Present

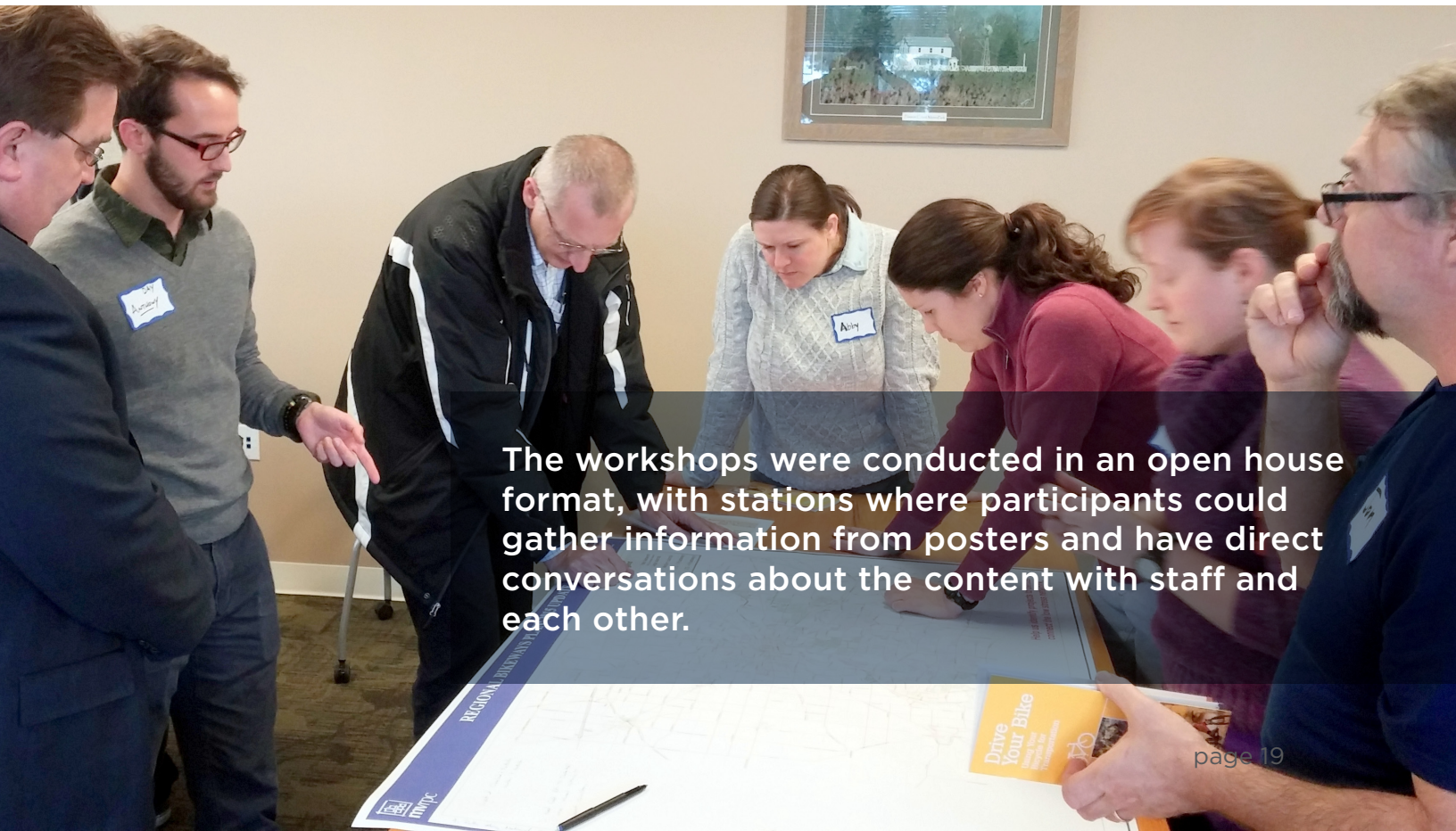
In preparing this update, MVRPC staff gathered relevant data and reported on public priorities and on trends related to cycling in the Miami Valley. Topics covered in this chapter will include:

- **Public input to the Update from workshops and the online survey**
- **Regional bike and pedestrian crash and safety analyses**
- **Level of Traffic Stress analysis — overview of the concept, regional, and local application**
- **Cycling demographics, including regional census, equity, and health data**

Public Input Workshops and Online Survey Results

MVRPC hosted Input Workshops to learn what projects the public is interested in, and to get feedback on local bicycling priorities. The Bike Plan Input Workshops were well-attended, gathering input from over 140 people. Attendees included representatives of a handful of neighboring counties and park districts from outside the planning area, as well as our local government officials (mayors, trustees, city department directors, police, and ODOT), consultants, the general public and news reporters. MVRPC partners from local park districts helped host the workshops and were very helpful, staffing the sign-in tables at each meeting and answering local questions.

The workshops were conducted in an open house format, with stations where participants could gather information from posters and have direct conversations about the content with staff and each other. The three stations focused on **Level of Traffic Stress**, where the public could inspect and correct our LTS ratings for their county and mark project



The workshops were conducted in an open house format, with stations where participants could gather information from posters and have direct conversations about the content with staff and each other.

recommendations on the map; **Priorities Brainstorming**, where they could offer ideas for "Es" activities that would move cycling forward; and on the **Plan Update Data**, where they could learn about the changes from 2008 to 2014 in U.S. Census journey-to-work data, traffic crashes, health data, and local projects completed on our network. Staff heard positive comments from attendees about the open house with input stations format, which allowed people to have in-depth discussions and get their questions answered.

The people who attended the workshops were generally well informed about local bicycling issues; they brought a wealth of suggestions. The Enforcement suggestions primarily centered on feeling safe as a rider. Many Education priorities were also aimed at safe rider/driver interactions and teaching kids to bike. In the Equity category, MVRPC received suggestions to better manage information resources and suggestions for developing partnerships aimed at different audiences. Better signage and amenities are needed, as well as community supported Encouragement events. By far, the most suggestions received were focused on new Engineering projects. People want to bike safely and comfortably, especially to the trails and to parks from their own neighborhood and to do so with their families. Connecting and extending the trails network is one of the public's highest priorities. This exercise did not seek public input on Evaluation.

The following are examples of the input received, grouped by topic area. A complete list of suggestions is included in Appendix B.

1 EDUCATION

IDEAS FOR INCREASING CYCLING KNOWLEDGE AND SKILLS (16 suggestions)

- The importance of sharing the road
- Youth cycling skills
- Safety PSAs and motorist education

2 ENCOURAGEMENT

IDEAS FOR INCREASING RIDERSHIP (28 suggestions)

- Bike racks & end of trip amenities
- Employee wellness outreach
- Frequent community rides
- Family events & competitions
- Amenity, business & history signage

3 ENFORCEMENT

IDEAS CONCERNING LAWS/RULES REGARDING CYCLING (14 suggestions)

- "No Right on Red" at bike crossings
- Enforce speed limits & safe passing
- Warning tickets & awareness campaigns
- Targeting improper sidewalk riding

4 ENGINEERING

IDEAS FOR NEW INFRASTRUCTURE PROJECTS (57 suggestions and 74 mapped projects)

- Getting to the trails & parks from local neighborhoods via low-stress connections
- Marked routes and lanes to neighborhood destinations
- Extending the trails (especially over/under/around barriers)

- Maintenance of lanes and trails
- Campsites & amenities along bikeways

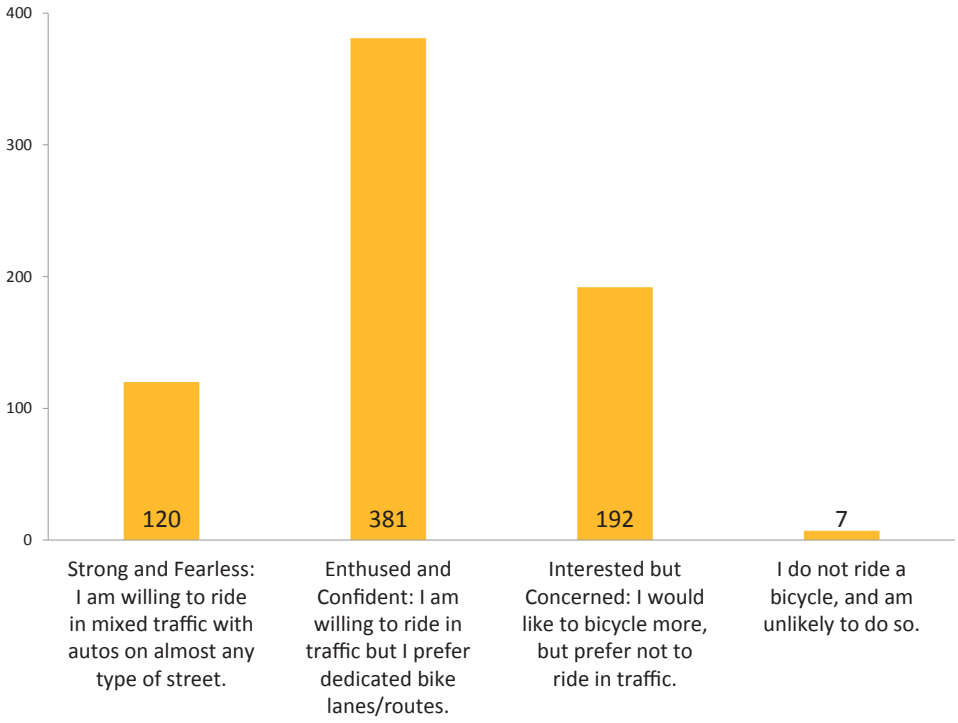
5 EQUITY

IDEAS FOR SHARING THE ACCESS TO CYCLING ACROSS THE REGION (16 suggestions)

- Earn-a-Bike programs
- Resources in multiple languages
- Better neighborhood directional signage
- Partnering with YWCAs and YMCAs, Life Enrichment Center, schools

Online Survey Results

An online survey was created by MVRPC with the input of Five Rivers MetroParks and Miami Conservancy District staff. Five Rivers also hosted the survey. The survey was open from January 22 through March 6, 2015, and was advertised via social media and shared with many of our agency partners, who also publicized it. At closing, 701 respondents had taken the survey. The survey results are attached at the end of this report. (Appendix A) A Complete list of suggestions from the workshop and survey is attached as Appendix B.



This was not an unbiased sample of the general population, but a self-selected audience of bicyclists: 96% of respondents own a bike. Even among our bike-centric audience, the smallest percentage group was those who self-identified as Strong and Fearless riders, willing to ride in mixed traffic with autos on almost any type of street. Eighty-two percent of respondents identified as Confident, who prefer to ride in dedicated bicycle lanes or routes, or are Interested but Concerned. These later two groups would bicycle more if they didn't have to mix with traffic.

Our survey respondents were 89% white and 66% male. Partly due to the way we publicized the survey through partner agencies, 46% were part of a bicycle club, advocacy group, or employees of a trail-managing, engineering, or planning agency. 54% had no such affiliations.

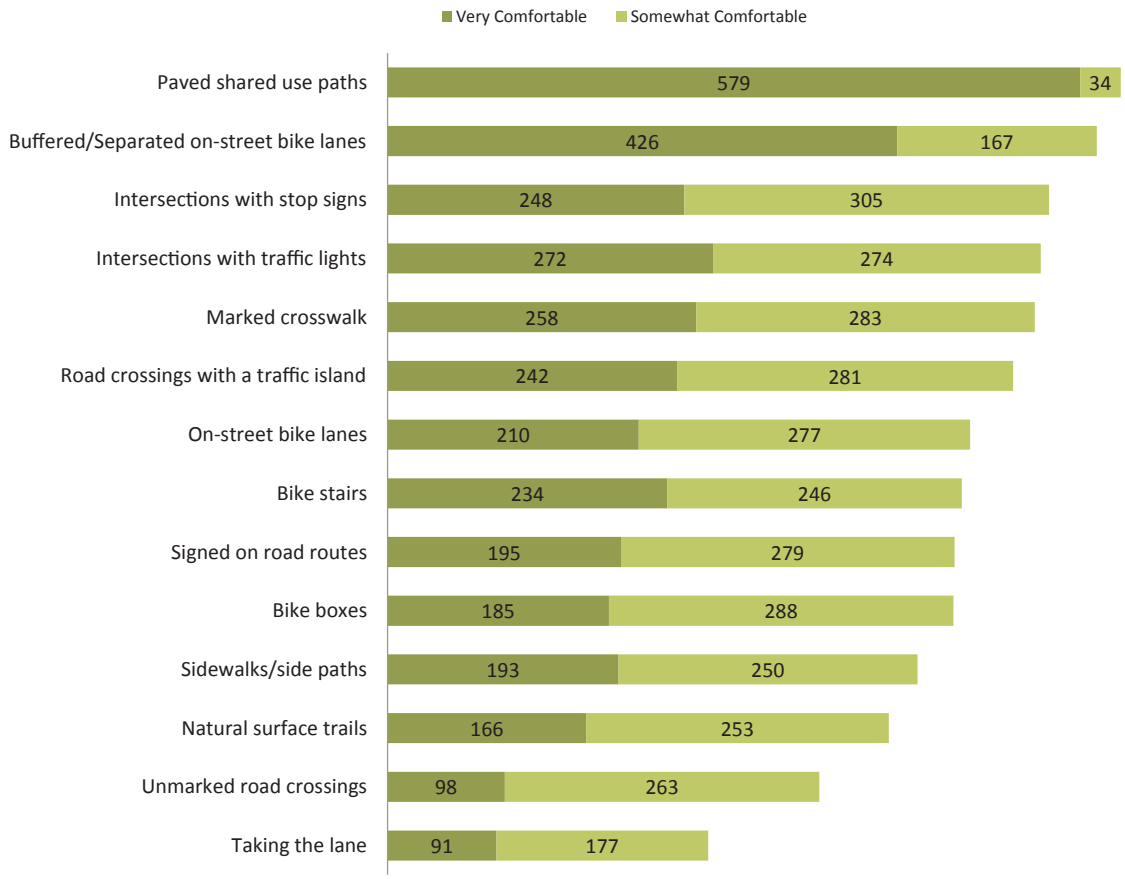
Top Destinations

The most important destinations to survey respondents were the **Miami Valley Trails** and also **parks**, echoing what MVRPC heard in the workshops. The importance of the trails as a destination informed the Level of Traffic Stress analysis. Additional destinations that ranked highly were **restaurants, coffee shops, a friend's home or nearby neighborhood, recreation or community centers, libraries, and local shopping.**

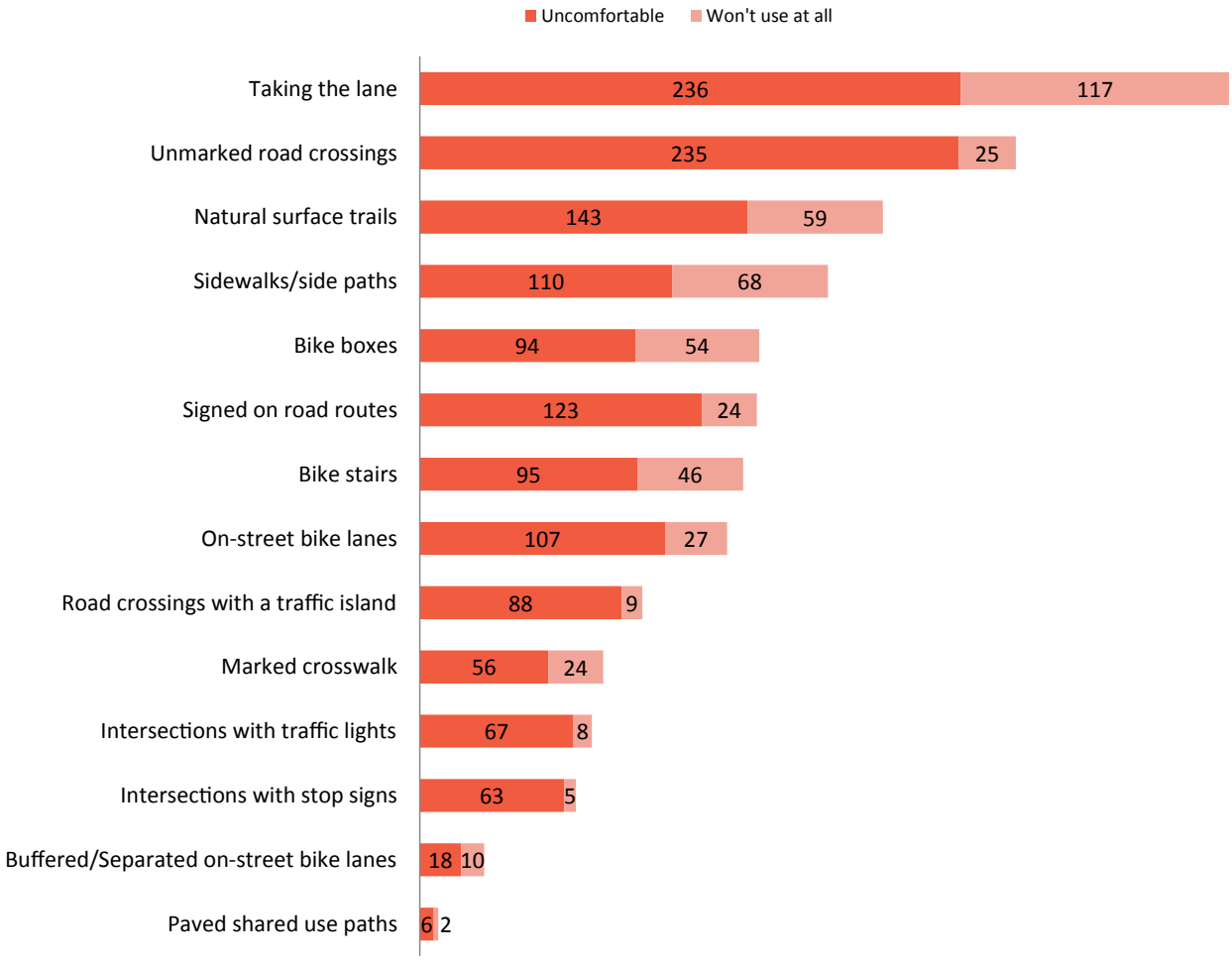
Comfort of Non-Motorized Facilities

The survey offered images of facilities and asked respondents which non-motorized facilities they would feel comfortable using. We combined the "uncomfortable and "won't use at all" ratings to get a least-comfortable list. We also combined the "very comfortable" and "somewhat comfortable" ratings for comparison.

Most Comfortable Facilities for Bicycling



Least Comfortable Facilities for Bicycling



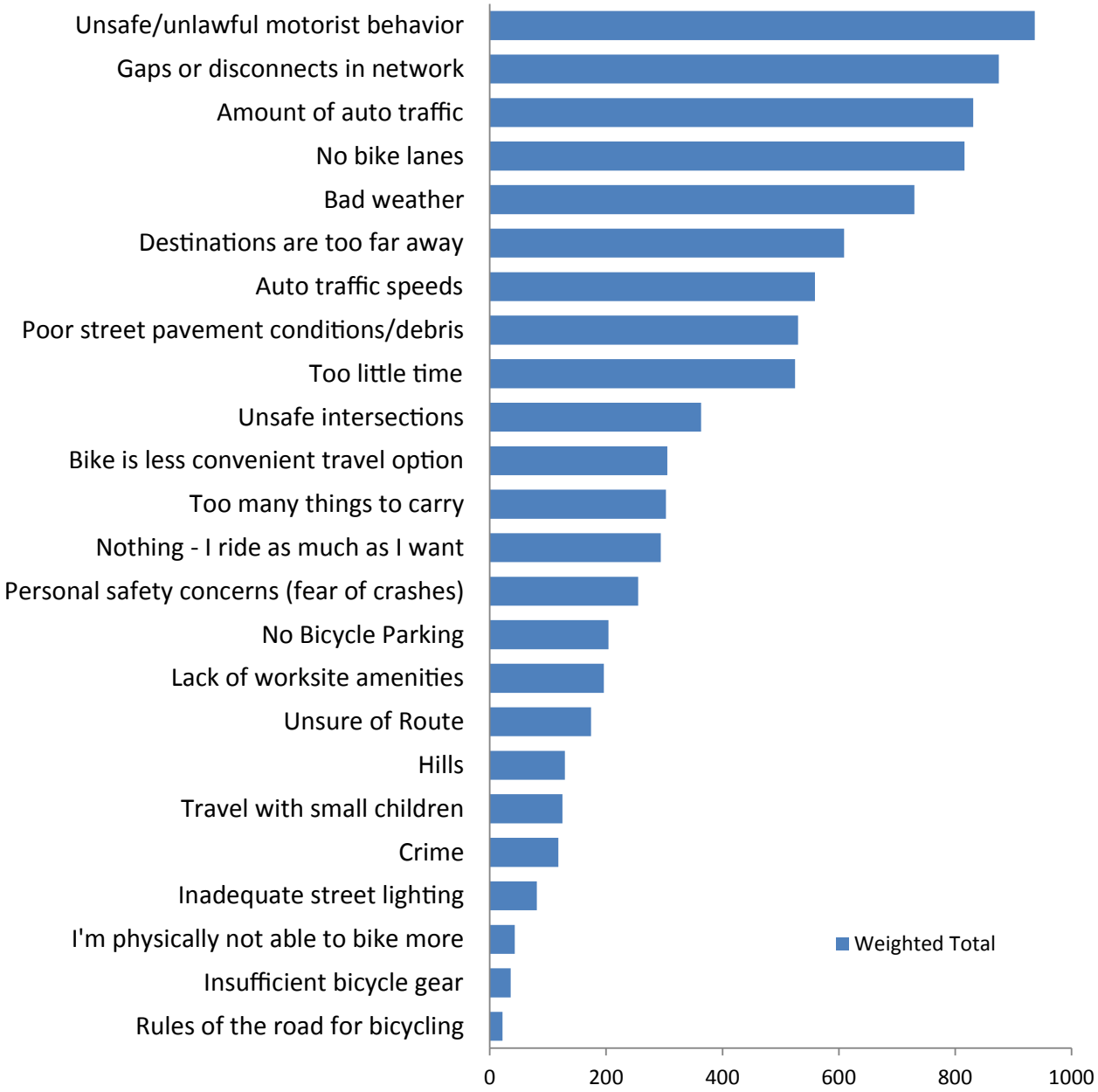
Consistent with the self-ratings as enthusiastic but cautious riders, respondents are clearly more comfortable with separated facilities such as separated multi-use paths and buffered or protected bike lanes. As the Miami Valley doesn't have any local examples of protected lanes and only a few examples of buffered lanes, staff interprets this as a signal that the respondents are familiar with these concepts from cities they have visited like Indianapolis and New York or from the media, and are ready for more advanced bicycling facilities. The Miami Valley is in a good position to expand our cycling mode share if we build buffered or protected facilities. Experience in cities like Washington, D.C., Chicago, and Portland shows a direct correlation between safer on-street facilities and increased ridership rates. (Andersen, 2014)

Conversely, bike facilities that offer less separation from motor traffic were consistently rated as uncomfortable or "won't use at all." Typical on-street lanes and signed on-road routes are solidly in the middle of the "comfortable list" while sidepaths/sidewalks fall towards the bottom of the list. That may be due to the bike-centric audience taking the survey, who understands the statistics and right-of-way issues that argue against sidewalk and side-path riding. For guidance on side-paths, see Appendix E.

Barriers

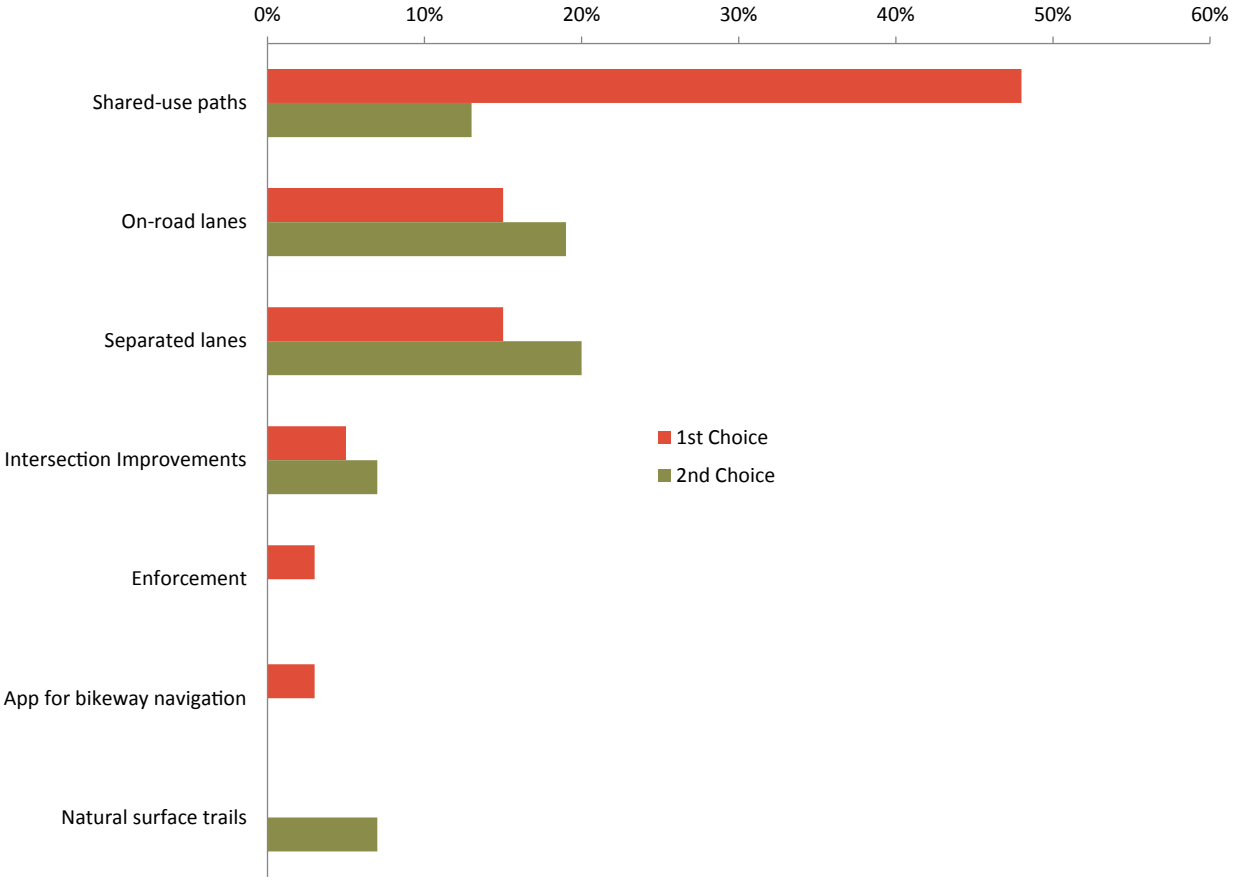
Barriers to bicycling were addressed in the survey, seeking to understand what keeps people from choosing to bike. When asked what the top barrier to using a bicycle was for daily activities, by far the top three answers were lack of bike lanes, bad weather, and gaps or disconnects in the bicycle network. The survey then asked for respondents to report their second, third, fourth, and fifth most significant barriers. Notably, when the top five barriers are aggregated and compared, unsafe or unlawful motorist behavior was a clear concern. Creating more high quality bike lanes would be a solution to the top four barriers in the list below, which presents the barrier responses weighted by the survey takers' priorities.

Barriers to Bicycling for Daily Activities and Errands: Aggregated Total



Project Priorities

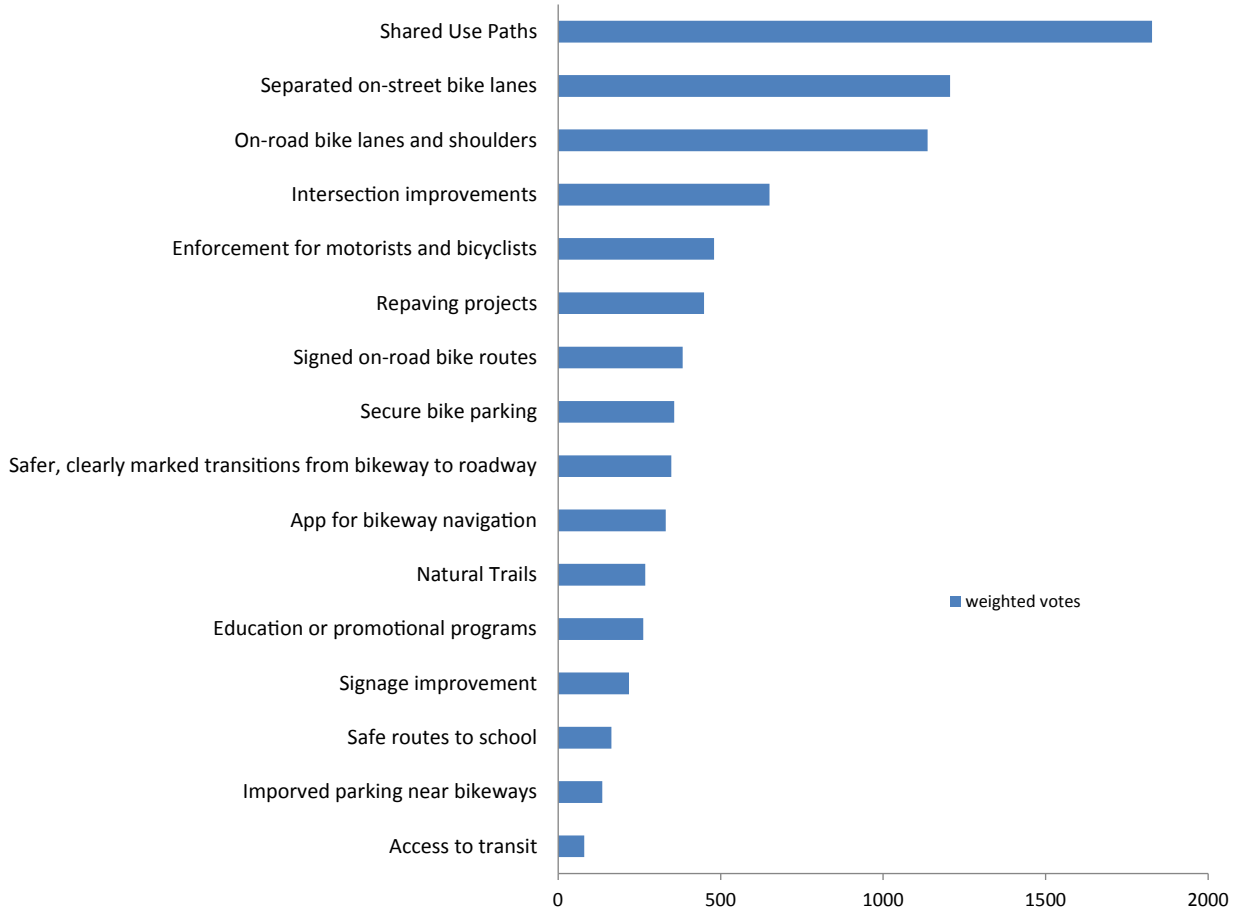
We asked survey respondents to rank their priorities for types of projects they would like to see in the Update, and they overwhelmingly chose shared-use paths as their first priority. Facilities with some degree of separation also received considerable public support.



These priorities held through the cumulative analysis. Shared-use paths were the highest cumulative priority. Separated or buffered bike lanes were the second priority, and on-road painted lanes and shoulders were the third, followed by intersection treatments and enforcement programs. Respondents marked as important but of lower priority: repaving and maintenance, signs and navigational aids, secure bike parking, and better/clearer transitions from bikeway to roadway.

Staff used these priorities to inform the Bikeways Advisory Committee and to rebalance the project scoring criteria in the Update. The scoring criteria is included in Appendix B.

Top Public Priorities



Project Suggestions

Questions 19 and 20 or the survey asked for "other project priorities not listed," and asked respondents for their suggestions of up to five projects or programs they would like to see in the Update. These 600+ project suggestions created the basis for our updated project list. Staff condensed the suggestions to eliminate duplicates and to determine how often similar projects were suggested. The 300 condensed suggestions were then compared with projects currently in MVRPC's TIP and Long range Plan. Projects not currently listed in MVRPC planning documents were then scored. The suggested projects are listed by County and Region, attached at the end of this report. (Appendix B)

Safety and Crash Data

The Miami Valley has embraced cycling and promoted trails development for more than 40 years. These trails are perceived as safe for all ages and types of riders. Now, the call to make street cycling safer has never been more important if cycling is going to become a viable transportation mode in the Region. Statistically, trail riders are primarily a recreation

and fitness rider group. Trails do not always connect riders with practical destinations, and like a highway they have limited access. In order to make transportation cycling available and practical for more people, more local destinations must become accessible by bikes via the roadway, and the streets must become safer and more inviting for a broader range of cyclists. Cyclists also have to be trained as skilled, smart street cyclists.

Feeling unsafe and vulnerable is a particular hazard of cycling, particularly when sharing the road with vehicles weighing over two tons moving at high speeds. Cyclists and pedestrians are considered vulnerable because they lack the protection provided by riding inside a motor vehicle. Even away from traffic, the act of balancing on two wheels can sometimes be perilous. More than 50% of bicycle crashes are single-person crashes or falls. The reward—having fun, traveling under one's own power, experiencing the freedom of the wide open road—is worth the chance of scrapes to most. But the calculation of risk vs. reward is different in the context of motor vehicle crashes, and the perceived risk of riding with motor vehicle traffic is too high for many potential riders.

MVRPC tracks crash rates in our Region and works to address areas with high crash rates in cooperation with local engineers and planners. The crash analysis aggregates bike- and pedestrian-related crashes together in most charts because the small sample size for each individual crash type limits statistical analysis. There are several important points to keep in mind while looking at the following crash data.

- 695 crashes between a person driving a motor vehicle and a person either walking or biking were reported on the regional road network from 2011 through 2013.
- These represented 1.7% of all reported crashes involving people driving a motor vehicle.
- Crashes between a person driving a motor vehicle and a person walking or biking were the most severe of all reported crash types.
- 80% of reported collisions between a person driving a motor vehicle and person biking and 91% of crashes between a motor vehicle and a person walking led to an injury or fatality.
- 24% of the 29 fatal crashes between a person driving a motor vehicle and a person either riding a bike or walking involved alcohol.
- 12% of crashes between a person driving motor vehicle and people either biking or walking involved someone under 16 years old, and 29% involved someone 16 to 25 years old.
- 68% of reported crashes between a person driving a motor vehicle and a person either walking or biking were intersection related.

In the MVRPC Region, crashes between someone driving a motor vehicle and a person either walking or biking are a small percentage of the total crashes: 695 out of over 40,000 crashes

Crash Data from the Ohio Department of Public Safety

It is important to understand that MVRPC examines only a selection of vehicle crashes in the Miami Valley. The data received from the Ohio Department of Public Safety only tracks motor vehicle involved crashes in the public right of way, not bike/bike, bike/pedestrian, or single-cyclist crashes. Also, the reports are only for crashes that result in more than $1,000 in damages or any crash that results in an injury or fatality. MVRPC then filters the data to report only crashes on federally functionally classified roads to exclude crashes on locally-maintained streets.

in a three year period. In the following tables the most severe (injury and fatality) crashes are tracked by year. The number of bike-related crashes is smaller still, compared to the combined bike- and pedestrian-involved crashes.

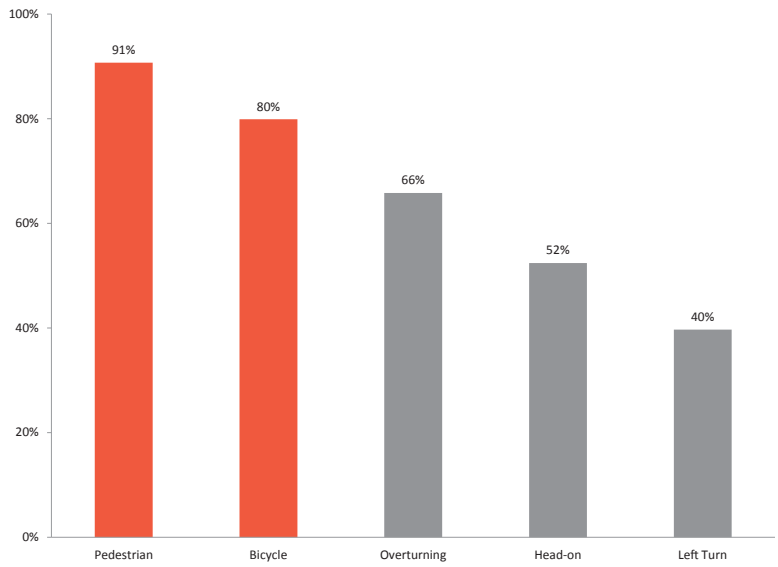
Annual Bike Crashes by Severity

Severity	2005	2006	2007	**05-07 Total**	2008	2009	2010	**08-10 Total**	2011	2012	2013	**11-13 Total**
Property Damage Only	16	14	20	**50**	14	20	9	**43**	31	15	12	**58**
Injury Crash	76	78	85	**239**	74	93	88	**255**	66	90	69	**225**
Fatal Crash	1	0	2	**3**	0	1	1	**2**	2	1	2	**5**
Grand Total	93	92	107	**292**	88	114	98	**300**	99	106	83	**288**

Annual Bike/Ped Crashes by Severity

Severity	2005	2006	2007	**05-07 Total**	2008	2009	2010	**08-10 Total**	2011	2012	2013	**11-13 Total**
Property Damage Only	45	23	30	**98**	31	27	19	**77**	50	27	19	**96**
Injury Crash	226	174	195	**595**	185	215	212	**612**	194	202	174	**570**
Fatal Crash	7	5	10	**22**	2	6	4	**12**	11	9	9	**29**
Grand Total	278	202	235	**715**	218	248	235	**701**	255	238	202	**695**

Percent of Severe Crashes per Crash Type

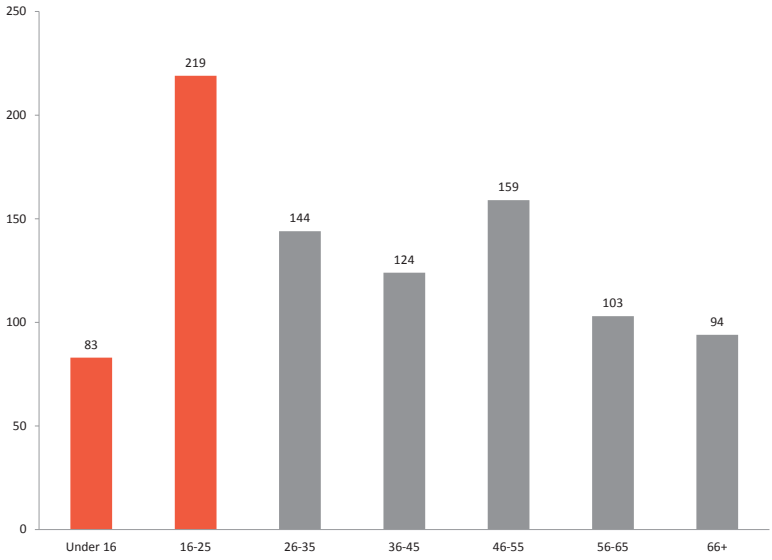


These tables demonstrate that while crashes between an automobile driver and either a person walking or biking are rare, when they do occur they are more likely to be severe; causing injury or fatality. This issue cannot be ignored. Many improvements have been made in vehicle safety technology, and those improvements have made a big difference in the rates of fatality and injury resulting from car crashes. The State of Ohio does not mandate helmet use for bicyclists. Helmet use does reduce the frequency and severity of head injuries resulting from a bicycle crash. (Thompson 1999)

Ages Involved in Bike/Ped Crashes

The young age of many drivers (of both motor vehicles and bikes) points again to the continuing need for education and right-of-way decision-making skills. In discussions with educators at the Regional STEM School, the junior high school students who have not taken driver's education training have a very simplistic understanding of traffic rules and dynamics, compared to the high school students. Younger cyclists may also not have the skills to judge the speed of oncoming vehicles, due to the later natural development of that cognitive function.

Intersections are particularly challenging for drivers and cyclists of all ages. **68% of Crashes are intersection-related.**



MVRPC staff tracks the high crash locations in our Region. Since most of the crashes on our roads are intersection-related, it helps to look at contributing causes, including:

- High vehicle speeds and volumes
- Low visibility crosswalks
- Wide lanes and road cross-sections that induce speeding
- Disregard of traffic control devices (i.e., running red lights)
- Motorists failing to yield to bicyclists and pedestrians

The top high-crash intersections are listed in the following chart. The map below depicts the intersections and roadway segments where three or more crashes between an automobile driver and a person bicycling or walking have occurred in three years' time.

High-Crash Locations for Bicycle or Pedestrian-Related Crashes (based on 2011 to 2013 crash data)

Road Segments

Road	Location	Jurisdiction	Bike Crashes	Ped Crashes	Total	Repeat High-Crash Location
Smithville Rd.	US 35 WB Ramp to Burkhardt Rd.	Dayton	1	6	7	●
Third St.	Smithville Rd. to Findlay St.	Dayton	3	4	7	●
Main St.	Siebenthaler Ave. to Hillcrest Ave.	Dayton	1	5	6	
North Dixie Dr.	Needmore Rd. to Bartley Rd.	Harrison Twp.	0	6	6	●
Dorothy Ln.	Wilmington Pk. to Woodman Dr.	Kettering	4	1	5	
Wayne Ave.	Stewart St. to Wyoming St.	Dayton	2	3	5	●

Intersections

Intersection	Jurisdiction	Bike Crashes	Ped Crashes	Total	Repeat High-Crash Location
North Dixie Dr. at Needmore Rd.	Harrison Twp.	0	5	5	
Woodman Dr. at Forrer Blvd.	Kettering	5	0	5	
Keowee St. at Fifth St.	Dayton	2	2	4	
Salem Ave. at Grand Ave.	Dayton	2	2	4	
Salem Ave. at Philadelphia Dr.	Dayton	0	4	4	
Stroop Rd. at Shroyer Rd.	Kettering	0	4	4	
Wyoming St. at Brown St.	Dayton	1	3	4	

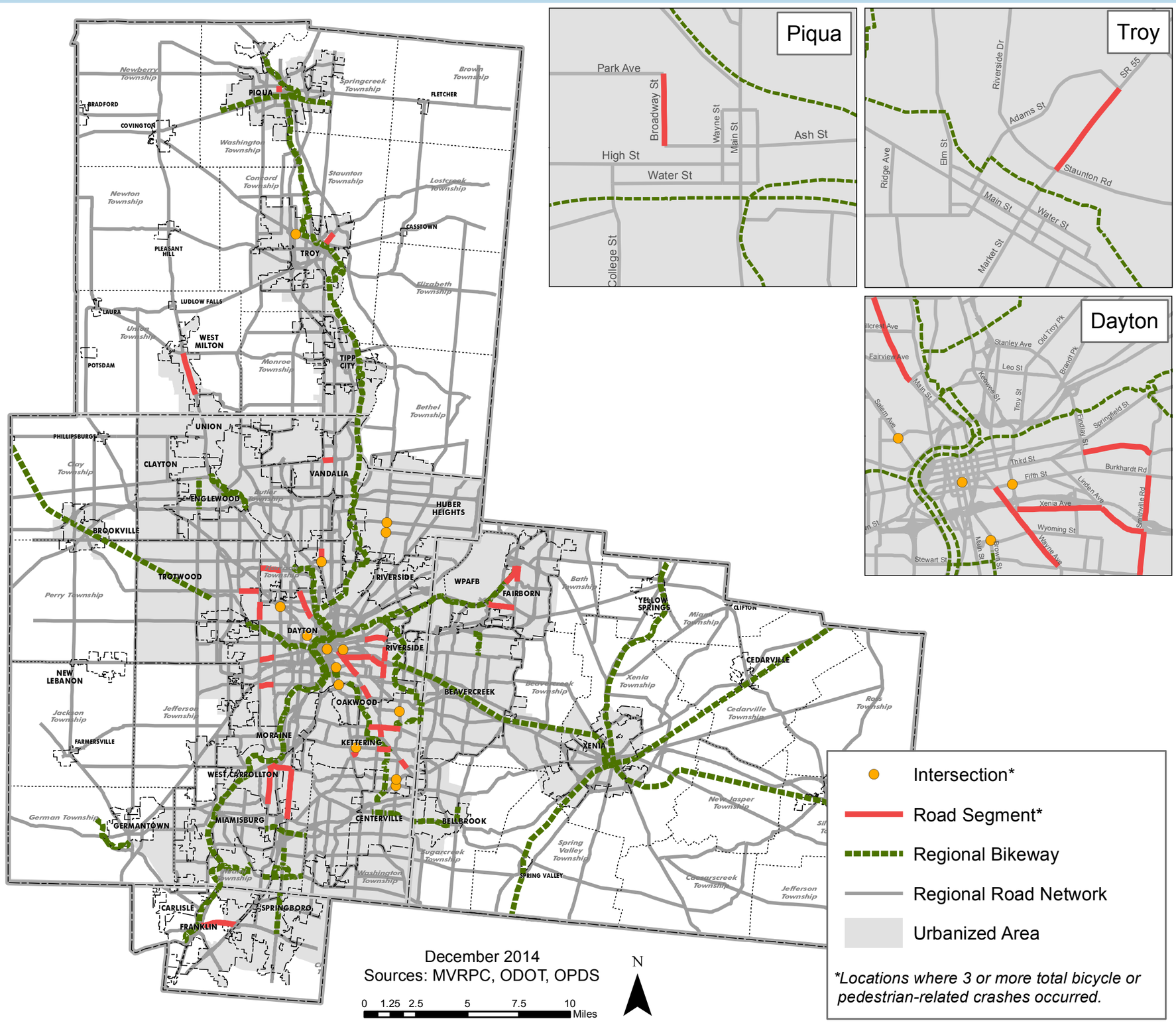
- List based on 2011 to 2013 reported crashes data.
- This list omits local roads and only includes Federal functionally classified roads.
- "Repeat High-Crash Location" are locations that were on high-crash list from SFY2012 (2008 to '10 data).

There are movements at the national and international levels to provide traffic design and treatments that will accommodate cyclists of wide-ranging ages and abilities. Safety has long been a central focus of engineers and planners. New resources are being produced nationally that work to prevent and/or reduce the severity of crashes with alternative roadway design. Another tool for roadway designers is to work from the perspective of a younger, less skilled, less confident 'model user.'

MVRPC

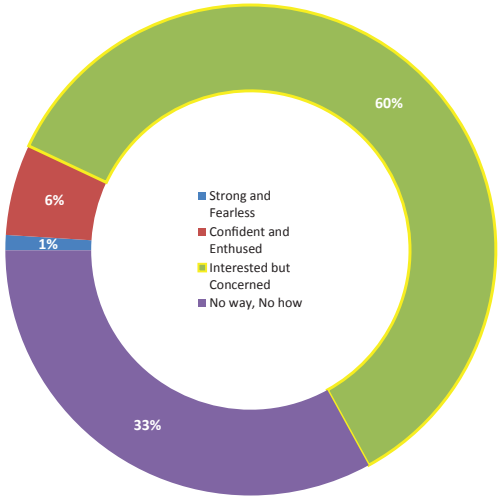
High-Crash Locations for Bicycle or Pedestrian-Related Crashes

2011 - 2013



Level of Traffic Stress

The original 2008 Plan discusses the needs of different types of cyclists, categorized by their confidence level. The Level of Traffic Stress analysis method expands on this concept to measure how well bicycle facilities provide a sense of safety and comfort for different user groups. This new approach provides a strategy for targeted improvements that will encourage more bike riding by a broader range of people.



Riding a bike is a healthy, fun, inexpensive, sustainable way to get around. But for many people, riding to a destination means riding on the road, and riding on the road means mixing with cars and trucks. Most people find riding in traffic to feel unsafe and stressful. Research originally from Portland, Oregon, but reconfirmed in locations across the country, determined that less than one percent of the population are "strong and fearless" riders who will ride just about any place, regardless of traffic density and speed. Another 6% are "enthused and confident," willing to ride in on-street bike lanes, on lower traffic roads, and in places where the speed limit is lower and enforced. (Geller 2006)

About 60% of the population describes themselves as "interested but concerned." They might want to ride a bike for transportation if they felt safe from traffic. These people feel safe on bike paths, on low speed neighborhood streets, and in protected bike lanes, but do not like to mix with cars.

This tells us that the Region will not likely see an increase the percentage of trips taken by bike unless bike riding is made less stressful. The Level of Traffic Stress concept was first used by the Mineta Transportation Institute in San Jose, California as a way to think about the bike friendliness of a city (Mekuria, Furth, Nixon 2012). Using a few simple metrics, speed limits and number of lanes, the authors mapped the City of San Jose into the following four categories of facilities:

Using these categories, the researchers discovered that roadway networks, from the cyclist's perspective, are divided into many low-stress islands separated by high-stress connections or crossings. This prevented all but the bravest of cyclists from cycling from "island to island." Many destinations were found to be within a reasonable cycling distance of residential areas, but they were inaccessible to most potential riders because the Level of Traffic Stress was too high.

Source Material

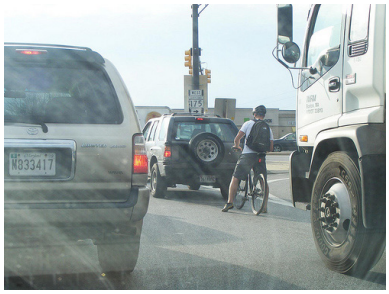
To read the Mineta Transportation Institute report, "Low-Stress Bicycling and Network Connectivity," please follow this link: http://transweb.sjsu.edu/project/1005.html

Level of Traffic Stress One (LTS 1): Bikeways and low-volume streets where the speed limit is 25 mph or less

Level of Traffic Stress Two (LTS 2): Some striped bike lanes, protected lanes, cycle tracks

Level of Traffic Stress Three (LTS 3): Roads with 30 mph+ speeds and/or four lanes

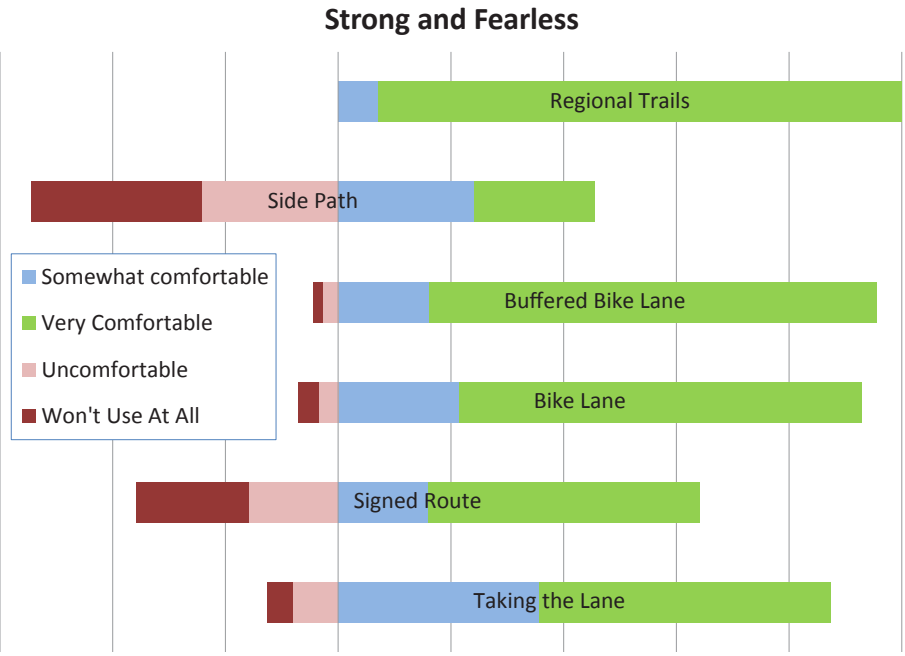
Level of Traffic Stress Four (LTS 4): Most roads with 30 mph+ speeds and/or five or more lanes



Survey Analysis

Local data, pulled from the online survey conducted by MVRPC for this 2015 Update, confirms the notion that "interested but concerned" cyclists prefer the safety benefits of separation from motor traffic. Previously, data about level of comfort on different facilities was shown in aggregate for the full population of survey takers. Here, these same responses are broken down by the types of cyclists. First, the responses of the "strong and fearless" show high comfort on many types of facilities. Note that the facility labels here match those used in the survey itself; "Regional Trails" refers to a shared use path and "Taking the Lane" means bicycling in traffic with no bike-specific facility.

Strong and Fearless

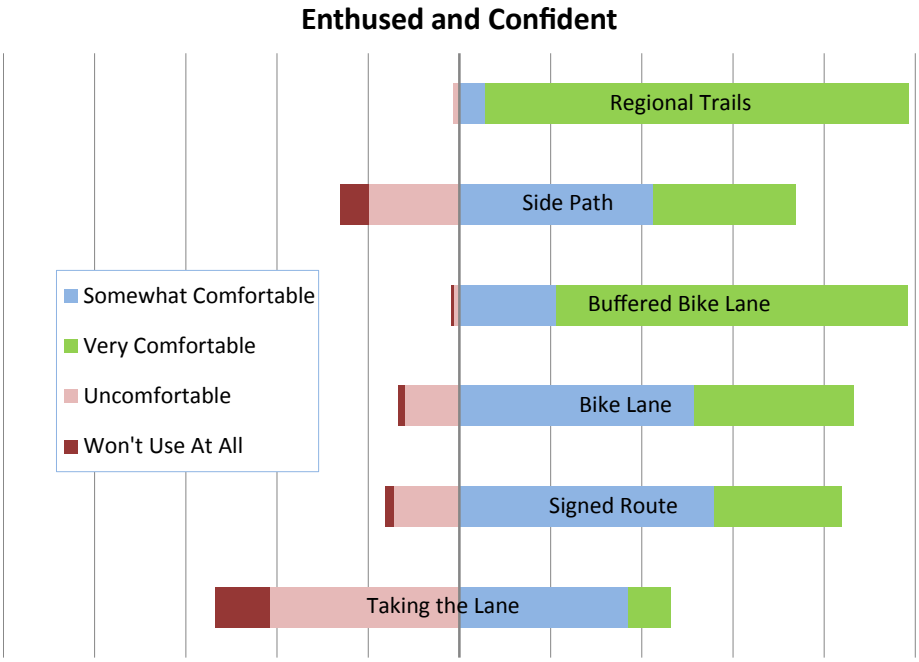


Note that the facility types highlighted in this chart progress from least stress at the top (trails) to most stress at the bottom (taking the lane).

The "enthused and confident" group, representing about 6 percent of the population, shows similar levels of comfort, but with some notable differences.

National Data on Protected Bike Lanes
Page through a Bike Miami Valley presentation on the safety and ridership benefits of protected bike lanes. It can be found in Appendix G.

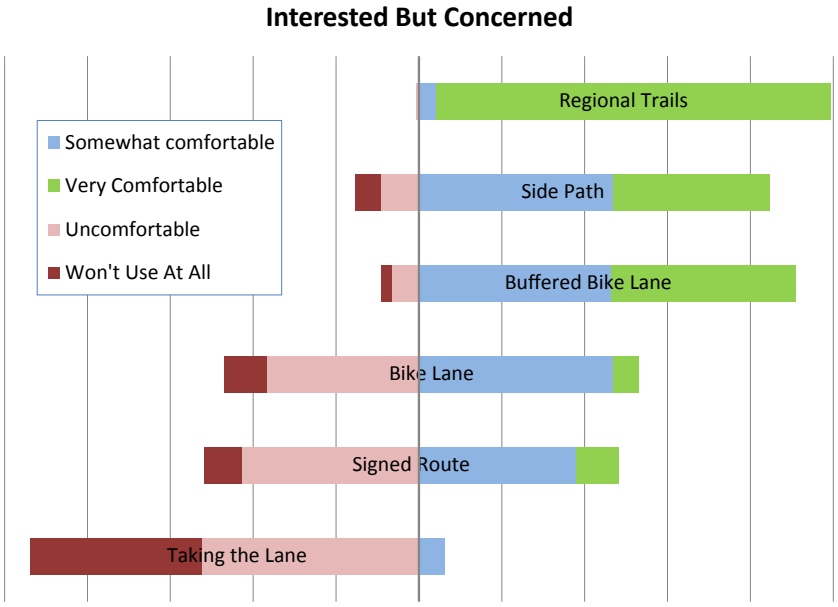
Enthused and Confident



Enthusiasm for taking the lane is lower in this group, but the other facility types with separation or on calm streets show high comfort.

The final group is the "interested but concerned," which represents a majority of the general public.

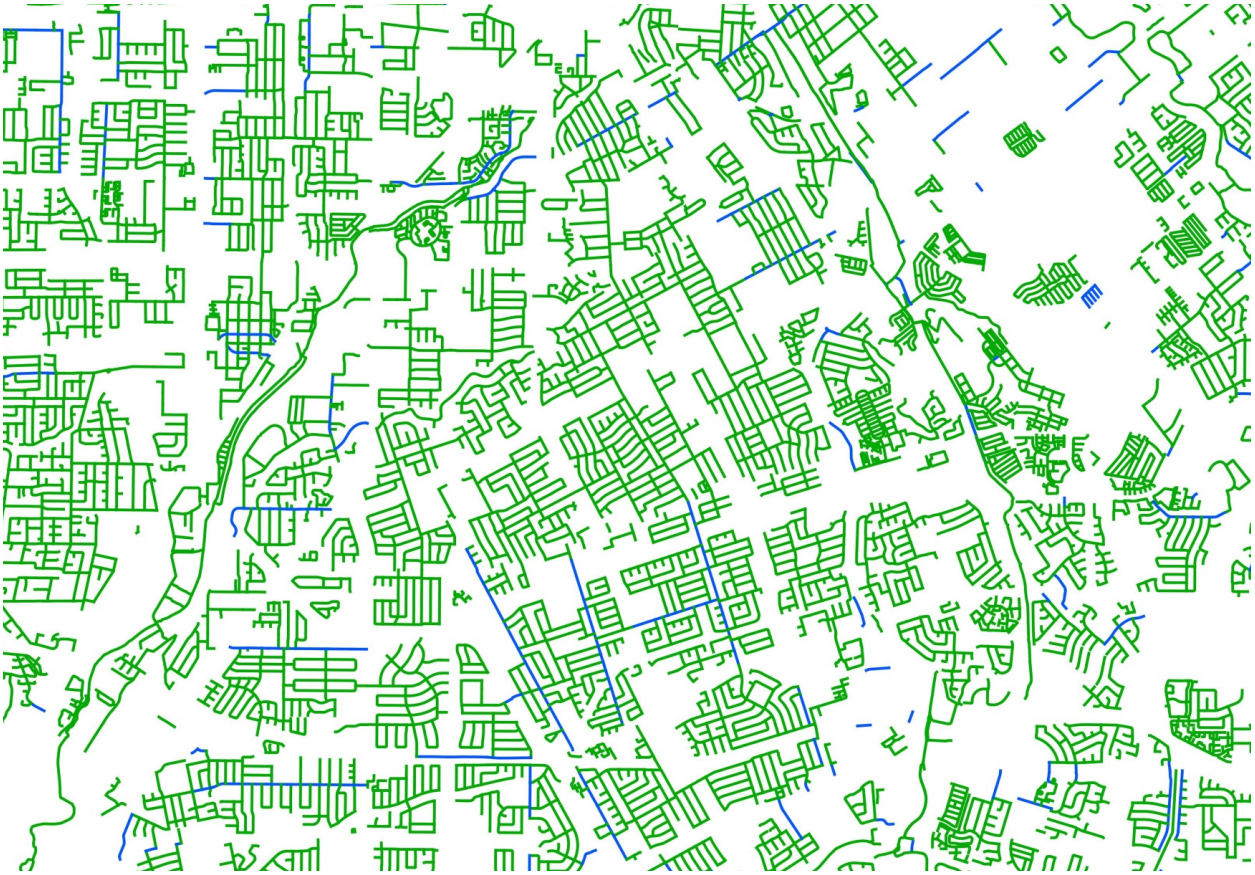
Interested but Concerned



The pattern with this group is very clear. The greater the degree of separation from motor traffic, the greater the comfort with riding a bicycle these people express.

Local Level of Traffic Stress

In this 2015 update process, the Level of Traffic Stress analysis has been simplified and adapted to the regional scale. The basic premise of this analysis is that to increase the number of cyclists, we must increase the low-stress connections between "islands." Using a modified version of the San Jose model, MVRPC staff mapped the entire Region to identify where the low-stress islands already exist. The initial premise was that the Miami Valley Trails network is a large low-stress (LTS 1) set of facilities. Streets within residential land use areas were also presumed to be LTS 1 facilities. Roadways that are federally functionally classified were assessed using the scale developed by the Mineta Institute. Most were found to be LTS 4 facilities, with a small minority found to be LTS 3. Limited-access highways were not scored, since they are not legal roads for bicycle traffic in Ohio. Using GIS analysis, the largest low-stress islands were identified in terms of population. Finally, visual review was applied to the largest islands to identify potential projects that would provide low-stress connections from those islands to either the trails network or neighboring islands.



Sample Mineta Institute map showing only LTS 1 (green) and LTS 2 (blue) links (Furth 2012).

MVRPC example map showing disconnected (red circle) and connected (blue circle) islands in Xenia.

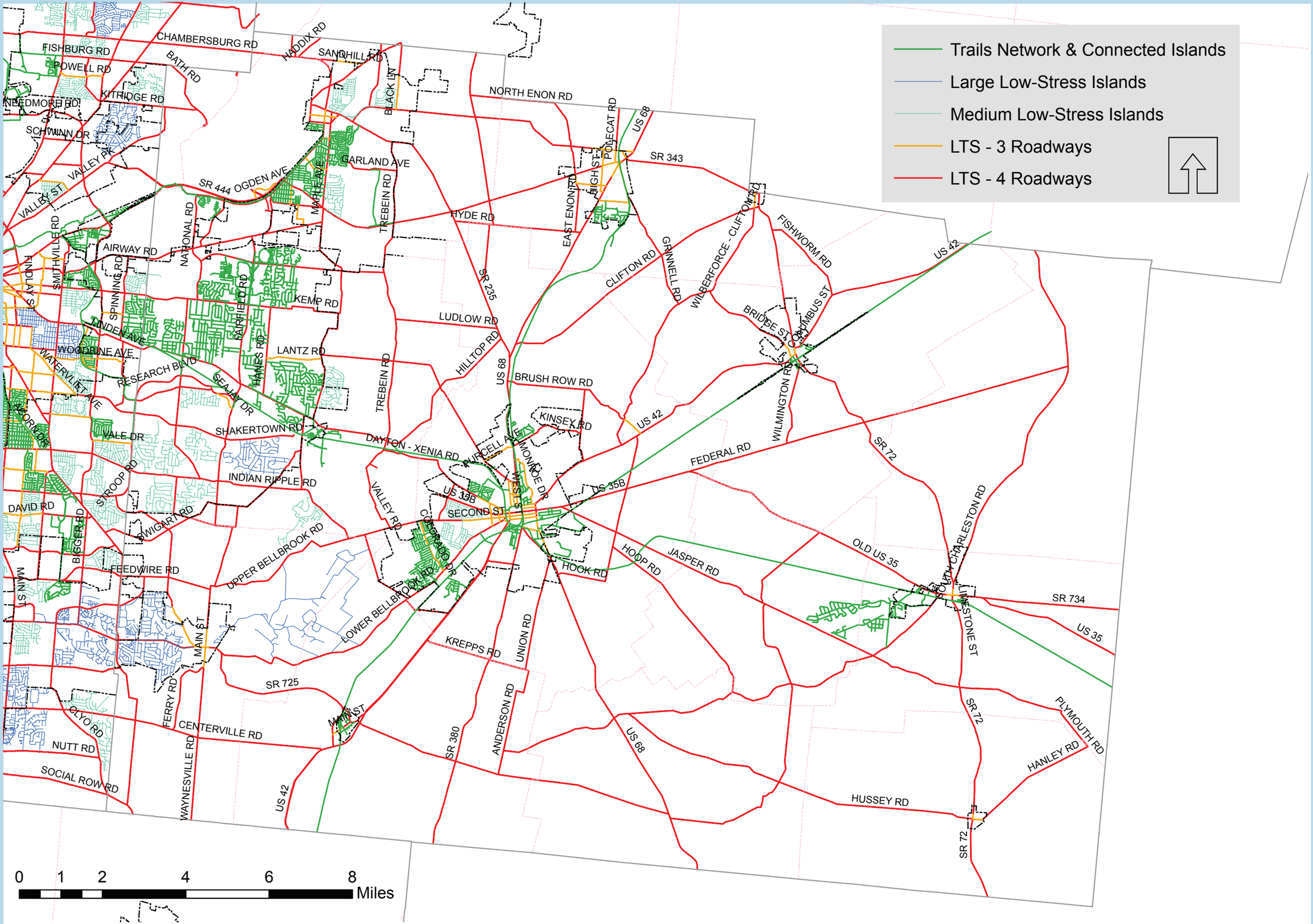
The resulting regional LTS map was one criterion used in scoring potential projects. That is, if a project provides a low-stress connection between two or more low-stress islands or to the regional trails, that project may significantly improve the bikeway network, and therefore is given more points in the project scoring process.

Many important projects are likely to be intersection projects, where cyclists need to cross a high-stress road to continue their low-stress journey. One rule of LTS analysis is that the highest stress segment of journey defines the whole journey. So, one high-stress (LTS 3 or 4) crossing in a three-mile ride, even if 2.95 miles are LTS 1, becomes a LTS 3 or 4 ride, because most cyclists will not cross the high-stress intersection.

The Miami Valley has the nation's largest paved trail network, which provides a very low-stress riding environment where cyclists are completely separated from traffic except for where the trails cross roads. However, these trails do not lead directly to many work, shopping, residential and recreational destinations. To reach those, riders need to be comfortable on the street grid. Increasing connections between the regional trail system and low-stress streets will make the regional network safer and more useful to many riders who are "interested, but concerned." We believe that is the key to increasing the share of trips taken by bicycle in the Miami Valley.

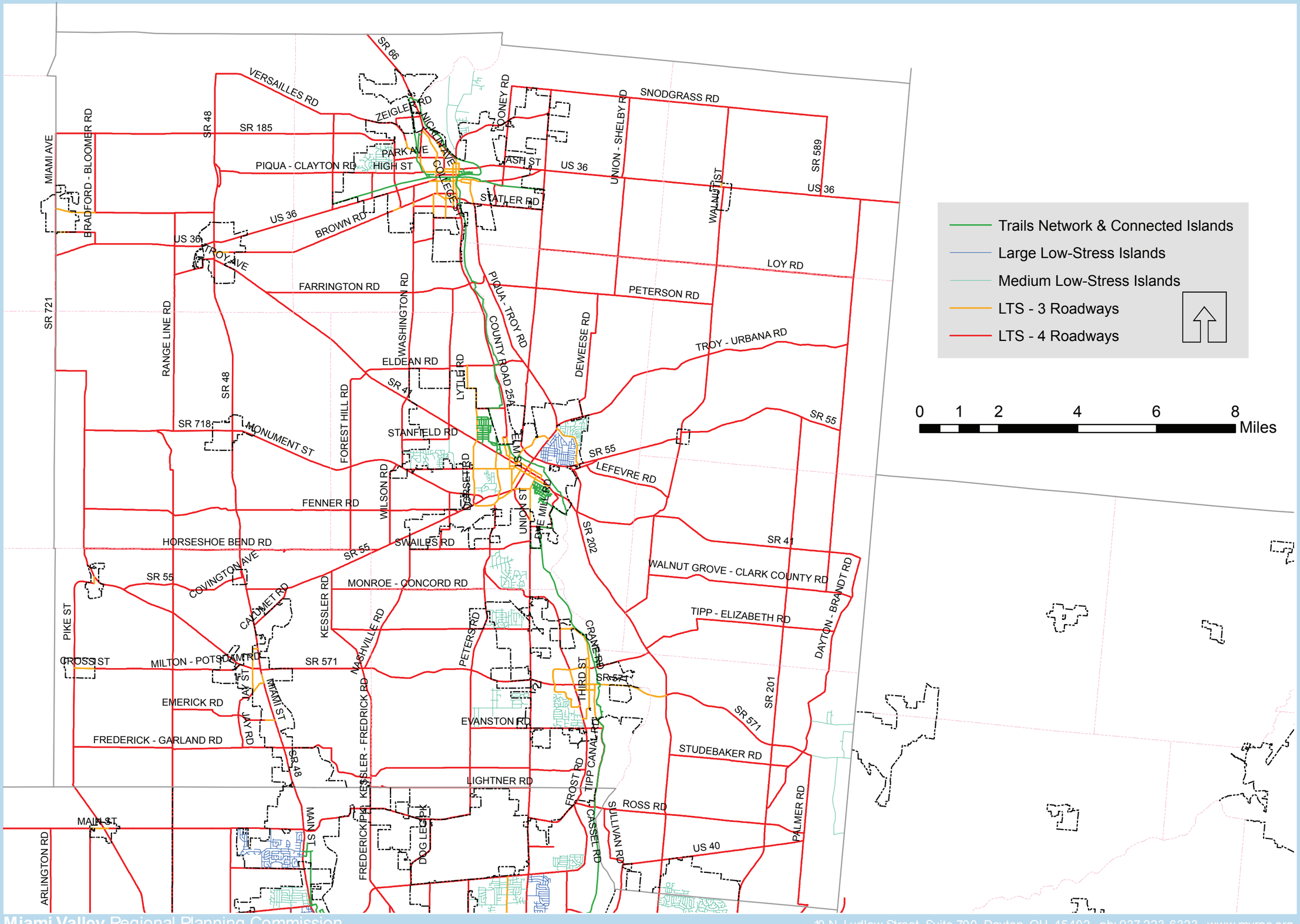
MVRPC staff is happy to provide education and technical support to all jurisdictional staff interested in applying the Level of Traffic Stress methodology.

LTS Analysis: Greene County



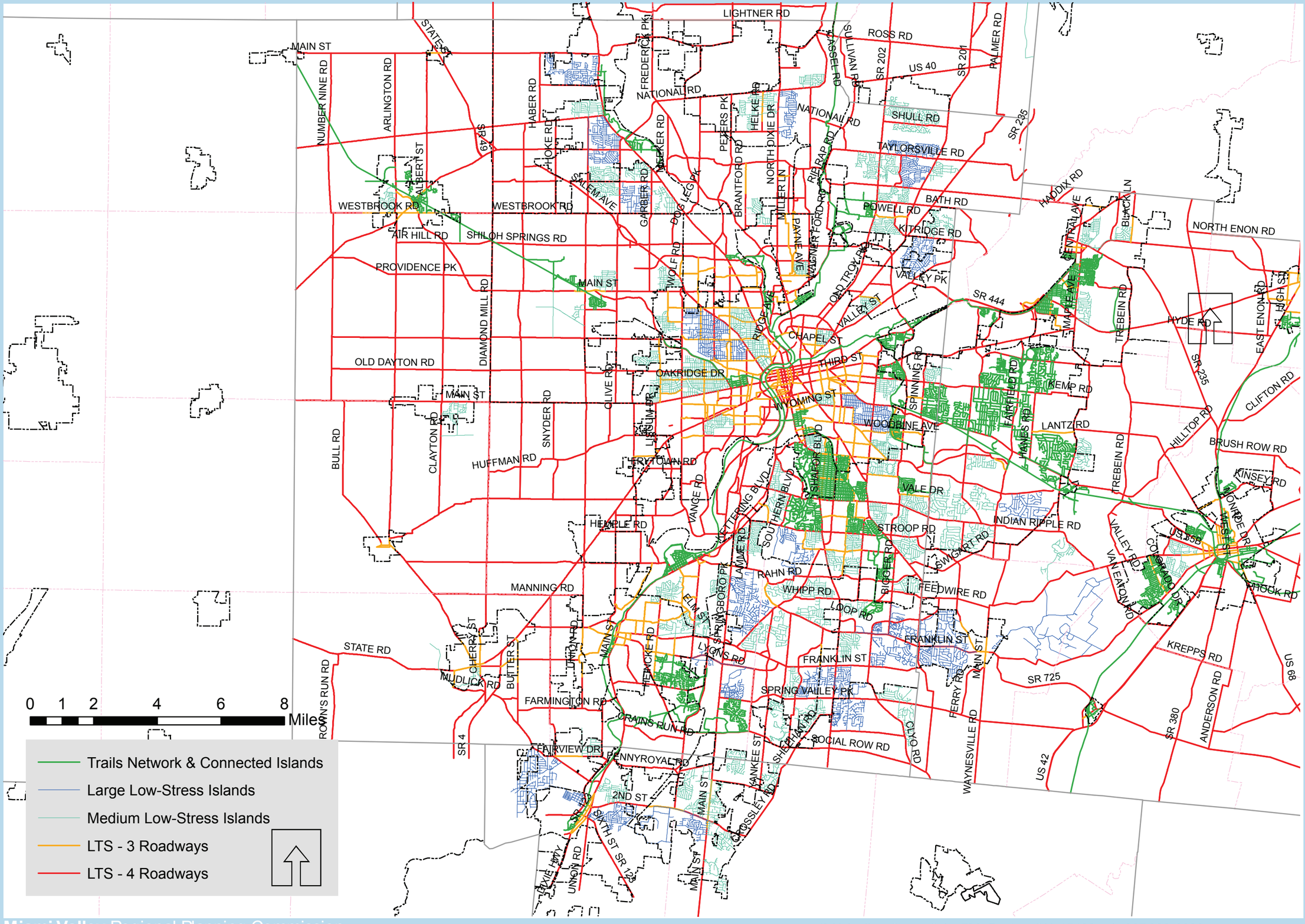
LTS Analysis: Miami County

MVRPC



LTS Analysis: Montgomery and Northern Warren Counties

MVRPC

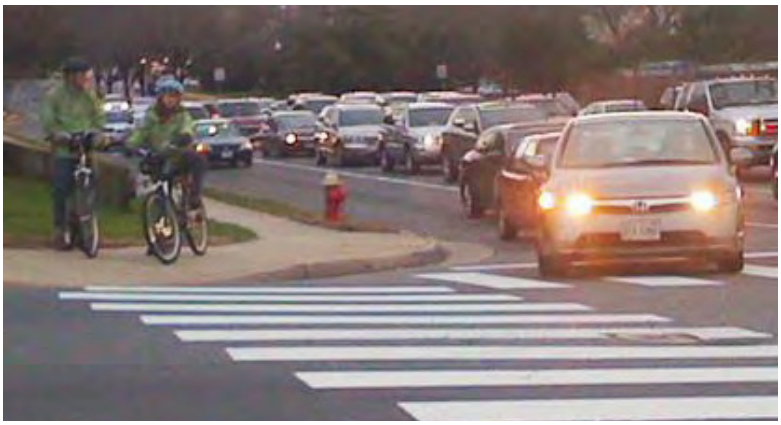


How Local Jurisdictions Can Use the Level of Traffic Stress Concept

Respondents to the online survey and people who attended the update public meetings overwhelmingly said they wanted more low-stress connections, especially to the regional bikeway system and to parks and other recreational opportunities. Many projects critical to making our Region more bike-friendly will be local in nature. By incorporating Level of Traffic Stress thinking in local planning, it would be fairly simple to identify the high-stress barriers that separate low-stress islands. In the public workshops for this update, citizens were given a short tutorial on the LTS concept and most of them understood immediately. Attendees were able to point to their neighborhood and to a desired destination and say "I could ride there, except for this intersection." Jurisdictional staff could do the same on a community level.

MVRPC staff is happy to provide education and technical support to all jurisdictional staff interested in applying the Level of Traffic Stress methodology. The matrix below can help jurisdictional staff score community streets. This matrix applies to streets without a bike lane.

	2–3 lanes	4–5 lanes	6+ lanes
Speed Limit Up to 25 mph	LTS 1* or 2*	LTS 3	LTS 4
30 mph	LTS 2* or 3*	LTS 4	LTS 4
35+ mph	LTS 4	LTS 4	LTS 4



High-stress Crossing

Often, the neighborhood street grid already offers a low-stress riding environment, but residents sometimes don't know how to get from where they live to their destinations using neighborhood streets. Signage is one low cost method that can help riders get from their neighborhoods to the trail network and other destinations. When the street grid intersects with a barrier road (a high-stress crossing) the answer may be an intersection treatment that detects bicycles, or light phasing that gives adequate time to cross, or a mid-crossing refuge island.

Traffic calming devices like bump-outs, speed tables, raised crosswalks, and median barriers are sometimes used to slow down cars and discourage "cut through" automobile traffic. These approaches have been shown to significantly reduce injuries and fatalities. (Kazis, 2010) Many communities across the country are combining these techniques with traffic

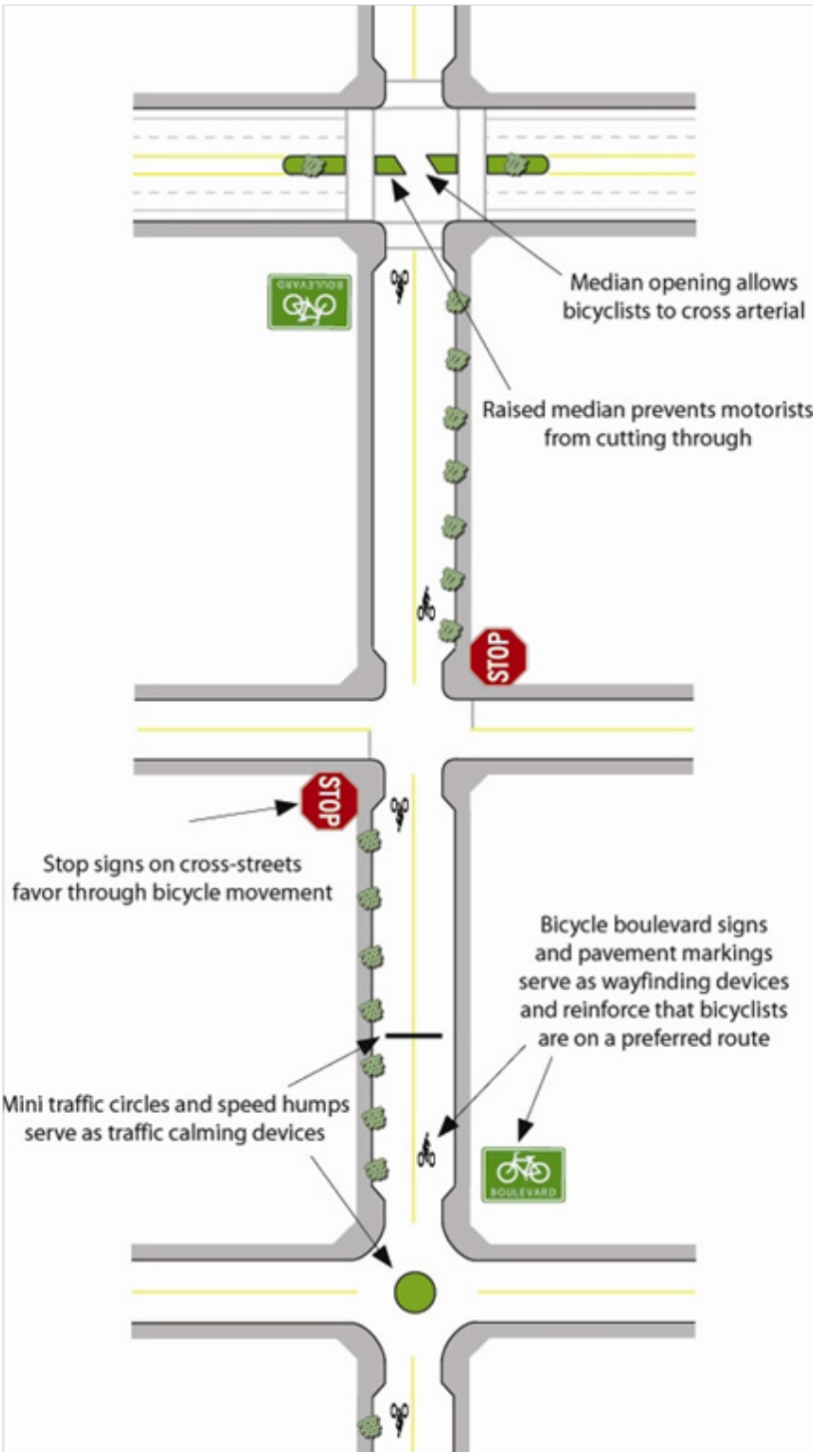
diversion techniques to define "bike boulevards" where cyclists have the priority. Bike boulevards often parallel busy, high speed roads. Local auto traffic is maintained on a bike boulevard, but right-of-way priority is given to cyclists. These bike boulevards help cyclists complete trips on low-stress residential streets and ensure that where crossing higher stress streets is necessary, it can be done safely.

Intersections are another area that local engineers and planners will need to address. Getting cyclists to an intersection but not through it is a recipe for trouble. Difficult intersections and crossings can turn an otherwise low-stress bike ride into a car trip. We know that 68% of our Region's bike and pedestrian crashes occur at intersections, and so for safety reasons, the engineering treatments need to be very clear and predictable for all transportation users. Leading people to the intersection has to be matched with helping people through the intersection.

Local jurisdictions can take the LTS analysis method a step further and look at the directness of bikeway connections to important local destinations. If a rider has to detour significantly (25% longer than the most direct path) to stay on LTS 1 or 2 routes, the jurisdiction should examine ways to reduce the detour and improve low-stress connectivity.

To read the Mineta Transportation Institute report, Low-Stress Bicycling and Network Connectivity, please follow this link: http://transweb.sjsu.edu/project/1005.html.

Sample Bicycle Boulevard treatments (CLRBP 2008)



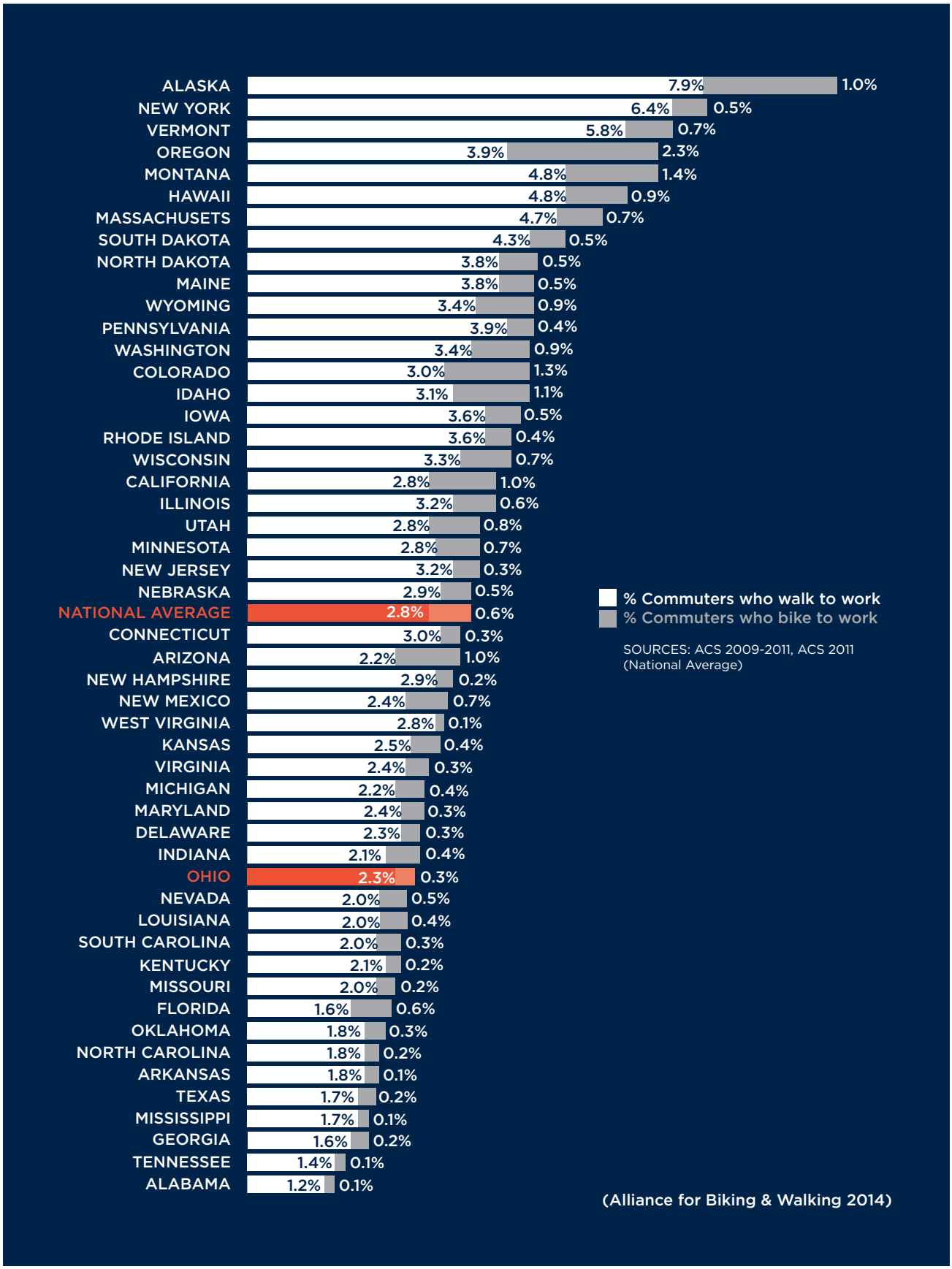
Biking in the Region: Measuring Cycling

Since the 2008 CLRBP was adopted, the level of academic attention and the number of studies on the impact of bicycling has increased dramatically. There is a clear empirical tie between active transportation and positive health impacts for individuals and the community. There is also a strong effort nationally to address safety, health, and equity issues with more proactive strategies and tactics. Evaluating the number and types of cycling trips in the Region provides data on the best use of such strategies to reach regional goals.

Journey to Work Trips

Based on data from the 2010 U.S. Decennial Census and 2009-2013 American Community Survey (ACS) five-year summary, the share of work-related trips made by bike in our Region has remained stable compared to data used in the 2008 planning process. In the same time period, the Region has continued to make progress in growing our bicycling network. We have added miles of trails and on-street facilities. Why has the additional infrastructure not translated into increased work-related trips? To get a complete picture of cycling in the Miami Valley, MVRPC looked at a variety of data sources at the federal, state, and local levels.

Ohio sits below the middle of the pack when it comes to work-related bicycling rates compared across the U.S. Our Region's bicycle commuting rate at 0.31% ± 0.07% is comparable to the State of Ohio rate of 0.3%.

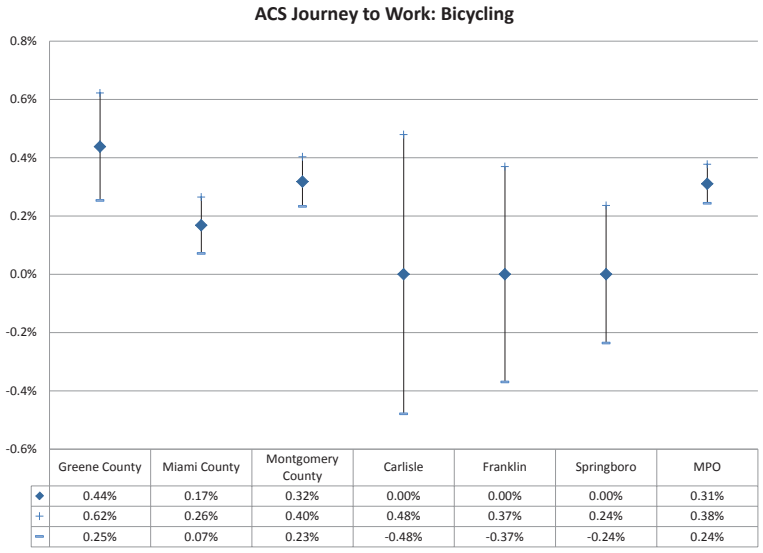

ALASKA 7.9% 1.0%
NEW YORK 6.4% 0.5%
VERMONT 5.8% 0.7%
OREGON 3.9% 2.3%
MONTANA 4.8% 1.4%
HAWAII 4.8% 0.9%
MASSACHUSETS 4.7% 0.7%
SOUTH DAKOTA 4.3% 0.5%
NORTH DAKOTA 3.8% 0.5%
MAINE 3.8% 0.5%
WYOMING 3.4% 0.9%
PENNSYLVANIA 3.9% 0.4%
WASHINGTON 3.4% 0.9%
COLORADO 3.0% 1.3%
IDAHO 3.1% 1.1%
IOWA 3.6% 0.5%
RHODE ISLAND 3.6% 0.4%
WISCONSIN 3.3% 0.7%
CALIFORNIA 2.8% 1.0%
ILLINOIS 3.2% 0.6%
UTAH 2.8% 0.8%
MINNESOTA 2.8% 0.7%
NEW JERSEY 3.2% 0.3%
NEBRASKA 2.9% 0.5%
NATIONAL AVERAGE 2.8% 0.6%
CONNECTICUT 3.0% 0.3%
ARIZONA 2.2% 1.0%
NEW HAMPSHIRE 2.9% 0.2%
NEW MEXICO 2.4% 0.7%
WEST VIRGINIA 2.8% 0.1%
KANSAS 2.5% 0.4%
VIRGINIA 2.4% 0.3%
MICHIGAN 2.2% 0.4%
MARYLAND 2.4% 0.3%
DELAWARE 2.3% 0.3%
INDIANA 2.1% 0.4%
OHIO 2.3% 0.3%
NEVADA 2.0% 0.5%
LOUISIANA 2.0% 0.4%
SOUTH CAROLINA 2.0% 0.3%
KENTUCKY 2.1% 0.2%
MISSOURI 2.0% 0.2%
FLORIDA 1.6% 0.6%
OKLAHOMA 1.8% 0.3%
NORTH CAROLINA 1.8% 0.2%
ARKANSAS 1.8% 0.1%
TEXAS 1.7% 0.2%
MISSISSIPPI 1.7% 0.1%
GEORGIA 1.6% 0.2%
TENNESSEE 1.4% 0.1%
ALABAMA 1.2% 0.1%
% Commuters who walk to work
% Commuters who bike to work
SOURCES: ACS 2009-2011, ACS 2011 (National Average)
(Alliance for Biking & Walking 2014)

The journey-to-work data comes from the 2009-2013 ACS five-year summary tables. The numerical estimate for the various jurisdictions is listed first with the margin of error in the next column.

Regional Journey to Work Chart

	Greene County		Miami County		Montgomery County		Carlisle		Franklin		Springboro	
	estimate	margin of error	estimate	margin of error	estimate	margin of error	estimate	margin of error	estimate	margin of error	estimate	margin of error
Total	75,866	990	47,615	813	231,194	2,005	2,296	229	4,869	451	7,623	424
Car, truck, or van	69,225	1,096	45,117	811	209,758	2,091	2,247	236	4,755	442	7,623	424
Drive alone	63,967	1,222	40,892	897	190,296	2,339	2,101	231	4,517	426	6,763	436
Carpooled	5,258	596	4,225	443	19,462	1,051	146	94	238	119	510	208
Public transportation	249	97	227	134	5,040	472	1	2	15	17	19	32
Bus or trolley bus	224	89	227	134	4,953	462	1	2	15	17	19	32
Streetcar or trolley car	25	30	0	27	8	14	0	11	0	18	0	18
Subway or elevated	0	27	0	27	27	31	0	11	0	18	0	18
Railroad	0	27	0	27	52	57	0	11	0	18	0	18
Ferry boat	0	27	0	27	0	27	0	11	0	18	0	18
Taxicab	10	16	0	27	14	15	0	11	0	18	9	14
Motorcycle	90	62	28	22	377	137	9	14	0	18	0	18
Bicycle	332	140	80	46	735	197	0	11	0	18	0	18
Walked	2,502	363	750	190	6,166	641	8	13	24	35	0	18
Other means	232	100	186	100	1,766	347	0	11	0	18	13	20
Worked at home	3,226	386	1,227	204	7,338	580	31	46	75	50	309	94

When these estimates get down to the level of the individual community, the margin of error increases dramatically, as shown in the journey-to-work graph below. For small communities like Carlisle, Franklin, and Springboro, the estimated number of people who bike to work is 0 for each city, but with a margin of error of 11 to 18. County estimates are more reliable because the sample size is larger. At the regional level, we can fairly say that 0.31% ± 0.07% of the Region's 369,463 workers are cycling regularly, or 1,147 ± 248 people use bicycling as their primary mode of transportation to work.

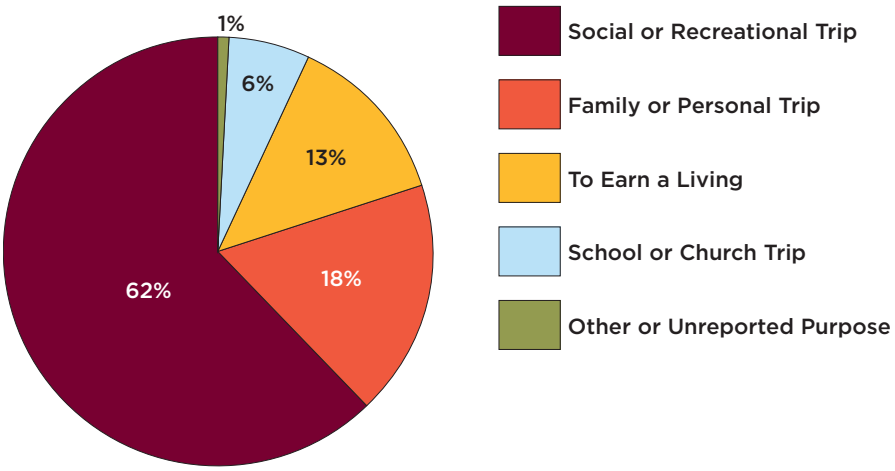


Other Active Transportation trips

The ACS journey-to-work data referenced here specifically counts the regular daily mode of travel for employed persons age 16 and over in households to their workplace. It does not count:

- College students who live on or near campus, who are more likely to bike
- High school and younger students biking to school
- Retired people and others without a job
- People who ride to work occasionally but not daily
- Utility trips to the grocery or running errands, recreation trips, or family and social trips

To understand these other trips, we rely upon the 2009 National Household Travel Survey (FHWA 2011), which shows only 13 percent of bicycle trips are taken to earn a living. The following analysis is an attempt to more closely estimate total bicycle usage in the Region.



Bicycle Trips By Purpose

Staff used a variety of data sources in the following table to determine an aggregate of daily bicycling activity in the Miami Valley. The results indicate that 117,750 utility bicycle trips off all types are taken each day around our Region.

Total Regional Bicycling Activity; All Utility Trips

Variable	Figure	Calculations
Employed Adults, 16 Years and Older		
a. Study Area Population (1)	831,904	
b. Employed Persons (2)	361,488	(aggregated)
c. Bicycle Commute Mode Share (2)	0.31% ± 0.07%	(aggregated)
d. Bicycle Commuters	1,147 ± 248	(aggregated)
e. Work-at-Home Percentage (2)	3.30% ± 0.20%	(aggregated)
f. Work-at-Home Bicycle Commuters (3)	6,103	(aggregated)
School Children		
g. Population, ages 6-14 (4)	96,690	
h. Estimated School Bicycle Commute Mode Share (5)	2%	
i. School Bicycle Commuters	1,934	(g*h)
College Students		
j. Full-Time College Students (6)	66,004	
k. Bicycle Commute Mode Share (7)	10%	
l. College Bicycle Commuters	6,600	(j*k)
Work and School Commute Trips Sub-Total		
m. Daily Bicycle Commuters Sub-Total	15,784	(d+f+i+l)
n. Daily Bicycle Commute Trips Sub-Total	31,568	(m*2)
Other Utilitarian and Discretionary Trips		
o. Ratio of "Other" Trips in Relation to Commute Trips (8)	2.73	ratio
p. Estimated Non-Commute Trips	86,182	(n*o)
Total Estimated Daily Bicycle Trips	**117,750**	**(n+p)**

(1) 2010 Census, P1.

(2) 2009-2013 American Community Survey 5-Year Estimates, B08301.

(3) Assumes 50% of population working at home makes at least 1 daily bicycle trip.

(4) 2010 U.S. Census, PCT12.

(5) Estimated share of school children who commute by bicycle, as of 2000 (source: National Safe Routes to School Surveys,2003).

(6) Fall 2013 enrollment, National Center for Education Statistics.

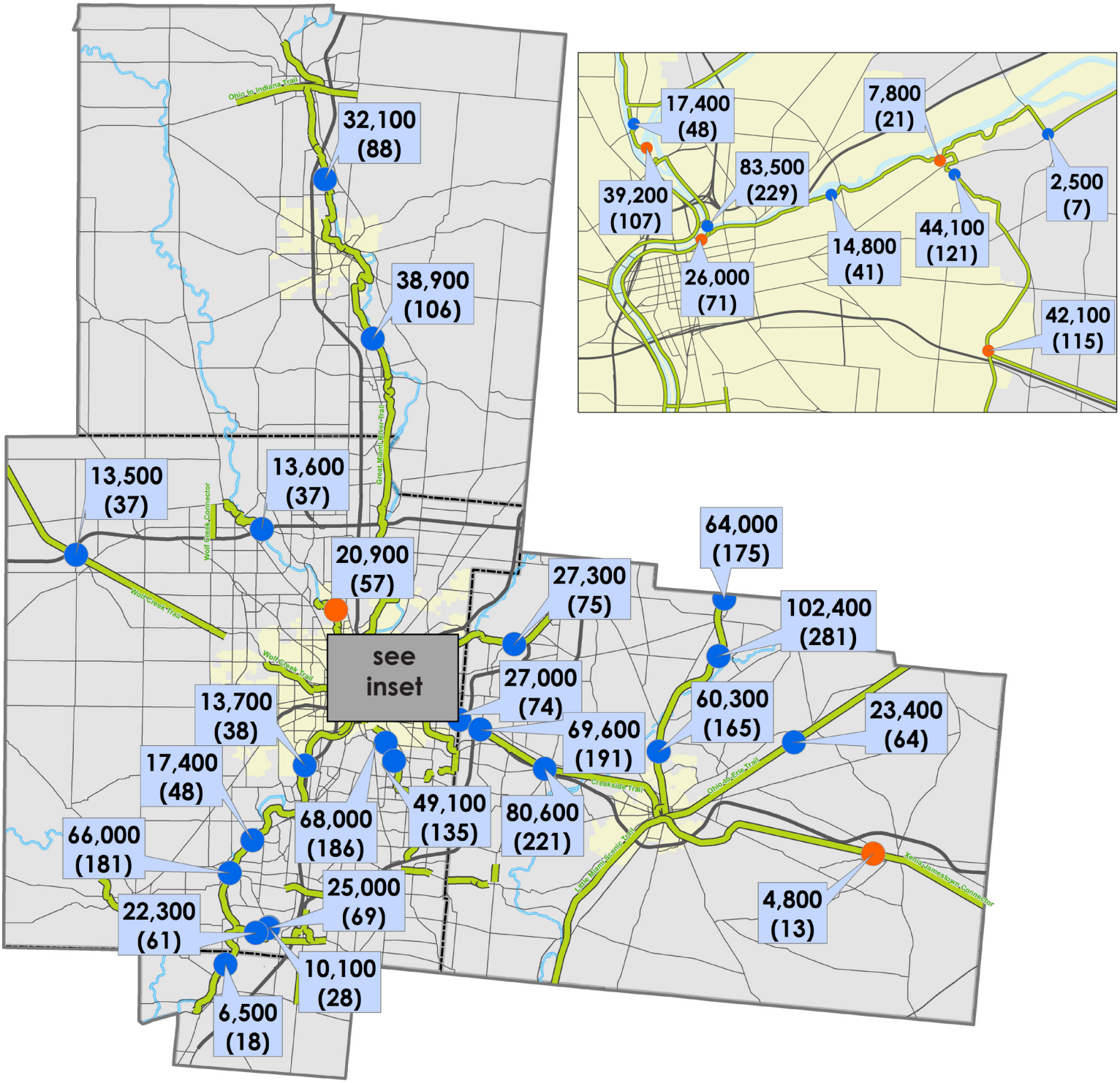
(7) Review of bicycle commute mode share in 7 university communities (source: FHWA,Case Study #1, 1995).

(8) 27% of all trips are commute trips (source: National Household Transportation Survey, 2001).

Permanent Counters

Existing Counters on the Bikeway

2014 Data



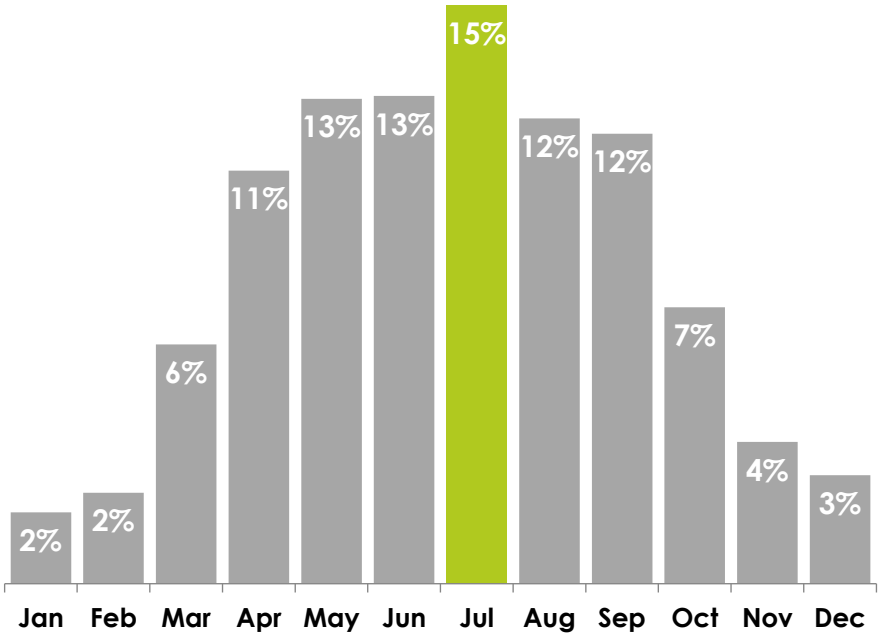
Bikeway

Roads

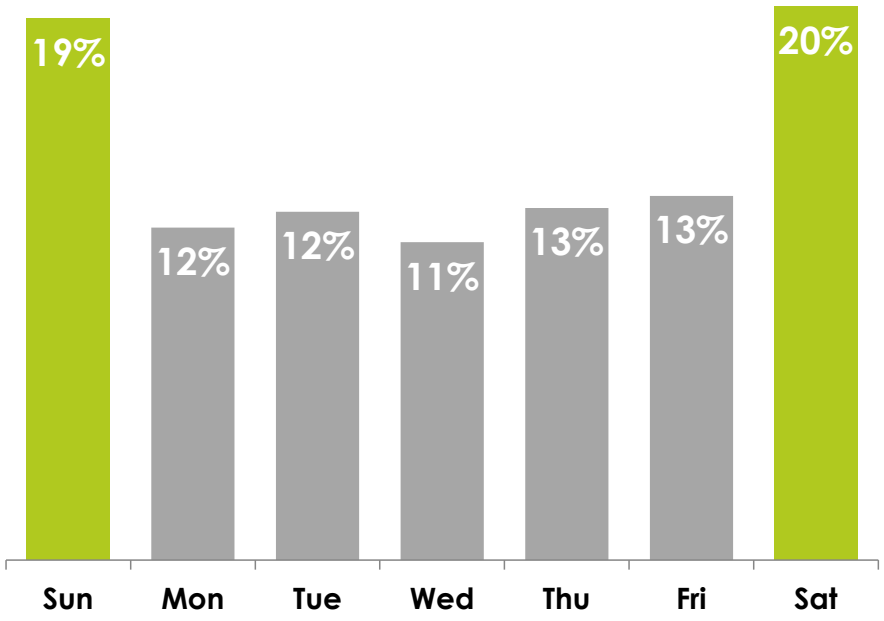
Est. Annual Total (Daily Avg - ADT)

Less than 274 Days Counted

More than 274 Days Counted



July
had highest percent of annual counts



Sat & Sun
had highest percent of weekly counts

- 6 trail agencies count at over 30 locations on the bikeway.
- The permanent counters count each pass of a user (bicyclist, pedestrian, etc) for 24 hours, 365 days each year.
- Count data from 2014 was collected and analyzed.
- Findings from 2014 counts are shown above.

Bike Counting Program

Another approach to measuring bicycle use is to combine trail counter data from across the Miami Valley Trails network. Currently six trail-managing agencies in the Region have permanent counters installed at over 30 locations. Most of the locations use infrared sensor type counters. These permanent counters count each pass of a user (bicyclist, pedestrian, etc.) for 24 hours, up to 365 days a year. The count data was collected by MVRPC starting in 2014, and the results were analyzed. Trail use is concentrated in the warmer months and on weekend days. (MVRPC, 2015) This information highlights the fact that the Region's trail network is under-utilized as a transportation facility, but serves primarily recreational uses.

MVRPC is starting a bicycle counting program using special tube counters which measure the weight of the vehicle passing over the tube, and can be calibrated to distinguish the weight of a bike from that of a car. These tube-type counters are regularly deployed by MVRPC staff as a part of the routine Traffic Monitoring Program. Bike specific counts will be conducted as a new element of the program, on select trails and roads. The new counts will take place from May to September, with counters left for 7 days at each location.

http://www.mvrpc.org/transportation/traffic-count-program/bicycle-counting-program

Health and Equity Data

These broad demographic estimates of bicycle use can be further viewed in light of health and equity data collected about different parts of the Region. These other data shine different light on the issue of cycling demand in the Miami Valley.

One example is ACS data regarding zero-car households, presented below. The 2013 5-year ACS shows that about 8 percent of households in the region as a whole are zero-car households. This is below the Ohio and national averages. However, Montgomery County, with more than 9.5% zero-car households is above the statewide and national averages. These households, no matter their county, are likely more dependent on active transportation

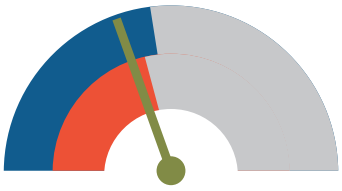
modes than households with access to at least one motor vehicle. These residents are likely to benefit from improvements in cycling infrastructure and to use such facilities for more utilitarian trips.

Households with No Motor Vehicle

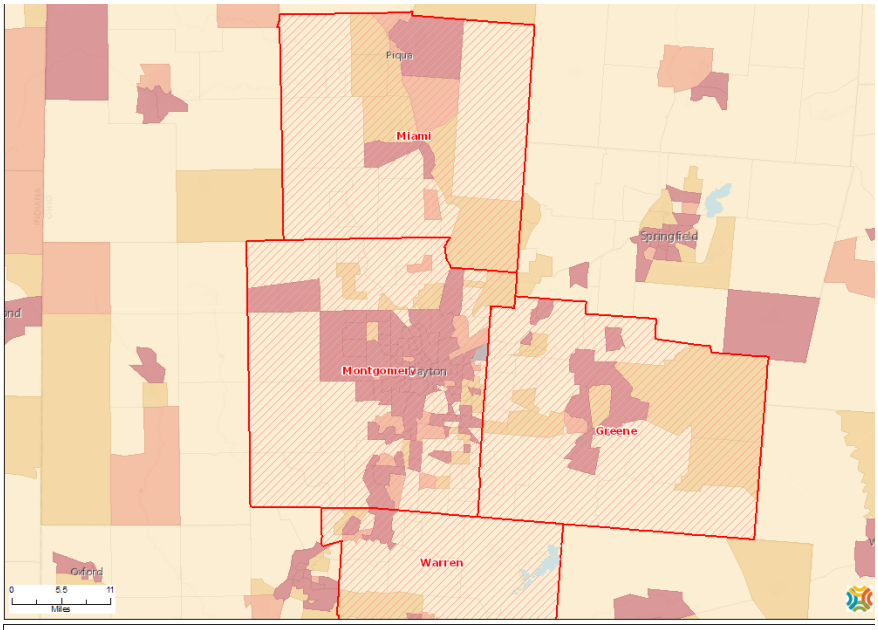
This indicator reports the number and percentage of households with no motor vehicle based on the latest 5-year American Community Survey estimates.

Report Area	Total Occupied Households	Households with No Motor Vehicle	Percentage of Households with No Motor Vehicle
Report Area	403,199	28,522	7.07%
Greene County, OH	62,836	3,200	5.09%
Miami County, OH	41,239	2,080	5.04%
Montgomery County, OH	222,578	21,333	9.53%
Warren County, OH	76,546	1,909	2.49%
Ohio	4,557,655	377,326	8.28%
United States	115,610,216	10,483,077	9.07%

Percent of Households with No Motor Vehicle



Report Area (7.07%)
Ohio (8.28%)
United States (9.07%)



Map Legend

Households with No Vehicle, Percent by Tract, ACS 2009-13
Over 8.0%
6.1 - 8.0%
4.1 - 6.0%
Under 4.1%
No Data or Data Suppressed

(Community Commons 2015)

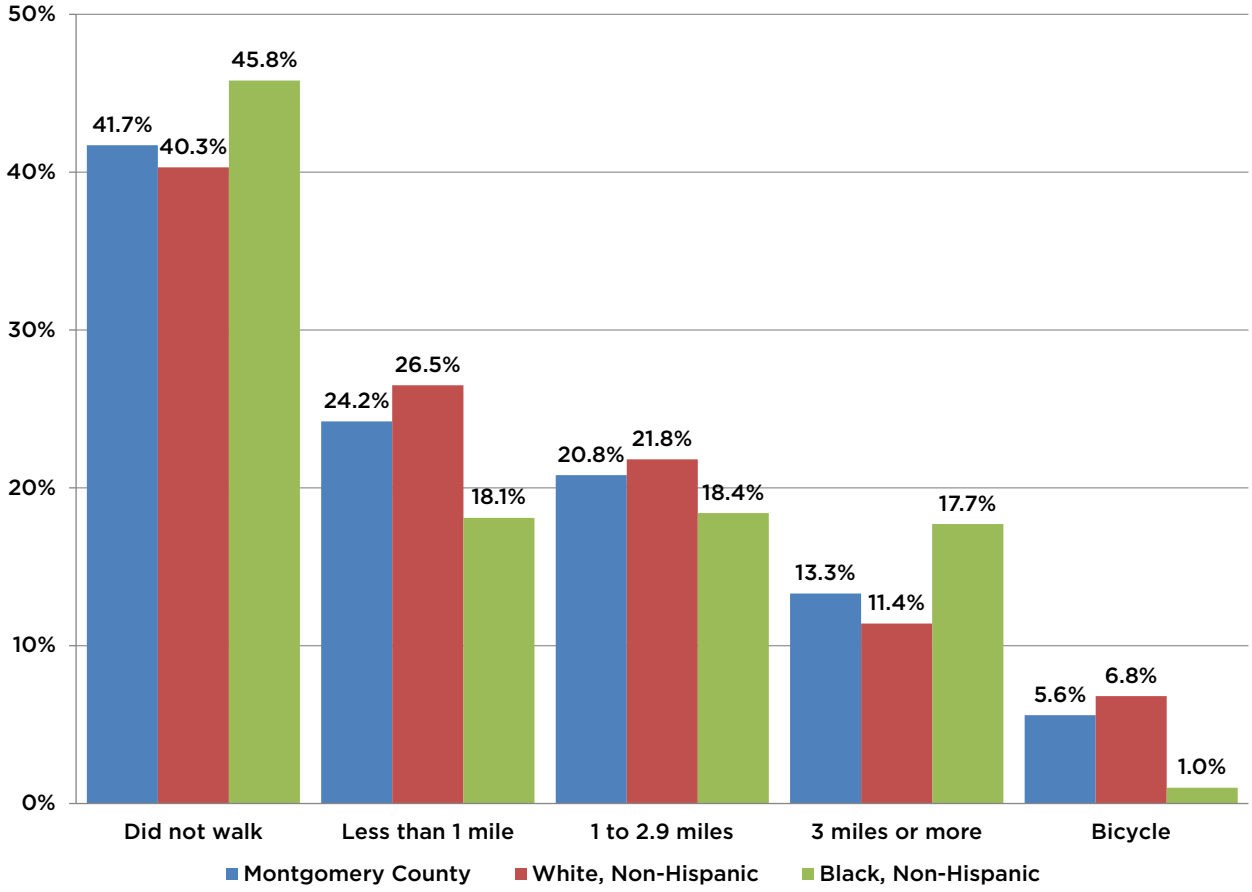
Another data set that informs our understanding of active transportation in the Miami Valley is public health data about physical activity and chronic disease. Transportation is one of the economic and social factors that influence an individual's health and the health of a community. The Robert Wood Johnson Foundation suggests in their October 2012 Health Policy Snapshot that "health impacts and costs should be factored into decisions about transportation and community development at all levels. Increasing transportation options,

such as those that promote walking, biking, and use of public transit, can help improve public health." (RWJ 2012)

The health outcomes in some of the Region's neighborhoods are very poor. According to the 2014 Montgomery County Community Health Assessment "Many of the poor health outcomes are directly related to inactivity," and 43% of our population does not meet aerobic activity recommendations (PHDMC 2014, 28). "Physical inactivity is linked to a number of chronic diseases including diabetes, heart disease, and obesity. A lack of sidewalks, heavy traffic, and criminal activity can make it unsafe and difficult to walk within a neighborhood for exercise. (PHDMC 2014, 73)" The report's Built Environment section calls on people to take advantage of the many trails and parks in our area.

* 18 and over

Adults* who walked outdoors or rode a bike for transportation in the past 7 days by race, Montgomery County, 2013

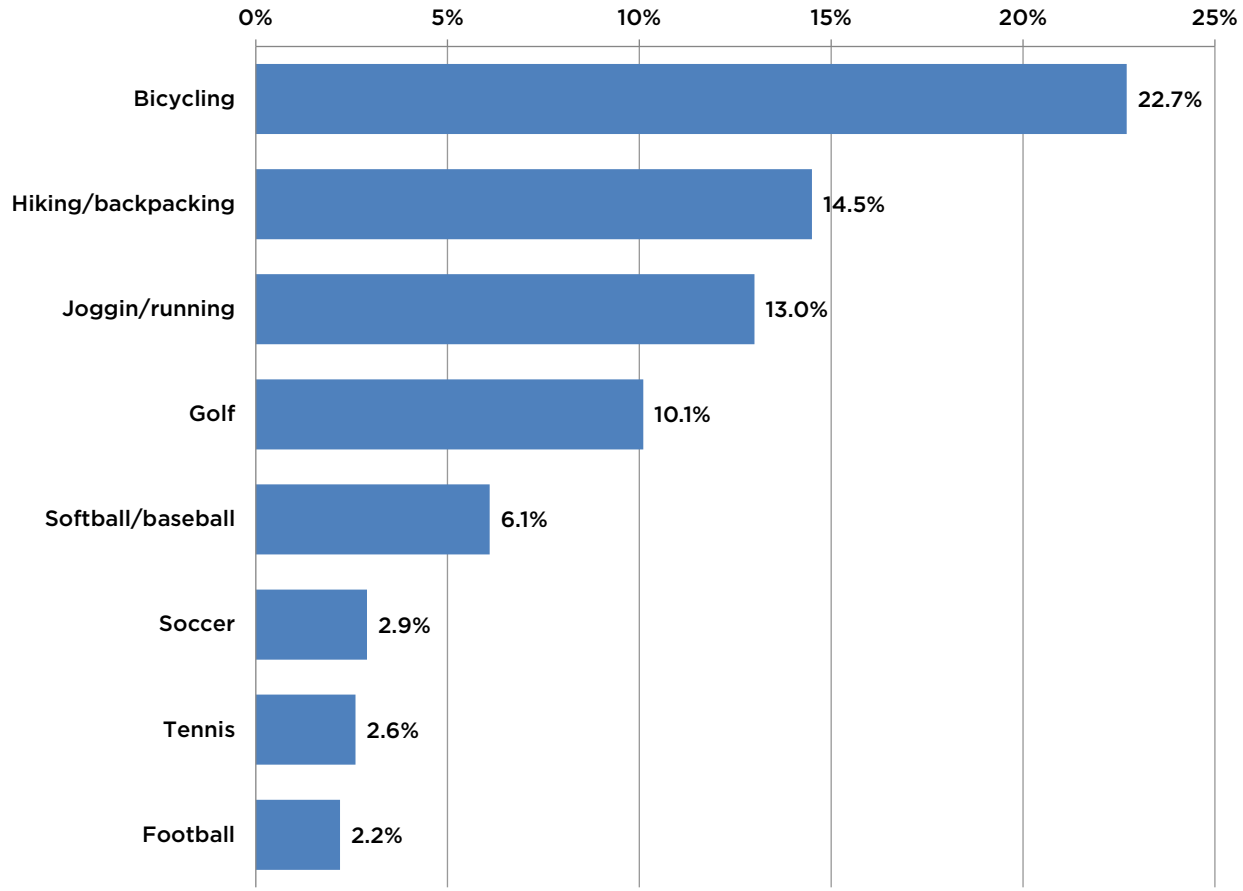


(PHDMC 2014, 73)

From Montgomery County's survey, whites bike more than blacks, and the black community is walking less than the white or county averages. Of those residents who do participate in outdoor activities, bicycling is a top choice.

Adult* participation in outdoor activities in the past 12 months, Montgomery County, 2013

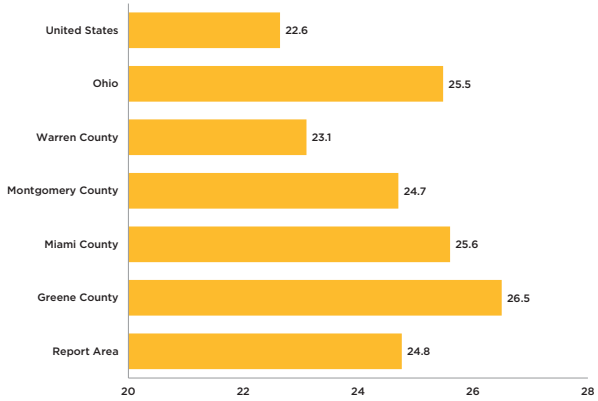
* 18 and over



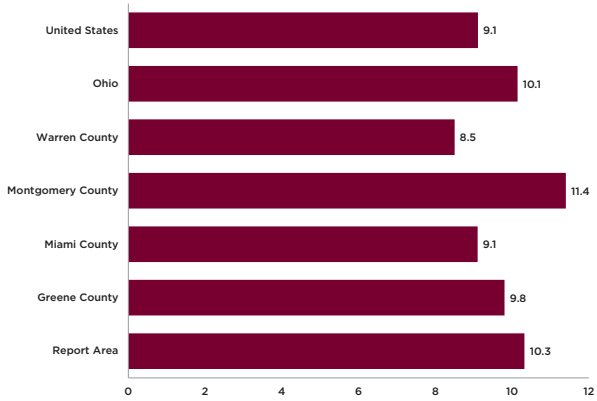
(PHDMC 2014, 73)

The Centers for Disease Control also states that a quarter of the Region's adult population is not physically active in their leisure time, a rate higher than the national average. It is therefore not surprising that when compared to the national average, more people in the region are obese, are diagnosed with diabetes, and are diagnosed with heart disease.

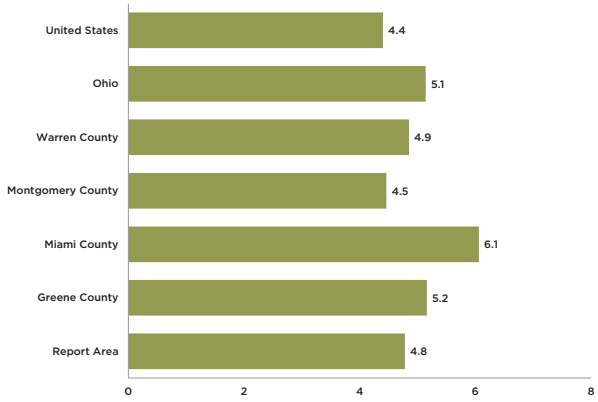
Percent Populations with no Leisure Time Physical Activity



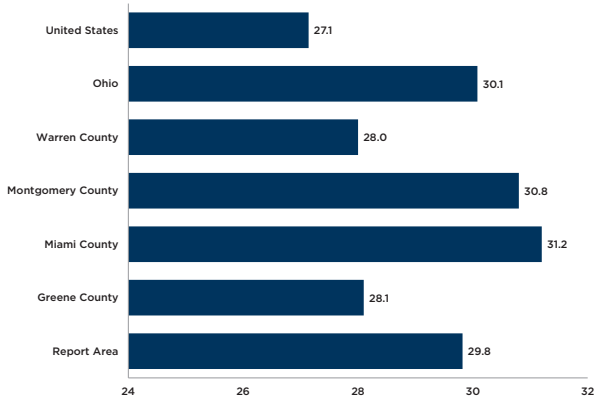
Population with Diagnosed Diabetes (Age Adjusted Rate)



Percent Adults with Heart Disease



Percent Adults with BMI > 30 (Obese)



(Community Commons 2015)

Adults need at least 2.5 hours of moderate aerobic activity each week and should also be engaged in strengthening activities. Forty-six percent met this measure, while 38% did not meet the minimum recommended activity level. Bicycling can provide low-impact aerobic activity. Our Region's network of trails and neighborhood roads provides a low-stress cycling environment for riders of all skill levels, including children.

These snapshots of the Miami Valley provide additional reasons to continue to improve access to the Region's cycling network: to improve the well-being and quality of life of the residents of the Miami Valley. The evaluation of project suggestions was guided by these principles; projects addressing an equity issue were given designated points in the scoring matrix.