (i.e. annual or 24-hour) is unlimited. The bikes typically have several features to promote safety, such as reflectors, puncture-resistant tires, reflective tires, a bell, and a light that remains charged by pedaling the bicycle.



DAYTON BIKE SHARING OVERVIEW

Bike share programs can be relatively inexpensive and quick to implement to provide a convenient, fun, and sustainable transportation alternative for downtown employees, residents, students, and visitors. Over 300 cities worldwide, including U.S. cities of Cincinnati, Columbus, Denver, Chattanooga, Washington D.C., Portland, and Minneapolis are investing in bike share initiatives.¹

DEVELOPMENT OF BIKE SHARE TECHNOLOGY

A bike share is typically designed to provide users transportation for short distance trips (0.5 to 3 miles) by picking up a bicycle at a location (station) in the network and returning it to any other bike sharing station (including the origin).² Bike sharing programs have evolved over time to incorporate advances in technology, management systems, and multiple-modality transportation methods. Four generations of bike sharing are described below.

Beginning in the 1960s, the first generation or simplest form of bike sharing was the “White Bike or Free Bike.” Bicycles were distinctly colored, left unlocked, and placed haphazardly around an area with no user fee or attempt to manage their usage. This method of bike distribution has been found to be highly susceptible to lost or stolen bikes since there is no ability to supervise inventory or manage repairs. In the early 1990s, the second generation bike sharing programs added coin-deposit systems at bike docking stations where bikes were locked and required users to pay a nominal fee to unlock the bike. With no ability to track users, the minimal deposit was not enough to reduce bike theft. Beginning in the mid 2000s, the third generation of bike share programs integrated information technology systems at kiosks, such as credit card transactions and smart cards for check-in/check-out procedures to track user information and create a membership system with cost recovery available when the bicycles were not returned or found vandalized. However, the kiosks and bike sharing stations of the mid 2000s were unable to be moved to a new location (fixed installations) and often required electrical hook up for function.³

Fourth generation systems incorporate advanced bike sharing technology that allows for station mobility. The stations are solar powered and feature wireless communication, thus they require no excavation for installation. In fact, stations can be moved in a matter of hours and without additional cost. Station technology for monitoring bike usage tracks cycling patterns, and enables system planners to shift the mobile docking stations to meet demand. The technology provides flexibility for growth as the bike share

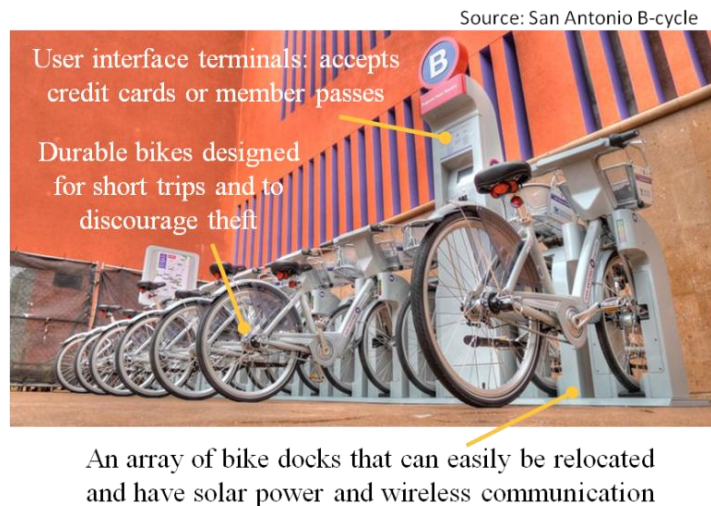


Figure 1: Fourth Generation Bike Share Technology

¹ Alta Planning + Design. 2012. Cincinnati Bike Share Feasibility Study. <http://www.cincinnati-oh.gov/bikes/news/study-recommends-35-bike-share-stations/>.

² Pedestrian and Bicycle Information Center and the Toole Design Group. 2012. Bike Sharing in the United States: State of the Practice and Guide to Implementation. <http://www.bicyclinginfo.org/promote/bikeshare.cfm?/bikeshare>.

³ Alta Planning + Design. 2012. Cincinnati Bike Share Feasibility Study. <http://www.cincinnati-oh.gov/bikes/news/study-recommends-35-bike-share-stations/>.



DAYTON BIKE SHARING OVERVIEW

program matures and becomes integrated as part of the public transit system. A fourth generation bike sharing program, which is the technology under consideration for Dayton, allows for flexibility in determining the best locations for stations based on demand coupled with technologically advanced management systems that have proven cost effective, secure, and environmentally friendly.

DAYTON'S HISTORY OF BIKE SHARE INITIATIVES



In the past few years, several organizations in the Dayton area have worked to make bicycles a practical method of transportation in the downtown region. In May 2011 the Life Enrichment Center (LEC), a social service organization in Dayton, launched a first-generation bike sharing initiative called Yellow Bikes to teach its volunteers skills to refurbish bicycles and then drop them off downtown for public use. A total of 50 bikes were painted yellow and marked with a small label on the frame reading, “If found call or return to the Life Enrichment Center.” Anyone that found the bike could ride it—at no cost and for any length of time. Measures were taken to work with the Dayton police, pawn shops, and individuals who found the bikes to contact the LEC with issues or repair needs. Unfortunately, in the first month of the program almost all of the bikes disappeared. The program outcome was a result of the difficulty in managing the bike fleet and keeping users accountable, which is consistent with the experience of other cities with similar “Free Bike” programs. However, for at least one Urban Nights, Yellow Bikes showed the potential of greater access to cycling in the downtown landscape.

A new bike sharing initiative is in development by the Life Enrichment Center. Soon the LEC will launch the Errand Bike program to offer employees of participating businesses free bikes to check-out for round trip errands.⁴ Similarly, the University of Dayton in the fall of 2011 established the RecBike program that allows students to check-out bikes from dawn until dusk from the Campus Recreation facility. Only twenty bikes are available for check-out, and on warm days, there is often a wait to check-out a bike. The limited hours for bike check-outs and small number of bikes available do not meet the current demand of the student population, let alone the growing number of individuals desiring to bike in and near the downtown region. Both RecBikes and Errand Bikes only allow for roundtrip rentals, which limits the bikes available for other users and tethers the bike user to the original check-out location. Both the Life Enrichment Center and University of Dayton have noted the difficulty in supervising misuse of bikes and management of inventory. The bike share technology proposed in this study significantly reduces the issues cited with free bike sharing programs. The proposed bike share program for Dayton would offer several stations and include the most recent evolution of GPS-enabled and electronic locking bikes. Each bike could only be unlocked by pre-registered users with electronic credentials, and the bikes could be returned by users to any station available in the city.

⁴ Errand Bike Program. <http://www.daytonlec.org/services/bike-shoppe-safety-village/yellow-bike-program/>.



BIKE SHARING BENEFITS

Given the relatively short life of bike sharing programs in the United States, data is only starting to emerge on the many benefits of a bike share transportation system. However, the data that has surfaced so far is encouraging. Across both North America and Europe, cities large and small are beginning to not only reap the benefits of a bike share investment, but also to better measure the direct and indirect impact of the system on their communities. Bike share systems impact many different dimensions of quality of life, and thus provide a variety of economic, transportation, health, and environmental benefits to the cities they serve.

ECONOMIC BENEFITS

Bike Sharing Increases Urban Vibrancy. Several recent studies have shown an increasing demand for an urban lifestyle, especially among the younger demographic so sought after by policy makers.⁵ A variety of efforts are underway in the Miami Valley to help meet that demand so the Dayton region can position itself for future economic prosperity. Bike sharing would not only be complementary to those efforts, but could be a game-changer for connecting the areas in and around downtown Dayton, while increasing street traffic, the visibility of people, and overall vibrancy. The community enjoying the outdoors downtown is a powerful image that combats almost every negative perception someone might have for the city. Greater utilization of our streets could transform perceptions of downtown almost overnight.

Young People are Early Adopters. Data from other cities have shown that young people are highly supportive of bike shares and are first to adopt this mode of transportation in their communities. For example, in its 2011 survey, Capital Bikeshare found that two-thirds of its bike share members are under the age of 35, which is considerably skewed relative to the approximate 19% of commuters who are under age 35 and live in the District of Columbia (which composes the majority of the Capital Bikeshare service area).⁶ Results are similar for the Nice Ride bike share system in Minneapolis, which reports approximately 50% of its members are age 18-34.⁷ As is also demonstrated by the survey data discussed later in this report, a bike share is highly supported by young people in the Dayton community, and thus could serve as a powerful tool for young talent attraction and retention.

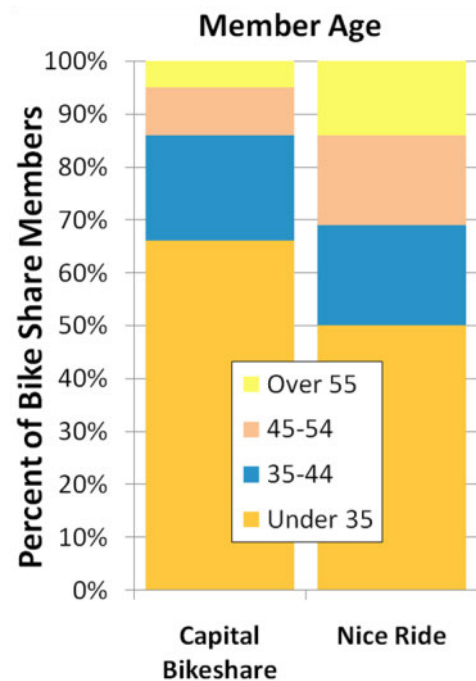


Figure 2: Age of Bike Share Users for Nice Ride and Capital Bikeshare

⁵ CEOs for Cities has conducted several studies showing increasing demand for urban living, and the connection of urban vibrancy to talent attraction and retention. Locally, UpDayton has documented similar findings in its annual reports (www.updayton.com/annual-report/).

⁶ Capital Bikeshare. 2011. Capital Bikeshare 2011 Member Survey Report. <http://capitalbikeshare.com/assets/pdf/Capital%20Bikeshare-SurveyReport-Final.pdf>

⁷ Data from 2011 Nice Ride Season. http://www.bikewalktwincities.org/sites/default/files/measurement_fest_niceride.pdf.



BIKE SHARING BENEFITS

Bike Sharing Benefits Local Businesses. A bike share system not only replaces trips users would have made via another form of transportation, but it also encourages completely new trips. For example, Capital Bikeshare users report approximately 4% of their total trips were ones they would not have made at all if not for the availability of the bike share. Furthermore, bike sharing makes users more likely to patronize businesses in the bike share service area. More than eight in ten respondents of the Capital Bikeshare survey said they were either much more likely (31%) or somewhat more likely (52%) to patronize an establishment that was accessible by Capital Bikeshare.⁸

More than eight in ten respondents of the Capital Bikeshare survey said they were more likely to patronize an establishment that was accessible through the bike share.

Investing in Bike Infrastructure Creates Jobs. In addition to the jobs that would be created through implementation of a bike share system, research shows that investing in bike infrastructure is an effective job creator relative to investments in other forms of transportation. A 2011 study looking at 58 separate projects found that \$1 million invested in bike infrastructure produced 11.4 jobs, against 10 jobs for the same amount invested in pedestrian projects, and 7.8 jobs for road-only projects.⁹

TRANSPORTATION BENEFITS

Bike Shares Improve Public Transit Connectivity. Perceptions about the convenience of local public transit has been identified in research by UpDayton to be a barrier to young talent attraction and retention. Survey data collected for three North American cities with existing bike share systems indicates a bike share could help overcome this barrier. Over 75% of bike share members in Minnesota, Montreal, and Toronto indicate bike sharing has improved the “connectivity” of their public transit. Furthermore, over 40% report using the bike share with another form of local transit to complete a trip that they otherwise would have done by car.¹⁰ Bike sharing completes the “last mile” between a transit stop and a user’s eventual destination, thus improving the convenience of the entire system.

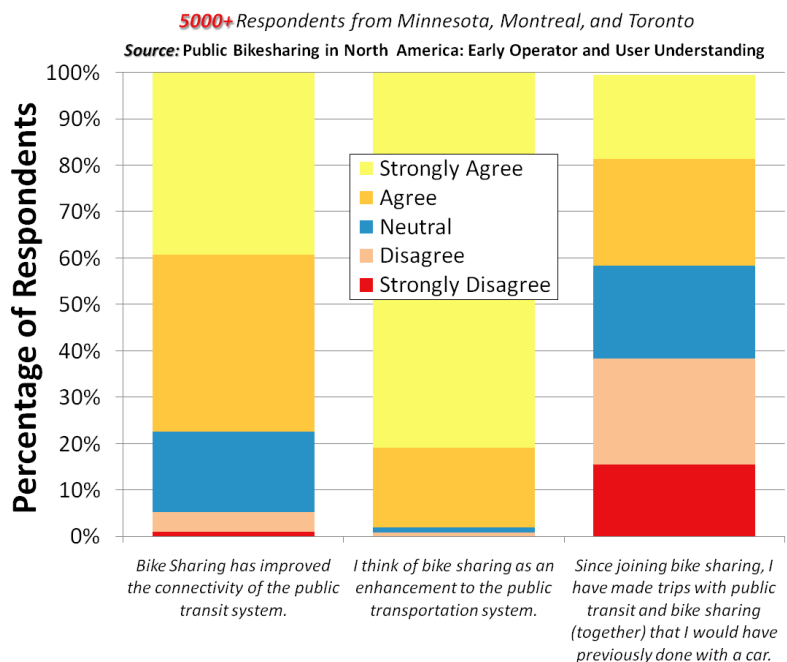


Figure 3: Bike Sharing and Public Transit - Survey of Three Cities

⁸ Capital Bikeshare. 2011. Capital Bikeshare 2011 Member Survey Report. <http://capitalbikeshare.com/assets/pdf/Capital%20Bikeshare-SurveyReport-Final.pdf>.

⁹ Garrett-Peltier, H. Pedestrian and Bicycle Infrastructure: A National Study of Employment Impacts. 2011. Political Economy Research Institute. http://www.peri.umass.edu/fileadmin/pdf/published_study/PERI_ABikes_June2011.pdf.

¹⁰ Mineta Transportation Institute. 2012. Public Bikeshaing in North America: Early Operator and User Understanding. <http://transweb.sjsu.edu/PDFs/research/1029-public-bikeshaing-understanding-early-operators-users.pdf>.



BIKE SHARING BENEFITS



2009 Bike to Work Day hosted by Five Rivers MetroParks

Bike Share Systems are Economically Sustainable. In comparison to other forms of public transit, bike shares require significantly less capital cost to start and are more economically sustainable once operating. The U.S. Department of Transportation estimates the capital cost of one transit bus to be \$321,000,¹¹ which is approximately equivalent to the capital cost of six bike share stations and 60 bikes. Furthermore, the U.S. National Transit Database reports that existing public transportation systems provide a range of 20-40% of farebox recovery,¹² meaning transportation fares recover 20-40% of the operating cost. North American bike shares (which in comparison are much more immature) are already reporting an average farebox recovery of 74%, with some self-sustaining.¹³

Bike Sharing Increases Cycling Mode Share. Not surprisingly, bike shares increase the number of local residents that use cycling as a form of transportation. On average, bike sharing raises the cycling mode share between 1.0 to 1.5 percent in cities with pre-existing low cycling use.¹⁴ Considering that approximately 40% of daily trips are less than two miles (a ten minute bike ride),¹⁵ cycling has great potential for growth as a convenient form of transportation.

Bike Sharing Increases Overall Cycling Safety. It is somewhat counter-intuitive, but increasing the number of bikes on area roadways will actually increase cycling safety.¹⁶ Several cities have shown a “safety in numbers” effect of additional cyclists on the road. One such example from NYC is illustrated in Figure 4. More bikes on the street decreased both the crash rate *and* the total number of crashes. This is likely a result of motorists practicing increased caution with the greater presence of bike commuters.

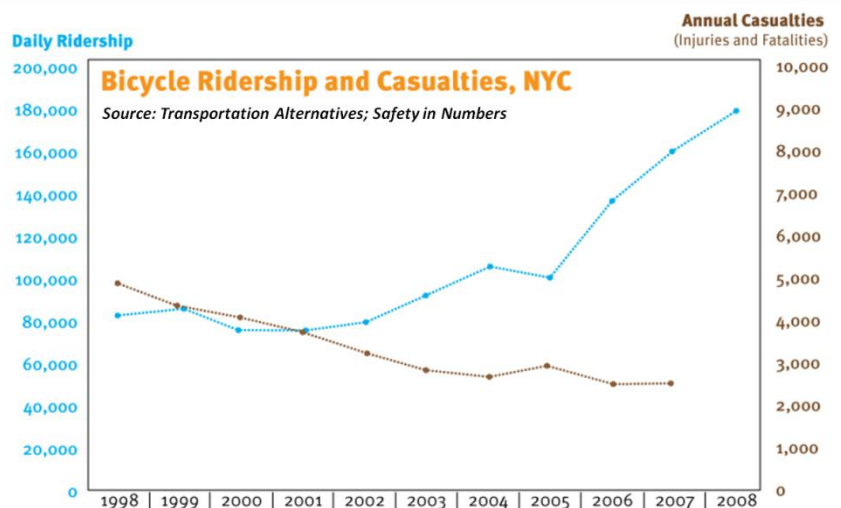


Figure 4: Cycling Safety in Numbers

¹¹ Federal Transit Administration. 2007. Transit Bus Life Cycle Cost and Year 2007 Emissions Estimation. http://www.fta.dot.gov/documents/WVU_FTA_LCC_Final_Report_07-23-2007.pdf.

¹² American Public Transportation Association. 2012. Presentation: U.S. National Transit Database. <http://www.apta.com/members/memberprogramsandservices/international/Documents/>.

¹³ Mineta Transportation Institute. 2012. Public Bikes sharing in North America: Early Operator and User Understanding. <http://transweb.sjsu.edu/PDFs/research/1029-public-bikesharing-understanding-early-operators-users.pdf>.

¹⁴ DeMaio, P. Bike-sharing: History, Impacts, Models of Provision, and Future. Journal of Public Transportation, Vol. 12, No. 4, 2009. <http://nctr.usf.edu/jpt/pdf/JPT12-4DeMaio.pdf>.

¹⁵ Pedestrian and Bicycle Information Center. Benefits of Bicycling. <http://www.bicyclinginfo.org/why/benefits.cfm>.

¹⁶ Jacobsen, P. L. Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Bicycling. Injury Prevention. 2003. <http://safetrec.berkeley.edu/newsletter/Spring04/JacobsenPaper.pdf>.



BIKE SHARING BENEFITS

Cycling Reduces Parking Lot Expenses. Because bike sharing increases the connectivity of public transit and convenience of multi-modal transportation, it also has the potential to avert the cost of building new parking lots, which can be quite expensive. Figure 5 is from a study of parking lot costs from the Victoria Transport Policy Institute.¹⁷ Subject to varying property values between cities, the annualized cost of parking spaces can range from about \$650 for surface spots in suburban locations to almost \$4,000 for structured spaces in cities. The cost of new parking is so prohibitive, universities like Stanford actually pay their faculty and staff to carpool and / or use public transit to get to work, plus implement other strategies to limit solo car commuting. Stanford estimates its mix of programs like building bike infrastructure, strategically adjusting parking prices, and offering free transit passes to faculty has saved the build of 3,000 new parking spaces since the early 2000s. Given this parking would have been underground, they estimate \$100 million in spending has been saved.¹⁸

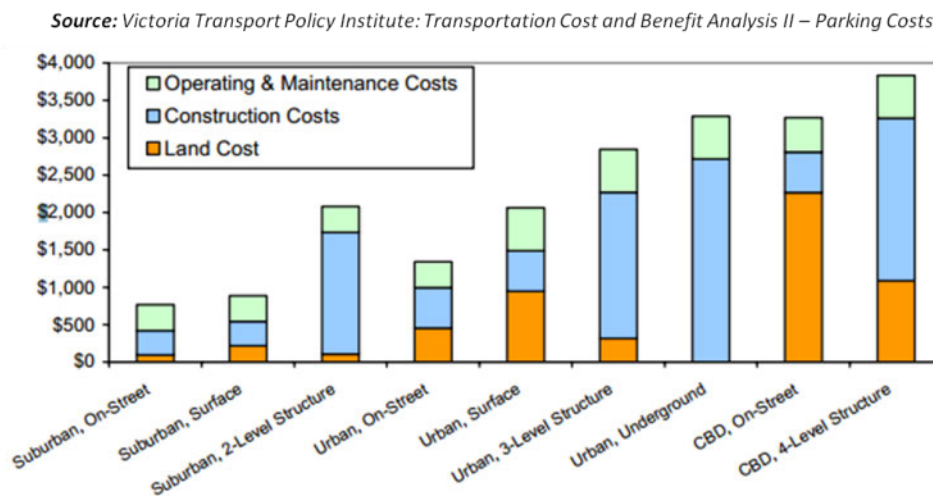


Figure 5: The Cost of Parking Lots

BENEFITS FOR BIKE SHARE USERS

Bike Sharing Reduces Household Expenditures. Using a bike share helps keep money in people's pockets. The annual cost of operating a sedan for one year is approximately \$7,800, which for an average household consumes approximately 18% of the annual income.¹⁹ In comparison, the annual membership fee for a bike share program is around \$60. North American cities with bike shares report a quarter of bike share trips replace a vehicle trip,²⁰ so the local savings for a community are significant.

Cycling Improves Community Health. The health benefits from increased cycling and physical activity are numerous. GetUp Montgomery County estimates that approximately 70% of Montgomery

¹⁷ Victoria Transport Policy Institute. 2012. Transportation Cost and Benefit Analysis II – Parking Costs. <http://www.vtpi.org/tca/tca0504.pdf>.

¹⁸ Schmitt, A. Transport U: Colleges Save Millions By Embracing Policies to Reduce Driving. D.C.StreetsBlog.org. 2013. <http://dc.streetsblog.org/2013/04/16/transport-u-colleges-embrace-policies-to-reduce-driving/>.

¹⁹ Pedestrian and Bicycle Information Center. Benefits of Bicycling. <http://www.bicyclinginfo.org/why/benefits.cfm>.

²⁰ Alta Planning + Design. 2012. Cincinnati Bike Share Feasibility Study. <http://www.cincinnati-oh.gov/bikes/news/study-recommends-35-bike-share-stations/>.



BIKE SHARING BENEFITS

County adults are currently overweight or obese.²¹ According the International Bicycling Fund, the average person loses 13 lbs. his or her first year of commuting by bike.²²

It's Cheaper than Owning a Bike. The League of American Bicyclists estimates the annual cost of operating a bike to be \$120,²³ which is twice the expected cost of an annual membership in a bike share system. Furthermore, borrowing a bike through a bike share eliminates barriers to cycling in a busy city like finding a place to lock your bike and / or fear of damage or theft.

ENVIRONMENTAL BENEFITS

Reduction in Emissions. Increased cycling offers many environmental benefits for a community. For every mile driven, cars produce almost a pound of CO₂. Considering that 40% of all car trips are less than two miles (i.e. very bikable), the savings in pollutants emitted could be substantial. A person who cycles to a job four miles away saves approximately 2,000 miles of driving and 2,000 lbs of CO₂ emissions each year. This equates to nearly a 5% reduction in the average American's carbon footprint.²⁴

Bike Shares Have Minimal Carbon Footprint. The bike share stations under consideration for Dayton are solar powered, therefore they have a minimal carbon footprint. Additionally, some systems use bike pulled trailers to help with redistribution of bikes, so even the operations can be environmentally friendly.

²¹ Public Health - Dayton & Montgomery County. 2013. GetUp Montgomery County. <http://www.phdmc.org/getup>.

²² International Bicycle Fund. 2013. 60+ Benefits (Advantages) of Bicycling. <http://www.ibike.org/encouragement/benefits.htm>.

²³ Pedestrian and Bicycle Information Center. Benefits of Bicycling. <http://www.bicyclinginfo.org/why/benefits.cfm>.

²⁴ Gardner, G. Power to the Pedals. WorldWatch Institute. 2013. <http://www.worldwatch.org/node/6456>.



DAYTON BIKE SHARE SURVEY

OVERVIEW AND SURVEY OBJECTIVES

This section presents the results of the 2012 Dayton bike share survey conducted as a part of a volunteer initiative exploring the feasibility of a bike share program in the Dayton region. The survey was conducted for three primary purposes:

- To measure the current level of support across the Dayton region for a bike share;
- Gather quantitative evidence to determine if there is interest in use of a bike share beyond just the cycling community; and
- Collect data on how a bike share could be best marketed to the local community to maximize ridership.

Audience. The survey's primary target audience consisted of those most likely to use a bike share: young people ages 18-40, and those living, working, or going to school in and around downtown.

Questionnaire Development. A 20-question survey was drafted, refined, and implemented as an online survey that could be easily distributed via email or social media.

The survey questionnaire was developed by volunteer committee members. A copy of the final questionnaire is provided in Appendix B. The questionnaire, which was designed for online self-administration, collected data on the following major topics:

- Current bike use
- Bike share interest
- Costs
- Demographics

Survey Distribution. The survey was distributed through following outlets with the intent to have those on these lists spread the survey virally to others they know who may be interested in the bike share concept.

- Dayton Daily News
- DaytonMostMetro.com
- Downtown Dayton Partnership email list
- Neighborhood Association newsletters
- Priority Boards
- UpDayton email list
- Facebook, via pages for afore mentioned organizations, study members, and community members interested in the concept.

Timing. The survey was released to the public on 09/05/2012 and was turned off on 12/17/2012 after receiving 516 responses, 76 of which were partial responses. Over 300 of these responses were received in the first 5 days of the survey distribution, which could indicate a high level of community interest.



SURVEY RESULTS: EXECUTIVE SUMMARY

- Support for a bike share was high among all respondents (85%), but those 18-40 have a higher likelihood of both supporting (98%) and using (73%) a bike share program in the Dayton region.
- More than half of survey respondents (54%) do not currently use a bicycle for transportation, and 30% more said they use a bike just “sometimes,” indicating the survey’s reach beyond just the avid Dayton cycling community.
- Bike share trip attractors are most likely to be in the downtown Dayton area, and many respondents expected to be able to start their bike use from a location near their home, school, or work. Therefore, residents, workers, and students in and around downtown also have a higher likelihood of supporting and using a bike share.
- The majority of those who seldom use their own bikes today for transportation indicated that they would both support and use the bike share.

This survey indicates the highest potential for bike share support among those 18-40, living, working, or attending school in and around downtown. These users will utilize the bike share for recreation as well as short trips to cultural events, to see friends, shopping, and running errands.

- This audience is likely to see value in the program as a means to improve their own health and the environment, while having fun – but the system has to be convenient to use.
- We conclude that this audience also is more likely to pay an annual membership to improve that convenience and get more flexibility and value, since they indicated that they would most likely use the bikes a few times a month. An annual membership fee of \$60 was acceptable to the majority of respondents (77%).

There are some public perceptions to overcome to make the community support widespread – including explaining the difference between modern bike sharing and the Yellow Bikes model, the feasibility of how a system might work in the Dayton market, and the notion that bikes are only used for recreation.

SURVEY: DETAILED RESULTS

This section presents an overview of the survey findings. The survey collected data in several primary topic areas. Results for these topics are presented below:

- Survey Respondent Demographics
- Current Bike Use
- General Transportation Use
- Potential Travel/Use Patterns
- Level of Support
- Costs
- Value Proposition

Survey Respondent Demographics

A summary of the demographics is shown in Figure 6. Survey respondents were largely under 40 years of age and Caucasian. The average age of respondents was 40, with a range of 16-73. Respondents were 85% Caucasian, 8% African-American, and 7% other races. Respondent gender was evenly split.



DAYTON BIKE SHARE SURVEY

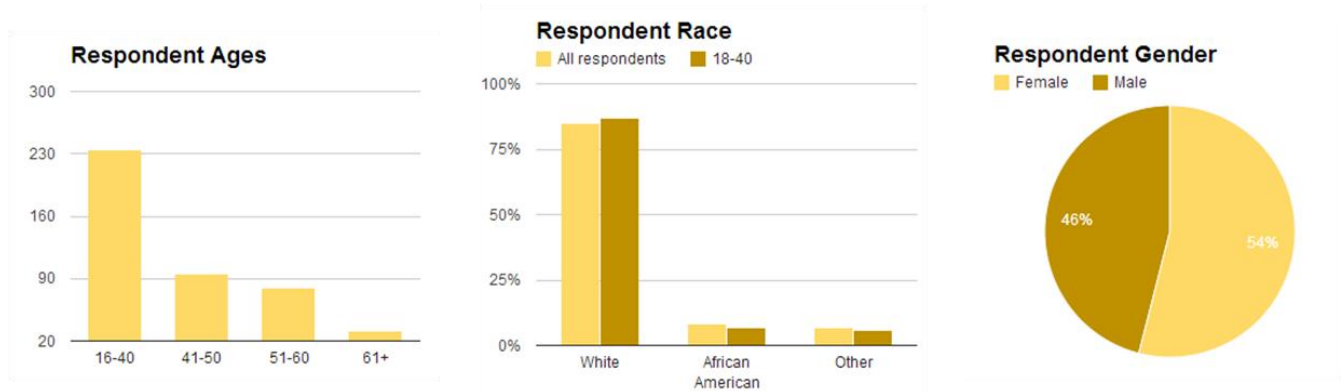


Figure 6: Survey Demographics

Respondent Home and Work Zip Codes

Respondents resided in 65 zip codes from more than 7 counties, but the highest number of respondents live in zip codes in and around downtown Dayton (Figure 7). Where respondents spend their day is much more varied. The only zip code with more than 20 responses was downtown: 45402 (Figure 8). When looking at respondents who live and work/school in same zip code, those respondents were most likely to be live in downtown Dayton or surrounding zip codes to the north or south (Figure 9).

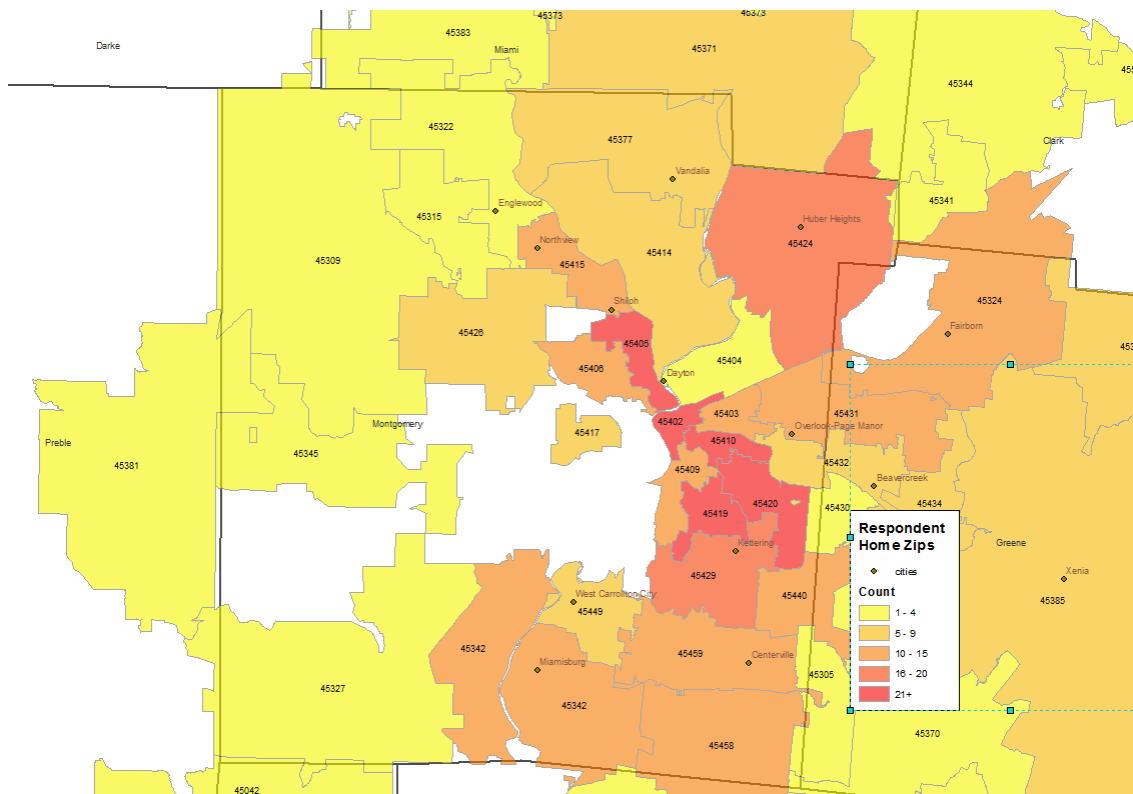


Figure 7: Survey Respondent Home Zip Codes

DAYTON BIKE SHARE SURVEY

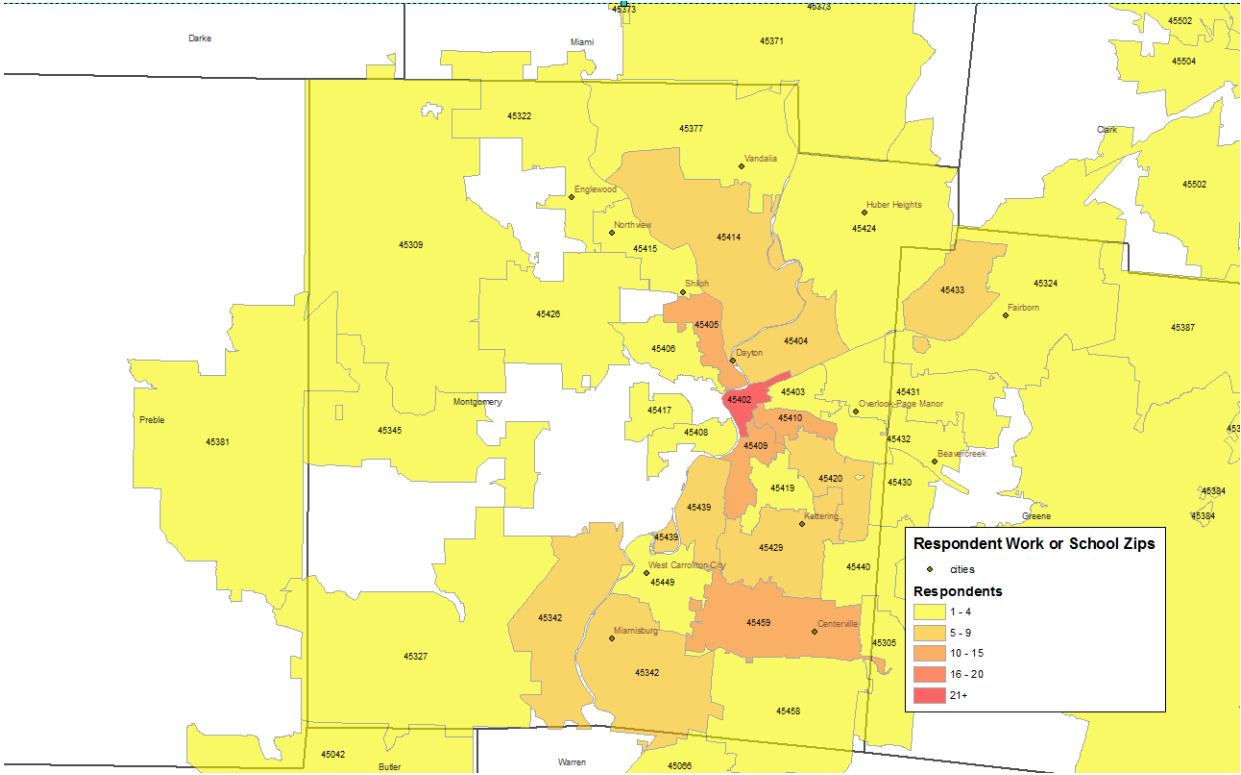


Figure 8: Survey Respondent Work Zip Codes

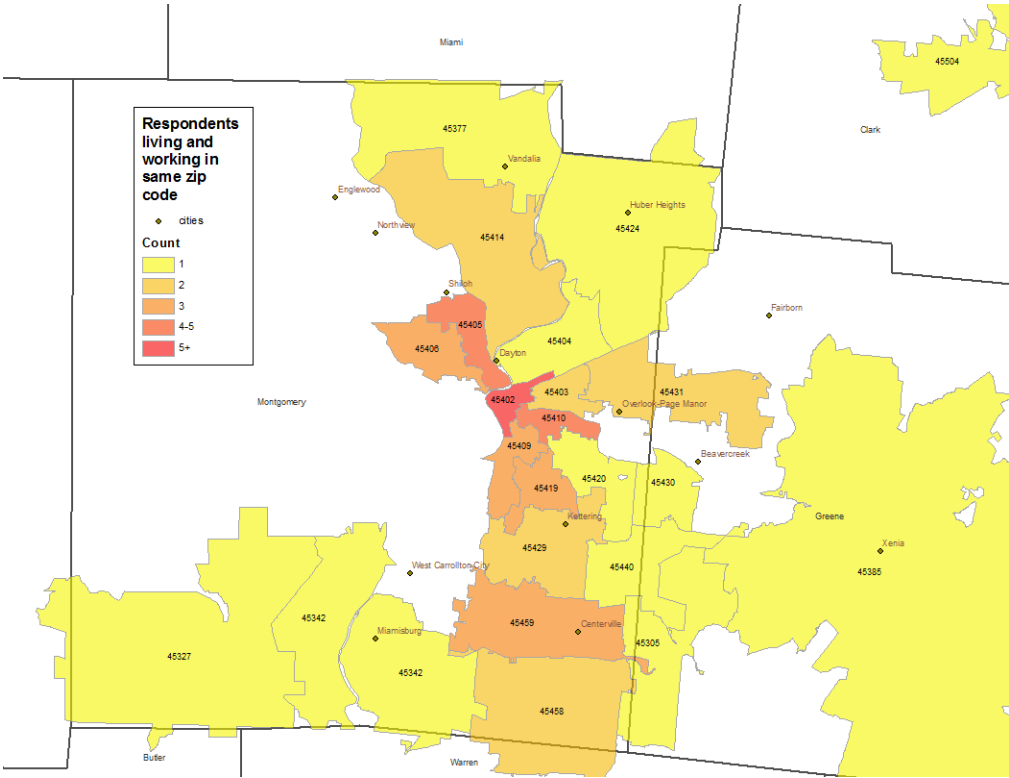


Figure 9: Survey Respondents Living and Working in the Same Zip Code



DAYTON BIKE SHARE SURVEY

Current Bike Use and Transportation Habits

Current use of bikes was another important factor in considering bike share acceptance and potential use. Nearly 76% of survey respondents already own a bike, but 54% do not use a bike for transportation today and 30% more just use a bike “sometimes” (Figure 10). This illustrates that the respondent pool is not purely the existing avid cycling community of Dayton, rather a more casual bike user base.

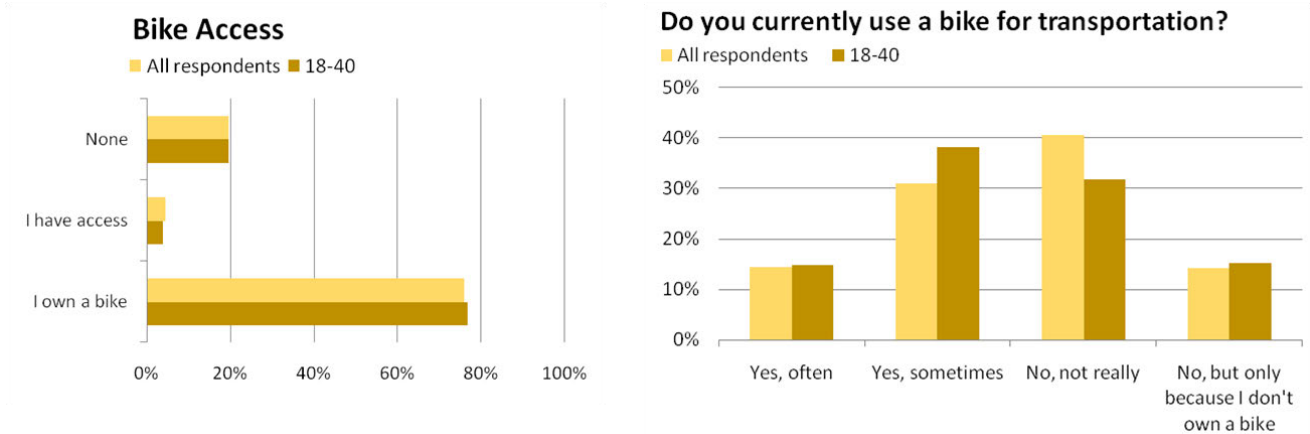


Figure 10: Current Bike Use

When asked what modes of transportation they commonly use, not-surprisingly, 70% of respondents use their own vehicle as a sole passenger. They are least likely to use a city bus at almost an equal percentage (Figure 11). This data is consistent with the results of the previous question, indicating that more than half of respondents do not use a bike frequently for transportation now, which shows the survey reach beyond the cycling community.

Bike shares are most commonly used for short trips. When respondents were asked how often they take 0-3 mile trips weekly, nearly 37% said 1-5 and more than 30% take more than 10 such short trips in a given week (Figure 12).

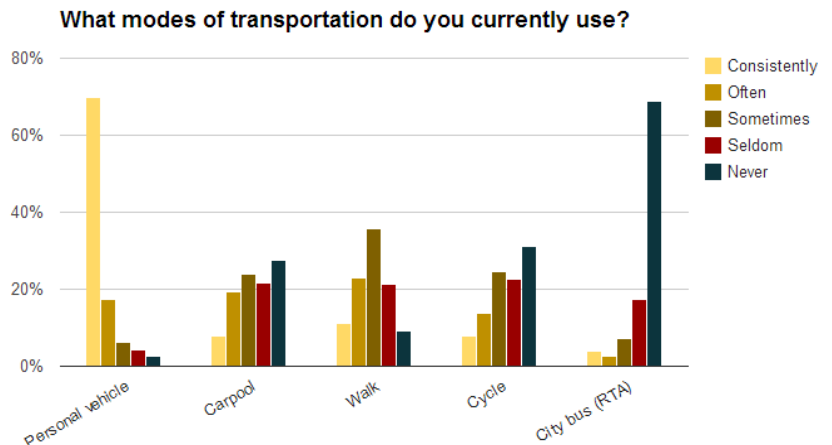


Figure 11: Current Transportation Use

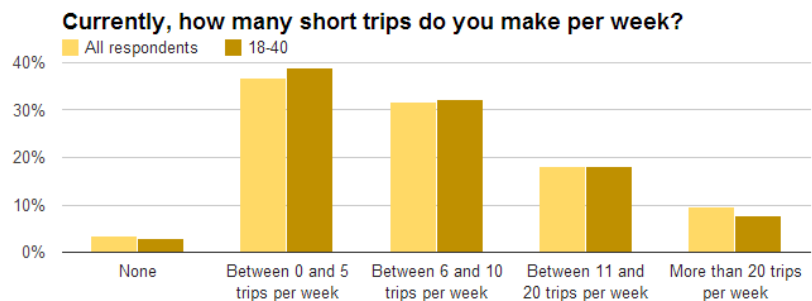


Figure 12: Number of Short Trips Per Week



Level of Support for a Bike Share

We wanted to understand how the Dayton community might support the concept of a bike share, both in theory and in practice. We started by asking survey respondents if they would generally support a bike share program, 85% said yes – but when filtered to just those 18-40, that percentage rose to 98% (Figure 13). Even 80% of those not riding a bike for transportation today were supportive of the idea. Those who indicated that they would not support a bike share primarily had concerns about the bikes being stolen or abused (likely a consequence of Yellow Bikes), expressed doubt whether the program would be successful in Dayton, or they lived outside of the downtown area and thus did not believe the program would be accessible to them.

We then asked those who said they would generally support the concept of a bike share if they would actually use the bike share program. 27% said they definitely would; another 36% said they might. When filtered to only respondents that are 18-40, those percentages rose to over 34% (definitely will use) and nearly 39% (may use) (Figure 14). Those who do not use bikes as transportation today also showed strong support for using the bike share, with 20% indicating that they definitely would use it, and another 36% indicating that they might.

Potential Travel / Bike Share Use Patterns

Respondents were then asked how often they might use the bike share program. While 22% said rarely, 78% said that they would use the bikes at least a few times per month. When filtered for survey respondents 18-40, the breakdown was similar – but with fewer responses for rarely and more than 2x a week, and more responses for at least once a week and a few times a month (Figure 15).

When asked to categorize the purpose of their trips, respondents indicated a much higher likelihood to use the bike share for recreation

Bike Share Support

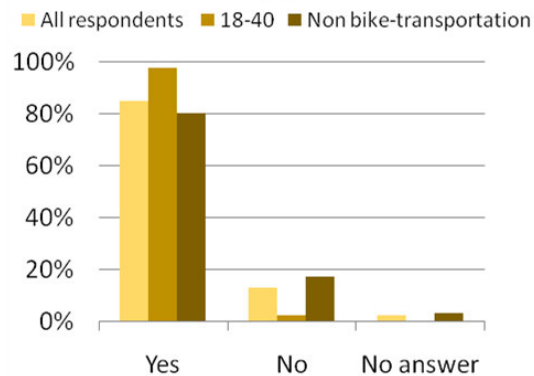


Figure 13: Bike Share Support

Would you use a bike share?

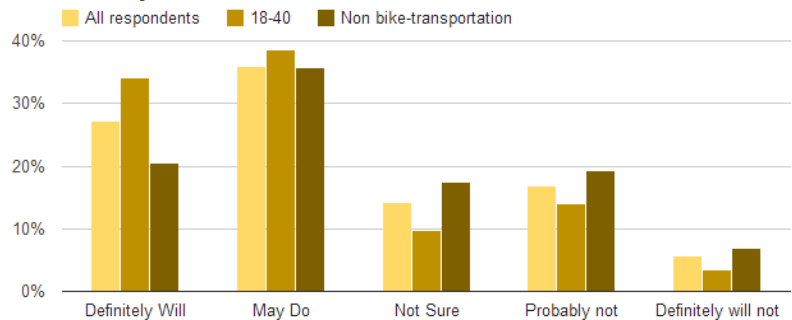


Figure 14: Interest in Using a Bike Share

How frequently would you use the bike-share bikes?

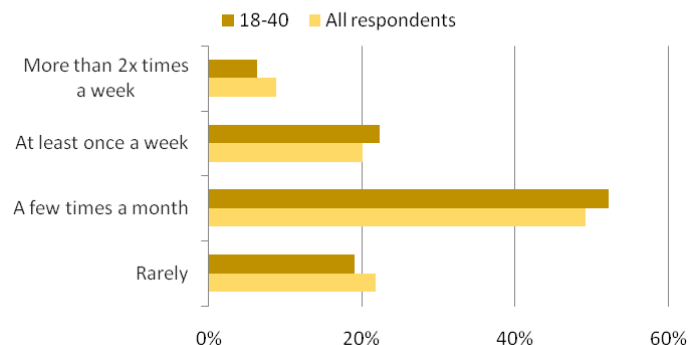


Figure 15: Frequency of Bike Share Use



DAYTON BIKE SHARE SURVEY

and fitness than for commuting. Respondents also indicated a high likelihood of using the bikes for shopping, errands, and cultural activities. Last mile transportation and visiting friends also scored highly in this group (Figure 16). When filtered for those 18-40, the breakdown was similar, but there was a higher level of commitment to use the bike share for all reasons, including areas that had lower response rates with the general audience such as commuting to work or school. Cultural activities, last mile transportation, and visiting friends also scored highly in this group (Figure 17). Those who indicated that they do not currently use bikes for transportation today were also much more likely to use the bike share for recreation and fitness than for commuting. Cultural activities also scored highly in this group.

What kind of trips might you use the shared bicycles for?

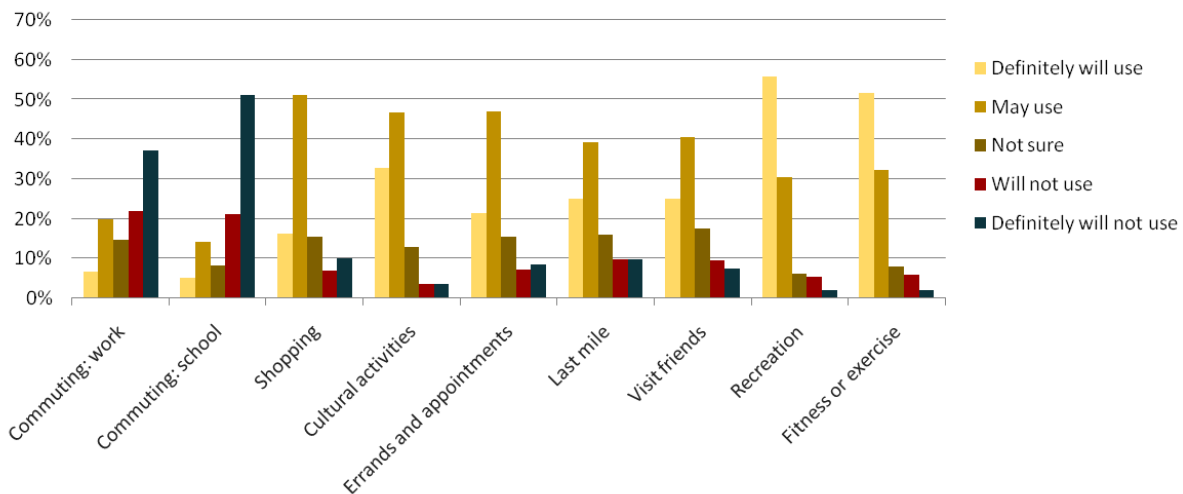


Figure 16: Most Likely Bike Share Trips (All Respondents)

What kind of trips might you use the shared bicycles for? (Age 18-40)

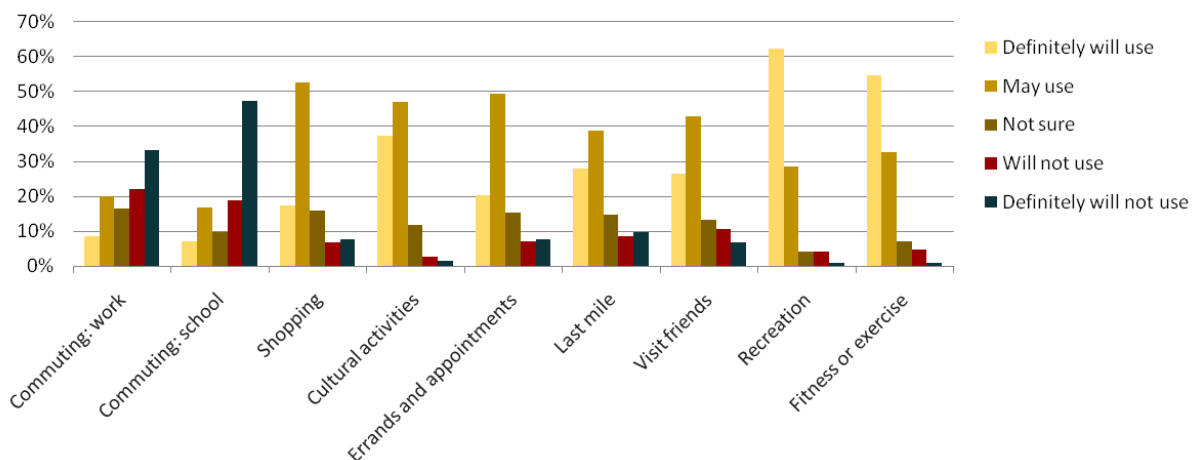


Figure 17: Most Likely Bike Share Trips (Age 18-40)



DAYTON BIKE SHARE SURVEY

Weather has been shown to be a barrier for bike share use in other cities. When we asked those interested in using the bike share whether they would use the program in all seasons, 32% said yes, and another 37% said maybe (Figure 18). For those who indicated that they would ride year round, we asked how clearing bike paths and streets would impact their willingness to use the bike share. 62% answered that clearing the way would make them more willing to use the program.

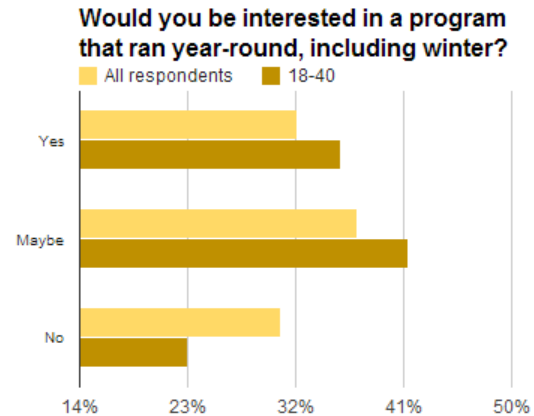


Figure 18: Likelihood of Year Round Use

Willingness to Pay Membership Costs

We benchmarked other bike share programs around the U.S. and averaged their fees for daily, monthly, and yearly use. We then asked respondents if these average rates were fees that they would be comfortable paying. The majority of respondents were willing to pay \$5/day, \$25/month or \$60/year (Figure 19). In fact, nearly 8% were willing to pay more annually. Filtered to those who are ages 18-40, there was very little change in results. When the survey responses were narrowed to those who said they do not use bikes for transportation today, there was slightly more support for the daily pass at the rates we suggested (and a little less support for the monthly pass), indicating that this audience might be more interested in trying a short term pass before making a longer commitment to use the bike share.

To better understand what is most valuable about a bike share to potential users, we asked survey respondents to tell us which benefits were most influential on them. Their answers can be used to aid in the marketing messages for a bike share program locally. The strongest response was to the health benefits of riding the bike for short trips, followed closely by convenience, fun, and being environmentally friendly (Figure 20).

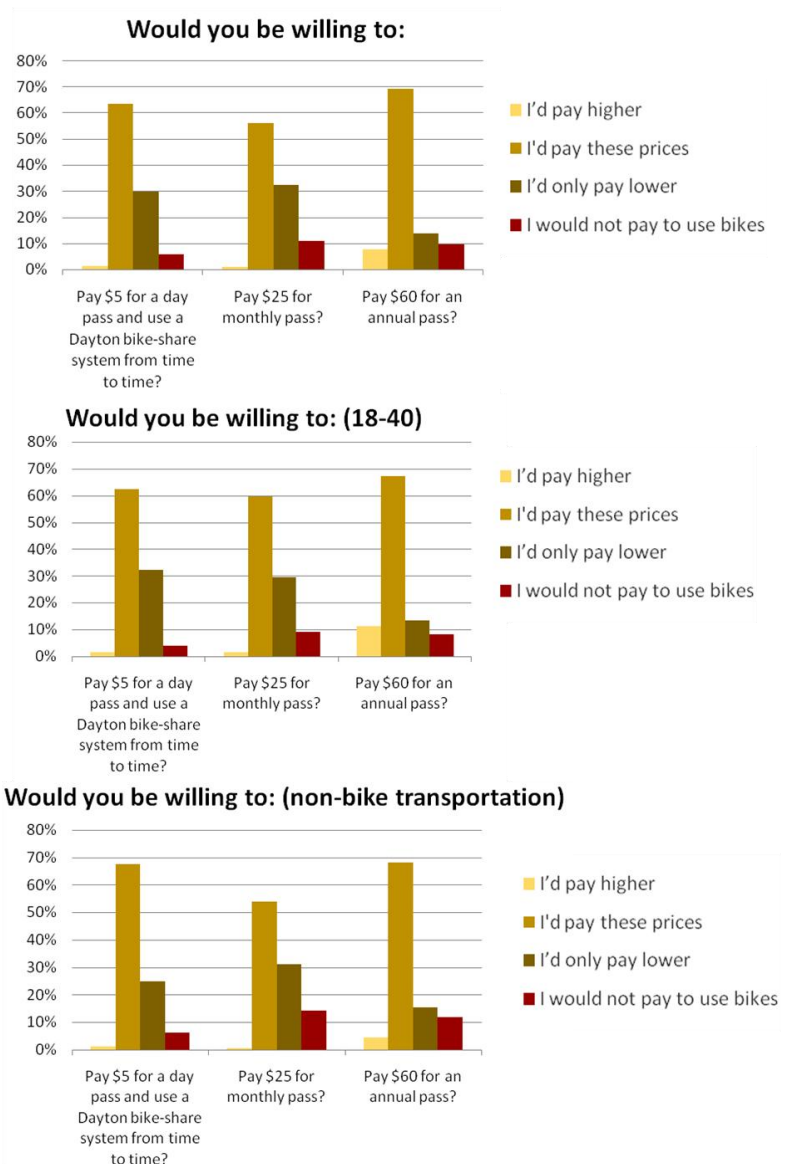


Figure 19: Willingness to Pay for Bike Share



DAYTON BIKE SHARE SURVEY

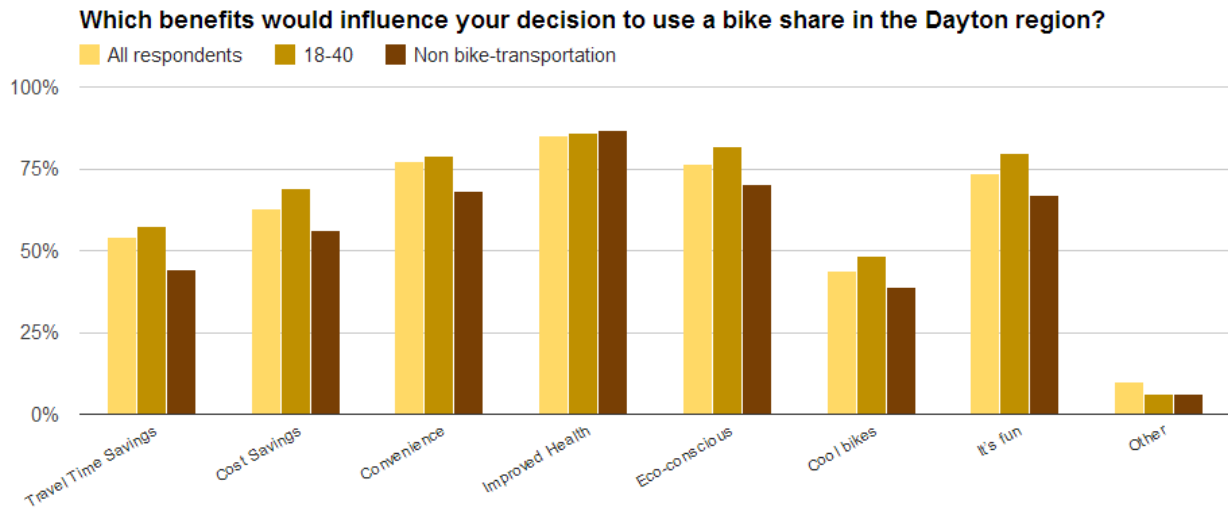


Figure 20: Bike Share Value Proposition

Trip Origins and Attractors

To identify the best locations for bike share stations, we asked respondents to tell us where they would be most likely to start and end short trips for which they would use the bike share. Most expected to start from a place near their home. Other popular answers included downtown, work, the Oregon District, UD, and South Park (Figure 21).

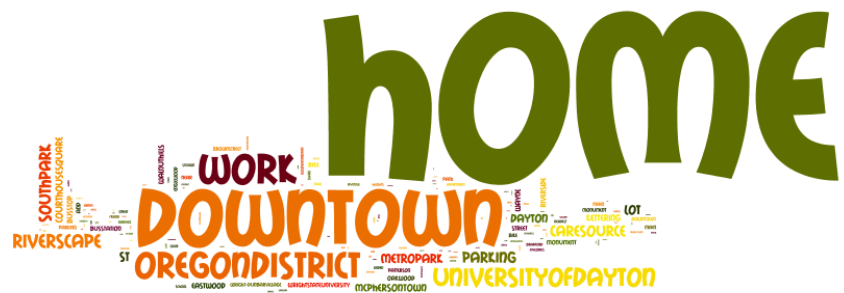


Figure 21: Most Likely Trip Origins

Similarly, respondents were asked where they were most likely to end their short trips. These answers were more varied. They included the Oregon District, downtown, RiverScape and the bike path, the 2nd Street Market, their work location, as well as general statements of purpose such as errands, lunch, shopping, and banking (Figure 22).



Figure 22: Most Likely Trip Attractors

When primary short trips intended for a bike share were mapped, these trips are concentrated in Downtown Dayton (Figure 23). Zooming in, we see patterns of start and end locations beginning to form, suggesting possible locations for bike share stations (Figure 24).



DAYTON BIKE SHARE SURVEY

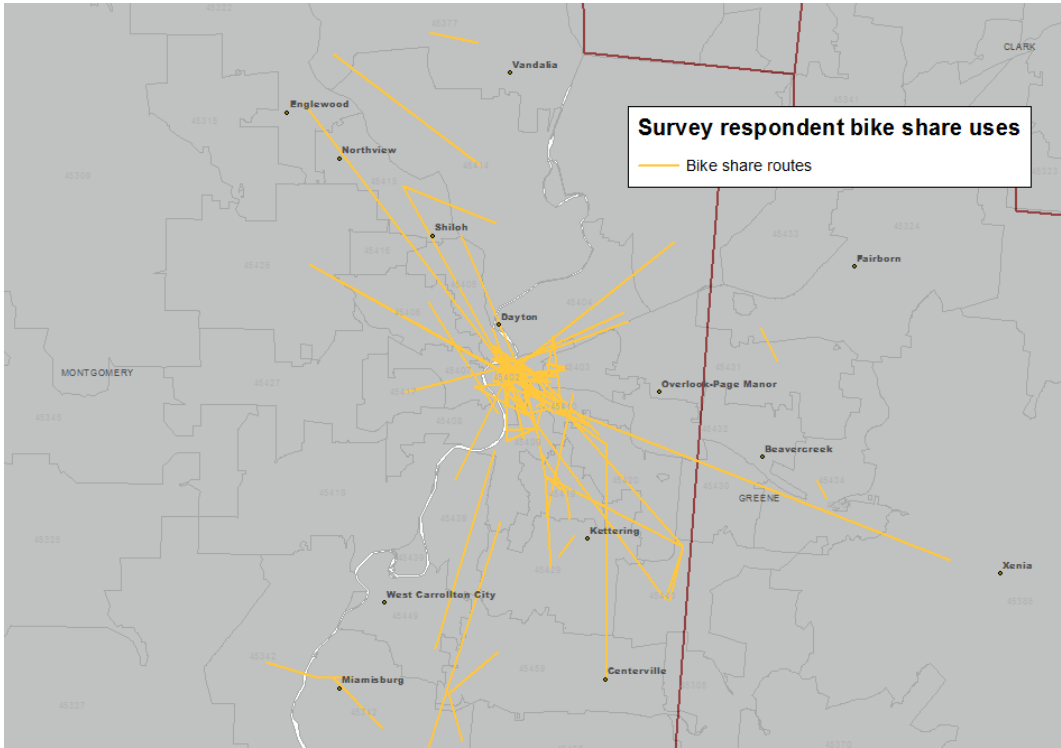


Figure 23: Reported Bike Share Trips (Origins and Destinations)

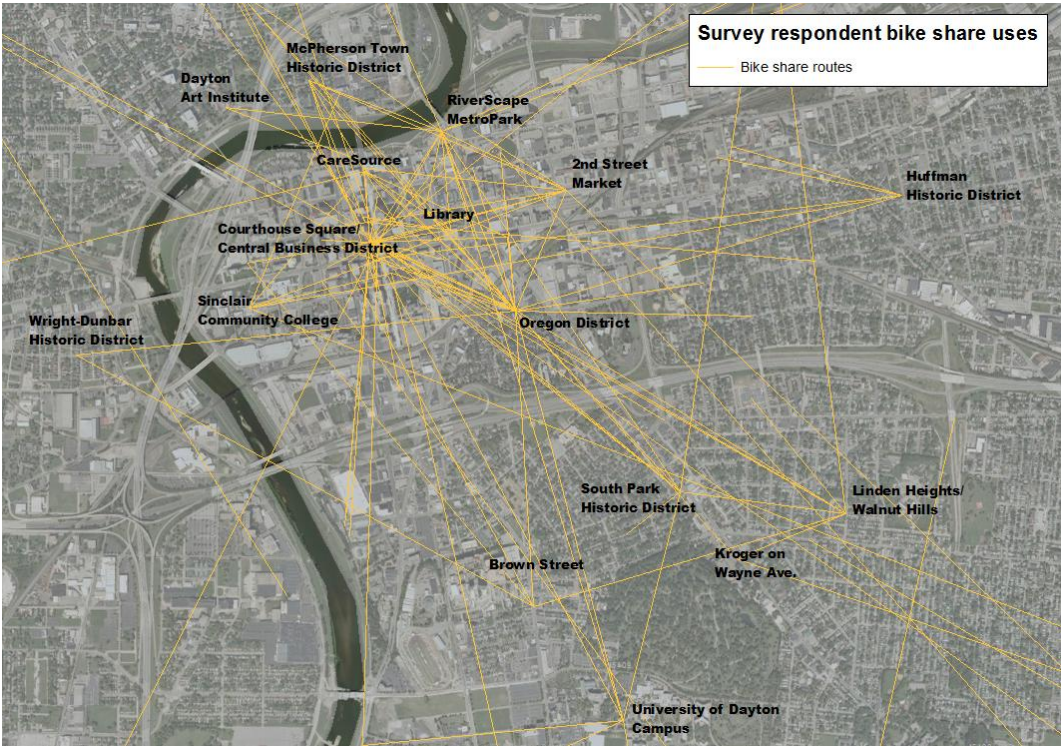


Figure 24: Reported Bike Share Trips (Zoomed-in on Downtown)



DAYTON BIKE SHARE DEMAND

DEMAND ANALYSIS OVERVIEW

To assess the Dayton region's readiness for a fourth generation bike share transportation system, Bike Miami Valley conducted a "demand analysis" based on lessons learned from studies performed for other cities. This type of analysis was first implemented by Philadelphia in 2010,²⁵ then evolved by Seattle later that same year.²⁶ Since Seattle's study, the bike share consulting firm Alta Planning + Design has conducted similar analyses for several clients.²⁷ The U.S. Department of Transportation recommends a demand analysis as a first step in its "Bike Sharing in the United States: State of the Practice and Guide to Implementation" survey of best practices for communities considering the start of a bike share.²⁸ An example heat map that is the product of a typical bike share demand analysis is shown in Figure 25.

The bike share demand analysis is rooted in three basic questions that are fundamental to the implementation of any bike share system:

- Who uses a bike share?
- How will a bike share be used?
- What are the most likely bike share trips?

At the time of the Philadelphia and Seattle studies, bike shares in the U.S. were still in their infancy, so data to answer the above questions did not exist, at least not specific to the United States. Since those studies, a significant amount of data has been collected to assist modern bike share planning. Urban planners no longer have to guess when assessing the factors most likely to predict a bike share's success.

To answer the above questions for the Dayton region, Bike Miami Valley conducted a GIS based analysis to identify the areas in the Miami Valley most likely to support a bike share. A total of ten factors that impact bike share suitability were evaluated for their geographic correlation in Montgomery and Greene County. The locations where those factors correlate the best are those deemed most likely to support a bike share system.

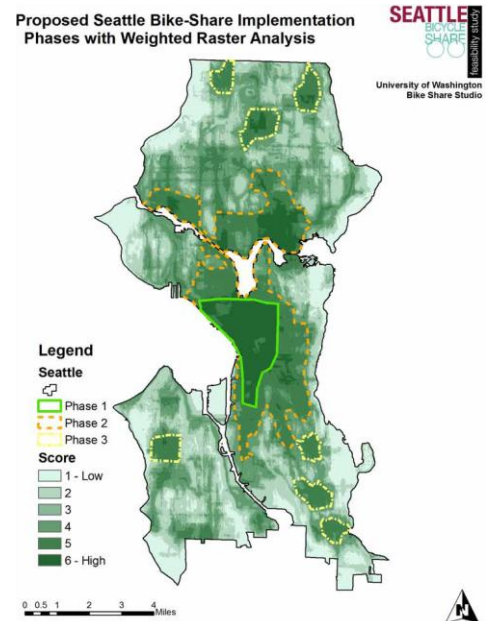


Figure 25: Seattle "Heat Map" of Bike Share Suitability

Urban planners no longer have to guess when assessing the factors most likely to predict a bike share's success.

²⁵ JzTI and Bonnette Consulting. 2010. Philadelphia Bikeshare Concept Study. <http://bikesharephiladelphia.org/>.

²⁶ University of Washington, Department of Urban Design and Planning. 2010. Seattle Bicycle Share Feasibility Study. <http://seattlebikeshare.org/>.

²⁷ Alta Planning + Design. <http://www.altaplanning.com/>.

²⁸ Pedestrian and Bicycle Information Center and the Toole Design Group. 2012. Bike Sharing in the United States: State of the Practice and Guide to Implementation. <http://www.bicyclinginfo.org/promote/bikeshare.cfm?/bikeshare>.

WHO USES A BIKE SHARE?

Photo courtesy of UD RecBikes



UD Students on Bikes

The most basic consideration when designing any transportation system is the location of people, including where they live and the places they go to work. Both contribute to the pool of potential customers who might take advantage of a bike share. Additionally, areas with greater population density also correlate to a reduced automobile dependence, and thus a higher receptivity to public transportation.²⁹ While the Dayton region as a whole is relatively low in density for jobs and people compared to some of the larger cities that have bike shares, this analysis is really only interested in whether there are enclaves of high population and job density in Dayton that can support a bike share. Bike shares have been implemented in cities across the U.S. for geographic areas of vastly different sizes. For example, the Capital Bikeshare in Washington, D.C. covers a service area of almost 36 square miles, while Spartanburg, SC covers only a small 1.5 square mile area.³⁰

In addition to basic population density, recent research has shown that young people (under 40) are early adopters of bike share transportation. In a 2011 survey, Capital Bikeshare found that 66% of its members are younger than 35, predominantly educated (95% had four year degree),

and three fourths make more than \$50k.³¹ Furthermore, as Seattle asserted in its 2010 research and the U.S. Department of Transportation reaffirmed in its study in 2012, university campuses with large resident populations are ripe for cycling due to the lower rates of automobile ownership and tendency to be surrounded by mixed use development, which both further support bike share usage.

For purposes of this demand analysis, portions of the Dayton region with high population density and employment density were weighted higher to identify the locations most suitable for a bike share. Parts of the region with a higher density of young people also received additional weight to account for their higher likelihood to embrace a bike share as a mode of transportation.

HOW WILL A BIKE SHARE BE USED?

For a bike share to be successful, it must find customers outside the existing cycling community. Less experienced bike riders are naturally more likely to use a bike share if they perceive the trip to be safe and enjoyable. Several studies have shown the correlation between available bike infrastructure (i.e. off-street paths and on-street lanes) and bike commuting. Research in Portland, Oregon tracked the commute patterns of 166 cyclists for one week through Global Positioning System (GPS) technology. The study discovered that about half of the distance traveled by the cyclists occurred on roads with

²⁹ Litman, T., & Steele, R. Land Use Impacts on Transport: How Land Use Factors Affect Travel Behavior. 2008. Vancouver, British Columbia: Victoria Transport Policy Institute.

³⁰ Pedestrian and Bicycle Information Center and the Toole Design Group. 2012. Bike Sharing in the United States: State of the Practice and Guide to Implementation. <http://www.bicyclinginfo.org/promote/bikeshare.cfm?/bikeshare>.

³¹ Capital Bikeshare. 2011. Capital Bikeshare 2011 Member Survey Report. <http://capitalbikeshare.com/assets/pdf/Capital%20Bikeshare-SurveyReport-Final.pdf>.



DAYTON BIKE SHARE DEMAND



bicycle lanes or bicycle paths, despite this infrastructure constituting only about 8% of the total street infrastructure available to Portland bicycle riders.³²

Bike infrastructure constitutes the highways and thoroughfares of bike transportation. For purposes of this demand analysis, geographic areas with close proximity to streets with bike lanes and bike paths received higher weighting. The City of Dayton recently classified its streets by the estimated level of skill required by bike riders. Specifically, each street received a novice, intermediate, or expert rating. This classification considered primarily car traffic volume and the speed limit of the street. Since they are deemed the most bike-friendly and thus most likely to be used by bike share customers, areas with close proximity to streets classified as novice were also weighted higher in the bike share demand analysis.

Anyone who has ever practiced cycling for either recreation or transportation knows that topography is a major consideration in the decision whether or not to ride a bike. A 2004 study by Parkin concluded that a 10% increase in “hilliness” (defined by an area with average gradient of 3% or more) is linked with a 10% to 15% reduction in the proportion of people cycling to work.³³ Another international study conducted by Midgley asserts that slopes at a grade of 4% or more are a major barrier to bike usage.³⁴ Topography is even more a factor for bike share bicycles given that they are required to be sturdier / heavier to minimize maintenance costs and typically have fewer gears than personal bicycles. Furthermore, bike shares with large elevation changes in the service area will result in a constant mal-distribution of bicycles given the propensity of users to ride the bikes down a slope, but not back up. Topography is a major consideration in the design of any bike share, thus it was included as a factor in the Dayton bike share demand analysis.

Finally, users have been proven to use bike share bicycles as “last mile” transportation connectors to complete other forms of public transit and make it easier to reach a final destination. Capital Bikeshare’s survey found that as many of 59% of its members had used the bike share to get to or from other public transportation.³⁵ A 2011 Dayton Most Metro blog emphasized the added convenience provided by bicycles in using the Greater Dayton RTA as a form of transit and the ability to live car-less in Dayton.³⁶ For the purposes of this demand analysis, proximity to RTA transit stops was considered as contributing factor to bike share demand.



**Bike Sharrows in
Downtown Dayton**

³² Dill, J. *Bicycling for Transportation and Health: The Role of Infrastructure*. 2009. Nohad A. Toulon School of Urban Studies and Planning, Portland State University, Portland, OR.

³³ Parkin, J. *Determination and Measurement of Factors which Influence Propensity to Cycle to Work*. 2004. The University of Leeds Institute for Transport Studies.

³⁴ Midgley, P. *Bicycle-Sharing Schemes: Enhancing Sustainable Mobility in Urban Areas*. 2011. Global Transport Knowledge Partnership International Road Federation.

³⁵ Capital Bikeshare. 2011. *Capital Bikeshare 2011 Member Survey Report*. <http://capitalbikeshare.com/assets/pdf/Capital%20Bikeshare-SurveyReport-Final.pdf>.

³⁶ Cooper, M. *Car-less in Dayton*. 2011. Dayton Most Metro. <http://www.daytonmostmetro.com/life/i-feel-happy-of-myself.html>.



WHAT ARE THE MOST LIKELY BIKE SHARE TRIPS?

A properly designed bike share should also consider the various uses bike share members might have for the transportation system. Fortunately, recent data collected for the Capital Bikeshare program provides ample information to make decisions about likely use. Their survey of over 5,000 program members found that 67% of survey respondents reported having used the bike share for social / entertainment, 64% for personal errands and appointments, 56% to go to a restaurant or go to a meal, 40% for shopping, and 36% for exercise and recreation. Of respondents' most recent trips, 38% identified transit to and from work, 22% for social / entertainment, and 7% for a restaurant / meal.³⁷ This data also corroborates with Bike Miami Valley's own survey results of potential bike share users. As was described earlier in this report, a high number of respondents anticipate using the bike share for shopping, cultural activities, and exercise / recreation.



Figure 26: Capital Bikeshare Trip Purposes

To identify the areas of the Miami Valley most likely to attract bike share trips, the above trip purposes were tracked by giving geographic areas with high retail job density and food and accommodations job density higher weight in the bike share demand analysis. Each provides a first order measure of customer traffic, and thus the potential of any one destination as a bike share trip attractor. The inclusion of accommodations job density also adds a measure of the number of hotel visitors, who are another pool of potential bike share customers. To account for exercise and recreational use, proximity to parks was included as a bike share demand factor. Parks are safe destinations for bike shares customers who are simply looking to get outside. However, the goal of the bike share is to serve primarily as a transportation system (benefits to recreation really are secondary), thus proximity to parks received a half weight in the demand analysis.

Similarly, tourist attractions are bike share trip destinations, particularly for visitors to Dayton. Not surprisingly, data from Capital Bikeshare indicates a portion of bike share rides are tourist in nature.³⁸ Admittedly, this data is for Washington D.C., which certainly has a higher amount of visitors per year than Dayton. Nevertheless, attractions such as the Dayton Art Institute, Dayton Convention Center, and Fifth Third Field are destinations that receive a significant amount of visits each year and are thus worthy of special attention in the demand calculation.

BIKE SHARE DEMAND ANALYSIS

Table 1 lists the factors considered in the demand analysis, the data sources, and the accompanying weights for the spatial correlation. To keep the analysis simple, most factors received a weight of one. However, the factors for age 18-39 population density, retail job density, and food and accommodations

³⁷ Capital Bikeshare. 2011. Capital Bikeshare 2011 Member Survey Report. <http://capitalbikeshare.com/assets/pdf/Capital%20Bikeshare-SurveyReport-Final.pdf>.

³⁸ JDantos Blog. 2012. <http://jdantos.wordpress.com/2012/02/13/capital-bikeshare-data-part-7-maps-edition/>



DAYTON BIKE SHARE DEMAND

job density received only weights of 0.5 given that they are already counted once in the overall population and job density factors (thus they receive a total weight of 1.5). The factors for bike infrastructure, tourist destinations, parks, and RTA stops are scored based on proximity. Specifically, areas that are closer to these features receive higher scores in the demand analysis.

Table 1: Bike Share Demand Inputs

| Indicator | Scale | Metric | Buffer | Weight | Data Source |
|---------------------------------------------------------------------------------|---------------|--------------------|-------------|--------|---------------------------------------------------------|
| Population Density | Census Block | Pop per Sq Mile | N/A | 1.0 | 2010 Census |
| Population Density: Age 18 to 39 | Census Block | Pop per Sq Mile | N/A | 0.5 | 2010 Census |
| Job Density | TAZ* | Jobs per Sq Mile | N/A | 1.0 | MVRPC+ |
| Retail Job Density | TAZ* | Jobs per Sq Mile | N/A | 0.5 | MVRPC+ |
| Food & Accommodations Job Density | Census Block | Jobs per Sq Mile | N/A | 0.5 | Census Bureau, Longitudinal Employer-Household Dynamics |
| Tourist Attractions | 10 meter cell | Proximity Distance | 1000 meters | 1.0 | Montgomery and Greene County Visitor's Bureaus |
| Open Space (i.e. parks) | 10 meter cell | Proximity Distance | 1000 meters | 0.5 | MVRPC+ |
| Topography | 10 meter cell | Slope | N/A | 1.0 | Ohio Geographically Referenced Information Program |
| RTA Stops | 10 meter cell | Proximity Distance | 1000 meters | 1.0 | MVRPC+ |
| Bike Trails, Streets with Bike Lanes, and Bike Friendly Streets (novice) | 10 meter cell | Proximity Distance | 1000 meters | 1.0 | MVRPC & City of Dayton (Existing or Funded) |

*Transportation Analysis Zone

+ Miami Valley Regional Planning Commission

The overall demand analysis is completed through a weighted sum raster calculation in ArcGIS. After obtaining the source data in geographic format, each factor was gridded into 10x10 meter cells in ArcGIS for both Montgomery and Greene County. Figure 27 depicts the weighted raster sum process. For every 10x10 cell, each demand factor was reclassified to a 1-10 scale (10 being best). For the factors graded by proximity, this was done through a multi-ring buffer over 0-1000 meters (rings of 100 meters each). For the other factors, the data was reclassified using the geometric interval classification algorithm in ArcGIS. This algorithm results in a sensible distribution of classes (i.e. data similar in value are grouped together), while also maximizing the spread of the data across all classes. This second feature of geometric interval classification is important to ensure the number of data points in any one class isn't excessively large or small.

Once each demand input is converted to a 1-10 scale, each cell is assessed for its specific bike share demand through a weighted sum of all the factors in Table 1. For example, if a given cell scored a ten for population density (weight of 1), job density (weight of 1), and retail job density (weight of 0.5), its combined score would be $10*1 + 10*1 + 10*0.5 = 25$ (neglecting the other seven factors).



DAYTON BIKE SHARE DEMAND

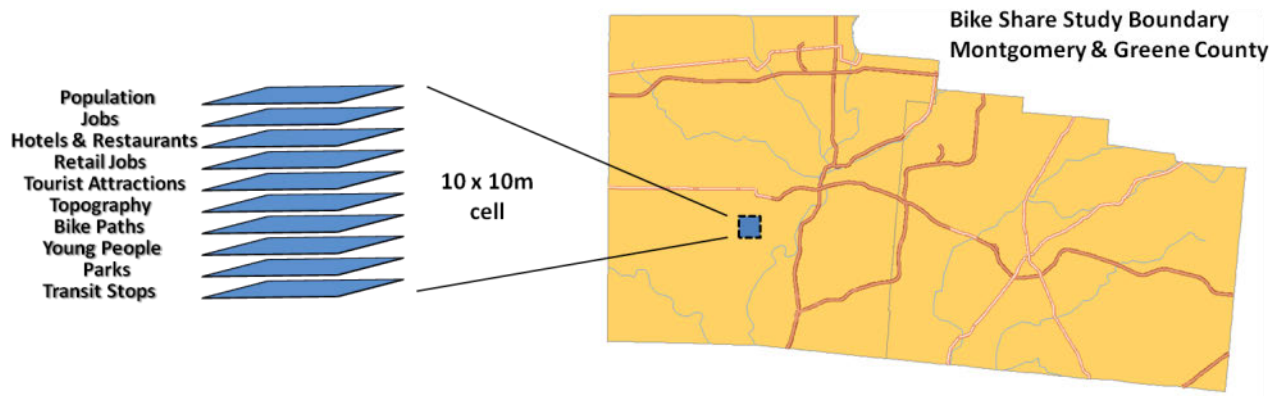


Figure 27: Bike Shared Demand Analysis Process

A sample bike share demand input is shown in Figure 28, plotting population density as determined from the data from the 2010 census. In this figure, the data has already been reclassified to a 1-10 scale. Plots for the other demand inputs have been included in Appendix A of this report.

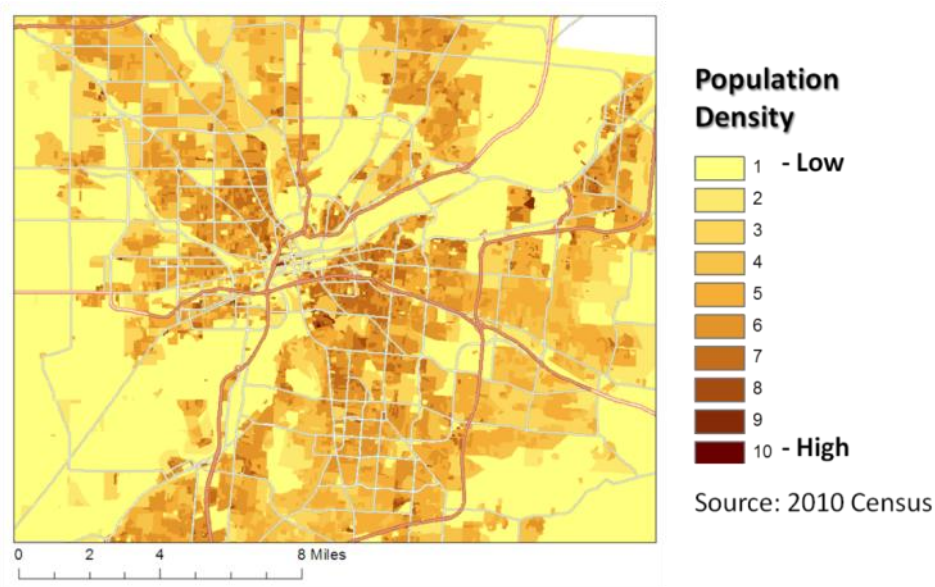


Figure 28: Sample Demand Input - Population Density

The demand calculation for the total analyzed geographic area is shown in Figure 29. The highest bike share demand area in the Miami Valley is constituted of an approximate four square mile area surrounding downtown Dayton, with a slight bias towards the southeast of downtown to encompass the University of Dayton campus. A zoom-in of this area is provided in the lower half of the figure, with a dashed box encompassing the highest demand portion of the region in the right hand side of the figure. The demand in this area was in the top five percent of the calculated bike share demand values across the entire two-county area considered. This area of the region not only has high concentrations of population, jobs, entertainment, and young people, but also easy access to streets with bike lanes and bike paths. It is fortunate that this area is also relatively flat, making trips to the edges of the bike share service area something that any novice bike share user would feel comfortable accomplishing.



DAYTON BIKE SHARE DEMAND

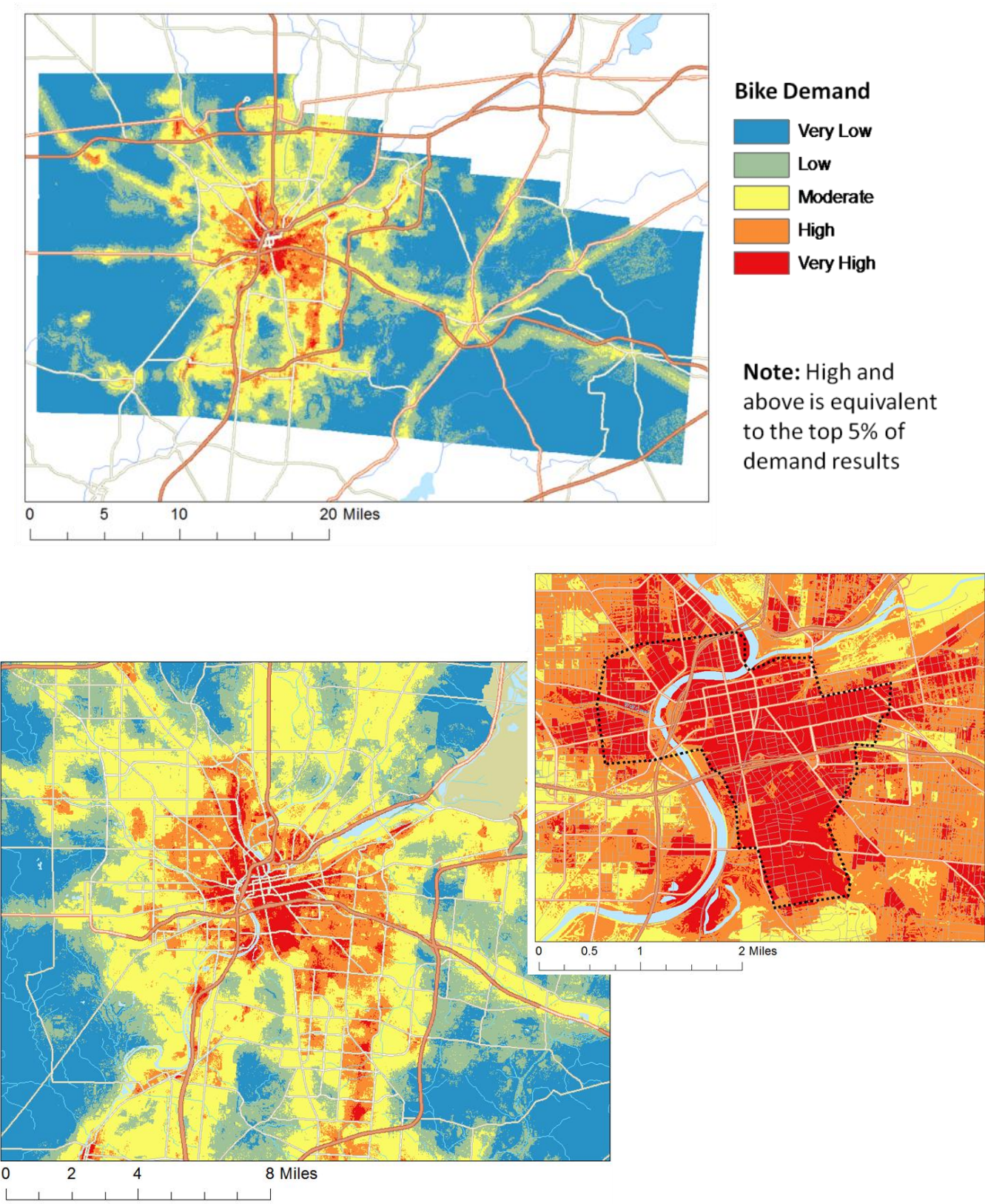


Figure 29: Bike Share Demand Analysis Results



CITY COMPARISONS – IS DAYTON BIKE SHARE READY?

While the above bike share demand analysis indicates the geographic areas in the Miami Valley best suited for a bike share, it does not benchmark the Dayton region against other cities that have either implemented bike shares or are considering new bike shares in the near future. To address the question of whether Dayton is bike share ready, a city comparison analysis was completed for the cities listed in Table 2. Included in the table are the relevant statistics on the approximate bike share service area and the status of the bike share in the comparing city (existing or proposed).³⁹ Cities with existing or proposed bike shares were selected because of their similarity in size relative to the proposed bike share area in Dayton identified in the previous section. The exception to this selection criterion is Seattle, which was primarily included as a benchmark because the Seattle bike share feasibility study was a model for this effort.

All of the factors considered in the Dayton analysis from Table 1 were not available for the other cities, thus this city comparison focused on just five of the bike share demand factors: population density, employment density, age 18-39 population density, retail job density, and food and accommodations job density. For the bike share demand calculation, the weights for each factor were identical to the weights identified in Table 1. All cities were evaluated against the same scale for each factor. Specifically, the value of population density that equates to a 10 in Dayton is the same that equates to a 10 in Seattle. This was necessary to ensure the comparison was consistent across all of the cities. To also maintain consistency in the analyzed geographic area, a five mile radius was drawn around the “center” of each city’s bike share area and only the area inside this radius was considered for the analysis.

Table 2: City Comparisons

| City | Bike Share Status | Number of Bikes | Bike Share Area (Square Miles) | Population Density (per acre)* | Job Density (per acre)* |
|--------------|-------------------|-----------------|--------------------------------|--------------------------------|-------------------------|
| Boulder | Existing | 110 | 4.64 | 12.34 | 15.16 |
| Chattanooga | Existing | 300 | 4.01 | 5.30 | 18.43 |
| Cincinnati | Proposed | TBD | 3.61 | 9.88 | 35.86 |
| Columbus | Proposed | 300 | 6.84 | 8.12 | 26.65 |
| Dayton | Proposed | TBD | 4.00 | 8.59 | 15.10 |
| San Antonio* | Existing | 200 | 4.76 | 6.26 | 29.04 |
| Seattle | Proposed | 1100 | 9.32 | 23.8 | 55.92 |

* Statistics are for Bike Share Service Area

+ San Antonio has since expanded to 30 stations & 300 bikes

The color maps that compare the demand results are shown in Figures 30 through 33. Included in each figure for the comparison cities are the bike share station locations, along with a service area that is defined via a 0.5 mile radius around each station.⁴⁰ As can be seen from comparing the maps, the high bike share demand area in the Dayton region is consistent with the results for the other cities (minus Seattle). Because this analysis only considers a five mile radius around the center of the bike share service area, which in general is much more urban than the two county area considered in the Dayton-only analysis from the previous section, locations classified as “high” demand scored in the top 10% for all cities. One of Dayton’s biggest strengths in this city comparison is the University of Dayton campus, which is unique relative to the other cities in its close proximity to downtown.

³⁹ The Cincinnati bike share stations came from a study conducted by Alta Planning + Design. Columbus’s station locations were obtained from a bike share operator request for proposals published by the City of Columbus. Finally, the Seattle station locations came from a bike share business plan created by Alta Planning + Design.

⁴⁰ This is the recommended service area definition from the USDOT report: Bike Sharing in the United States: State of the Practice and Guide to Implementation



DAYTON BIKE SHARE DEMAND

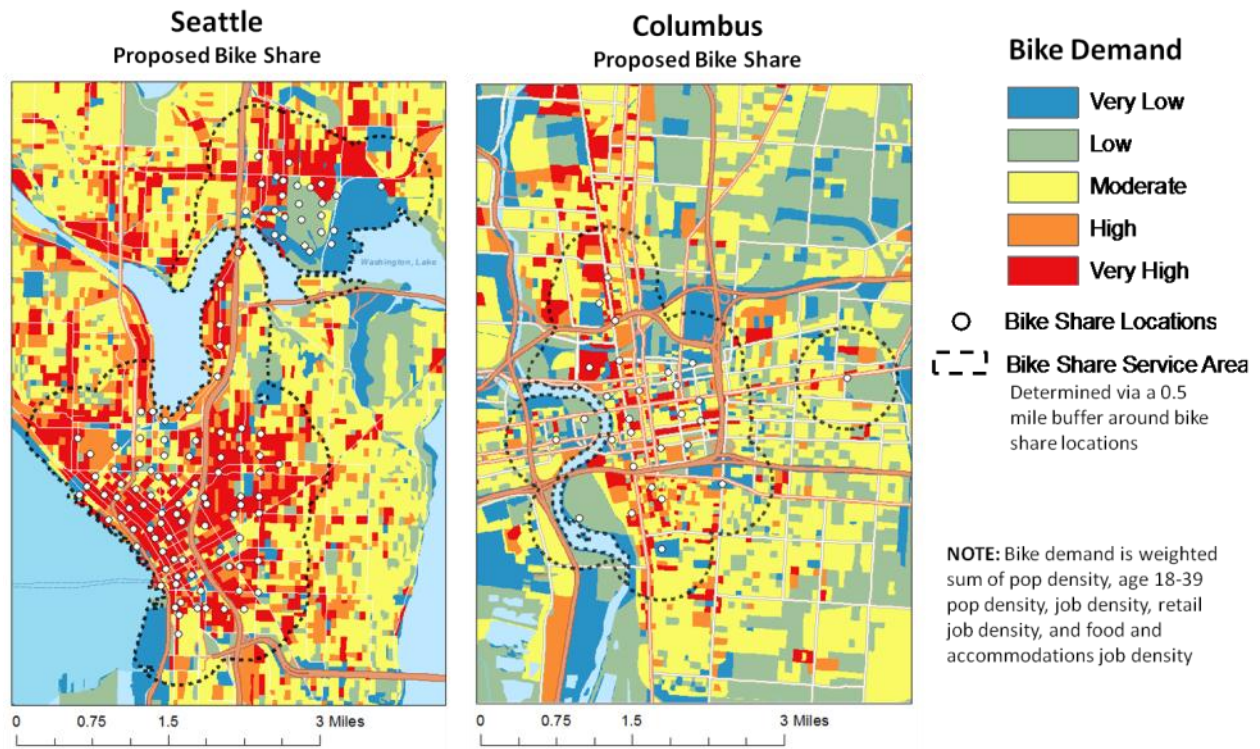


Figure 30: Seattle and Columbus Bike Share Demand

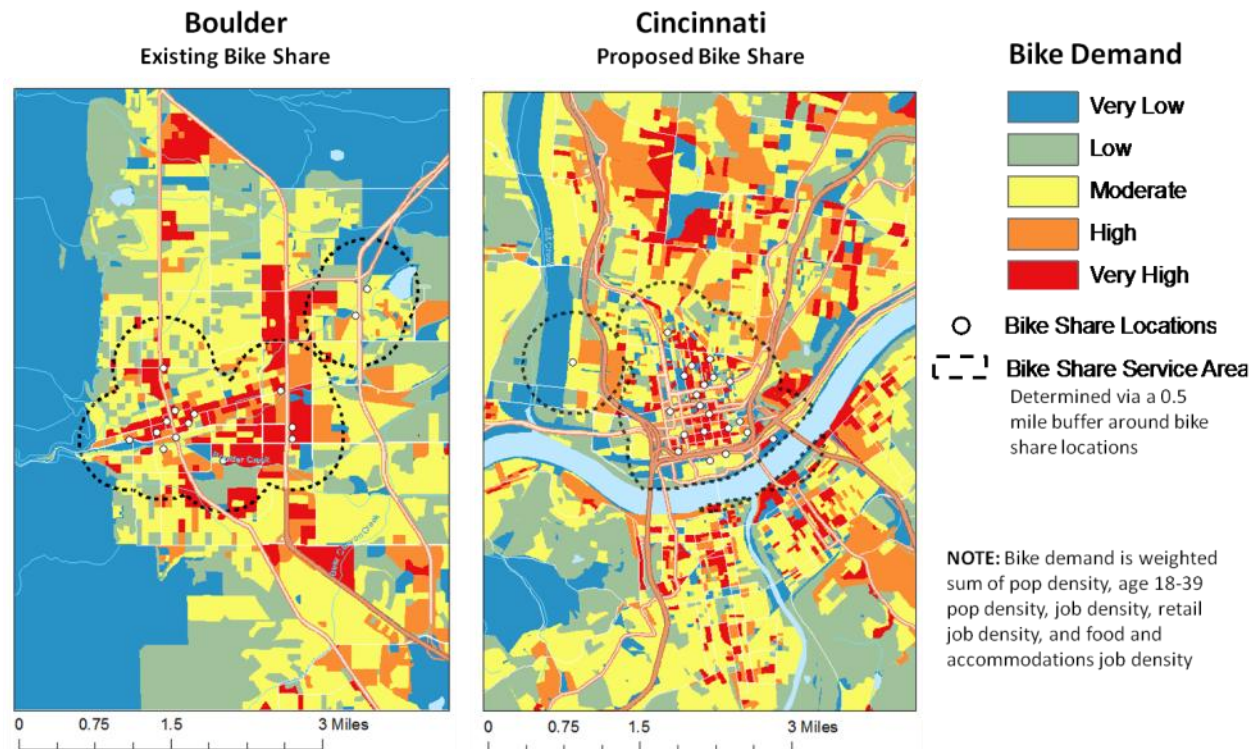


Figure 31: Boulder and Cincinnati Bike Share Demand

DAYTON BIKE SHARE DEMAND

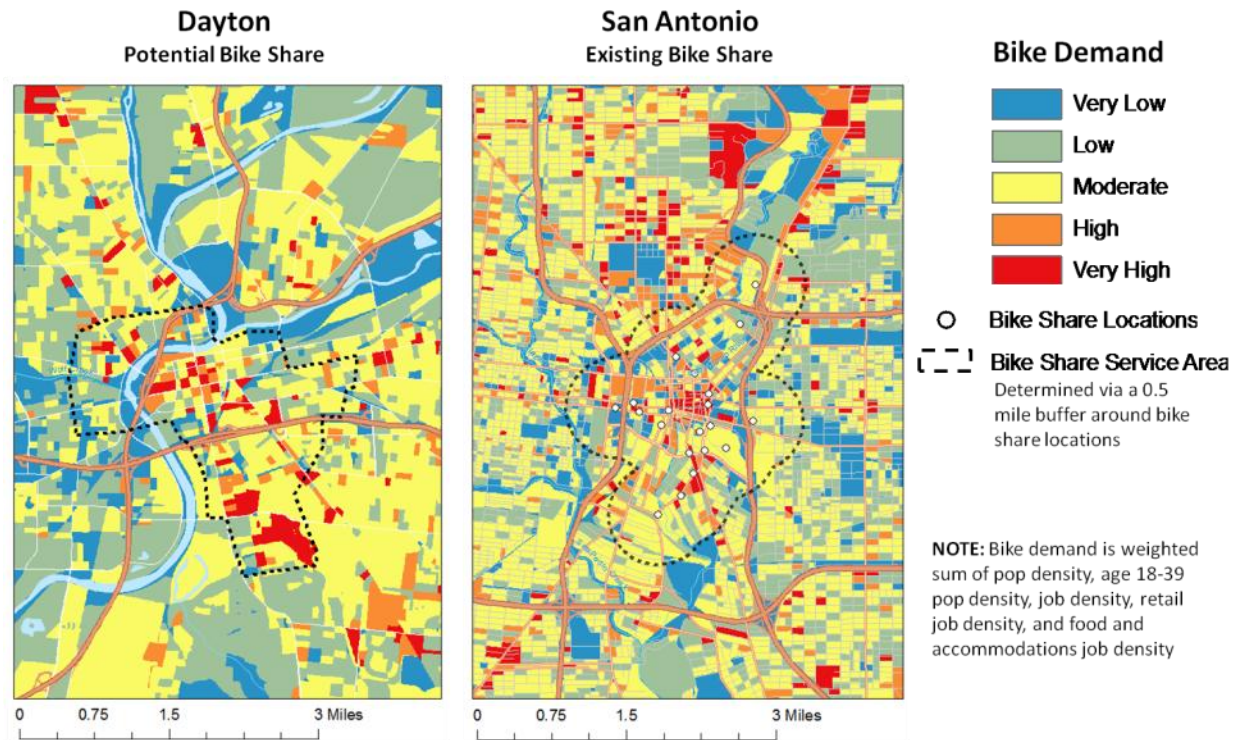


Figure 32: Dayton versus San Antonio Bike Share Demand

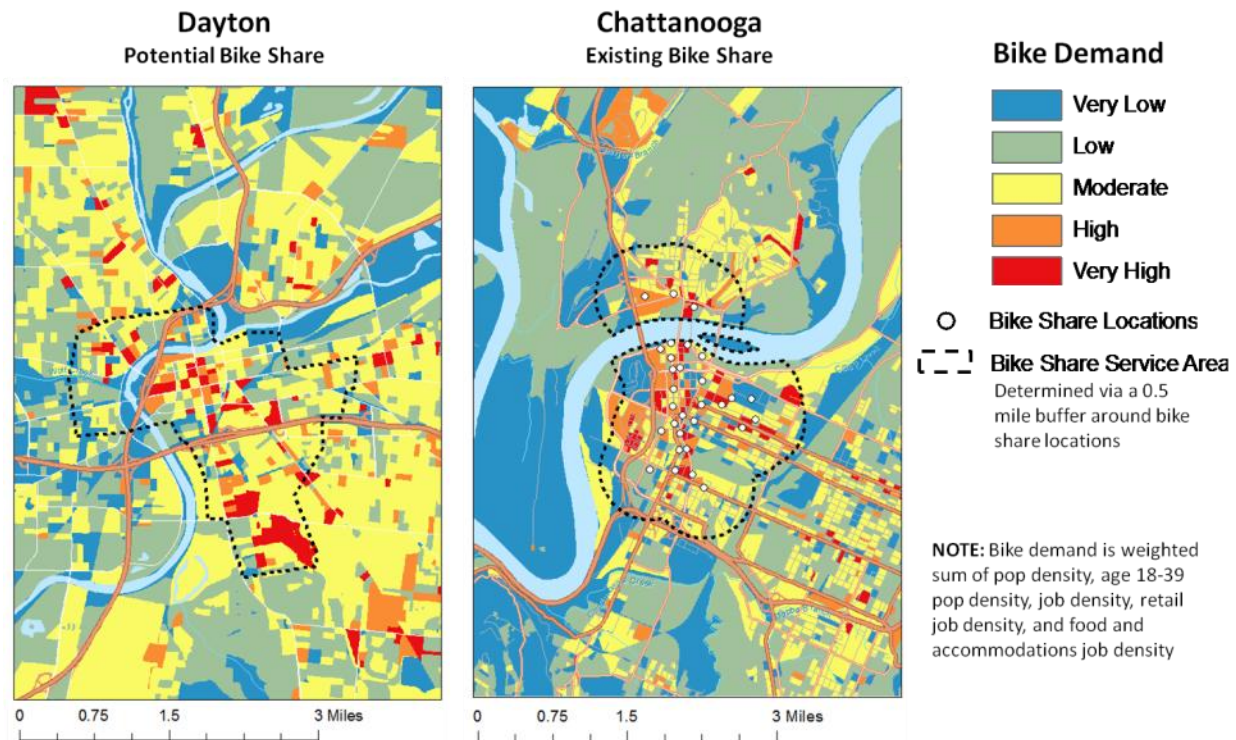


Figure 33: Dayton versus Chattanooga Bike Share Demand

DAYTON BIKE SHARE DEMAND

Further analysis of this comparison is shown in Figure 34, which is a histogram of the breakdown of demand levels for each city. This histogram only includes the raster cells in the bike share service areas. For reference, low demand is considered to be any area with a bike share score in the lower ~65 percentile, while high demand is the portion of cells in the top 10%. As can be seen from the figure, Dayton bike share demand is comparable, if not higher, than demand in Chattanooga, San Antonio, Columbus, and Cincinnati. For reference, San Antonio started with 14 stations, has grown to 30 since the bike share launch in 2011, and plans to be at 50 stations and 500 bikes by the end of 2013. Similarly, Chattanooga launched in July of 2012 and is already planning to add three more stations. A bike share might not only be sustainable in Dayton, but likely could thrive.

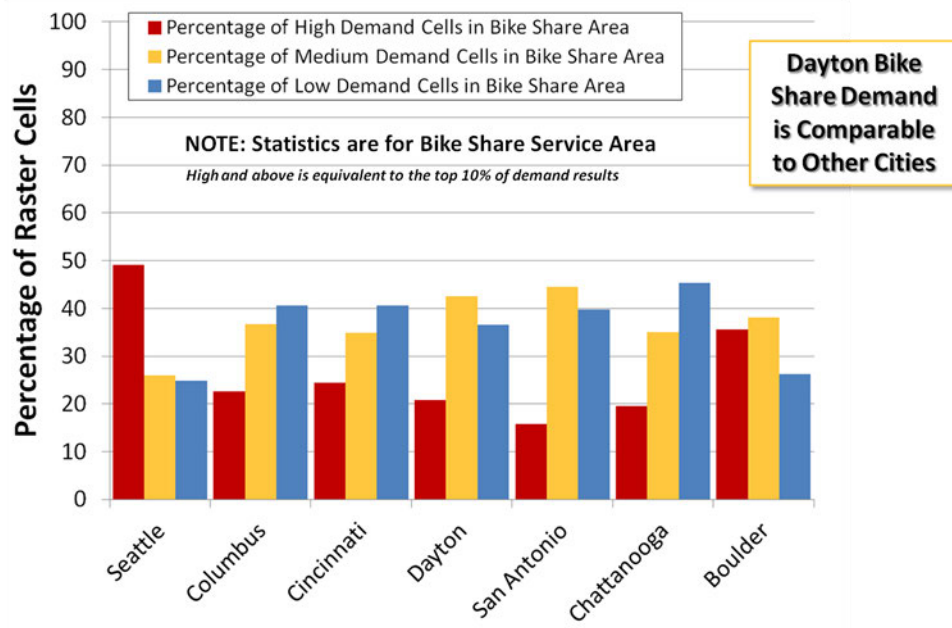


Figure 34: Bike Share Demand – City Comparison Summary

Based on this city comparison, the area around downtown Dayton is concluded to be suitable for a bike share. This analysis is even more compelling considering that it does not even include factors that are strengths for the Dayton region, e.g. our extensive network of bike ways, which is much larger than many of the cities included in this comparison. Within the proposed four square mile Dayton bike share service area there are over twelve miles of cycling infrastructure. Also not captured in these results are Sinclair students, who constitute a large daily population in the proposed Dayton bike share service area, but are missing in the data because they are not classified as residents or employees.



INITIAL BIKE SHARE PLANNING

RECOMMENDED BIKE SHARE SIZE

The demand analysis results and city comparisons prove the feasibility of a bike share that serves the areas in and around downtown Dayton. Given a high bike share demand area of approximately four square miles, we can begin to target potential bike share station locations and an approximate number of required of bikes.

The Dayton bike share survey data provides information that helps guide this endeavor. On this survey, respondents were asked about the most likely short trips for which they would use a bike share. Figure 21 and Figure 22 (page 19) show the results of this question. In terms of trip origins, most popular answers included home, work, the University of Dayton, and downtown. The most desired trip destinations are largely located in the downtown area with high responses for trip attractors like RiverScape, Second Street Market, the Oregon District, and Brown St.

Figure 24 (page 20) provides a geographic depiction of these most desired trips. As is clear from the figure, trip destinations (and even to a large extent, trip origins) are highly concentrated in and around downtown. These data are valuable when coupled with the demand analysis, providing a guide for the best station locations. When selecting these, the following criteria were considered:

- Stations were selected to provide as much coverage as possible for the four square mile high demand area.
- Any one station should not be more than 0.3 miles from another station should a user returning a bike find all of the docks full. Additionally, the walking distance should be minimized for any particular user to get to a station in the first place. Figure 35 provides the best practices from existing bike share operators regarding the optimal distance between stations.

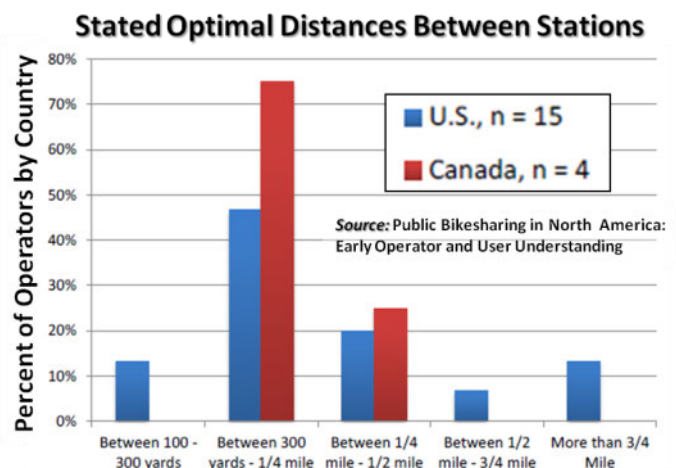


Figure 35: Optimal Distance Between Stations Based on a Survey of Bike Share Operators

- Surveying existing bike shares, the U.S.

Department of Transportation (USDOT) found an average station density of 4.7 stations per square mile (using the 0.5 mile radius service area per station definition); a Dayton bike share should be in this size range.⁴¹ For reference, San Antonio's station density is 4.2 stations per square mile (when it was 20 stations), while Chattanooga's is 7.5.

⁴¹ USDOT Presentation: State of the Practice and Guide to Implementation – Getting Started with Bike Share. <http://www.bicyclinginfo.org/promote/TDGNACTOBikeshareWorkshopPresentation.pdf>.

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Figure 36 identifies possible bike share station locations. The identified "core" set of bike share locations is the minimum size recommended bike share, corresponding to 22 locations in and around downtown Dayton. Based on national research and benchmarking of existing successful systems, anything less than the core set of stations has the potential to impact the convenience and connectivity of the bike share making it potentially less viable. The outer boundary locations are recommended (possibly for a second phase) to ensure the bike share is inclusive of the neighborhoods close to downtown. This second phase would increase the total number of stations to 30. The accompanying table provides additional information about the location of each proposed station.

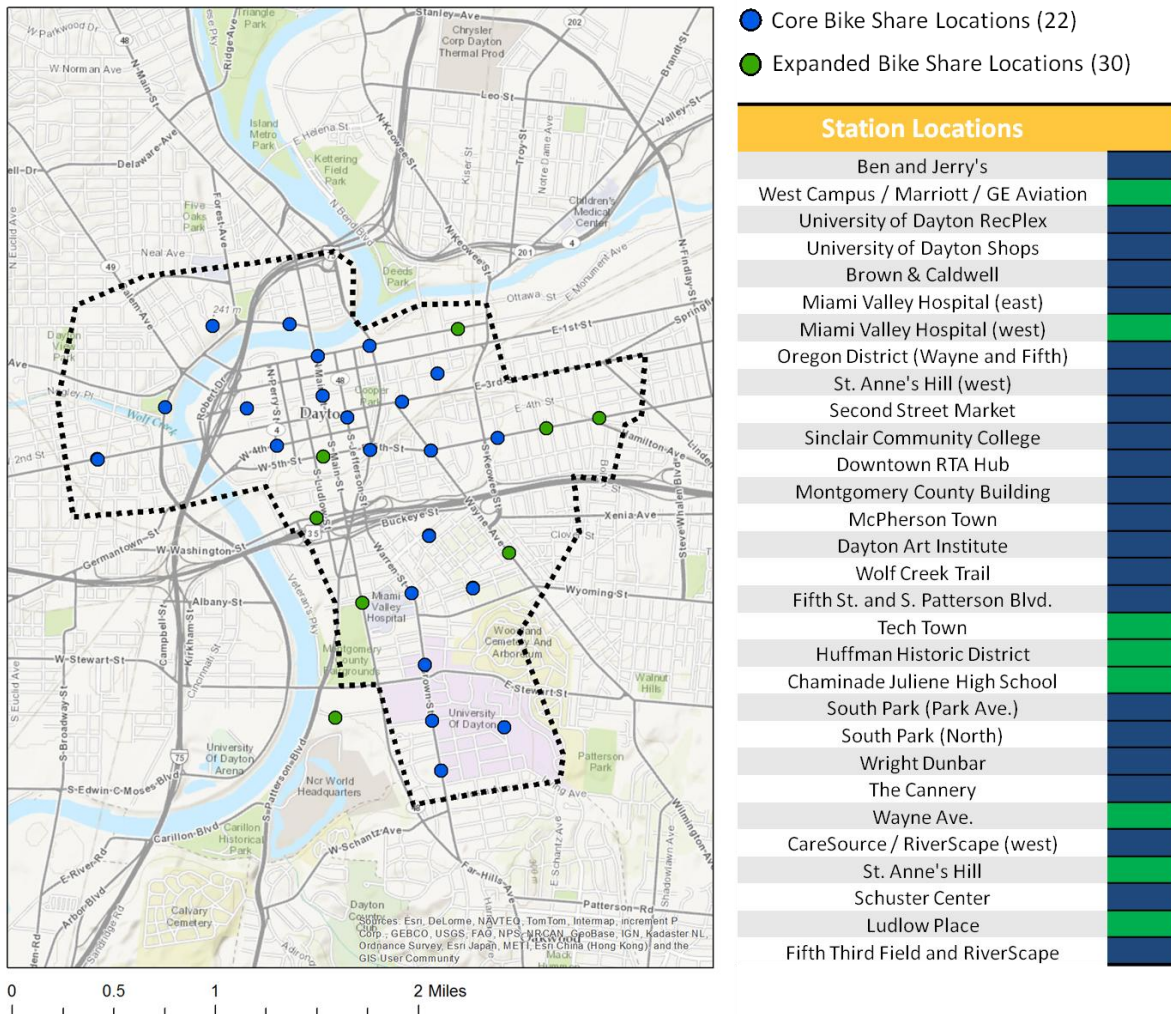


Figure 36: Proposed Dayton Bike Share Station Locations

The number of bikes and docks at each station should be customized based on the estimated trip demand for each location. The industry recommended total dock to bike ratio is 2:1 to minimize the likelihood of customers being unable to dock their bike and to also reduce bike redistribution costs. Stations can vary significantly in size, ranging from just 10 docks per station up to over 30. However, a typical size is 19 docks and 10 bikes. These locations and the overall bike share size are offered as a starting point for further community dialogue and business planning. Appendix C documents research done by the volunteer team to examine each of these locations in detail with respect to installing a bike share dock. All of the locations shown in Figure 36 were determined to be suitable for dock placement, with the



INITIAL BIKE SHARE PLANNING

exception of the two located on the east side of St. Anne's Hill and the Huffman Historic District. Neither of these locations have sufficient sidewalk space to accommodate a dock, thus they will need to be shifted slightly as the bike share system further evolves. Finalizing the station locations and the eventual number of bikes will require extensive communication with community stakeholders.

Using the definition of a 0.5 mile radius service area per station, the station density for the two phases of a potential Dayton bike share are 4.1 and 4.6 stations per square mile for the initial and expanded phases respectively, thus close to the 4.7 average for existing bike shares. Fortunately, fourth generation bike share technology is very forgiving should any of the bike share locations be underutilized or misplaced. Because the docks are solar powered and not installed permanently, the stations can be easily moved based on usage data collected after the bike share launch. Furthermore, the stations can be shifted for expected short term spikes in usage in a given portion of the service area, such as a high volume of people at RiverScape for a festival or a big crowd in the Oregon District for the annual Halloween Hauntfest. The ability to adapt the size and dimensions of fourth generation bike share transportation is a major advantage over other public transportation systems.

BIKE SHARE TRIP ESTIMATES

An extensive amount of data is available from existing bike shares* to project daily bike share trips for the Dayton system. For example, Capital Bikeshare has made available to the public all of its trip data since the program started in the winter of 2010. This data provides an opportunity to correlate the demand results from the previous section to actual bike share usage, then project trip totals for Dayton. Figure 37 shows the results of the demand analysis for the Capital Bikeshare service area and year one daily trips by station. The process for creating this demand map was identical to the approach applied for the city comparisons discussed earlier in this report. As can be seen from the map, the stations with the highest trip totals appear to correlate with the demand results.

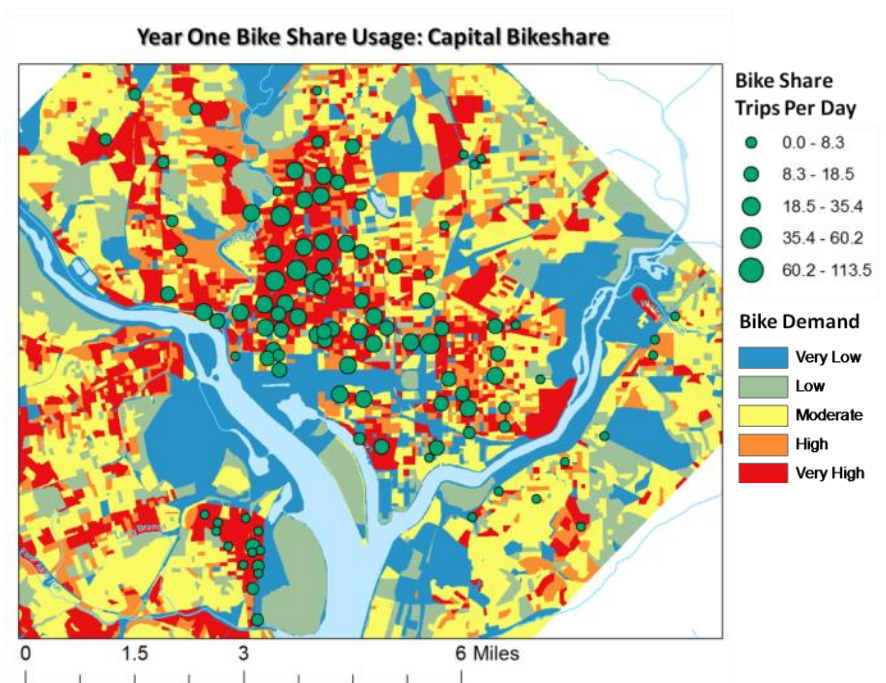


Figure 37: Capital Bikeshare Demand Analysis and Year One Daily Trip Totals

* Capital Bikeshare trip data is available on its website. Nice Ride data was obtained via an email request. Boulder B-cycle data is from its first year annual report on its website. San Antonio data (Table 3) came from the USDOT study (Ref 45) and Chattanooga data from multiple internet articles.

Figure 38 provides quantification of the correlation evident in Figure 37. In this figure, the average trips per day for all stations (19 docks or less) over the first year of operation are plotted against the average per station bike share demand (defined by the mean demand in a half mile radius around each station location). Also included for comparison on Figure 38 is the data from the first year of operation for the Boulder B-cycle and the Minneapolis Nice Ride. A power law non-linear regression fit has been faired



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through all of the data included on the plot. A power law curve was selected because the trip data appears to follow a “critical mass” behavior for the demand, i.e. above a certain threshold of population and / or employment density, trip totals climb very rapidly. While scatter in the data is evident, the fit is statistically significant. Given the factors that can impact bike share usage that haven’t been included in this city comparison analysis (e.g. topography, proximity to other public transit, etc.), the level of correlation is reasonable. Applying this model against the first year totals from other cities indicates some over-prediction of the actual trip data for Boulder and Chattanooga, but a relatively good prediction of the actual first year bike share usage for the other cities. Those comparisons are summarized in Table 3. Given that the goal for this model is to simply estimate the number of Dayton trips, the model is sufficiently accurate for preliminary bike share planning.

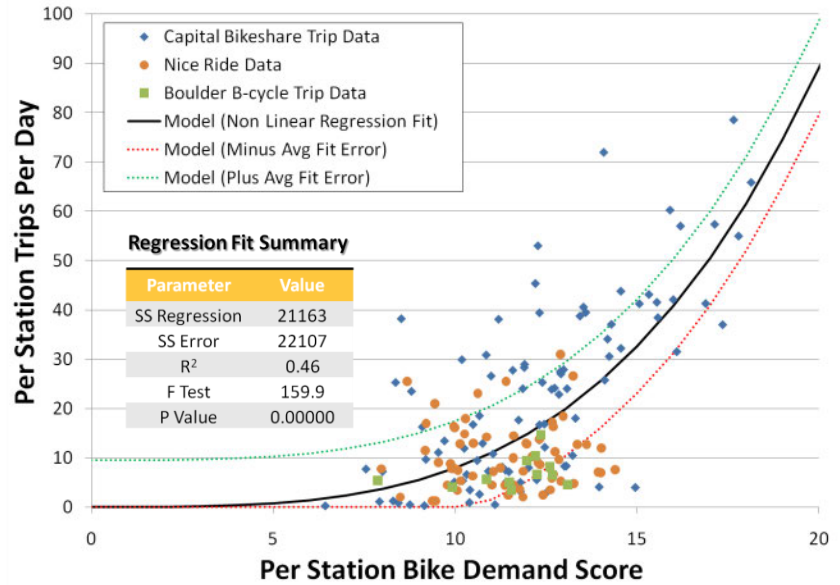


Figure 38: Bike Share First Year Trip Correlation

Table 3: First Year Trip Model Comparisons

| City | Actual Trips Per Bike Per Day | Model Predicted Trips Per Bike Per Day |
|-----------------------------|-------------------------------|----------------------------------------|
| Washington D.C. (365 days)* | 1.8 | 1.5 |
| San Antonio (180 days) | 0.65 | 0.71 |
| Boulder (210 days) | 0.76 | 1.5 |
| Chattanooga (180 days) | 0.23 | 0.54 |
| Minneapolis (150 days) | 1.1 | 1.4 |

* Only includes stations with 19 docks or less

With a trip estimation model in hand, projections can be made for the first year of a Dayton bike share. Figure 39 illustrates the estimated trip totals for each Dayton station. The average trips per year per station is a little over 2,000, with a maximum of approximately 4,000 first year trips at the University of Dayton RecPlex location. It should again be emphasized that this is purely an estimate to support initial planning for the bike share. Daily trip totals will vary considerably from winter to summer, plus they will increase significantly as the bike share matures and more Daytonians become comfortable using the system. For example, from the first to second year of Capital Bikeshare, trips per station grew by an average of 45% over the year one numbers (for stations present both years). Similarly, trip totals for Boston’s Hubway system grew by over 75% from year one to year two (again, for stations active both years), and Minneapolis’s Nice Ride trips doubled. A summary of the projected trip totals for the first five years of a Dayton bike share is also provided in Figure 39. The first to second year trip growth is conservatively assumed to be 50%, with an annual growth of 20% each year after. The year two to three growth rate is consistent with observed increases in Capital Bikeshare’s average trips per bike per day from its second to third year of operation, but this is also conservative because this increase was sustained while Capital Bikeshare was adding stations and bikes to the system (so some stations were less mature). The trip model estimates have known shortcomings. For example,

Trip totals for Minneapolis’s Nice Ride system doubled from year one to year two.



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as was discussed earlier, the data does not include the potential impact of Sinclair students. This is a daily downtown population likely to be very interested in using the bike share, thus the trip totals for the stations in this part of downtown are probably underestimated. Other considerations that will affect trip totals, but are not accounted for in this analysis, are tourist attractions like the Dayton Art Institute, Second St. Market, and Fifth Third Field and synergy with public transit like the downtown RTA hub.

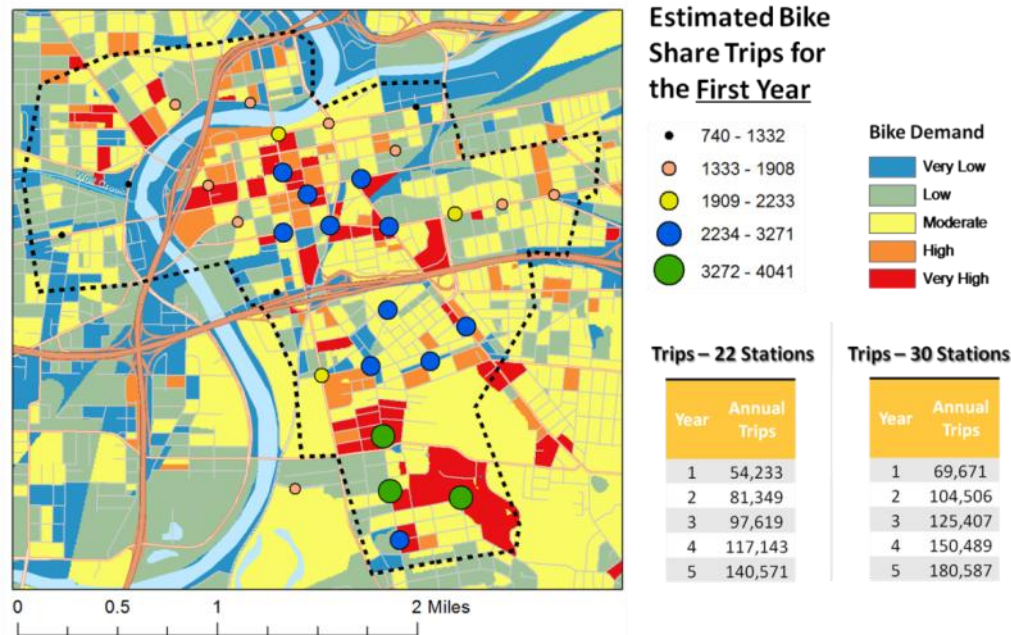


Figure 39: Estimated First Year Bike Share Trips

PRELIMINARY ESTIMATES OF BIKE SHARE PROGRAM REVENUE AND COST

With the predicted trip totals in hand, it is possible to project the capital costs, operational costs, and expected revenue for the Dayton bike share system. Typical capital and operating costs based on existing fourth generation bike shares are shown in Table 4 for various station sizes.⁴² In terms of expected revenue, a survey of North American cities with existing bike shares found an average farebox recovery of 74%, meaning that bike share rental fees typically recover 74% of operational costs. In some cities, bike shares have become completely self-sustaining, however that should not be the expectation for a Dayton bike share.⁴³

To support the cost estimation, assumptions must be made about the mix of station sizes (i.e. number of docks) and the total number

Table 4: Typical Bike Share Costs

| Station Size (Docks) | Bikes | Equipment and Installation (Includes Bikes) | Approximate Annual Operating Costs |
|----------------------|-------|---------------------------------------------|------------------------------------|
| 11 | 6 | \$35,000 to \$40,000 | \$12,000 to \$15,000 |
| 15 | 8 | \$45,000 to \$48,000 | \$18,000 to \$21,000 |
| 19 | 10 | \$53,000 to \$58,000 | \$24,000 to \$28,000 |

Table recreated from Bike Sharing in the United States: State of the Practice and Guide to Implementation

⁴² Pedestrian and Bicycle Information Center and the Toole Design Group. 2012. Bike Sharing in the United States: State of the Practice and Guide to Implementation. <http://www.bicyclinginfo.org/promote/bikeshare.cfm?/bikeshare>.

⁴³ Mineta Transportation Institute. 2012. Public Bikesharing in North America: Early Operator and User Understanding. <http://transweb.sjsu.edu/PDFs/research/1029-public-bikesharing-understanding-early-operators-users.pdf>.



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of bikes. Figure 40 shows a preliminary set of recommended station sizes for the “core” set of station locations. The projected trip totals informed the selection of station sizes, but some subjectivity was also applied based on the most popular trip attractors from the bike share survey. This mix of stations would require approximately 202 bikes.

Given the configuration of stations on the right, the expected capital and operational costs for the first five years of a Dayton bike share are provided in Table 5. Also included is an estimate of the fairbox recovery given the projected trip totals from the previous section. There are two primary sources of bike share revenue from program customers:

- **Membership Fees:** these are assumed to be purchased for either year-long or day passes to use the bike share. Some systems also offer a monthly rate for bike share passes, but these are generally a smaller fraction of actual memberships.
- **Usage Fees:** these fees are incurred if a bike user keeps the bike for longer than the “no-fee” period, which is typically 30 minutes. Fees increase considerably depending on the length of time beyond the no-fee period.

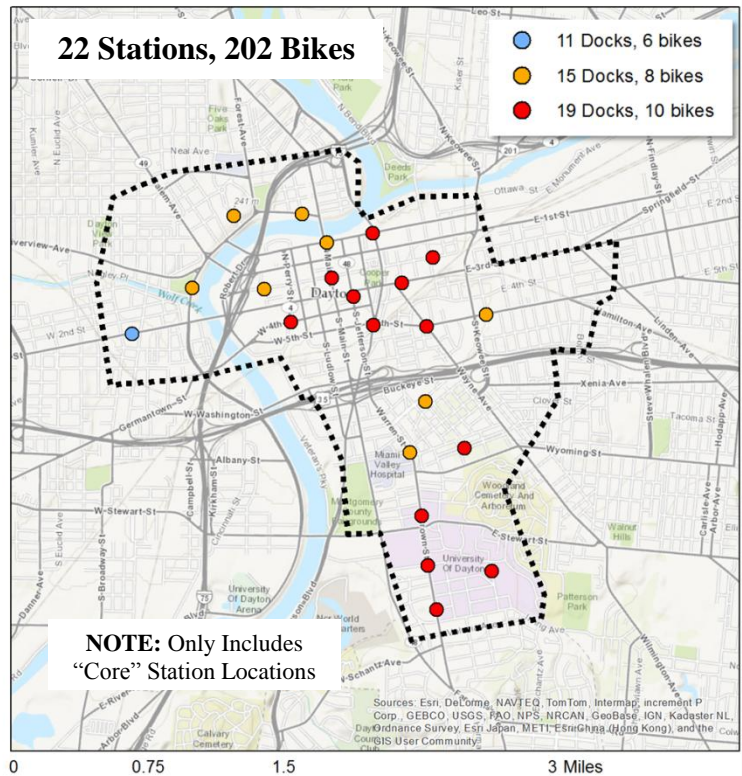


Figure 40: Bike Share Hub Sizes

Assumed bike share membership rates for this analysis are \$60 and \$5 respectively for annual and day passes. Recall that a large majority of survey respondents indicated a willingness to pay these costs to use the bike share. An average \$4 usage fee per 24-hour member trip was also assumed based on the average actual fees for casual members from Capital Bikeshare data.⁴⁴ Casual members are much more likely than annual members to exceed the 30 minute no usage fee period for a given bike check-out. Actual trip data from Capital Bikeshare and Hubway also informed the expected number of unique rides for each casual user per daily pass, which is assumed to be 2.6 in this analysis. The breakdown of casual versus annual members is based on the average casual / annual member ratio (approximately 9:1) from first year data from bike shares in San Antonio, Boulder, Chattanooga, Washington D.C., Minneapolis, Boston, and Denver.⁴⁵ An average from Capital Bikeshare and Hubway data also informed the assumed number of unique trips conducted by an annual user each year (56). With these assumptions in place, the projected costs and revenue from member services could be calculated. All cost calculations assume the higher value of capital and operational costs from Table 4.

⁴⁴ Capital Bikeshare provides all of its trip data to the public on its website: <http://www.capitalbikeshare.com/system-data>.

⁴⁵ USDOT Presentation: State of the Practice and Guide to Implementation – Getting Started with Bike Share. <http://www.bicyclinginfo.org/promote/TDGNACTOBikeshareWorkshopPresentation.pdf>.



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Table 5: Estimated Bike Share Costs and Fair Revenue (22 Stations and 202 Bikes)

| Year | Annual Trips | Trips Per Bike Per Day | Annual Members | Casual Members | Capital Cost | Operational Cost | Estimated Fair Revenue (assumes \$60 per year and \$5 per day) | Percent of Operating Cost (Fairbox Recovery) |
|------|--------------|------------------------|----------------|----------------|--------------|------------------|----------------------------------------------------------------|----------------------------------------------|
| 1 | 54,200 | 0.74 | 680 | 6,360 | \$1,200,000 | \$554,000 | \$139,000 | 25% |
| 2 | 81,300 | 1.1 | 1,020 | 9,540 | \$0 | \$554,000 | \$208,000 | 38% |
| 3 | 97,600 | 1.3 | 1,220 | 11,450 | \$0 | \$554,000 | \$250,000 | 45% |
| 4 | 117,100 | 1.6 | 1,460 | 13,740 | \$0 | \$554,000 | \$299,000 | 54% |
| 5 | 140,600 | 1.9 | 1,760 | 16,490 | \$0 | \$554,000 | \$359,000 | 65% |

While the capital and operational costs of the bike share might appear daunting on the surface, they are a relatively small amount of funds when compared to typical costs for other forms of transportation (Table 6). For example, the approximate capital cost of adding a mile of one lane highway is over \$10 million.⁴⁶ Furthermore, the fairbox recovery estimates shown above are considerably higher than the national average recovery for other forms of public transportation (20-40%), which are comparatively much more mature than a Dayton bike share would be in even its fifth year of operation. In just the first year of operation for a Dayton bike share, the farebox recovery is projected to be equivalent if not higher than most other forms of public transit.

The above revenue estimates do not assume any organizational partnerships. Partnerships with local institutions are possible to partially recover the gap in operational costs and farebox recovery. For example, Bike Chattanooga has established a partnership of this kind with the University of Tennessee at Chattanooga for student passes.⁴⁷ Additionally, existing bike shares have been successful in obtaining revenue through advertising and sponsorships. There are several advertisement placement opportunities on the bikes and station equipment. A survey of existing bike share operators identified the top three funding and revenue sources for bike shares to be user fares / memberships (collected by 95% of all operators), sponsorships (collected by 89% of operators), and advertising (collected by 68% of operators).⁴⁸

Table 6: Typical Transportation Capital and Sustainment Costs

| FORM OF TRANSIT | CAPITAL COST | SUSTAINMENT |
|--------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| One Mile of One Lane Highway | \$10 Million* | <ul style="list-style-type: none"> • Annual maintenance: \$20,000 • Asphalt resurface (every 15 years): \$300,000 – \$400,000 • Reconstruction (every 30 years): \$1.5 – \$2.0 Million* |
| Public Bus | \$325,000 per bus [#] | 20-40% farebox recovery (most are less than 30%) [^] |
| Entire Dayton Bike Share (estimated costs) | \$1.2 Million | Equivalent or higher fairbox recovery than most other forms of transit in just first year of operation |

* Victoria Transport Policy Institute. 2013. *Smart Congestion Relief: Comprehensive Analysis of Traffic Congestion Costs and Congestion Reduction Benefits*. http://www.vtpi.org/cong_relief.pdf

+ Sacramento Region Transportation Plan. *Road Maintenance Issue Paper*. <http://www.sacog.org/mtp/pdf/MTP2035/Issue%20Papers/Road%20Maintenance.pdf>

Federal Transit Administration. 2007. *Transit Bus Life Cycle Cost and Year 2007 Emissions Estimation*. http://www.fta.dot.gov/documents/WVU_FTA_LCC_Final_Report_07-23-2007.pdf

[^] American Public Transportation Association. 2012. *Presentation: U.S. National Transit Database*. <http://www.apta.com/members/memberprogramsandservices/international/Documents/>

⁴⁶ Victoria Transport Policy Institute. 2013. *Smart Congestion Relief: Comprehensive Analysis of Traffic Congestion Costs and Congestion Reduction Benefits*. http://www.vtpi.org/cong_relief.pdf

⁴⁷ Bike Chattanooga's website: <http://www.bikechattanooga.com/news>

⁴⁸ Mineta Transportation Institute. 2012. *Public Bikes sharing in North America: Early Operator and User Understanding*. <http://transweb.sjsu.edu/PDFs/research/1029-public-bikes sharing-understanding-early-operators-users.pdf>



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Publicly available data for San Antonio's B-cycle system shows the expense estimates from Table 5 to be credible. In its first year of operation, the non-profit that administers San Antonio B-cycle collected more than \$900,000 in revenue (\$292,881 from sponsorship, \$474,308 from government grants, and \$133,392 from fairbox revenue), while totaling expenses of approximately \$500,000 to operate the bike share.⁴⁹ As demonstrated by this data, annual sponsorship and government grants can provide a major share of the initial funds necessary to sustain a bike share until it matures enough to collect greater revenue from membership.



Boulder B-cycle Advertisements on the Bike Baskets and Station Kiosks

Grant revenue to cover the capital and operational costs for a bike share can come from a variety of sources. According to the study commissioned by the U.S. Department of Transportation to provide a guide for implementing bike share programs in the United States, the programs specified in Table 7 have been utilized by existing bike share systems as sources of funds.⁵⁰ Some of these federal grants offer resources for extended periods of time (two to five years), so they can be used to assist with sustainment costs in the initial years of the bike share, as well as provide funds to cover capital costs. The operational model for the bike share should be created with the potential sources of revenue in mind. For example, some of these sources are only available to government agencies or other public entities, thus a partnership with these agencies would be required to access the funds.

Table 7: Federal and Local Sources of Bike Share Funds⁵¹

| FEDERAL | | | | | STATE & LOCAL |
|----------------------------------------------------------------------|-------------------------------------------------|-------------------------------------|-----------------------------------------|--------------------------------------------|----------------------------|
| U.S. Department of Transportation | | Centers for Disease Control | Department of Health and Human Services | Department of Energy | |
| Federal Highway Administration | Federal Transit Administration | | | | |
| Congestion Mitigation Air Quality (CMAQ) | Job Access Reverse Commute (JARC) | | | | Public and Health Grants |
| Surface Transportation Program: Transportation Enhancements (TE) | Bus Livability Pilot Programs | Health and Obesity Prevention Grant | Communities Putting Prevention to Work | Energy Efficiency Conservation Block Grant | |
| Transportation, Community and System Preservation Program (TCSP) | | | | | |
| Transportation Investment Generating Economic Recovery (TIGER) Grant | Paul S. Sarbanes Transit in Parks Program Grant | | | | Local Transportation Funds |
| Nonmotorized Transportation Pilot Program | | | | | |

Table recreated from Bike Sharing in the United States: State of the Practice and Guide to Implementation

⁴⁹ Finance Report for San Antonio Bike Share. <http://www.guidestar.org/PartnerReport.aspx?ein=27-2887426&Partner=Amex#>.

⁵⁰ Pedestrian and Bicycle Information Center and the Toole Design Group. 2012. Bike Sharing in the United States: State of the Practice and Guide to Implementation. <http://www.bicyclinginfo.org/promote/bikeshare.cfm?/bikeshare>.

⁵¹ Ibid.



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OPERATIONAL MODELS

A variety of operational models have been attempted for bike shares in the United States. Options generally are categorized by whether a public or private entity is responsible for owning and operating the bike share. Public entities can be government municipalities, non-profits, or transit authorities. Private entities are typically companies like B-cycle or Alta Bicycle Share. Hybrids of operational models have also been utilized with success. For example, an administering non-profit or municipality that contracts with a private entity like B-cycle to operate the bike share.

Model selection should be done with potential sources of revenue in mind. The best models are constructed to enable access to revenue streams from a wide range of sources, such as federal or state grants or local sponsorship. Table 8 is a summary of the three primary bike share operational models in the U.S. from a bike share feasibility study conducted for the City of Memphis by Alta Planning + Design. Included in the table is a definition of each model, plus some characteristics of each. A Dayton model should only be selected after consideration of potential bike sharing partners and likely revenue streams.

Table 8: Bike Share Operational Models⁵²

| Business Model | Ownership | Operations | Agency Role | Transparency | Risk |
|-----------------------------------------------------|---------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Non-profit / Publicly Owned, but Privately Operated | Non-profit / Gov't Agency | Private Contractor | The public agency is responsible for capital investment, owns the infrastructure and equipment, administers contract with private operator, and makes decisions and drives direction of the program. | This model allows for the greatest amount of agency control. The agency drives the direction of the program and sets the terms of the operating contract. | Financial risk is taken on by the public agency. Liability exposure is taken on by the private contractor. |
| Non-Profit / Publicly Owned and Operated | Non-profit / Gov't Agency | Non-profit / Gov't agency | Agency can be involved as a financial partner providing start-up funding for the non-profit or acting as a fiscal agent to pass through federal, state, and local funding. Agency may be represented on the non-profit board or as a technical advisor. | Some transparency through representation on Executive Committee | Financial and liability risk is shifted to the non-profit organization. |
| For Profit Business | Private | Private | Agency has a less active role and may only be responsible for certain aspects of planning for the system such as station siting and permitting. | Less control over decision making, re-investment / expansion, and operations. | All risk is taken on by the private sector. |

Table recreated from Memphis Bike Share Feasibility Study Prepared by Alta Planning + Design

CONSIDERATION OF SOCIAL EQUITY

Although it did not receive significant attention at the initiation of bike sharing in the United States, several existing and new bike share systems are taking social equity into consideration for bike share implementation. At issue is how to make the system accessible to residents who don't have access to a bank account and / or credit card to purchase bike share passes at station locations. Additionally, a major access route for bike share annual passes is through the internet, which inhibits access to the system for some potential customers.

⁵² Alta Planning + Design. 2013. Memphis Bike Share Feasibility Study. http://bikepedmemphis.files.wordpress.com/2013/02/memphis-bike-share-final-report_021913.pdf.



INITIAL BIKE SHARE PLANNING

Dayton's bike share must be designed with social equity in mind. Strategies from other cities provide a guide to overcome these barriers. For example, Boston's Hubway system has made sure stations are placed in lower income neighborhoods, and it offers subsidized memberships for residents who receive any form of public assistance or have an income that is up to 400 percent of the poverty level. Additionally, Hubway has a full time staff member who is responsible for selling the subsidized memberships and registering people who do not have access to a computer.⁵³ Another strategy to make sure the system is accessible to residents of all income levels is through partnership with agencies that are already successful reaching this population. For example, a shared access card with another form of public transit or public agency.

IMPACT OF WEATHER

Weather is an important consideration for potential bike share usage. Bike shares in the U.S. have been implemented with success for a wide range of climates. While these bike shares have been successful, weather definitely impacts bike share usage. A comparison of Dayton's climate relative to other cities that have successfully launched bike shares is shown in Figure 41. Both temperature and humidity have been shown to affect usage; extremes in either suppress bike share trips. Not surprisingly, precipitation is also a major factor. Some cities with extreme winters like Minneapolis have elected to shut down for several months each year. While this has benefits for reduced operating cost during periods of low usage, it also introduces logistical challenges for bike share operators because of the need for staff for only a portion of the year. Finding the right choice for Dayton should be studied further in subsequent business plan analysis of the expected bike share costs, operating model, and revenue.

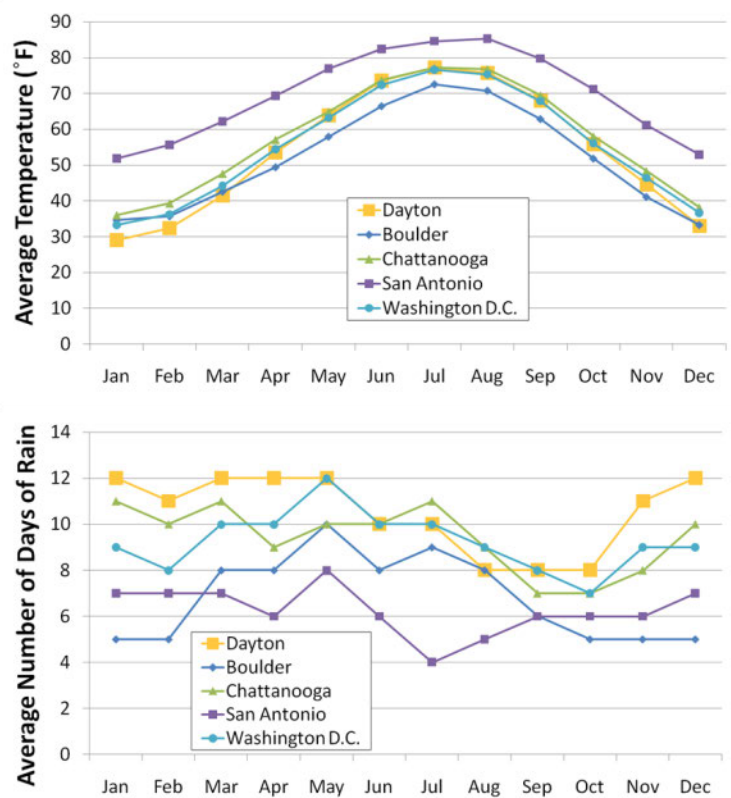


Figure 41: Climate Comparison

TOURISM AND BIKE SHARE DESIGN

A common perception among many people is that bike shares are primarily for tourists. This belief is understandable considering that many of the first bike shares launched in the U.S. were in cities with high levels of tourism. However, a deeper look at the data on bike share usage in these cities reveals that perception to be incorrect.

⁵³ Next City. 2013. Learning from Boston and D.C. in an Early Look at Philly Bike Share. <http://nextcity.org/daily/entry/learning-from-boston-and-d.c.-in-an-early-look-at-philly-bike-share>.



INITIAL BIKE SHARE PLANNING

Shown in Figure 42 is the breakdown of daily (i.e. casual) and annual (i.e. subscriber) member bike share trips for Capital Bikeshare (Washington D.C.) and Hubway (Boston) for the first year of their operations. While the number of casual users in a given year outnumbers the annual subscribers, the vast majority of actual bike share trips are conducted by users with annual passes (i.e. people who likely live in the D.C. or Boston areas). Additionally, it is likely that a portion of the casual memberships are also people who live locally. What appears to impact the local use of a bike share most is the station design. Specifically, whether the stations are where people live and work. As can be seen in the right half of Figure 42, there are several Capital Bikeshare stations in areas with high population density, thus it isn't surprising that the bike share has been embraced by people who live in the D.C. area.

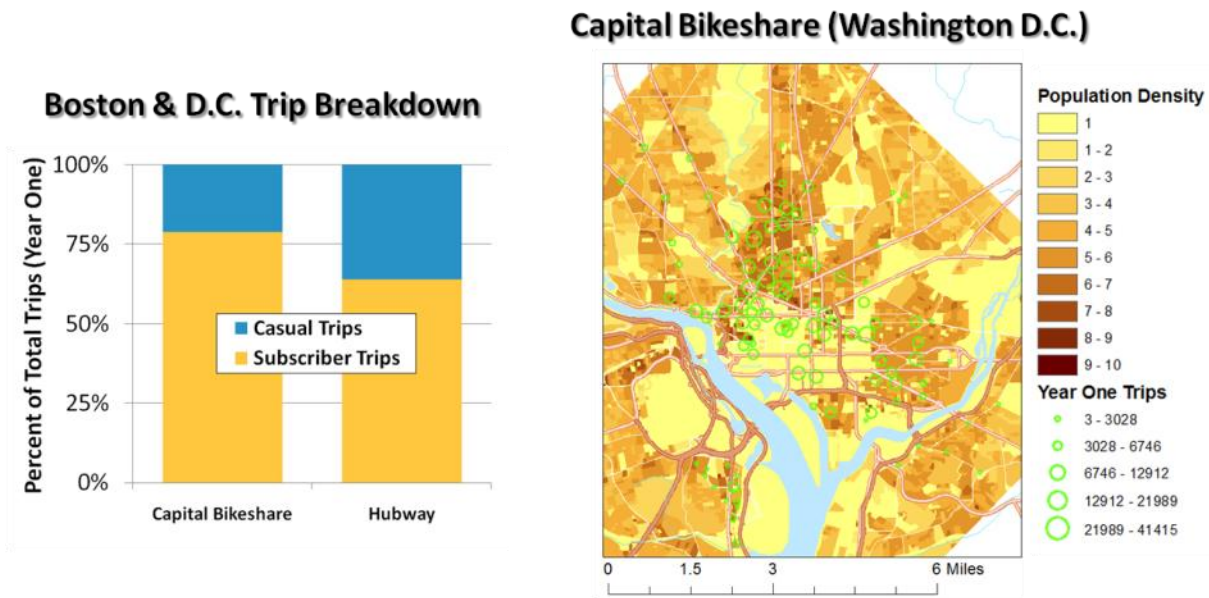


Figure 42: Boston and D.C. Trips: Casual versus Subscriber Trips

UD RECBIKES: A DAYTON BIKE SHARE PILOT

Since September of 2011, the Recreation Department at the University of Dayton has administered a bike check-out program called RecBikes. The results of this program thus far provide a glimpse into the potential performance of a Dayton bike share.

RecBikes was created by the University of Dayton River Stewards program as part of its senior capstone project that challenges students to devise and implement a new initiative to capitalize on the assets of the Dayton region's river corridor. The 2012 student cohort created RecBikes. This program offers 20 bicycles for free check-out to UD students for use around the Dayton area. Since the program's start, the UD Recreation Department has collected a wealth of data that provides insight into the potential viability of a bike share on the UD campus.



INITIAL BIKE SHARE PLANNING

Figure 43 shows the monthly usage of RecBikes at UD, along with the user reported most popular trip destinations. In the first 15 months of the program, RecBikes have been checked out over 3,100 times (as of November 2012). In warmer months at UD while the students are on campus, the average check-out rate has been as high as 18 bikes per day, which likely means on some days, the program has run out of bikes. In comparison, Bike Chattanooga has recorded 12,600 trips in its first six months of implementation (July through December of 2012). Over the same six month span, 1,500 RecBikes have been checked out, which is 12% of the Chattanooga trips, with 7% of the bikes, and 3% of the total number of stations. While a terrific program, RecBikes is significantly more inconvenient than a typical bike share given that many students are required to walk much farther to get a bike than the recommended 0.3 miles / five minute walk standard for bike share design. All of the RecBikes are stored at the RecPlex, which can be as far as a half mile or more from students depending on where they live on campus. Furthermore, bike share bikes are available any time of the day, while check-out of RecBikes is restricted from dawn to dusk. RecBikes is just the tip of the iceberg when measuring bike sharing potential on the UD campus.

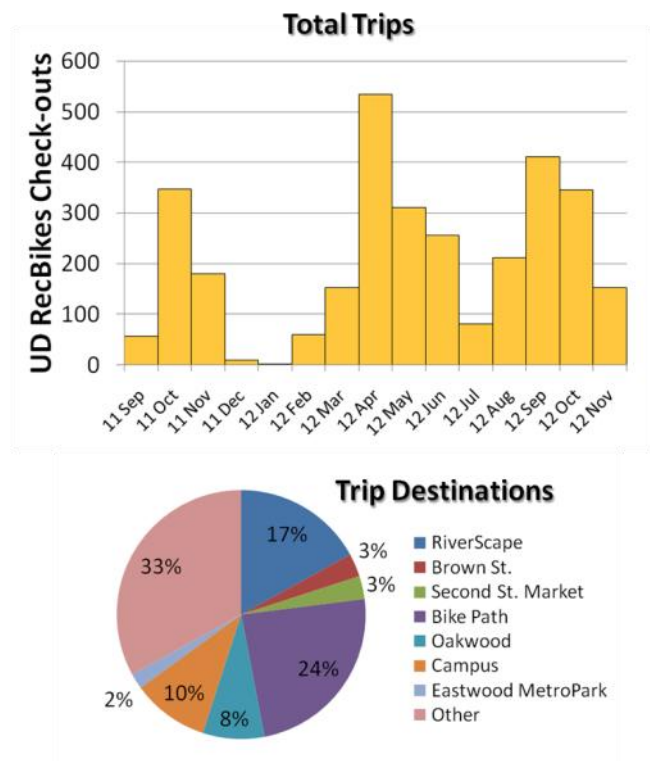


Figure 43: UD RecBikes Data

The RecBikes data is even more compelling after considering the nature of the trips relative to the Chattanooga data. One RecBike trip is essentially equivalent to two Chattanooga trips given that the same bikes are used for both the outbound and return legs. In an actual bike share, two distinct “rides” are typically required for a round-trip journey. When this is taken into account for the total trips and destinations listed in Figure 43 (only those positively confirmed to be inside the bike share service area are double counted), the total number of bike share trips generated from one University of Dayton location has been over 1,900 (over the same first six months of Bike Chattanooga’s operation). If just seven stations in a Dayton bike share perform like RecBikes has already, the Dayton trip demand will exceed the usage reported by Bike Chattanooga, which is reportedly already adding three more stations to its service area in the spring of 2013.

Over the same six month period, RecBikes generated ~12% of the total Bike Chattanooga trips, with 7% of the bikes and 3% of stations

SUMMARY AND BIKE SHARE PROGRAM NEXT STEPS

The Dayton region is bike share ready. Other communities similar to Dayton have launched and successfully sustained bike share programs. While Dayton’s bike share system would be a significant



INITIAL BIKE SHARE PLANNING

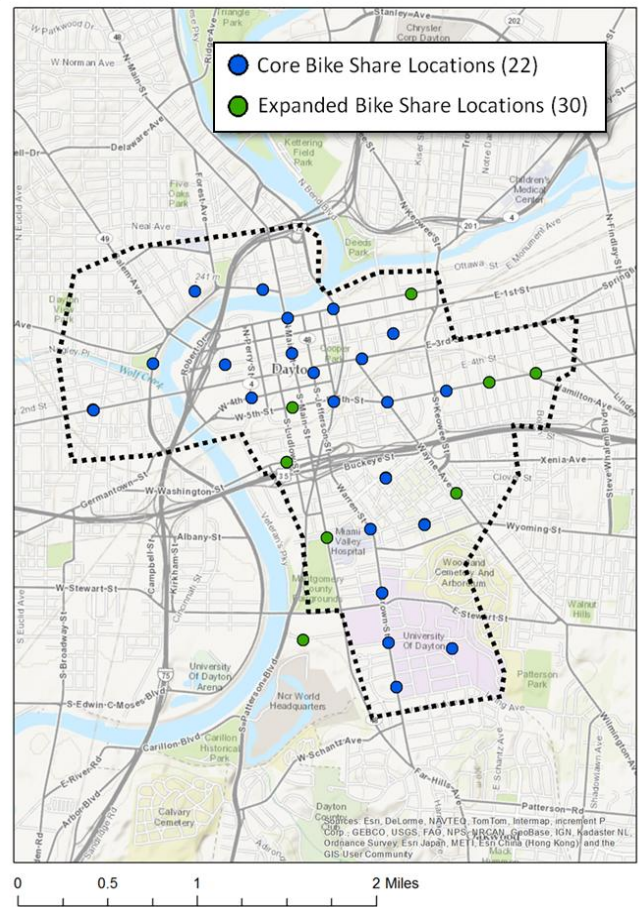
community investment, the long term economic, transportation, environmental, and health benefits are worth the cost. The survey data documented in this report indicate community support for a bike share is strong and there is a market for bike share memberships. The demand analysis shows that when Dayton is benchmarked against other cities that have successfully launched and sustained bike shares, a four square mile area around downtown Dayton compares favorably. In fact, bike share demand in Dayton is actually higher than in cities like San Antonio and Chattanooga that have successful bike share systems.

Using industry standards for bike share design, a system consisting of 22 to 30 stations with 202 to 268 bikes is projected to be successful in this four square mile area. Annual bike share trip estimates range from approximately 50,000 to 70,000 trips for the first year of operation depending on the number of stations. Preliminary cost estimates for both capital and operational expenses, along with revenue estimates show the bike share could approach self-sustainment solely from user revenue as early as five years after the bike share launch. However, existing public transit systems that are much more mature than bike sharing are still not close to self-sustaining, so this should not be the measure of success for a Dayton bike share system. When coupled with potential sponsorships and grant revenue, the long term success of a Dayton bike share is feasible. The bike share design recommended in this report is preliminary – finalizing the bike share size and station layout will require extensive coordination with community stakeholders.

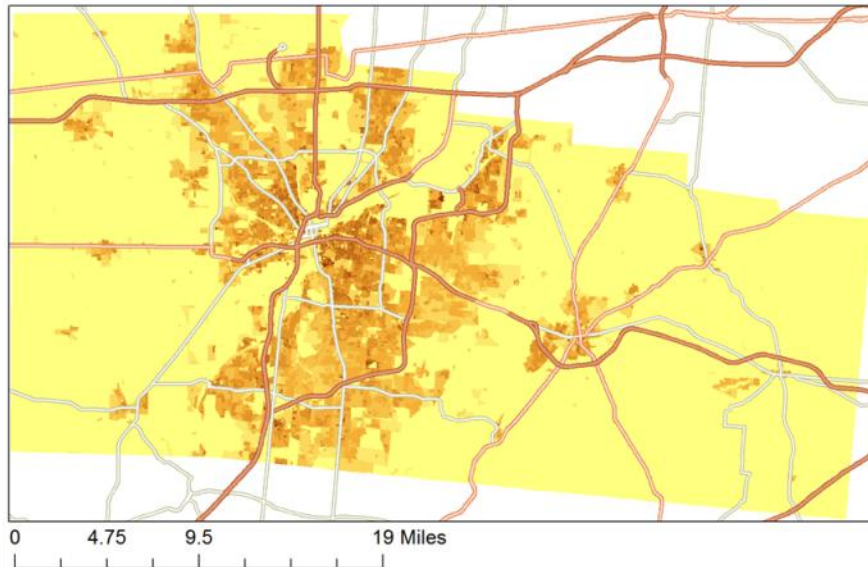
Conversations with community stakeholders regarding these feasibility study results have already begun and they will continue well after the release of this report. Feedback so far has been positive. Moving forward, Bike Miami Valley is ready to work with other community stakeholders to accomplish the following goals:

- Develop a detailed business plan for a bike share
- Finalize the bike share station locations, dock sizes, number of bikes, and installation plans
- Select an appropriate operational model
- Create a bike share funding plan
- Create a project schedule with key milestones for a bike share implementation

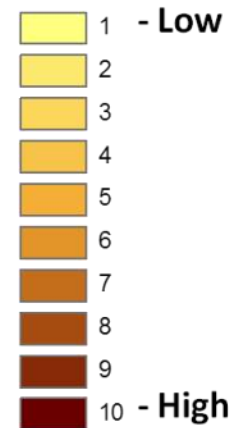
The year of the bike share has begun and city planners across the country have recognized that offering greater bike transportation and infrastructure is critical to creating vibrant communities. The Dayton region already has significant cycling momentum; launching a bike share is the logical next step to ensure Dayton is recognized as a bicycle friendly city for years to come.



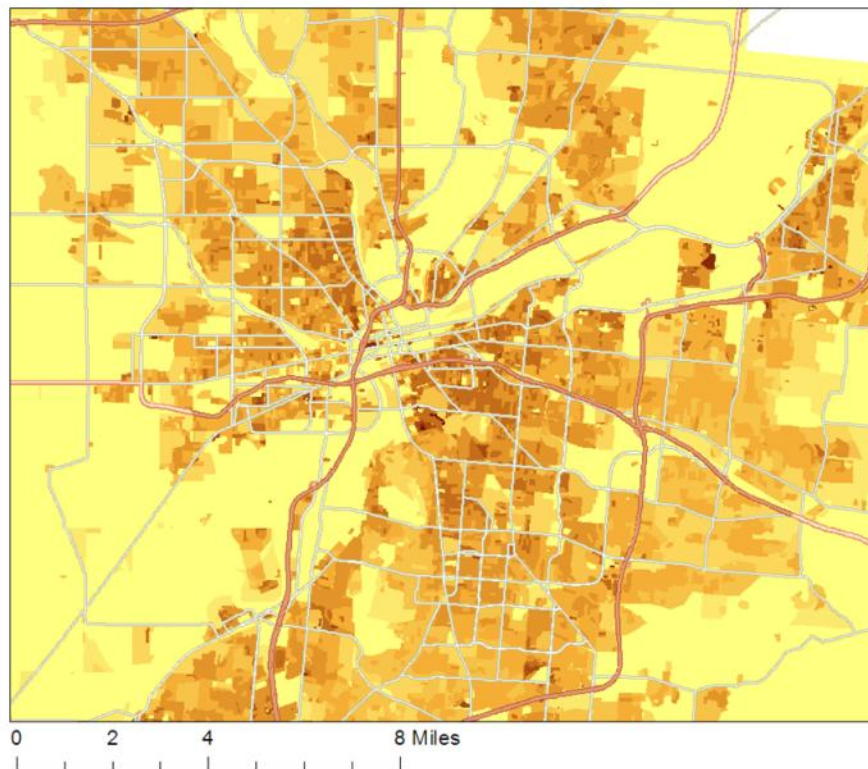
APPENDIX A: BIKE SHARE DEMAND INPUTS

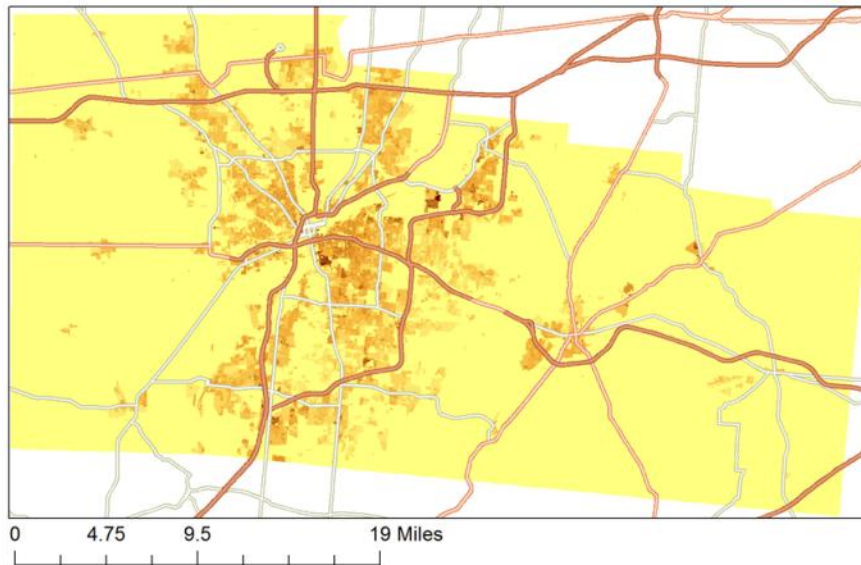


Population Density

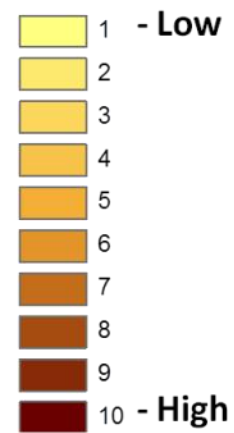


Source: 2010 Census

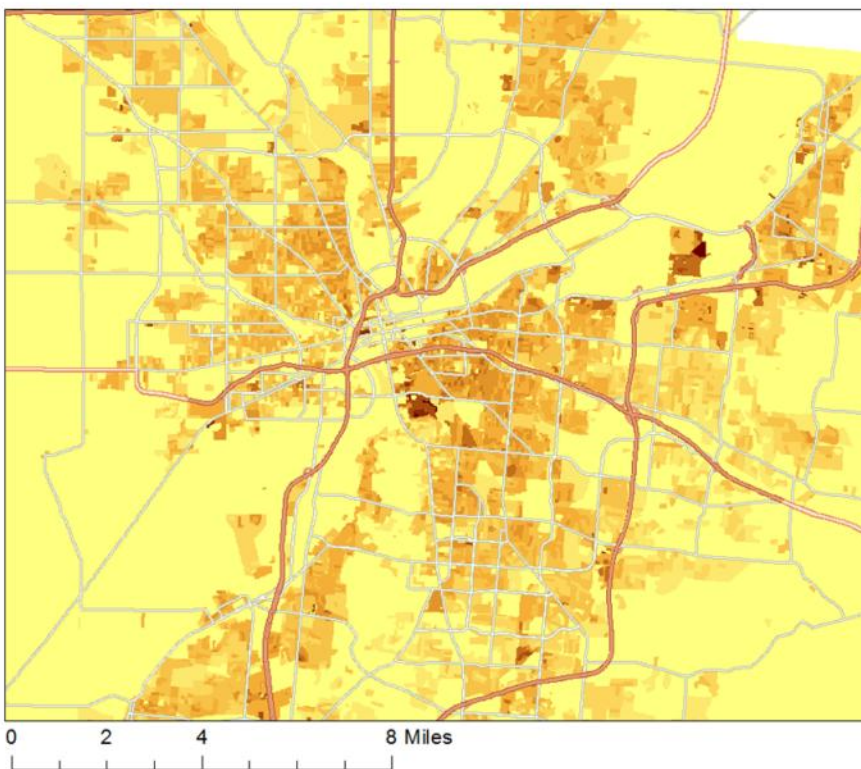




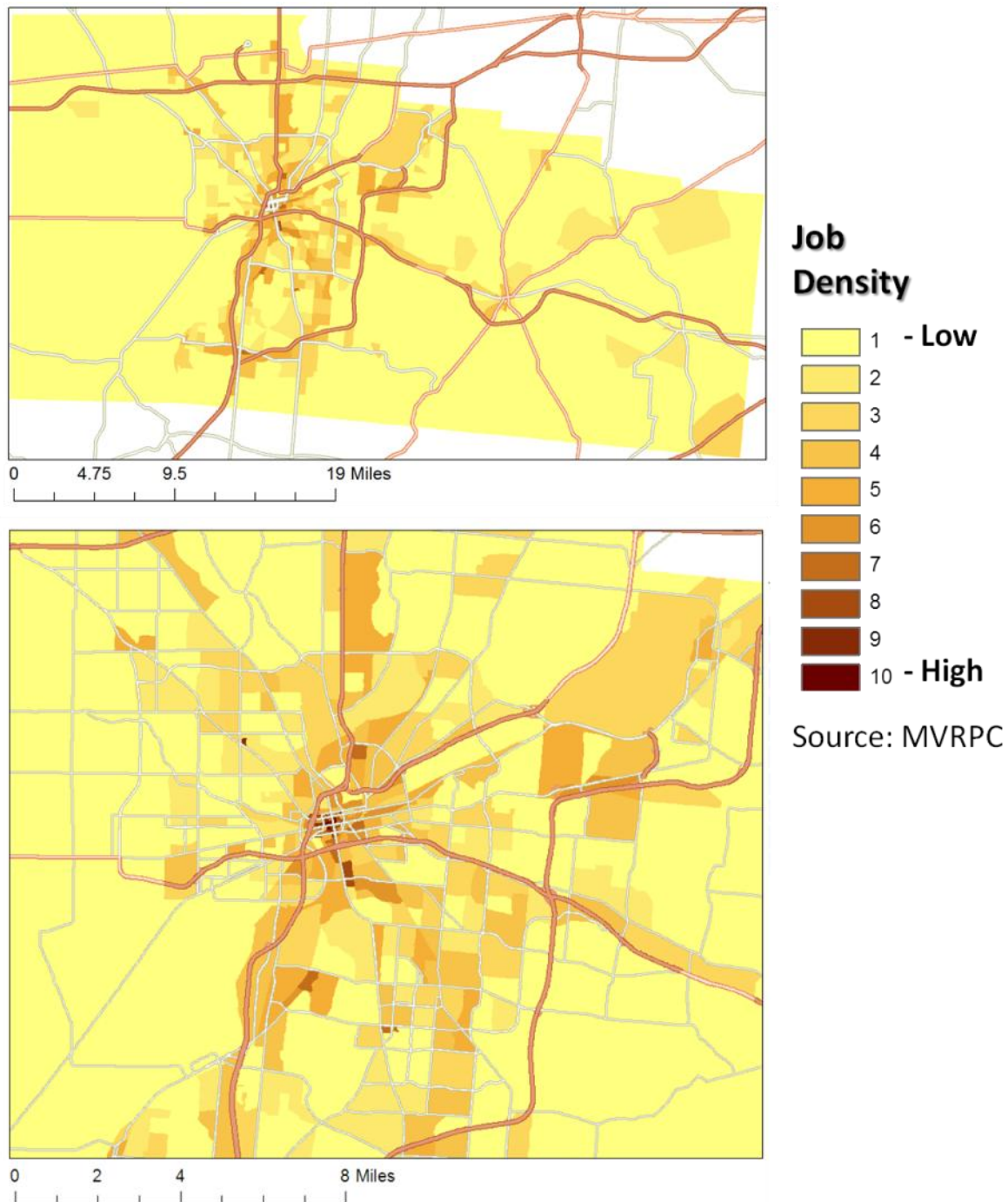
Age 18-39 Population Density

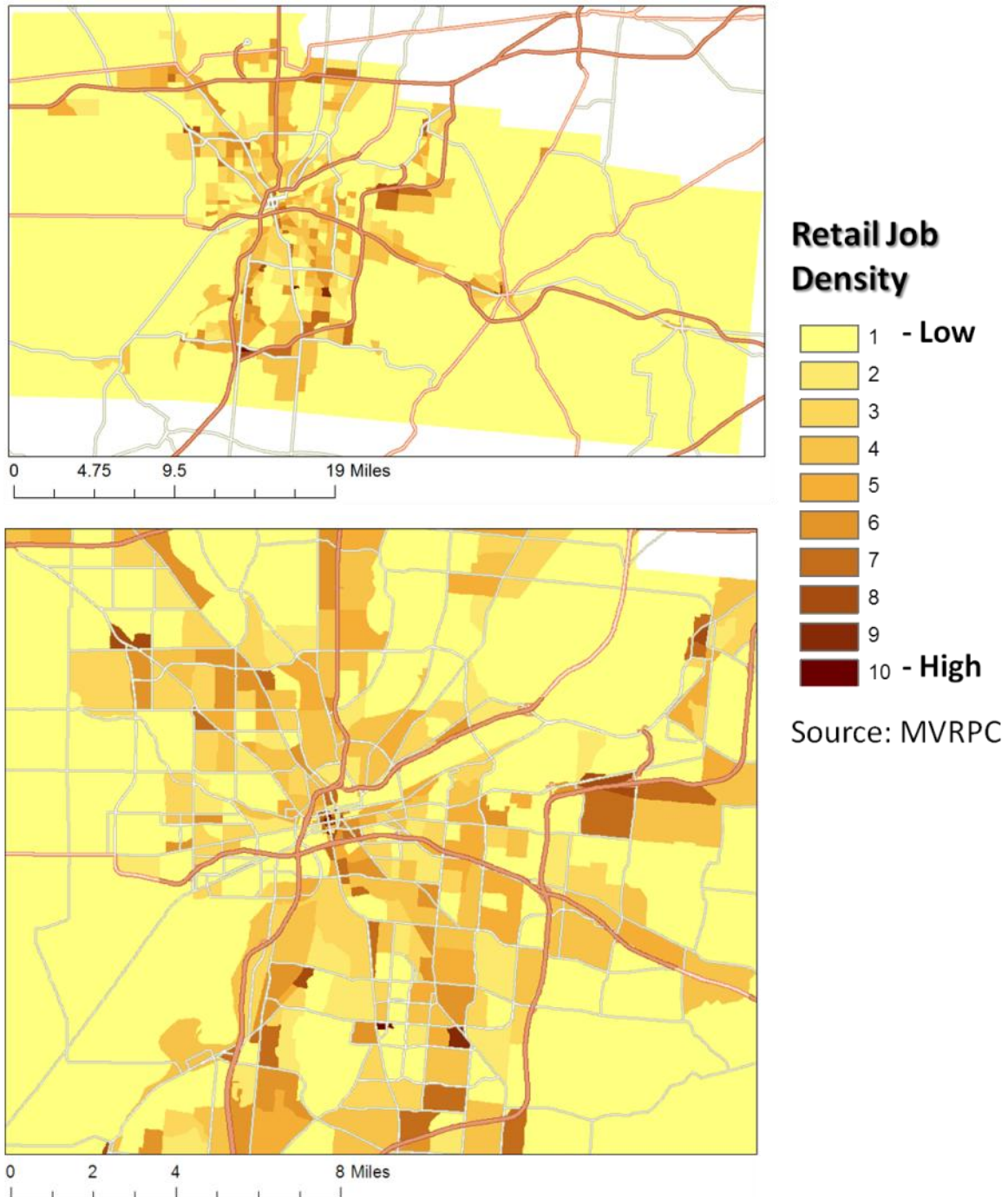


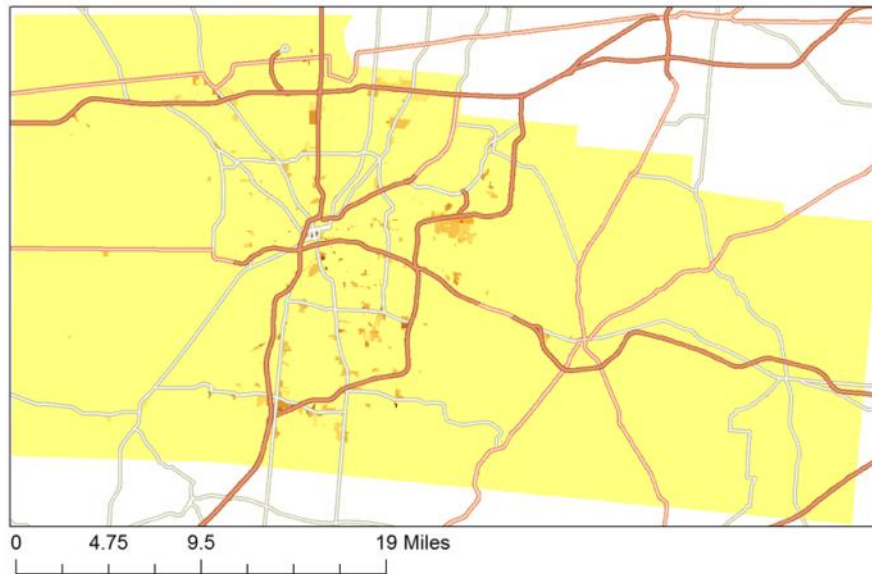
Source: 2010 Census



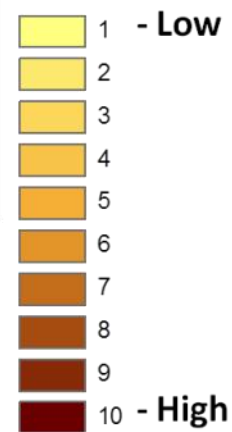
APPENDIX A



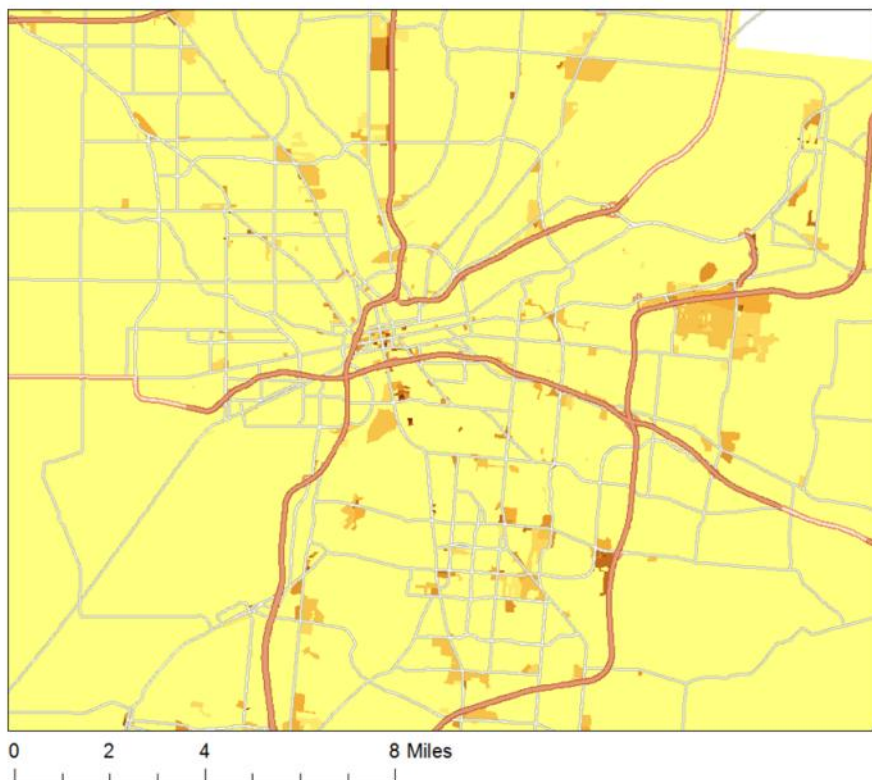


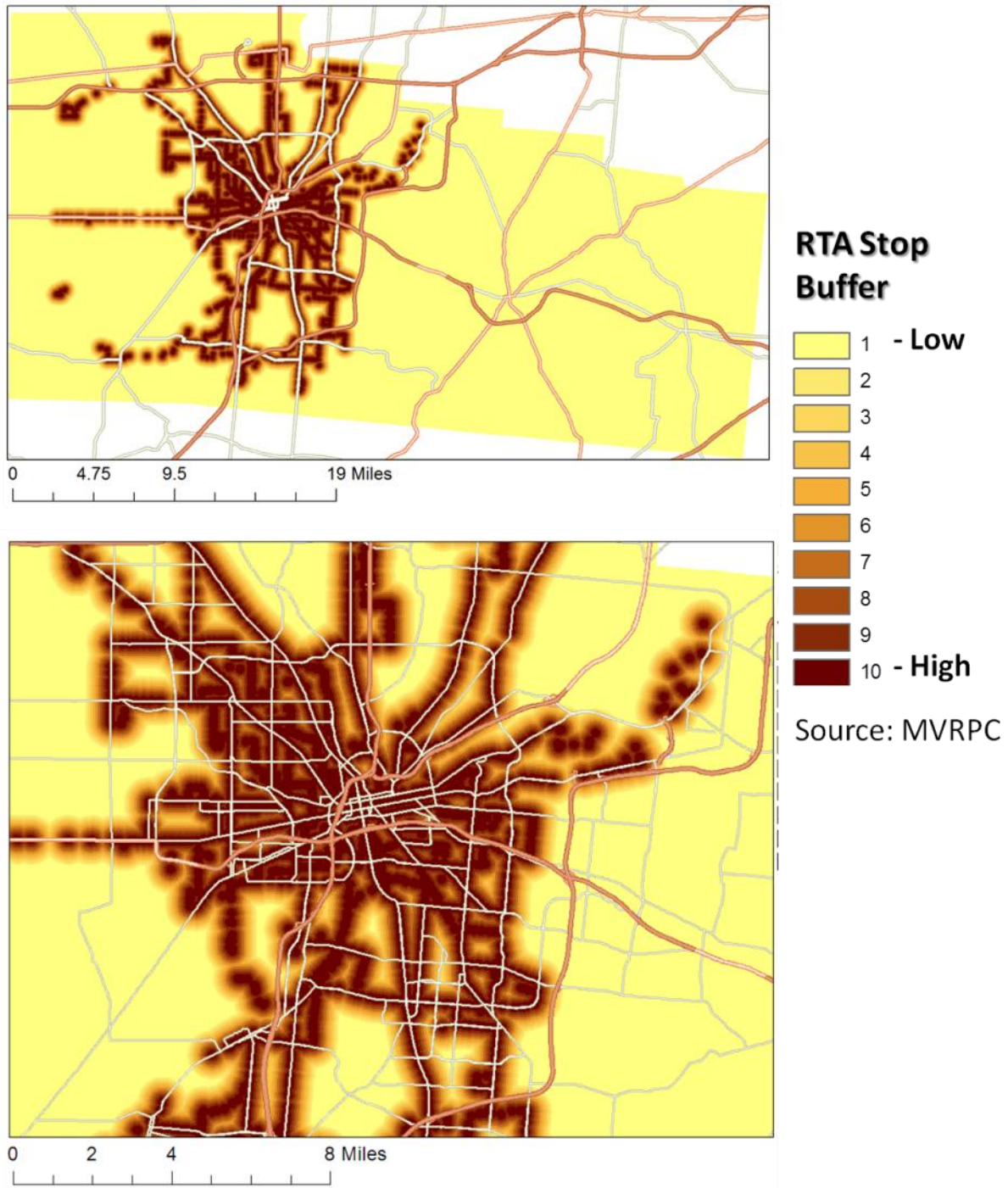


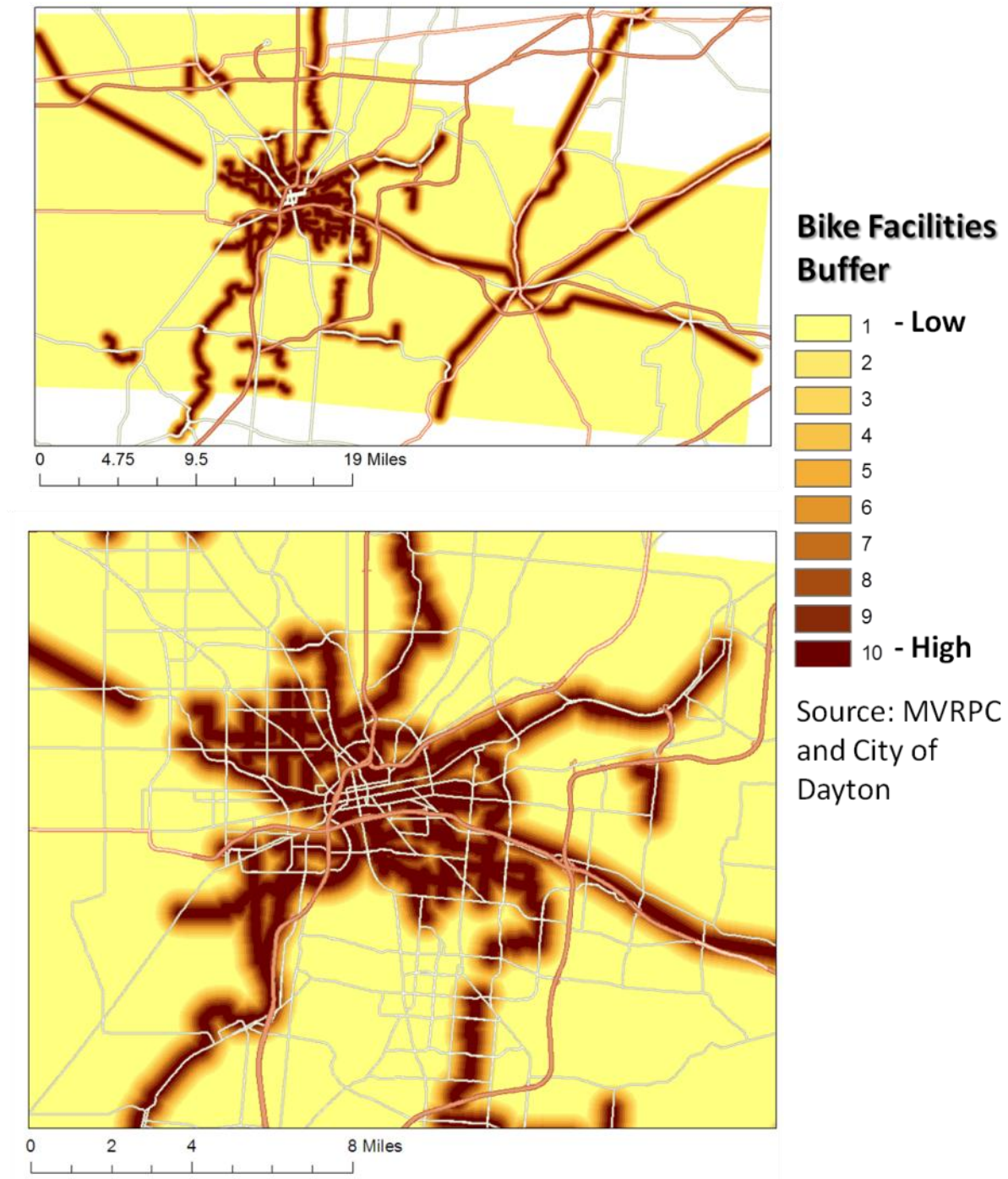
Food and Accommodations Job Density

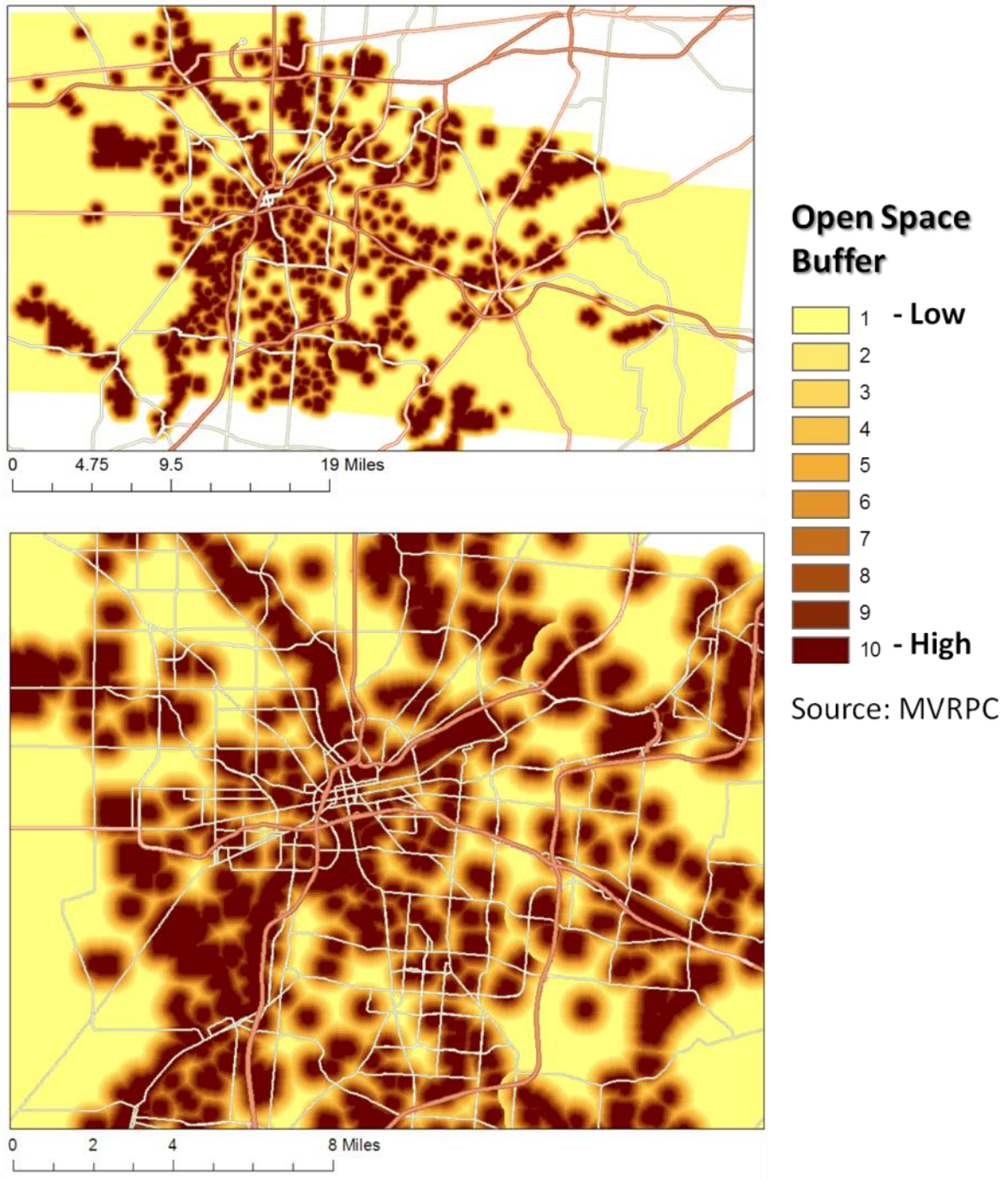


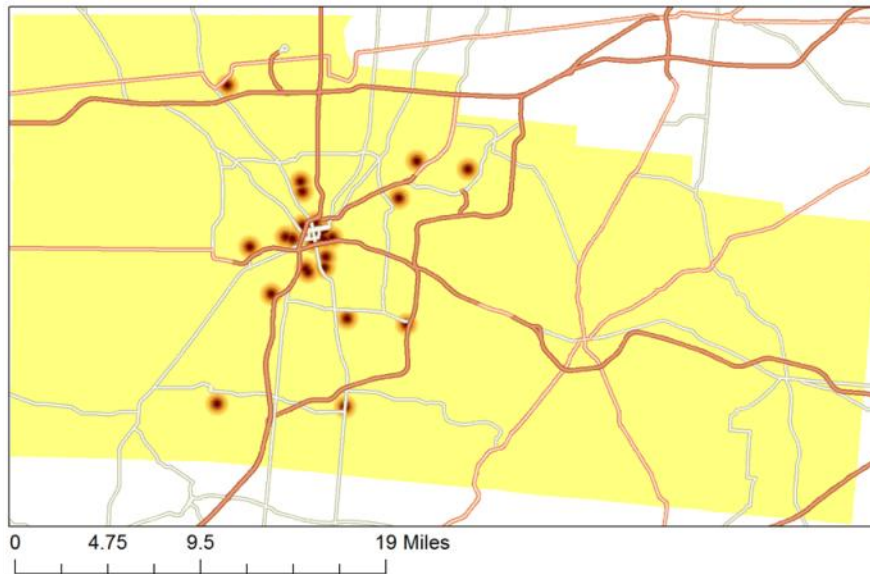
Source:
Longitudinal
Employer-
Household
Dynamics,
2010



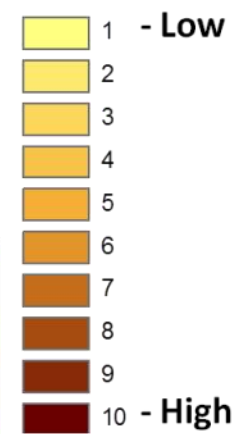




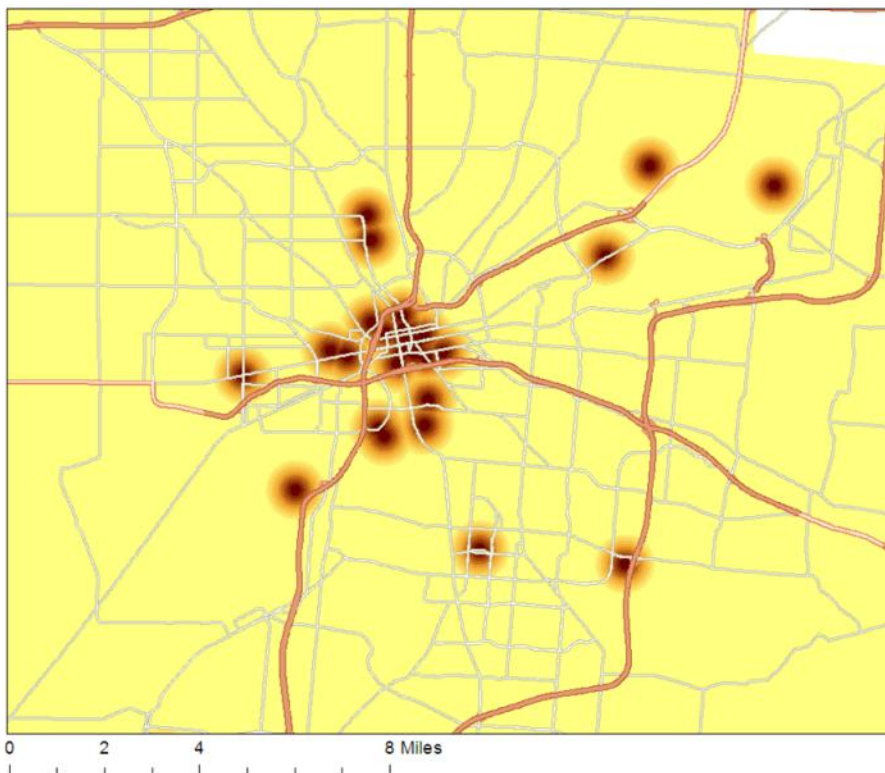


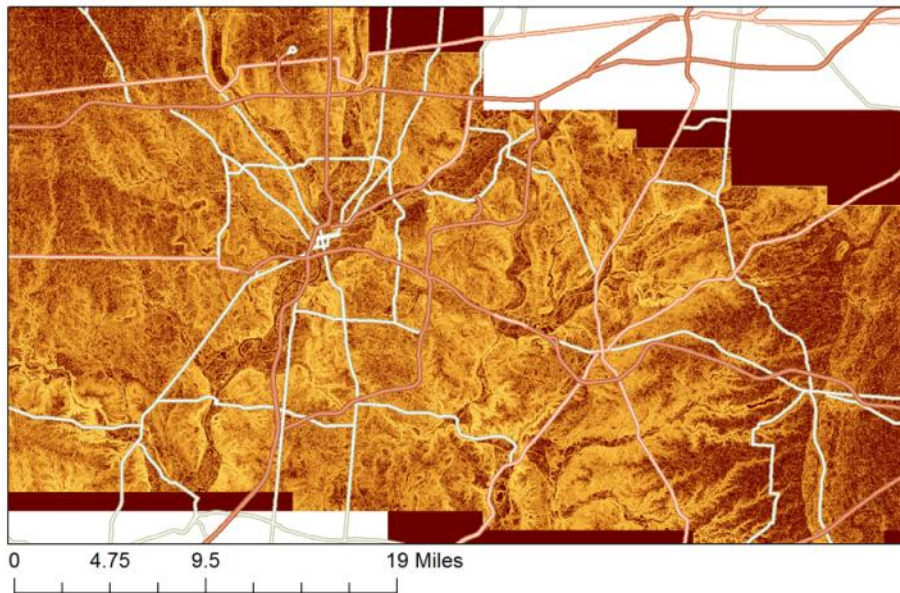


Tourist Attractions Buffer



Source:
Montgomery
and Greene
County Visitor's
Bureaus

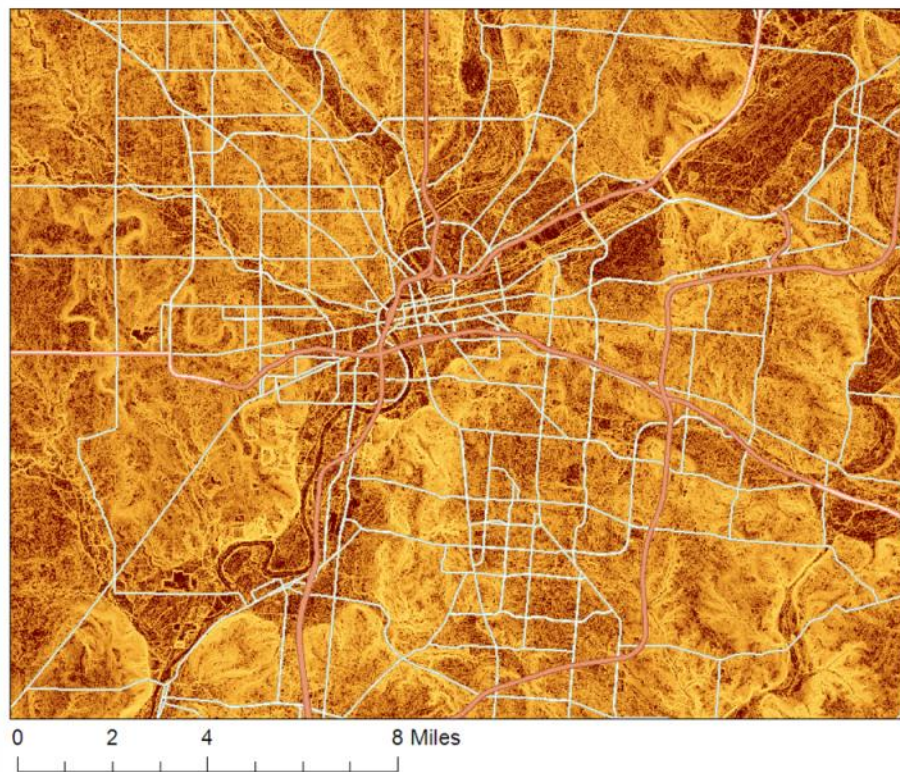




Topography (Slope)



Source: Ohio
Geographically
Referenced
Information
Program



APPENDIX B: SURVEY QUESTIONNAIRE

What is a bike share?

A bicycle sharing system is a service in which bicycles are made available for shared use to individuals who do not own them. The central concept of these systems is to provide free or affordable access to bicycles for short-distance trips in an urban area as an alternative to motorized public transportation or private vehicles, thereby reducing traffic congestion, noise, and air pollution.

We're gathering information about interest in a bike share program for the Dayton area, where you could easily "rent" a public bicycle for little to no cost at an automated station, bike to your destination, and return the bike at a similar station. Washington DC, Minneapolis and many other cities have programs like this.

Your current bike use

Do you own or have access to a bicycle?

- a) Yes -- I own a bicycle
- b) I do not own a bicycle, but have convenient access to one
- c) No

Do you currently use a bike for transportation?

- a) Yes, often
- b) Yes, rarely
- c) No, not really
- d) No, but only because I don't own a bike

What modes of transportation do you use? (often, occasionally, never, na)

- a) Personal vehicle (sole passenger)
- b) Carpool (2+ passengers)
- c) Walk
- d) Cycle
- e) City bus (RTA)
- f) Other (specify)

Currently, how many short trips (i.e. less than 5 kilometers/3 miles one way) do you make per week?

- a) None
- b) Between 0 and 5 trips per week
- c) Between 6 and 10 trips per week
- d) Between 11 and 20 trips per week
- e) More than 20 trips per week

Your bike share interest



If a bike share system was implemented in the Dayton region, would it be something you support?

- a) Yes
- b) No

How likely is it that you would personally use a bike share program?

- a) Very likely
- b) Somewhat likely
- c) Neutral
- d) Somewhat unlikely
- e) Very unlikely

Bike-share systems typically support trips of 1-3 miles. What kind of trips might you use the shared bicycles for? (Please check all that apply.)

- a) Commuting to and from work
- b) Commuting to and from school
- c) Cycle to shopping
- d) Cycle to cultural activities
- e) Cycle for errands and appointments
- f) Cycle to visit friends
- g) Cycle for recreation (on local trails, to the park, etc.)
- h) Cycle for fitness or exercise
- i) Other (specify)

If you were to use a Dayton bike share, your three most likely trips between Place A and Place B would be:

- Most frequent trip (From A _____ to B _____)
- Second most frequent trip (From A _____ to B _____)
- Third most likely trip (From A _____ to B _____)
- Other (specify)

How frequently would you use the bike share bikes?

- a) Rarely
- b) A few times a month
- c) Less than 5 times a week
- d) 5+ times a week

If you are interested in using a bike share service, which benefits would influence your decision to use it?

- a) Travel Time Savings - For many short trips within a service area, bike share trips are likely faster and more convenient than using a motor vehicle.
- b) Cost Savings - Using bike share is less expensive than operating and owning a motor vehicle, or owning and maintaining your own bike.
- c) Convenience – bike share bikes are easy to access and easier to park than a car.



- d) Improved Health – Bike shares increase active transportation and exercise.
- e) Eco-conscious – Bike share trips reduce your carbon footprint.
- f) Cool bikes - High quality, state-of-the-art bicycles are offered.
- g) It's fun - the city looks different by bicycle.
- h) Other (specify)

Would you be interested in a program that ran year-round, including winter?

- a) Yes, year-round is best
- b) Maybe
- c) No, I don't bike in the winter

Would you be more willing to use this program in winter if our streets/roads, regional bikeways, and sidewalks were cleared of ice and snow in winter months?

- a) Maybe
- b) Yes
- c) No

Costs

In U.S. cities offering bike shares today, the average daily rate is \$5, a monthly rate of \$25 and yearly rate of \$60. Would you be willing to:

- Pay \$5 for a day pass and use a Dayton bike share system from time to time? *Yes, Higher, Lower, No*
- Pay \$25 for monthly pass? *Yes, Higher, Lower, No*
- Pay \$60 for an annual pass? *Yes, Higher, Lower, No*

About you:

- Age
- Gender
- Race
- Home Zip
- Work Zip

Want to stay up-to-date on this project? (provide email)

Do you have any other comments or suggestions for us?



APPENDIX C: SURVEY OF POTENTIAL BIKE SHARE STATION LOCATIONS

Bike Share Locations

Aaron Buckley

4/30/13

The information that follows is a synopsis of the 30 potential bike share locations around downtown Dayton. This was completed over a few non-consecutive sunny days on a bicycle writing notes and taking pictures about each of the locations. In general, each of the bike share locations seem properly spread out across the city to allow users a short walk to important destinations. Furthermore, by placing locations around the exterior of downtown, future plans for the bike share might include more locations placed in the surrounding community.

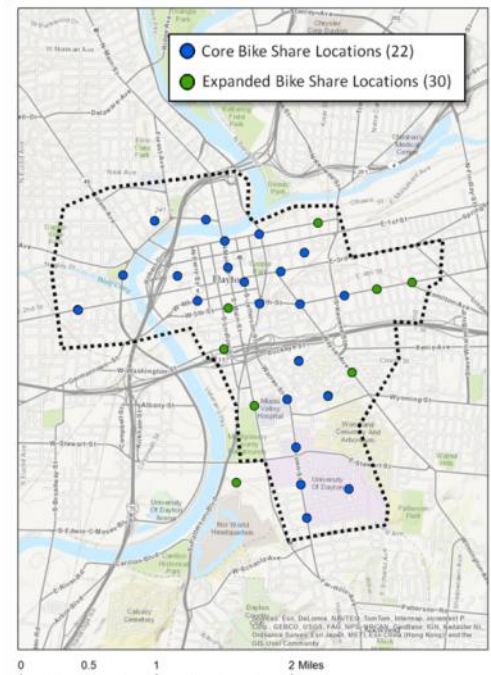
Each of the stops represents a future bike share location that is in a distinct and most likely themed area. Some stops are located at or near Greater Dayton RTA bus stops. This possible combination of bike share and bus stop would lend itself well to the goal of improving multimodal transportation.

All of the locations selected, except for St. Anne's Hill East and Wayne Ave., seem to have at least one corner that would have a large enough area for a bike share to be accommodated. Most of these locations have sidewalks, excess parking, or concrete pads that would make a location easy to place. Some locations have grass lots that would also be fairly easy to work with when determining the physical site. Finally, a few locations have landscaping or other features that would make a bike share location more difficult, but not impossible, to locate.

The visibility of each of these potential future sites is excellent and should be welcoming to new riders. Located near attractions and highly trafficked areas the bike share locations would be accessible to a large portion of the Dayton population. Intersections near potential sites like Wright Dunbar, along Salem Ave., and some others might be too highly trafficked by vehicles for people to feel comfortable with their first foray into bike shares. Some site adjustments or bicycle facilities should ameliorate most problems.

Further work with the City of Dayton will be important to ensure bike share facilities are along bicycle routes through town. As noted on each of the potential bike share sites, I have given a recommendation for which corner or area I feel would accommodate a bike share best. Site planning and other work will be necessary to confirm each of the locations. Finally, I enjoyed my time pedaling and gathering information and I hope you enjoy learning about each of the potential bike share locations.

-Aaron B.



Final bike share locations were selected based on Aaron's "reconnaissance"



Ben & Jerry's - 1st Stop

This location offers a large concrete pad directly in front of the Ben & Jerry's location. There is a line of street trees that are 12' off of Brown St., behind the street trees there is 15' of space to the building. This extends for 30+ ft. in width which would make a bike share location easy to place.

University of Dayton RecPlex – 2nd Stop

There are two large (14'x40') concrete pads on either side of the entrance that would make perfect bike share locations. Furthermore, there is a sizable portion of grass between the RecPlex and the adjacent student housing that could be used to site a bike share hub.



Aaron's Vehicle of Choice for the Reconnaissance

West Campus, Marriott, GE Aviation – 3rd Stop

There are various small grass pads in front of the Marriott. The closest grass pads also have some landscaping, including trees and shrubs. There is a large field located to the east of the Marriott parking lot that currently sits open. This location would still be close to the intended points of interest while not requiring a large transformation of current landscaping. Also, it should be noted that River Park Dr. which runs north of the Marriott is marked for 35mph, but cars regularly go well above the posted limit.

Brown and Caldwell – 4th Stop

On three sides of the intersection there are large concrete pads that would easily accommodate a bike share location. Each of the three sides has approximately a 9 foot sidewalk width (grass to roadway) that extent for 50+ feet along Brown St.

University of Dayton Shops – 5th Stop

There are large concrete pads on either side of Brown St. that extend for multiple businesses which would be plenty of space for a bike share location. The high amount of vehicle traffic paired with sometimes high speed driving makes this location somewhat challenging. Furthermore, there is a high amount of pedestrian traffic in this area around lunchtime that would be well served by the addition of a crosswalk.



University of Dayton Shops

Miami Valley Hospital, East – 6th Stop

The northeast corner of this intersection (E. Apple St. and Warren St.) there is a large grass lot that would easily accommodate a bike share location. Additionally, on the southwest corner there are some large (16'x18') concrete pads cut out of the landscaping that could be used as well. The remaining sidewalks and corners are either too small, lighted poorly, or lack visibility.



Miami Valley Hospital, West – 7th Stop

This intersection (W. Apple St. and S. Main St.) is a high speed, high traffic area. The sidewalks are relatively narrow (especially with the high foot traffic) with 10 feet between the grass and street. The northeast corner of the intersection has a parking lot that seems relatively unused and could possibly donate a few parking spots to a bike share location.

South Park, Park Ave. – 8th Stop

The large tracts of green space present on this boulevard style street would lend plenty of space for a bike share location. The whole length of Park Ave. looks feasible for a bike hub; its relative location to points of interest or other hubs would help determine its position.

Wayne Ave. – 9th Stop

The 8' sidewalks (from building to roadway) on either side of the street do not look conducive to a bike share location. There are, however, pockets between businesses on the western side of Wayne Ave. that could house a bike hub. The only down side would be possible visibility problems due to its 'hidden' location.

South Park, North – 10th Stop

There is a large (20'x50') amount of green space present on this boulevard style street. The adjacent sidewalks do not seem to have enough space necessary for a bike share location, but the central strip of grass would provide plenty of space. It might be worth moving up Burns Ave. into the neighborhood to the west since the Emerson Academy seems to be using all of their land.

Fifth St. and S. Patterson Blvd. – 11th Stop

This five way intersection has a few large empty concrete pads that would easily hold a bike share location. This high traffic area would give the system a high amount of visibility.

Ludlow Place – 12th Stop

This intersection (W. 5th St. and S. Ludlow St.) has many 18' sidewalks which would make a location easy to place. I would suggest the southeast corner because of its openness, visibility, and high amount of natural light in the afternoon.

Sinclair Community College – 13th Stop

The wide sidewalks and large parking lots should make this highly visible area easy to locate a bike share hub. Additionally, the large student population should offer the possibility of a large number of users.



Sinclair Stop Location



Chaminade Julianne High School – 14th Stop

One empty lot and one grassy field are across the street (W. Washington St.) from the High School. These easily placed locations would give the bike hub great visibility from people on the street as well as the U.S. Route 35 on-ramp directly south of the lots. Otherwise, there is limited space on the northern side of the roadway making a location difficult.

Montgomery County Building – 15th Stop

The various corners around the building have fairly narrow sidewalks, but there are a couple of locations directly in front of the County Building that might work. This location on the northeast corner of the intersection has a relatively unused parking lot as well as a large concrete pad. I would recommend either of the two locations on the northeast corner because other corners will be difficult to use.

Wright Dunbar – 16th Stop

There are multiple grass lots around this intersection that would be ideal for a bike share location. My primary recommendation would be for the southwest corner because of its large size and flat elevation. The main issue with this intersection is the high amount of vehicle traffic. These high speed vehicles spread across many lanes going both north/south and east/west do not look inviting to a new bike share user. I would recommend moving west into the Wright Dunbar area to offer future users a safer, quieter spot to get started.

NOTE: Based on this feedback, the Wright Dunbar bike share location was moved farther west for the final set of station locations

Salem Ave. – 17th Stop

This location lacks any space large enough to site a bike share location. Additionally, the number of lanes and the high speed traffic would be a possible deterrent for bike share users. I would recommend shifting the bike share location further north into the neighborhood to allow users a safer quieter location to get moving.

NOTE: Based on this feedback, the Salem Ave. bike share location was moved south closer to the Wolf Creek Trail for the final set of station locations

Dayton Art Institute – 18th Stop

The Art Institute has a large grassy area on the hill leading down to the river. This location, while changing in elevation, would probably offer the largest space that could be used for a bike share. Other locations in front of and adjacent to the Art Institute are hemmed in by low walls. These old looking walls are directly against sidewalks and might present a challenge to be removed.

McPherson Town – 19th Stop

This quiet street has multiple large concrete pads (40'x12') north



Second St. Market



of the roadway that I would recommend for a bike share location. The area south of the roadway consists of a large dirt levee making any location there impossible.

CareSource, RiverScape West – 20th Stop

This busy intersection has a few concrete pads that would make a bike share location fairly easy to place. The largest pad is directly in front of CareSource southeast of the intersection. The only obstruction would be some landscape features that could either be removed or possibly worked around to make a location.

Schuster Center – 21st Stop

Each corner has an excess of concrete making a location easily placed. The Schuster Center itself seems to have the most excess space and a bike share location here would have excellent visibility to users of the Center.



Schuster Performing Arts Center

2nd Street Market – 22nd Stop

The southeast corner of this intersection is the 2nd Street Market itself. The remaining corners house various businesses or parking lots. Each of the corners could potentially accommodate a bike share location. The northeast and southeast corners have building space that encroaches on the sidewalk more than either location to the west. The northwest and southwest corners have parking lots that could possibly lose a space or two to allow a bike share to be placed. Additionally, if bike share visibility is to be linked with the 2nd Street Market, a couple parking spaces could be moved.

Tech Town – 23rd Stop

The southeast corner of this intersection has a large building with narrow sidewalks making this corner unusable. All other corners could potentially accommodate the bike share location. The southwest corner also has a building, but it has a large sidewalk pad. The northeast corner is a large unused parking lot, but it is exposed to the elements. The northwest corner is another parking lot, but it is currently being used. I would recommend either the northeast corner with some sort of shelter or the southwest corner.

Fifth Third Field – 24th Stop

The E. Monument Ave. and N. Patterson Blvd. intersection could potentially accommodate a bike share on any corner. The large brick sidewalk area in front of the field would probably make the best location due to its size and visibility. Additionally, a second choice could be near the RiverScape Bike Hub to further promote riding to work.

RTA Downtown Hub – 25th Stop

The large concrete pads on either side of the eastern exit/entrance to the RTA Hub would make a bike share location easy to place. The high amount of foot traffic and connection to bus service could make



this location critical. The eastern side of the intersection would allow the largest amount of space for a bike share and it would be out of the way, but still accessible for people walking into the RTA Hub.

The Cannery – 26th Stop

This location, Wayne Ave. and E. 3rd St. lacks sidewalk on the southern side of the intersection directly in front of Olive and the Cannery. The northern side of the intersection has a large amount of excess sidewalk that should make a bike share location easy to place.



Oregon District

Oregon District, Wayne Ave. and E. 5th St. – 27th Stop

This large, high speed intersection has multiple corners that could be modified to accommodate a bike share location fairly easily. A shaded corner on the southwest corner of the intersection would keep the bike share directly in the main section of the Oregon District. The northwest corner is too small to be adequate for a location. The northeast corner has a large cut for a right turn lane from E. 5th St. onto Wayne Ave. heading north. The southeast corner has a fair amount of landscaping in front of the Dublin Pub, but with some removal could easily house a bike share location.

St. Anne's Hill, West – 28th Stop

This intersection has multiple grass pads that could be used for a bike share location. The most visible would be on the southern side of the intersection (S. Clinton St. and E. 5th St.). Both of the northern corners would be on school grounds which might make a location difficult to be placed.

NOTE: *The last two bike share locations will eventually need to be moved slightly given Aaron's feedback. They were not shifted in the final station map given that the suggested alternate locations are relatively close to the current spot.*

St. Anne's Hill, East – 29th Stop

This section of E. 5th St. between Henry St. and Tower Ln. is unsuitable for a bike share location. The sidewalks are too narrow for a hub. The nearest open locations that might be able to accommodate a bike share would be the front of the parking lot for M&R Electric Motor Service at the corner of Henry St. and E. 5th St. to the west or just south of E. 5th St. across from S. Terry St. to the east. Those two locations are off of E. 5th St. enough to give room for a bike hub location.

Huffman Historic District – 30th Stop

Most locations around this multiple intersection with railroad area are unsuitable for a bike share. Furthermore, the lack of wide sidewalks would make most locations impossible. The only open areas seem to be an open grassy lot just north of the E. 5th St. and Hamilton Ave. intersection or in the Huffman Historic Park itself. I would recommend the park because of its visibility and openness.



APPENDIX D: CLASSIFICATION SCALES FOR CITY COMPARISONS

The following population and job density scales were selected for the city comparison analysis and subsequent calculation of bike share demand. These scales were determined via a geometric interval classification of all data included in the city comparisons. All data is in persons or jobs per square mile.

To clarify how the scales were defined, for example, a score of 1 for job density would be awarded to all analysis cells containing 0 to 37 jobs per square mile. A score of 2 would be awarded to all cells with 38 to 172 jobs per square mile, and so on.

Classification Scales for City Comparisons (in persons or jobs per square mile)

| Scale | Population Density | Job Density | Retail Job Density | Food and Accommodations Job Density | Age 18-39 Population Density |
|-------|--------------------|-------------|--------------------|-------------------------------------|------------------------------|
| 1 | 408 | 37 | 6 | 3 | 103 |
| 2 | 1,315 | 172 | 28 | 13 | 336 |
| 3 | 3,335 | 655 | 107 | 50 | 865 |
| 4 | 7,826 | 2,391 | 392 | 179 | 2,066 |
| 5 | 17,816 | 8,629 | 1,414 | 632 | 4,791 |
| 6 | 40,039 | 31,047 | 5,086 | 2,229 | 10,975 |
| 7 | 89,474 | 111,614 | 18,285 | 7,856 | 25,008 |
| 8 | 199,437 | 401,158 | 65,717 | 27,677 | 56,856 |
| 9 | 444,046 | 1,441,723 | 236,181 | 97,503 | 129,128 |
| 10 | 988,164 | 5,181,320 | 848,797 | 343,477 | 293,141 |

