



Bicycle Facilities Master Plan

Missoula, Montana

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Bicycle Facilities Master Plan



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Section 1: Introduction



Introduction

Bicycle Facilities Master Plan Defined

The Bicycle Facilities Master Plan establishes a detailed strategy and project list for improving bicycling in Missoula and is the guiding document for bikeway implementation. The Bicycle Facilities Master Plan supports the vision and the goals of both the Long Range Transportation Plan and the Missoula Active Transportation Plan. It provides greater detail for achieving a more connected bikeway network that increases access and minimizes stress for Missoula Residents. The relationship between these planning documents is depicted in Figure 1.

The Bicycle Facilities Master Plan:

- Expands the bikeway network and increase the accessibility of bicycling to a larger portion of Missoula residents
- Focuses on facility types that are comfortable to a wide range of Missoula residents
- Improves bikeway network connections by creating safer and more comfortable intersection crossings

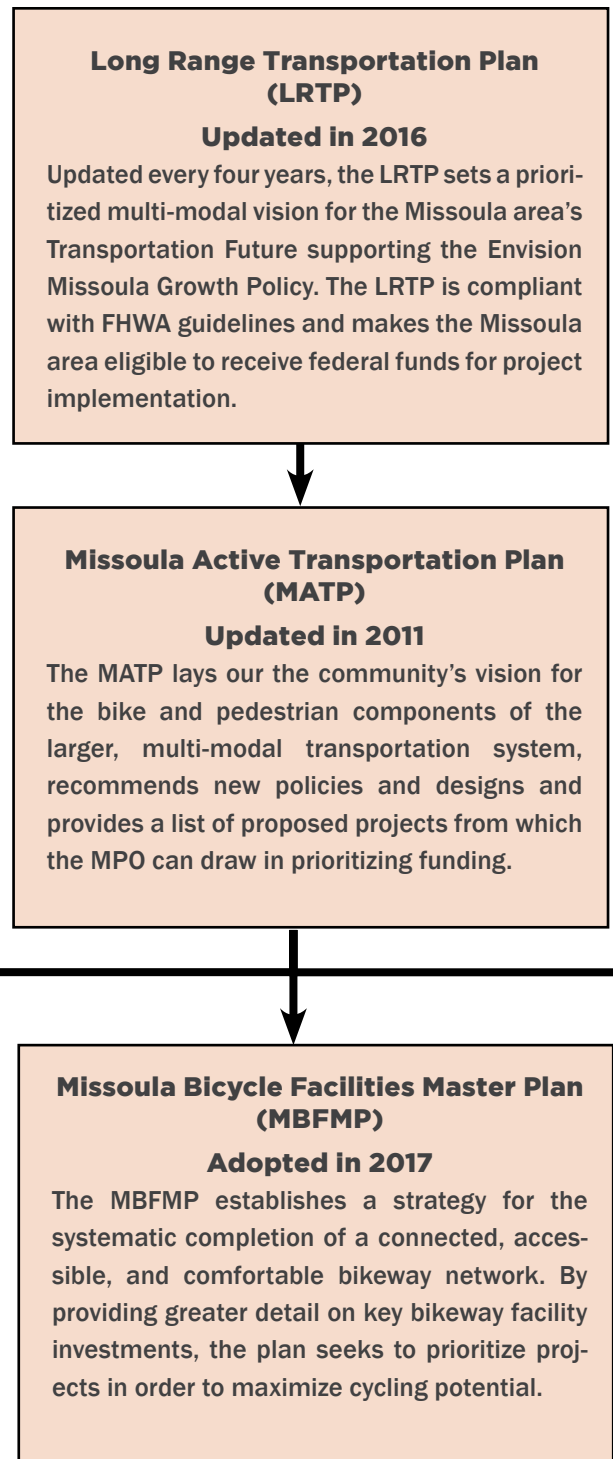


Figure 1. Missoula Transportation Planning Organization

Why Bicycling?

Bicycle mobility is an important component of overall mobility within the active transportation category, in concert with walking and transit.

Mobility, Independence, and Aging in Place

Nearly 25 percent, or about 21,000 of Missoula's 86,000 urban area residents (American Community Survey) are under the age of 16 or older than 70 and are not legally able or less likely to drive, respectively. This plan does not focus only on able-bodied adults that already enjoy bicycling. Rather, it is especially for those who will be given greater independence as the bicycling system improves. As the "under 16" and "70 and over" age groups become more mobile through walking and bicycling, fewer automobile trips will be made by their caretakers and parents, thereby improving the dependents' health, reducing the impact on the environment, and reducing traffic congestion, especially around schools at drop-off and pick-up times.

Parks & Recreation Plans:

Master Parks & Recreation Plan for the Greater Missoula Area - Adopted 2004

Missoula Parks & Open Space Plan (MPOSP) - Adopted 2006

Conservation Lands Management Plan (MCLMP) - Adopted 2010

Missoula County Parks & Trails Plan - Adopted 2011

These plans were created to protect open spaces, inventory and identify needed open spaces, inventory and identify needs for parks, trails and other recreational needs in the Missoula area.

The MCLMP, specifically focused on designated conservations land, provides long-term maintenance, acquisition, and design guidance for managed natural areas.

Quality of Life

Bicycling and walking are also important ways to improve quality of life for existing and prospective Missoula residents. Millennials and baby boomers alike are trending towards locations where they can ride a bike or walk to access their daily needs.

Cities that invest in active transportation are investing in people and their quality of life. Business decisions are increasingly being made based on quality of life amenities for employees and their families. Sidewalks, on-street bicycle facilities, shared-use paths, and transit service are important quality of life indicators. They demonstrate a commitment to healthy transportation options and lifestyles.

Safety

In cities where more people begin their commutes by walking or bicycling, corresponding fatality rates are generally lower.

Studies show that installing pedestrian and bicycle facilities directly improves safety by reducing the risk of pedestrian-automobile and bicycle-automobile crashes. For example, streets with bike lanes have been shown to be safer not just for bicyclists (compared with no bicycle facilities) but also for pedestrians and motorists.¹ Streets without bicycle facilities may pose a greater collision risk. When walking and bicycling rates double, per-mile pedestrian-motorist collision risk can decrease by as much as 34 percent.²

Health

In addition to the safety benefits that occur when more people are walking and bicycling, active transportation can have many positive impacts on personal and community health issues such as diabetes, heart disease, and obesity.

¹ Ewing, R. and Dumbaugh, E. (2010). *The Built Environment and Traffic Safety: A Review of Empirical Evidence*. *Injury Prevention* 16: 211-212.

² Jacobson, P. (2003). *Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Bicycling*. *Injury Prevention* 9: 205-209.



Bike lanes have become common in Missoula. As of 2015, 68 percent of arterial streets have bike lanes.

Studies show that people walk more in safe, walkable, and aesthetically pleasing places. Improved facilities promote physical activity by making walking and bicycling more appealing, easier, and safer.³

Climate

As of 2003, 27 percent of U.S. greenhouse gas emissions were attributed to the transportation sector and personal vehicles accounted for 62 percent of all transportation emissions.⁴ Individuals who replace 2 miles of

³ Robert Wood Johnson Foundation. *Active Transportation: Making the Link from Transportation to Physical Activity and Obesity*. Active Living Research. Research Brief; 2009. Available at http://www.activelivingresearch.org/files/ALR_Brief_ActiveTransportation.pdf.

⁴ Office of Transportation and Air Quality, Environmental Protection Agency. (2006). *Greenhouse Gas Emissions from the U.S.*

driving each day with walking or bicycling prevents 730 pounds of carbon dioxide from entering the atmosphere annually.⁵ Efforts to improve bicycling infrastructure and increase bicycling opportunities are critical to reducing the transportation sector's air quality impacts, improving air quality, decreasing public health concerns such as asthma and in Missoula, meeting the carbon neutrality goals of the municipal Conservation and Climate Action Plan (2013) and Community Climate Smart Action Plan (2015).

Environment

Air quality surrounding Missoula fluctuates widely depending on the season and other factors. Promoting active transportation over single-occupant vehicle trips is one way to mitigate seasonal air quality problems.

Bicycling and walking produce low land use impact, no direct air or water pollution, and minimal noise and light pollution. Nearly one-third of all developed land is dedicated to roads. Because of the smaller operator and vehicle footprint of pedestrians and bicyclists, not only does demand for streets and parking decrease but also the amount of road space required. Hence, streets that carry large numbers of bicyclists, pedestrians, and transit carry more people than streets that accommodate just private vehicles.

Economics

Active transportation makes economic sense. Benefits include decreased family transportation costs⁶, lower

Transportation Sector: 1990-2003. Report number EPA 420 R 06 003.

⁵ Federal Highway Administration. (1992). *Benefits of Bicycling and Walking to Health*.

⁶ AAA's "Your Driving Costs" Report (2013); League of American Bicyclists; Bureau of Transportation Statistics "Pocket Guide to Transportation" (2009); Metro Magazine, August (2014); Internal Revenue Service; "Quantifying the Benefits of Nonmotorized Transportation for Achieving Mobility Management Objectives".



Missoula's first two-way cycle track connects the Milwaukee Trail to the University of Montana along Maurice Avenue.

healthcare costs⁷, and higher property values⁸.

Facilities such as shared-use paths and trails can also positively influence property values. Nearly two-thirds of homeowners who purchased their home after a path or trail was built said that it positively influenced their purchase decision. Eighty-one percent felt that the nearby path or trail's presence would have a positive effect or no effect on the sale of their homes⁹.

7 Rous, Larissa, et al. "Cost Effectiveness of Community-Based Physical Activity Interventions". *American Journal of Preventive Medicine*, 2008; Pratt, Macera & Wang. *Higher Direct Medical Costs Associated with Physical Inactivity*, 2000; Chenoweth, D. *The Economic Costs of Physical Inactivity, Obesity, and Overweight in California Adults: Health Care, Workers' Compensation, and Lost Productivity*. *Topline Report*, 2005.

8 "Walking the Walk", *CEOs for Cities*, 2009; Lindsey, Greg, Seth Payton, Joyce Man, and John Ottensmann. (2003). *Public Choices and Property Values: Evidence from Greenways in Indianapolis*. *The Center for Urban Policy and the Environment*; "Valuing Bike Boulevards in Portland through Hedonic Regression", 2008.

9 "Omaha Recreational Trails: Their Effect on Property Values and Public Safety". *Rivers and Trails Conservation Assistance*, National Park Service. Donald L. Greer, 2000; "Nebraska Rural Trails: Three Studies of Trail Impact". *Rivers and Trails Conservation Assistance*,

Americans say that having bike lanes or paths in their community is important to them, and two-thirds of homebuyers consider the walkability of an area in their purchase decision.¹⁰ This preference for communities that accommodate walking and bicycling is reflected in property values across the country.¹¹ Houses in walkable neighborhoods have property values \$4,000 to \$34,000 higher than houses in areas with average walkability.¹²

National Park Service. Donald L. Greer, 2001.

10 Bureau of Transportation Statistics. (2010). *Transportation Statistics Annual Report*. Retrieved from http://www.bts.gov/publications/transportation_statistics_annual_report/2010/.

11 Racca, D.P. and Dhanju, A. (2006). *Property Value/Desirability Effects of Bike Paths Adjacent to Residential Areas*. Prepared for Delaware Center for Transportation and the State of Delaware Department of Transportation.

12 Cortright, J. (2009). *Walking the Walk: How Walkability Raises Housing Values in U.S. Cities*. *CEOs for Cities*.



Section 2: Existing System



Existing Network

Missoula's existing on-street bikeway system is limited almost entirely to collector and arterial streets. Historically, City staff have responded to the public's requests to include bike facilities on these major roadways and desire to have direct routes to destinations with limited traffic control. Administrative Rule 415 and the Complete Streets Policy have provided good guidance on when and how to add bicycle facilities to these major roadways. However, ROW constraints, funding issues, and a lack of a cohesive vision for a connected bicycle network have led to bicycle facilities that do not connect to all destinations or to each other and vary widely in their comfort levels. Meanwhile, seventy-four percent of Missoula's streets are local. Many of these streets represent tremendous opportunities to connect the network and maximize the amount of use it can attract. The following is a summary of the existing bikeway classifications in Missoula. Existing bikeways are depicted in Figures 2 and 3.

Cycle Tracks

Also known as Protected or Separated Bike Lanes, cycle tracks combine the user experience of a separate path with the on-street infrastructure of conventional bike lanes through various forms of physical separation from adjacent traffic. Cycle tracks are distinct from the sidewalk and can have many forms. In situations where on-street parking is allowed, cycle tracks are located to the curb-side of the parking (in contrast to bike lanes). Cycle tracks can be at street level, at sidewalk level, or at an intermediate level. By providing greater separation from motor vehicle traffic, cycle tracks offer a higher level of security than bike lanes and are attractive to a wider spectrum of the public. Missoula currently has two such facilities, a one-way raised example on Higgins Avenue and a two-way street level example on Maurice Avenue.



Raised one-way cycle track on Higgins Avenue



Street-level two-way cycle track on Maurice Avenue

Bike Lanes

A bike lane uses signage, striping, and stenciling to designate a portion of the roadway for the preferential or exclusive use of bicyclists, allowing both motor vehicles and bicycles to operate at their typical speeds in a way intended to reduce stresses and conflicts for all. These lane markings indicate that motorists must avoid travel on the bike lane portion of the roadway.

Bike lanes can vary considerably with the amount of comfort they provide to users. A bike lane on a two lane collector with a 25 to 30mph limit will feel much more comfortable than one on a higher speed arterial with multiple travel lanes. Similarly, the presence of on-street parking makes a bike lane less comfortable to users.



Bike lanes on a one-way street (Missoula Avenue)

Buffered Bike Lanes

Buffered bike lanes are enhancements of conventional bike lanes by including a designated painted buffer space separating the bike lane further from the adjacent vehicle travel and/or parking lane. Missoula currently has a buffered bike lane on East Spruce Street and on Arthur Ave. Buffered bike lanes can be considered on any street where sufficient width exists.



Buffered bike lane on East Spruce Street

Bike Route

Bike Routes include paved shoulders and shared roadways where people biking and driving operate within the same travel lane, either side by side or single file depending on roadway configuration. The most basic type of Bike Route is a signed shared roadway, which uses a combination of pavement markings and signage to identify the route and alert drivers to the presence of bicyclists. These facilities are used to connect other bikeways or designate preferred routes through high-demand corridors. In contrast to many other communities, Missoula typically designates bike routes on collectors and arterial roadways, often where there is not space for separate, designated bicycle facilities. This results in situations where vehicle volumes and speeds are higher and can make sharing a lane uncomfortable for all users. By designating some local streets as bike routes, Missoula has the potential to dramatically increase the number of people riding bicycles.



Bike routes are currently designated on many arterial and Collector streets where bike lanes are not feasible.

Shared-Use Paths

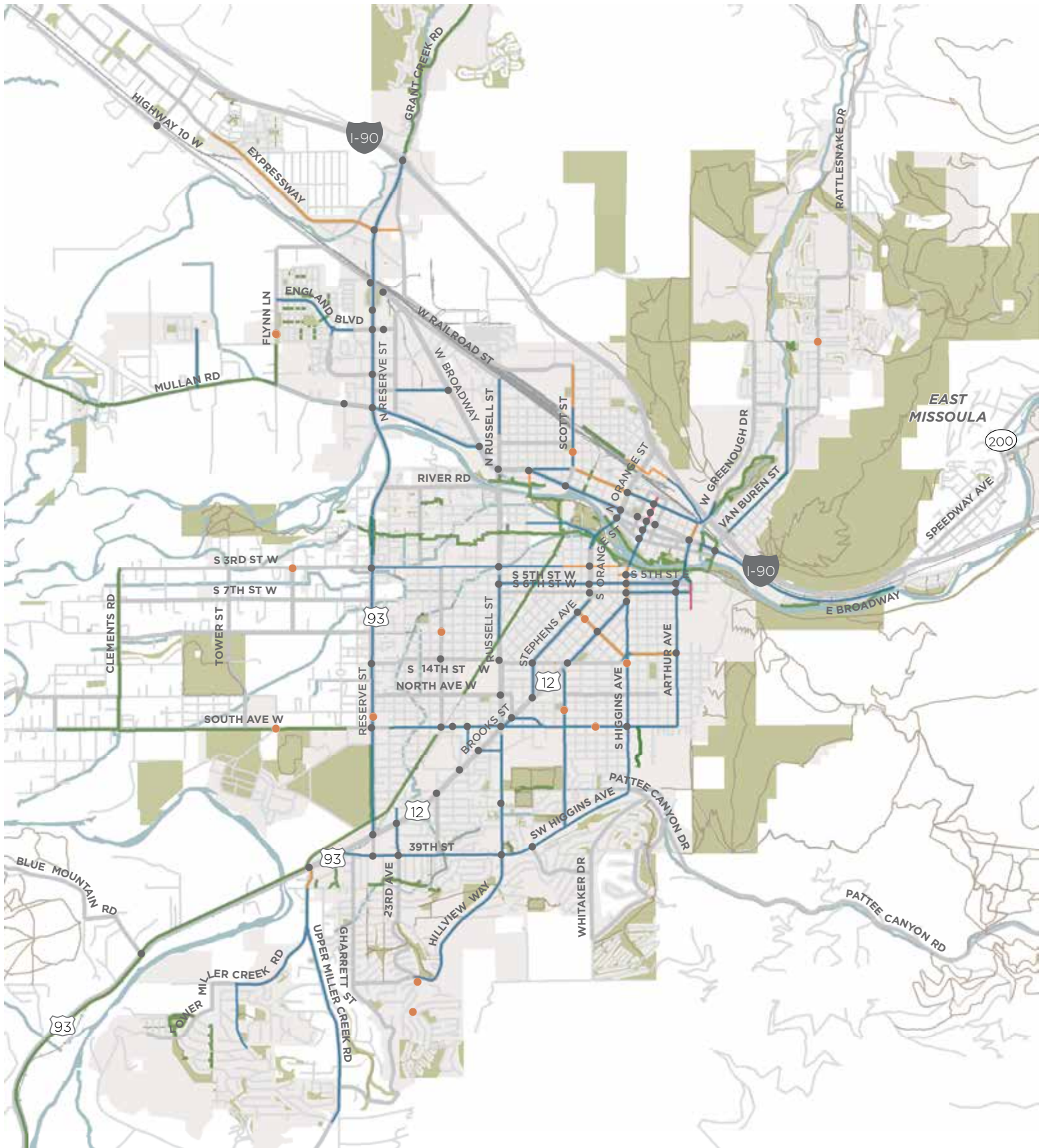
Shared-use paths are paved off-street bikeways that are open to most forms of non-motorized use including skateboarders and rollerbladers. Shared-use paths are physically separated from roadways either in its own right of way or paralleling a roadway. Shared-use paths that parallel roadways are called sidepaths. Shared-use paths can serve as transportation and/or recreation facilities. Missoula's most notable shared-use paths are the riverfront trail system, the Milwaukee Road, and the Bitterroot Trail.

Unpaved Trail

Natural surface trails are present in many parts of Missoula. These facilities link neighborhoods, and provide access to recreational areas. Natural surface trails can be narrow and steep such as those on Mount Jumbo, or similar in configuration to a shared-use path like the Kim Williams Trail.



The Milwaukee Trail transitions from a paved shared use path to an unpaved trail as it enters the Kim Williams Natural Area.



EXISTING BIKEWAYS

FIGURE 2

EXISTING BICYCLE NETWORK

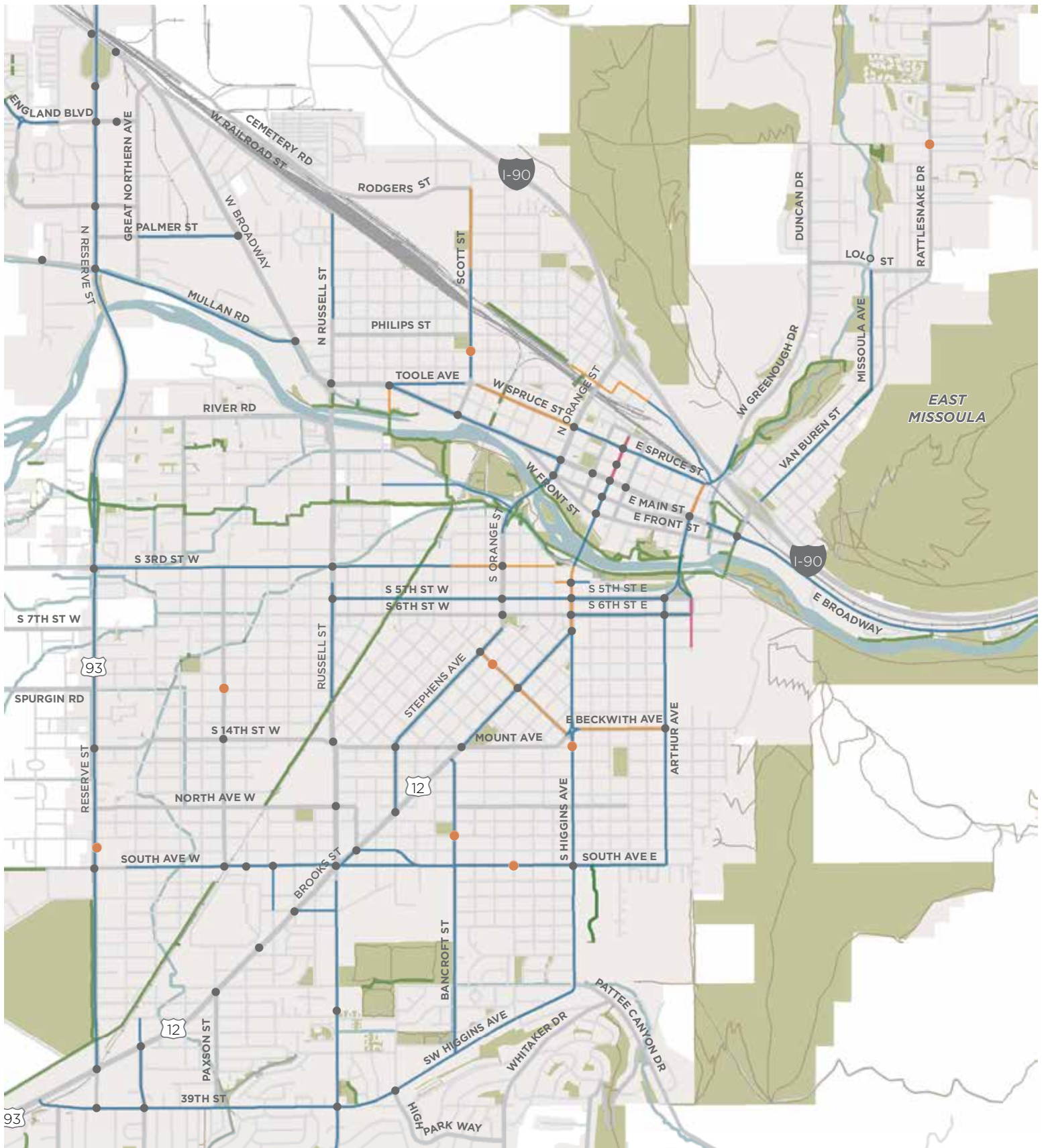
- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

- Enhanced Pedestrian Crossing
- Traffic Signal
- Road
- Rail

- Water Body
- Park
- City Limits





EXISTING BIKEWAYS - URBAN CORE

FIGURE 3

EXISTING BICYCLE NETWORK

- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

- Enhanced Pedestrian Crossing
- Traffic Signal
- Road
- Rail

- Water Body
- Park
- City Limits



Existing Use

Providing an accurate picture of bicycle activity within any community is difficult. Data is typically not available or not comprehensive enough to form a complete picture of transportation behavior. Data providing counts for vehicles is by comparison much better. Both the Montana Department of Transportation and the City of Missoula have collected regular data for years, allowing long-term trends to be understood. Overall, Missoula exhibits high overall levels of active transportation (including bicycling) when compared nationally.

American Community Survey

The US Census has long been one of the only readily available sources of data to measure general levels of transportation choices. The data is limited to commute based trips to work, and does not reflect the spectrum of potential trip types available. The American Community Survey (ACS) has supplemented the 10-year cycle of the overall census to provide additional annual data. For communities the size of Missoula, annual data is not statistically valid; therefore, 5-year averages of this data are used. This method provides some insight; however, it is slow to note significant changes over time. ACS surveys are sent out at random and serve as an annual average. The data does not pick up seasonal variability

in travel behavior and has a margin of error of +/- 1.4 percent. Figure 4 depicts bicycle commute mode share as reported by the US Census and the ACS for the last 15 years in the City of Missoula. Overall levels of bicycle commuting are stable in Missoula. Figure 5 depicts non-automobile based commuting for the various census blocks around Missoula. It is clear that bicycle commuting varies considerably depending on neighborhood, with generally higher rates—approaching 20 percent—near downtown.

Missoula Area Transportation Survey

The Bureau of Business and Economic Research at the University of Montana conducted a statistically valid transportation survey (+/- 4 percent) from September to November 2015. It included a mix of city and county residents and covered a wide variety of topics. For the survey period, a bicycle commute mode share of 15.9 percent within the city and 3.7 percent for county residents within the planning area was reported. Taken together these values average to 12.7 percent. Further, fully 54 percent of city residents and 45 percent of county residents had ridden a bicycle within the previous 30 days. These numbers are encouraging and represent significantly higher numbers than the yearly averages that take into account seasonality such as from the ACS.

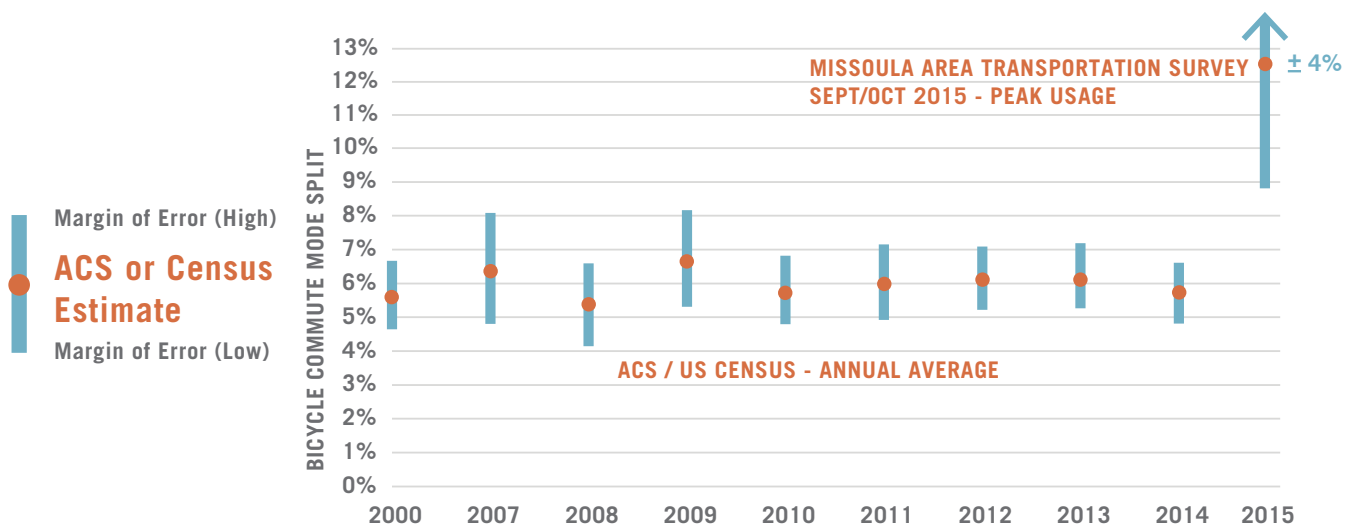
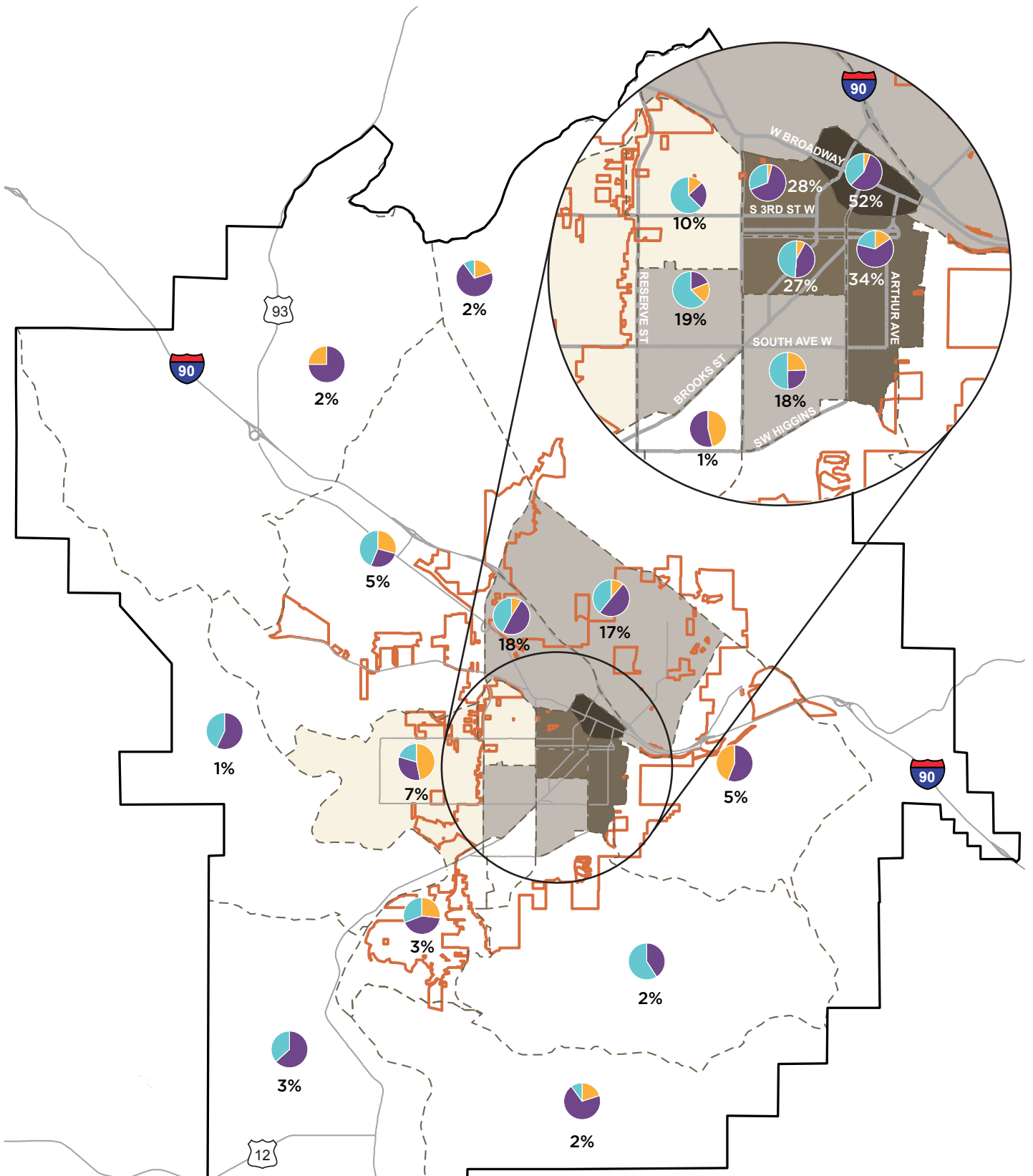
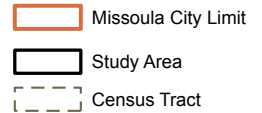
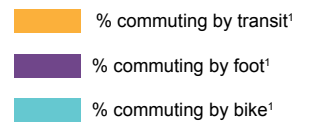
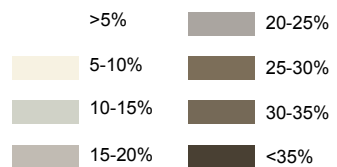


Figure 4. Bicycle Commute Mode Split (US Census and ACS)

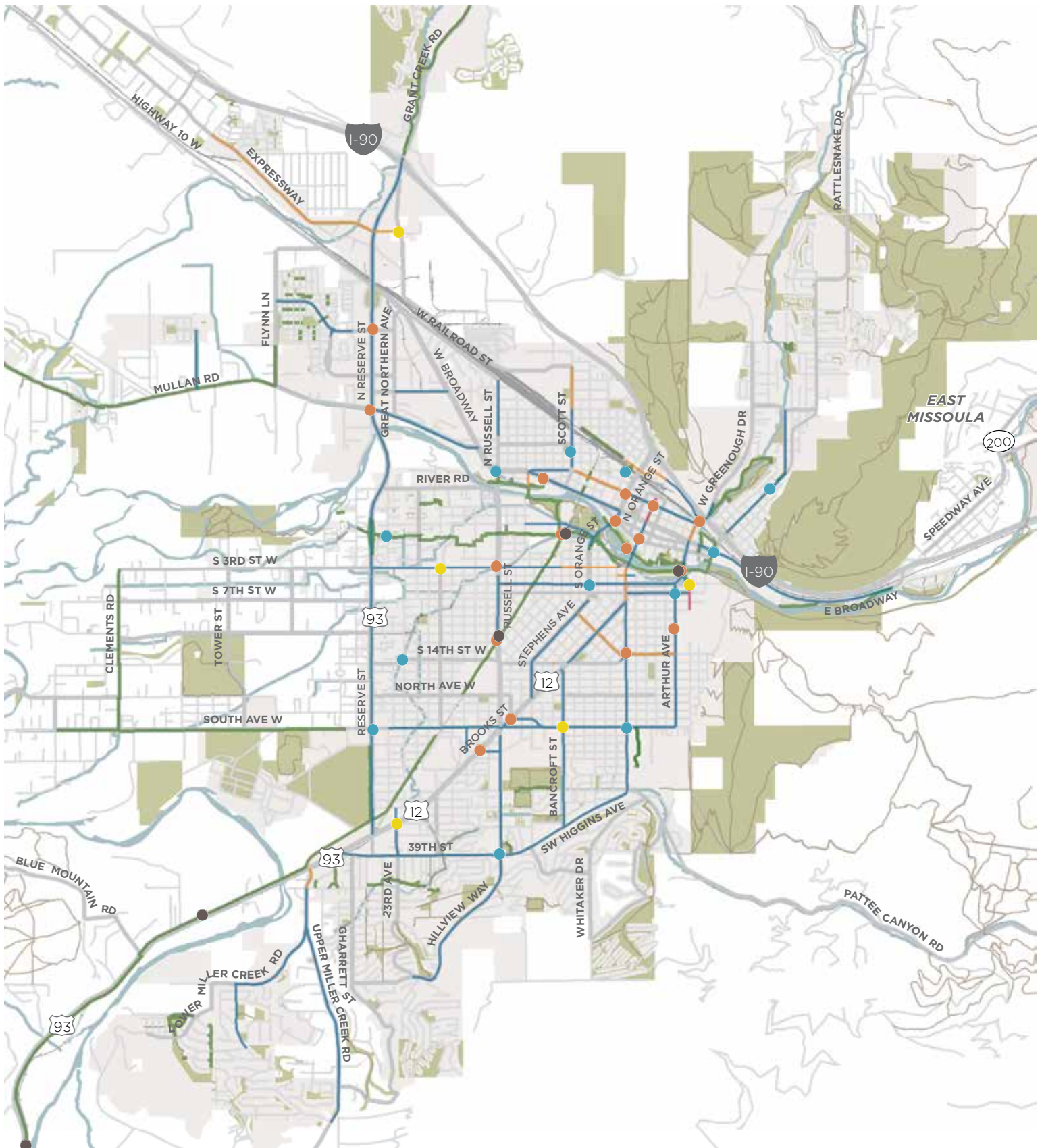


**ACTIVE TRANSPORTATION
MODE SHARE**
FIGURE 5

% of census tract commuting by transit, foot or bike¹



¹Source: U.S. Census Bureau, American Community Survey, 2009-2013



BIKE COUNT STATION MAP

FIGURE 6



COUNT & STATION TYPE

- Automatic, Continuous
- Manual, Annual
- Manual, Odd Years
- Manual, Optional

EXISTING BICYCLE NETWORK

- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

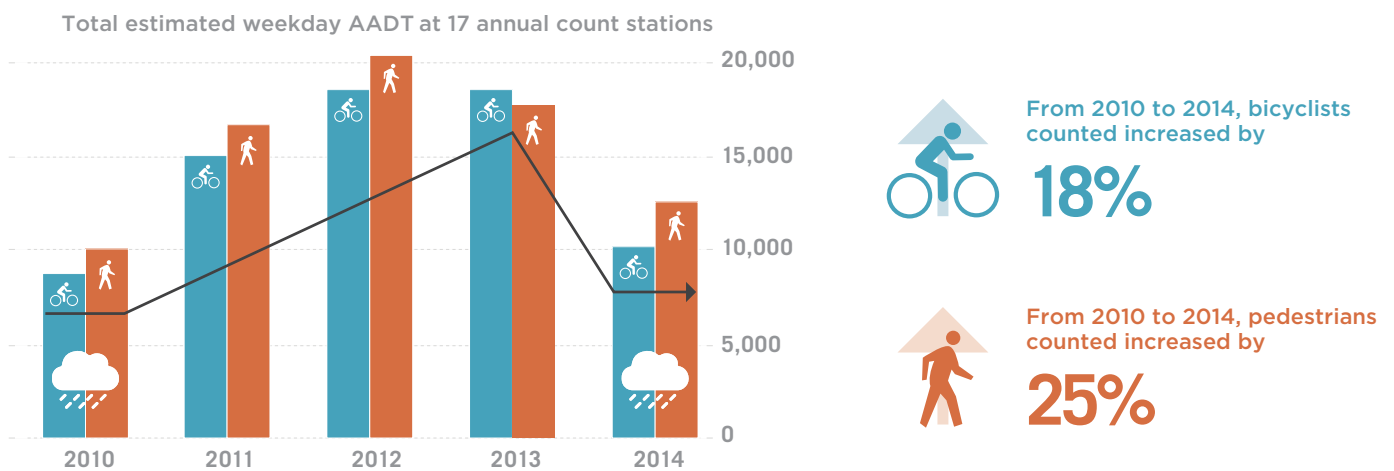
- Road
- Rail
- Water Body
- Park
- City Limits

Bicycle Counts

Manual Counts

Since 2010, bicycle and pedestrian counts have been conducted twice per year by volunteers organized by the MPO. Data is collected at seventeen stations during even years and an additional twelve stations on odd years. Weekday counts are collected during the peak two hours in the evening from 4:00 to 6:00 pm with an earlier peak of 3:00 to 5:00 pm at stations surrounding the University of Montana. Weekend counts are collected from 12:00 to 2:00 pm. Figure 6 shows the locations of each of the count stations.

The manual counts have provided a new source of data that measures a snapshot of overall levels of bicycling for all trips, and has allowed annual comparisons at the same location and comparisons to other areas of Missoula to be made; however, the weather and air quality can have a profound impact on the observed numbers. During some Septembers, poor air quality due to local and regional fires may have depressed counts. In 2014 and 2015, the fall count week overlapped with significant rainfall and also impacted counts. These factors illustrate the limitations of relying on this data in the long term. Figure 7 summarizes some of the data collected during the manual counts. Figure 8 displays intersection counts where vehicle counts were merged with those collected manually.

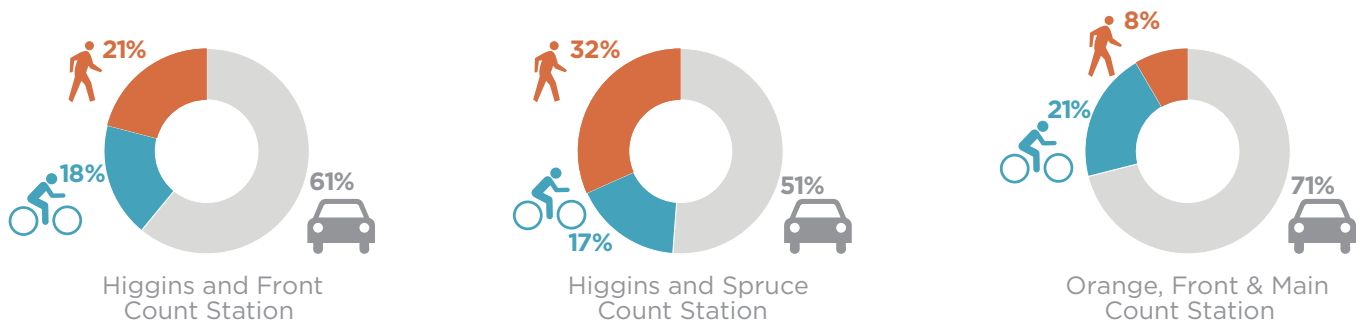


Manual counts indicate a steady increase from 2010 through 2013. Although pedestrian and bicycle counts fell nearly 50% between 2013 and 2014, counts remain greater than 2010. 2010 and 2014 were both cool and rainy on most count days suggesting low counts are indicative of the impact of weather on bicycle and pedestrian volumes.



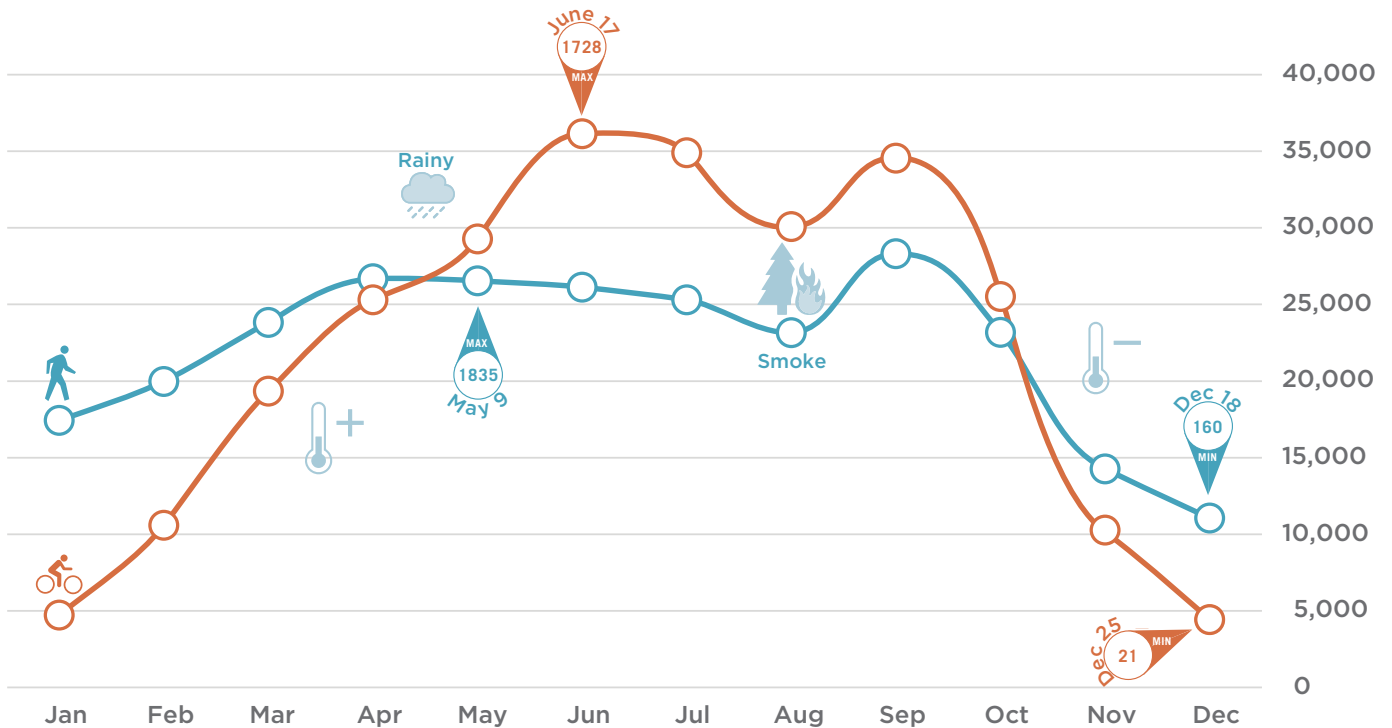
From 2011 to 2013, the largest increases in pedestrian and bicycle counts were recorded at S 6th St E and the Madison Street Pedestrian Bridge, while the most significant decreases were recorded at Arthur Ave and North Riverfront Trail - Brennan's Wave.

Figure 7. Manual count summary



From 2010 to 2014, over half of all pedestrians and bicyclists were recorded at downtown core count stations. Combined AADT numbers for pedestrians and bicyclists represent a large share of total roadway use.

Figure 8. Downtown spot mode share



Located on the Milwaukee Trail, the South Riverfront automated counter provides real-time data. Continuous collection provides a better understanding of how localized seasonal conditions and events impact bicyclist and pedestrian volumes. The first year of collected data illustrates the correlation between trail use, weather and localized events. Mirroring seasonal weather conditions, trail use fluctuates throughout the year.

Figure 9. Seasonal variation in walking and bicycling

Automatic Counters

Automatic counters have become inexpensive and provide streaming data at a particular location throughout the year. Missoula installed its first automatic counter on the Kim Williams Trail near the University of Montana in October 2014. In the fall of 2015, an additional five counters were added to the Bitterroot Trail in various locations. Data recorded from the Kim Williams trail provides

insight into the seasonal usage of bicycles. Figure 9 displays trail counter data collected on the Kim Williams trail for the 2015 calendar year. This data shows bicycling to be more impacted by the winter months than walking. From May to October, bicycling is more prevalent than walking.

Community Benefits

With bicycle mode share significantly higher than most other communities in the United States, Missoula experiences substantial benefits. This benefits analysis was conducted with a combination of available locally and nationally collected data. All projections are based on the most recent five-year estimates from the ACS, which are then extrapolated through the use of various multipliers derived from national studies and quantified in terms of monetary value where appropriate. The estimated monetary values are then calibrated to baseline values and compared to bicycle and walk mode commute splits of peer cities. This analysis is likely to under represent the existing levels of walking and bicycling as it is heavily influenced by the National Household Transportation Survey. It is likely that the typical Missoula resident walks and bicycles more than the average American.

Future estimates were derived from an estimate of future mode share in Missoula based on the 2045 mode share goals from the 2017 Long Range Transportation Plan. Low, mid, and high mode share growth scenarios were considered for 2045 as depicted in Figure 10. Missoula's projected population at 2045 is also included in this analysis. Figure 11 explores the potential increases in annual bicycle trips per year both through population growth alone and if Missoula hits the high bicycle commute mode share goal of approximately 18 percent. This figure shows that, even if bicycle commute mode share does not increase, the overall number of annual bicycle commute trips will increase by 27 percent in 2045 due to population growth alone. The high mode share goal of 18 percent at 2045 would result in a 300 percent increase in bicycle trips over existing.

Based on the analysis, Missoulian's bike approximately 19 million miles per year based on an estimated 8.2 million trips. This indicates the baseline value that can be projected into the future with increased mode share and increased population as variables.

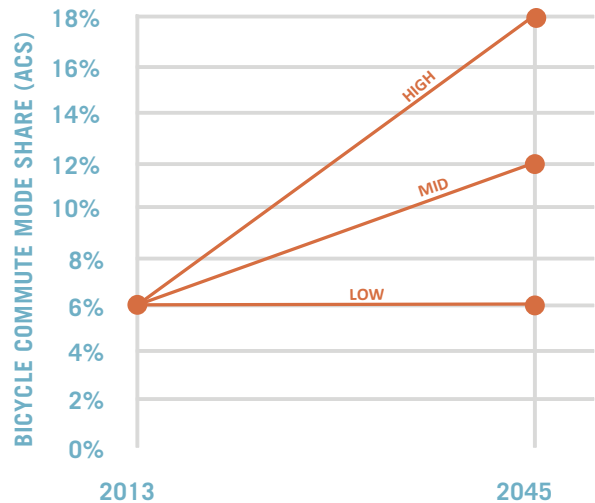


Figure 10. Bicycle mode share growth scenarios

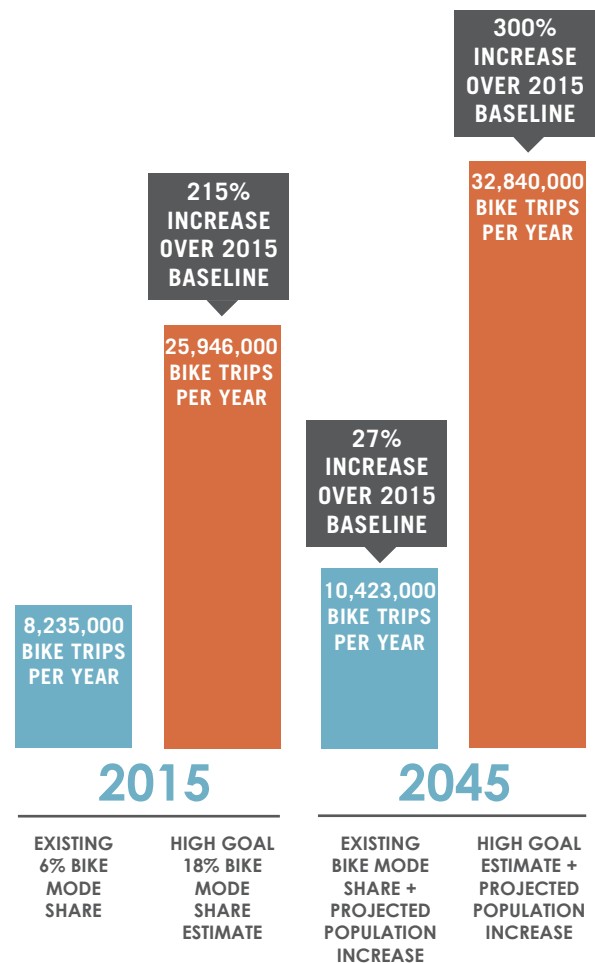


Figure 11. Bicycle trip growth projected in 2045

Health Benefits

Missoula's existing levels of bicycling equate to a great deal of physical activity. The Benefit Impact Model quantifies this existing estimated hours of physical activity and projected increases if modes share increases in the future. Benefits include improved community health and reduced household healthcare spending. The primary inputs into the health component of the Benefit Impact Model derived from 2009-2013 ACS journey to work data, 2009 National Household Travel Survey, and historic Safe Routes to School data. Existing bicycle and walk commute data was multiplied by national trip purpose ratios to generate mode split data that includes all trip purposes. This balanced mode split data was indexed against the mode split data of Missoula's six peer cities, and multiplied by various health factors.

Environmental Benefits

Many communities have minimal existing levels of bicycling. The existing levels of walking and bicycling provide environmental benefits to the community by not being emissions generating trips. Building off the health benefits analysis where annual trips and miles traveled and the mode share growth scenarios, the implications for hydrocarbon, particulate matter, nitrous oxides, carbon monoxide and carbon dioxide (CO₂) can be estimated. This analysis uses national methodologies to determine trip replacement. Every walking or bicycling trip is not equal to a replaced vehicle trip. Based on a review of air emissions studies, each pound of emissions was assigned an equivalent dollar amount based on how much it would cost to clean up the pollutant or the cost equivalent of how much damage the pollutant causes to the environment. Other potential ecological services associated with bicycle projects such as water

ANNUAL MILES BIKED

19,000,000

MILES BIKED
PER YEAR

That's the
equivalent of



750

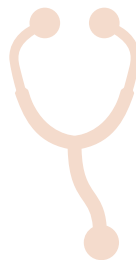
TRIPS AROUND
THE EARTH!

REDUCED HEALTHCARE COSTS

\$297,000

IN ANNUAL HEALTHCARE
COST SAVINGS

That's the equivalent of
1,700 trips to the doctor!



ANNUAL PHYSICAL ACTIVITY FROM BICYCLING

22%



OF MISSOULA RESIDENTS MEETING
THE CDC RECOMMENDED HOURS OF
PHYSICAL ACTIVITY JUST FROM
BICYCLING (~30 minutes/day)

Table 1. Estimated Health-Related Benefits

	Baseline	Low		Mid		High	
	Total	Total	Difference	Total	Difference	Total	Difference
Annual Bike Trips	8,235,000	8,649,000	414,000	17,297,000	9,062,000	25,946,000	17,711,000
Annual Miles by Bike	18,998,000	19,579,000	581,000	31,737,000	12,739,000	43,895,000	24,897,000
Annual Hours of Physical Activity	1,900,000	1,958,000	58,000	3,174,000	1,274,000	4,390,000	2,490,000
Rec. Physical Activity Minimum Met	14,500	15,000	500	24,000	9,500	34,000	20,000
Regional Physical Activity Need Met	21.4%	22.0%	0.7%	35.7%	14.3%	49.4%	28.0%
Total Health Related Savings	\$297,000	\$312,000	\$15,000	\$625,000	\$328,000	\$937,000	\$640,000

Table 2. Estimated Environmental Related Benefits

	Baseline	Low		Mid		High	
	Total	Total	Difference	Total	Difference	Total	Difference
CO ₂ Emissions Reduced (lbs)	9,327,000	9,795,000	468,000	19,591,000	10,264,000	29,386,000	20,059,000
Other Vehicle Emissions Reduced (lbs)	242,000	255,000	13,000	509,000	267,000	764,000	522,000
Total Vehicle Emission Related Savings	\$250,000	\$263,000	\$13,000	\$525,000	\$275,000	\$788,000	\$538,000

REDUCED VEHICLE EMISSIONS

9,327,000 lbs

CO₂ EMISSIONS REDUCED PER YEAR
242,000 lbs OF OTHER VEHICLE EMISSIONS REDUCED



regulation, carbon sequestration, carbon storage, and waste treatment exist, but the quantifiable value of these services are negligible on the overall impact. Even at existing levels of bicycling, Missoula may avoid almost 9

million pounds of CO₂ from being released into the atmosphere; reaching the high mode share goal could save an additional estimated 10 million pounds of CO₂ from being released annually.

Transportation Benefits

The most readily-identifiable benefits of active transportation exist in its ability to increase transportation options and access to activity centers for Missoula residents and visitors. Real savings can be estimated from the reduced costs associated with congestion, vehicle crashes, road maintenance, and household vehicle operations.

Using the same annual VMT reduction estimates highlighted in the health and environmental components, transportation-related cost savings were calculated. By multiplying the amount of VMT reduced by established multipliers for traffic congestion, vehicle collisions, road maintenance, and vehicle operating costs, monetary

values were assigned to the transportation-related benefits. This analysis is the most conceptual of the three, and actual savings may not ultimately result in the provided estimate.

Total Benefits

Further improving the bicycling system in Missoula will result in more trips being taken by bicycle. Increases in mode share can yield significant annual benefits. The city currently experiences approximately \$9.6 million in annual benefits from bicycling, and could experience a further \$480,000 to \$11 million in additional benefits depending on population growth and varying levels of future mode share increases.

Table 3. Estimated Transportation Related Benefits

	Baseline	Low		Mid		High	
	Total	Total	Difference	Total	Difference	Total	Difference
Annual VMT Reduced	7,473,000	7,848,000	375,000	15,696,000	8,223,000	23,543,000	16,070,000
Reduced Traffic Congestion Costs	\$523,000	\$549,000	\$26,000	\$1,099,000	\$576,000	\$1,648,000	\$1,125,000
Reduced Vehicle Crash Costs	\$3,736,000	\$3,924,000	\$188,000	\$7,848,000	\$4,112,000	\$11,772,000	\$8,036,000
Reduced Road Maintenance Costs	\$1,121,000	\$1,177,000	\$56,000	\$2,354,000	\$1,233,000	\$3,532,000	\$2,411,000
Household Vehicle Operation Cost Savings	\$4,259,000	\$4,473,000	\$214,000	\$8,947,000	\$4,688,000	\$13,420,000	\$9,161,000
Total Transportation Benefits	\$9,639,000	\$10,123,000	\$484,000	\$20,248,000	\$10,609,000	\$30,372,000	\$20,733,000

Table 4. Estimated Total Bicycle Related Benefits

	Baseline	Low		Mid		High	
	Total	Total	Difference	Total	Difference	Total	Difference
Health Benefits	\$297,000	\$312,000	\$15,000	\$625,000	\$328,000	\$937,000	\$640,000
Environmental Benefits	\$250,000	\$263,000	\$13,000	\$525,000	\$275,000	\$788,000	\$538,000
Transportation Benefits	\$9,639,000	\$10,123,000	\$484,000	\$20,248,000	\$10,609,000	\$30,372,000	\$20,733,000
Total Benefits	\$10,186,000	\$10,698,000	\$512,000	\$21,398,000	\$11,212,000	\$32,097,000	\$21,911,000

Bicycle Crash Analysis 2007-2014

Bicycle crashes are typically underreported as many minor collisions that do not involve injury or significant property damage are unlikely to produce a police report. Crash data for the 5-year period of 2007 to 2014 was obtained as part of the Long Range Transportation Plan Update. 394 Bicycle involved crashes were recorded within the five year period. The vast majority of these crashes, 77 percent, occurred along the arterial and collector system. Only 23 percent occurred on local roadways. Of the 394 crashes, 67 percent occurred at or involved an intersection. A summary of the overall crashes is shown in Figures 12 and crashes are visually depicted in Figures 13 and 14.

The data indicates a that a focus on intersection safety and providing alternative parallel bikeways to many of the major streets enabling Missoulians to get around without using some of the busier streets could help reduce the number of crashes significantly.



This “ghost bike” was placed at the location of a bicycle fatality at Mount Avenue and Plymouth Street.

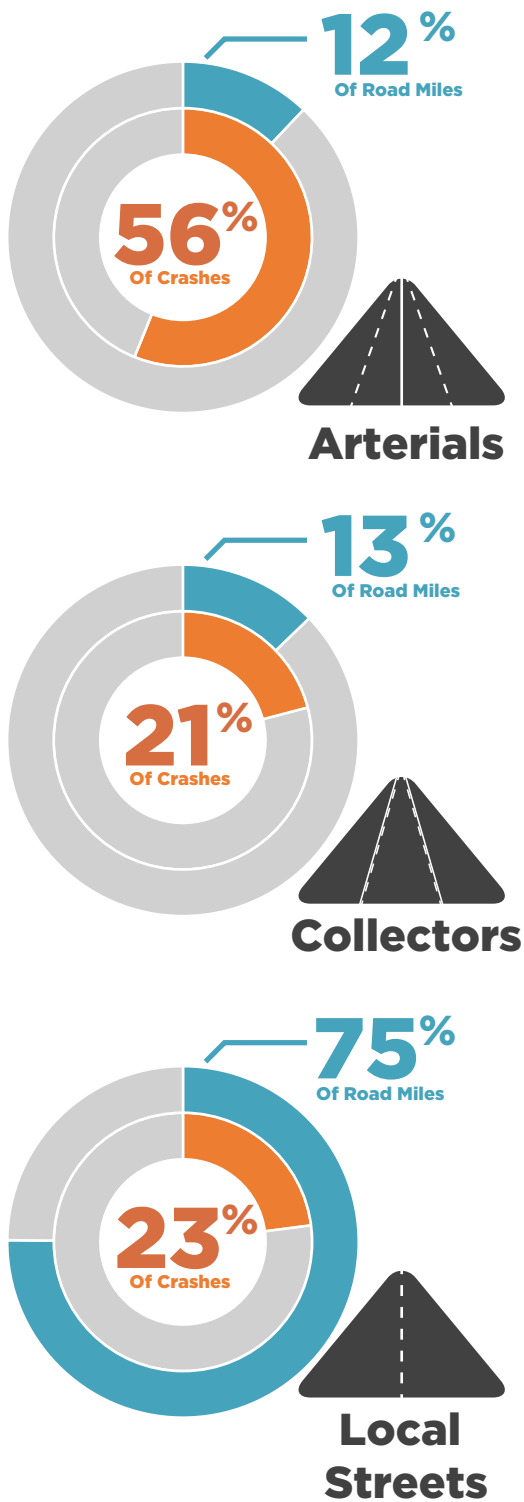
394



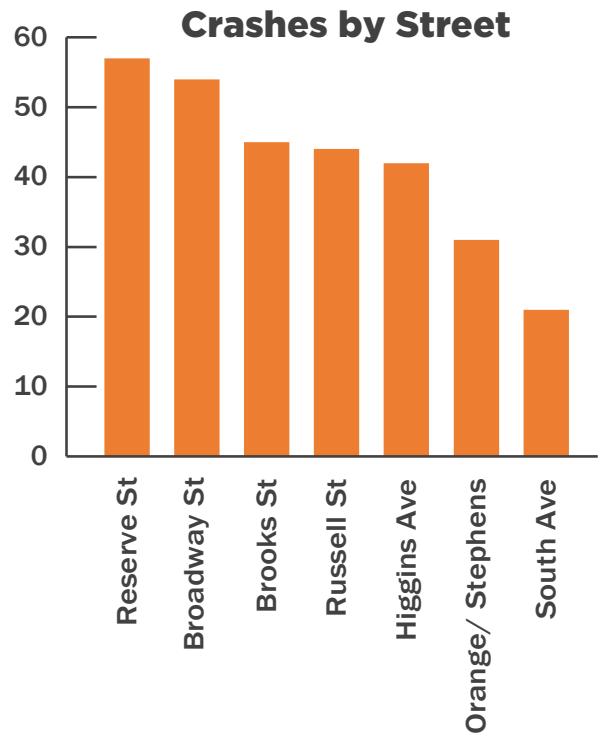
Crashes involving bicylists

- 99** **Incapacitating or Fatal Accidents**
25% of total bike crashes (3 fatal)
- 16** **Involved impaired drivers**
4% of total bike crashes
- 17** **Involved failure to yield right-of-way**
4% of total bike crashes

Where do Bicycle Crashes Occur?



67% Occured within 100 feet of a intersection



Note: Intersections between streets were counted for both streets

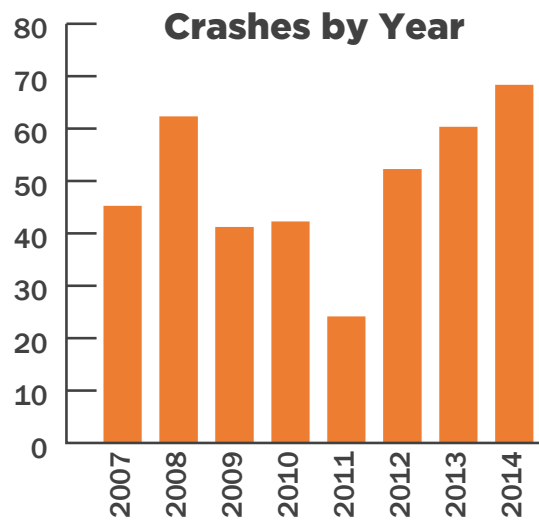
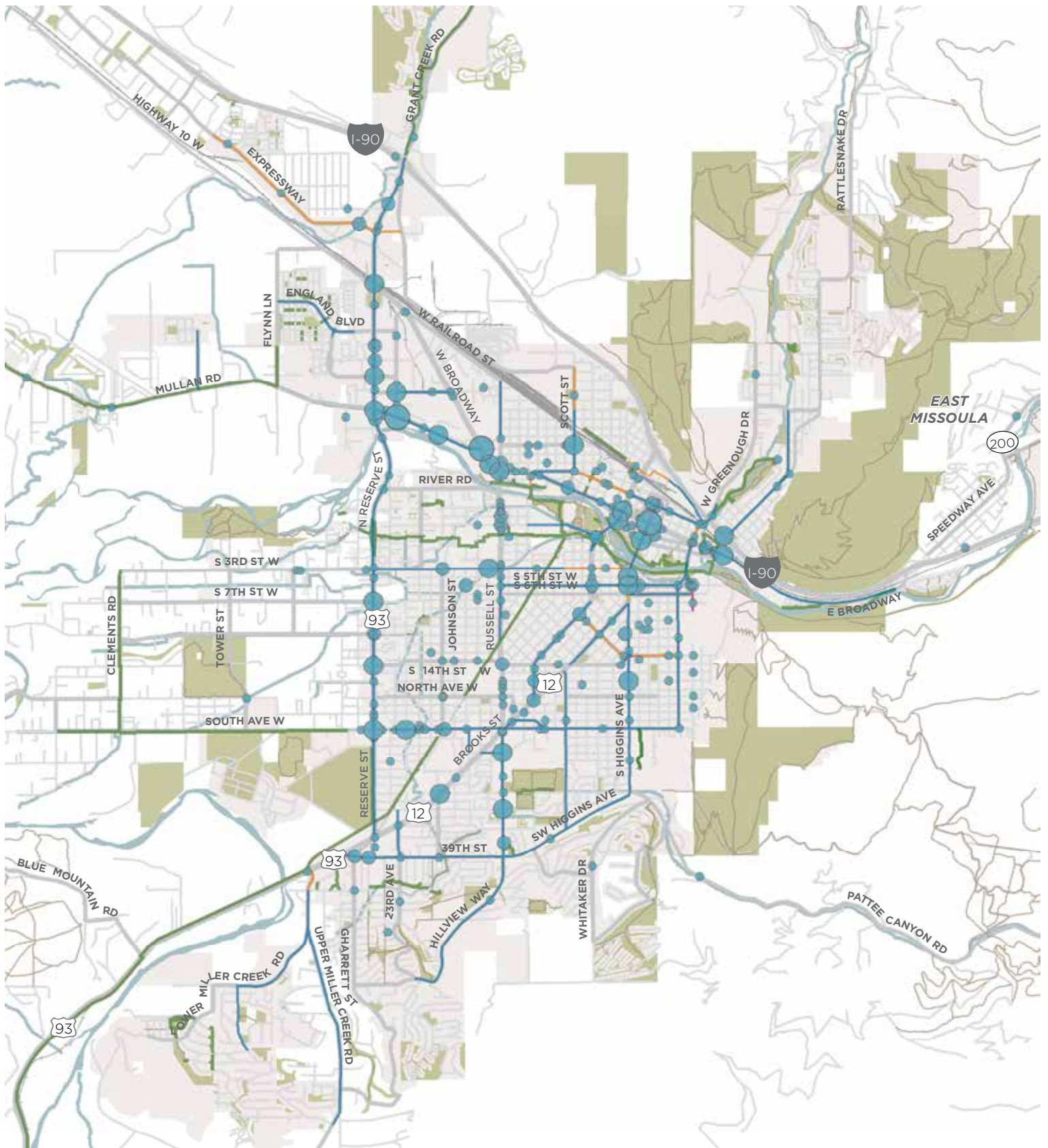


Figure 12. Bicycle crash summary



BIKE COLLISION FREQUENCY 2010-2014

FIGURE 13

COLLISION FREQUENCY

- 6 - 8
- 3 - 5
- 2
- 1

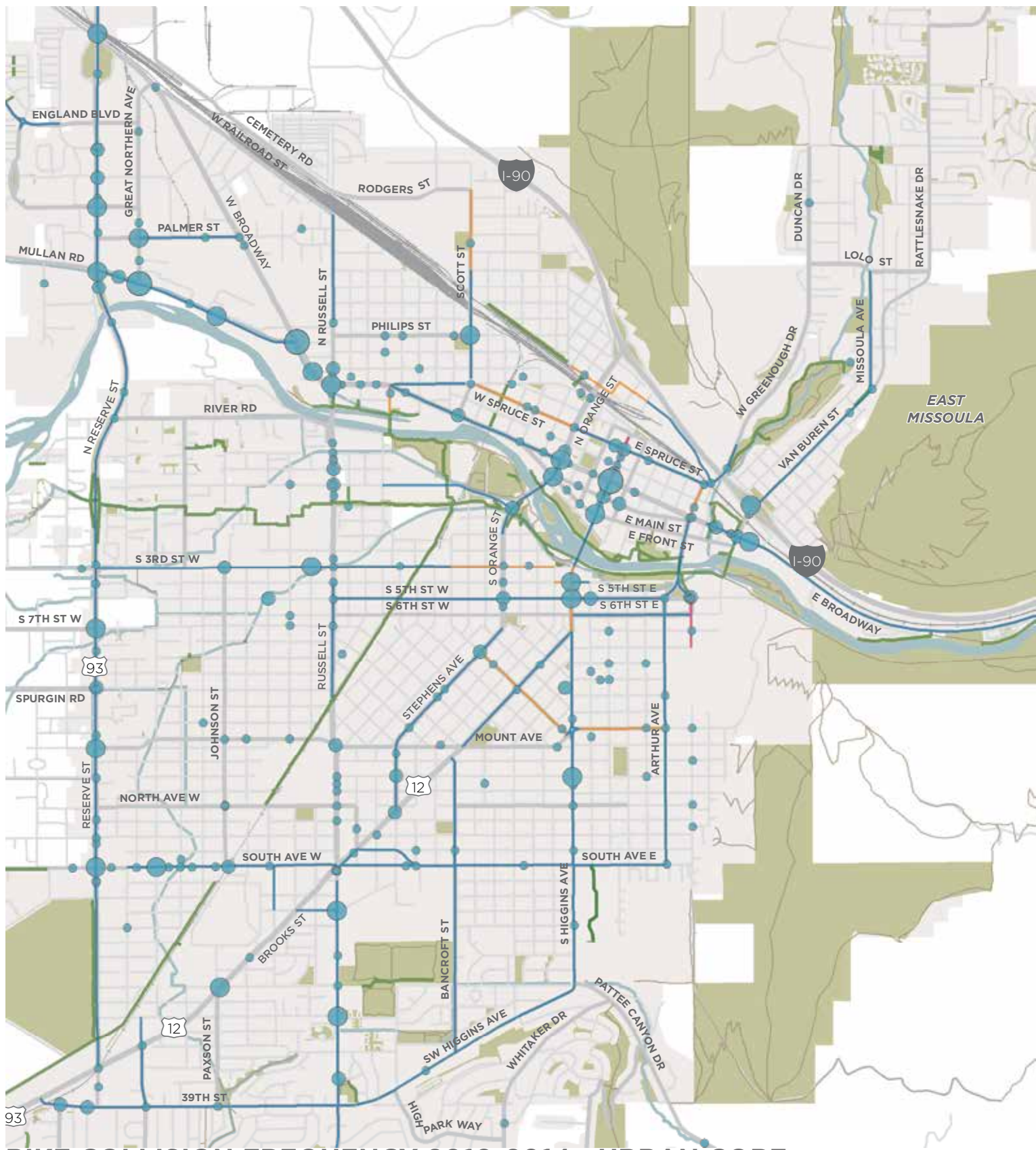
EXISTING BICYCLE NETWORK

- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

- Road
- +— Rail
- Water Body
- Park
- City Limits





BIKE COLLISION FREQUENCY 2010-2014 - URBAN CORE

FIGURE 14

0 0.5 1 MILES



COLLISION FREQUENCY

- 6 - 8
- 3 - 5
- 2
- 1

EXISTING BICYCLE NETWORK

- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

- Road
- Rail
- Water Body
- Park
- City Limits



Section 3: Needs Analysis



Design Users

Bicyclists, similar to pedestrians, are much more affected by poor facility design, construction and maintenance practices than motor vehicle drivers. Bicyclists lack the protection from the elements and roadway hazards provided by an automobile's structure and safety features.

It is important to consider bicyclists of all skill levels when planning and implementing bikeways. Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of people.

The current AASHTO Guide to the Development of Bicycle Facilities (2012) encourages designers to identify their rider type based on the trip purpose (Recreational vs. Transportation) and on the level of comfort and skill of the rider (Causal vs. Experienced).

The Four Types of Bicyclists

A more detailed framework for understanding of the US population as a whole, not just existing bicyclists, was developed by planners in Portland, Oregon¹, and supported by national research². This classification provides the following alternative categories to address varying attitudes towards bicycling in the US:

Strong and Fearless: Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes, and will typically choose roadway connections—even if shared with vehicles—over separate bicycle facilities such as shared-use paths.

¹ Roger Geller, City of Portland Bureau of Transportation. *Four Types of Cyclists*. <http://www.portlandonline.com/transportation/index.cfm?&a=237507>. 2009.

² Dill, J., McNeil, N. *Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential*. 2012.



1-3%

STRONG & FEARLESS



5-10%

ENTHUSED & CONFIDENT



50-60%

INTERESTED BUT CONCERNED



30%

NO WAY, NO HOW

Figure 15. Four types of bicyclists

Enthusied and Confident: This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low-traffic streets or shared-use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists—commuters, recreational riders, racers, and utilitarian riders.

Interested but Concerned: This user type comprises the bulk of the bicycling population and represents bicyclists who typically only ride on low-traffic streets or shared-use paths under favorable weather conditions. These users perceive significant barriers to their increased use of bicycling, specifically traffic and other safety issues, and may become “Enthusied and Confident” with encouragement, education, and experience.

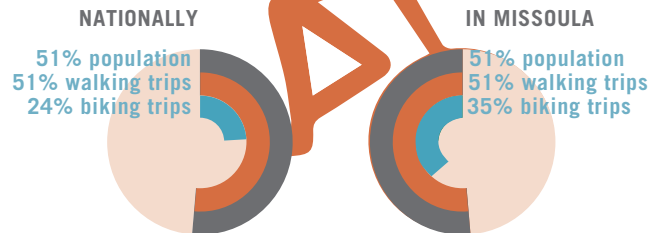
No Way, No How: People in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances. This group may also include residents who are physically unable to ride a bicycle.

Women on Bikes

The presence of women riding bicycles is often used as an indicator of how bicycle friendly a community is. In some European countries such as Germany, Denmark and the Netherlands, women take slightly more than half of all the bicycling trips. In the United States this number is approximately 24 percent³. Data gathered during the Missoula bicycle and pedestrian counts at seventeen locations from 2010 through 2014 showed consistent numbers year over year with women making 35 percent of the bicyclists counted at all stations. This number is higher than the national average but still below what it could be. Comparing data from various US cities and western European cities has indicated some correlation between a city having better bicycle infrastructure and more women bicycling.

³ Pucher & Buehler, *City Cycling*, Massachusetts Institute of Technology, 2012

WOMEN REPRESENT



Sources: ACS 2013, 1-yr est; NHTS 2009; Missoula Counts

Figure 16. Trips by women

Public Outreach Summary

This Bicycle Facilities Master Plan was produced concurrently with the Missoula MPO’s Long Range Transportation Plan (LRTP). As such, a robust level of public involvement was included in the planning process. Additionally, outside sources of recent information such as the 2015 Missoula Area Transportation Survey were consulted. The following sections summarize this input; however, they do not include activities or outreach targeted at the overall LRTP.

Missoula Transportation Summit and Bicycle Workshop

The project team, in partnership with the Missoula MPO, held a two-day series of public workshops on November 4 and 5, 2015. The bicycle network workshop was held at the Missoula Public Library and was attended by over seventy-five members of the public. Attendees were given an overview of bicycle facilities and then released to a series of activities. One activity featured area and city maps for more general bicycle related comments. In this way, the activity mirrored the wikimap format and output available on the project website (described in the following section). A second activity was also conducted asking participants to form small groups and develop a network of “neighborhood greenways,” which are local streets that are enhanced and prioritized for bicycle and

pedestrian travel. Such a network would utilize some of the 75 percent of Missoula streets that are currently undesignated as potential bikeways. In total, eighteen groups participated in this exercise. All public involvement was considered in the analysis that created the plan recommendations in Section 5.



Participants at the Bicycle Network Workshop

Project Website (www.activatemissoula.com)

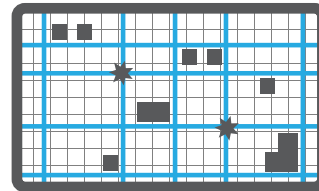
A project for the overall Long Range Transportation Plan Update was created to serve that project and the Bicycle Facilities Master Plan concurrently. The website contained an interactive “story” map, which provided previous recommendations and allowed the public to better understand the planning process. A interactive “wikimap” was created to allow solicit feedback from the public in a familiar Google Maps type interface. Participants were able to leave comments about driving, walking, biking, transit, and intersection specific comments. Overall 1,729 comments were provided within this framework during the last two months of 2015. The comments had a number of very clear themes, ranging from facility requests to safety concerns. This feedback received during the online mapping exercise is presented in Figure 18.

Wikimap Summary

765 Total Points Added to Map

That Generated

964 Additional Comments



Bicycle Comments



283 Total Points

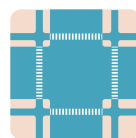
613 Additional Comments

86 Requests to better integrate existing bikeways

49 Requests for new bike lanes

30 Requests for new shared-use paths

Intersections / Crossings

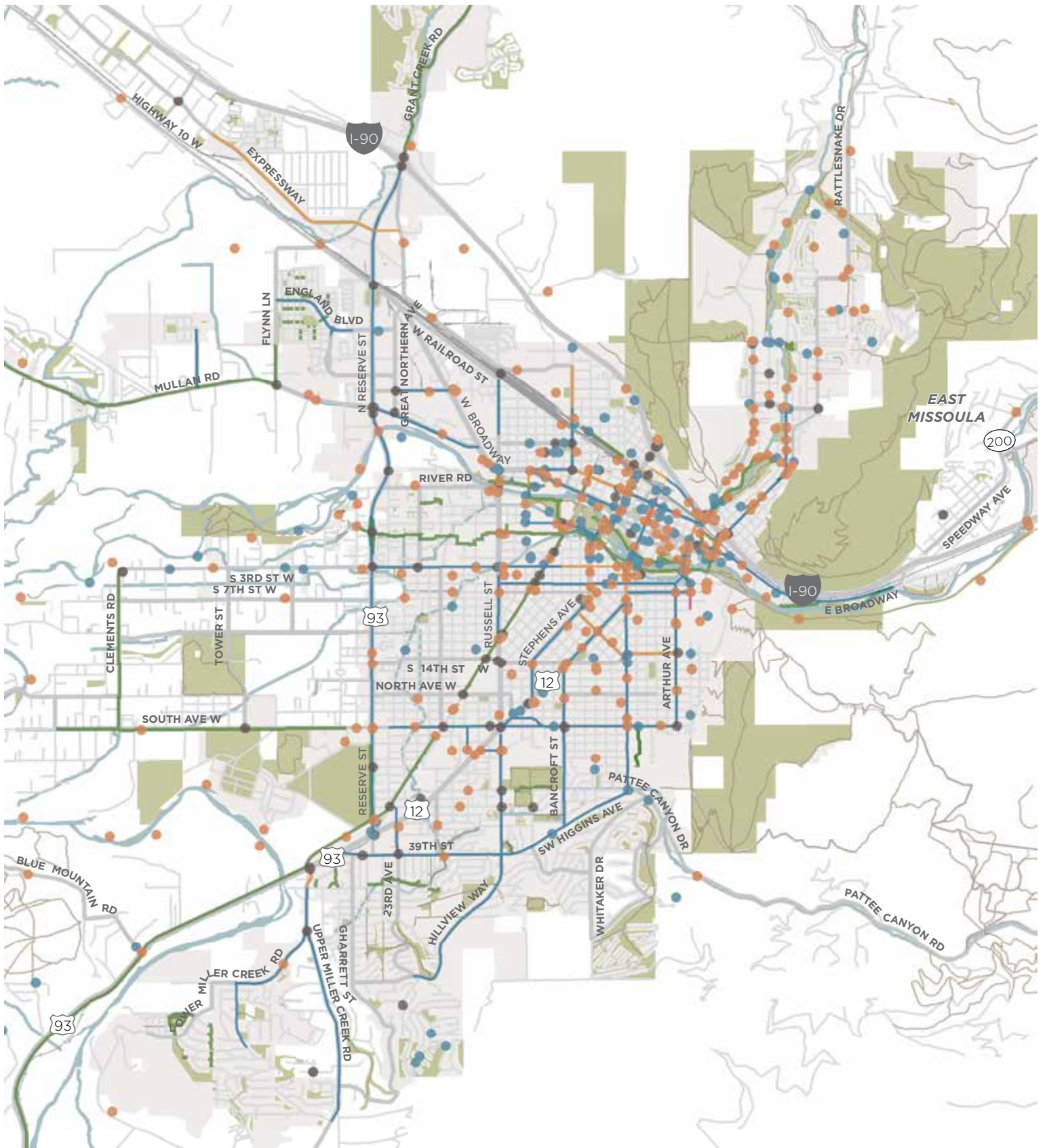


145 Total Points

173 Requests for improvements to existing crossings

70 Requests for new crossings

Figure 17. Wikimap results by the numbers



WIKIMAP RESULTS

FIGURE 18

COMMENT TYPE

- Bicycle Facility
- Pedestrian
- Intersection

EXISTING BICYCLE NETWORK

- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

- Road
- Rail
- Water Body
- Park
- City Limits



Issues and Themes

Figure 17 provides a high-level summary of public comment with regard to the bicycle network. For bicyclists, connection between bikeways was critical, with over 211 net likes on comments related to closing gaps between existing trails and on-street pathways or improving access destinations, with requests on extension of the Bitterroot Branch Trail being the most commented-upon topic, with over twenty respondents mentioning it. Safety and maintenance issues were also highly requested, with 36 and 35 net likes on related comments respectively. Street and shoulder width, pavement issues on shoulders, and dead-ends of bike lanes without transition were repeated throughout comments. There were also multiple comments about being uncomfortable sharing lanes with vehicles on busier collector roadways.

Residents also responded with bicycle and pedestrian issues at intersections. Many comments requested roundabouts or praised existing roundabouts, with over 27 net likes. Other common observations were issues with motorist speed at intersections, lack of signals or other treatments to aid crossings of arterial and collector roadways, and line-of-sight concerns.

Gaps and Opportunities Analysis

Although the existing bicycling system in Missoula is good by national standards, gaps and needs still exist, many of which are addressed in this plan. Opportunities differ from gaps because they represent the potential for development of facilities that are not necessarily missing segments. An example of this would be an under-utilized right of way that could be used for a new shared-use path or a popular bicycling route that lacks existing facilities. Many of Missoula's designated bike routes exist only as shared lane markings within the travel lanes of busy arterials and collectors. These routes were designated precisely because they constitute a gap between formal

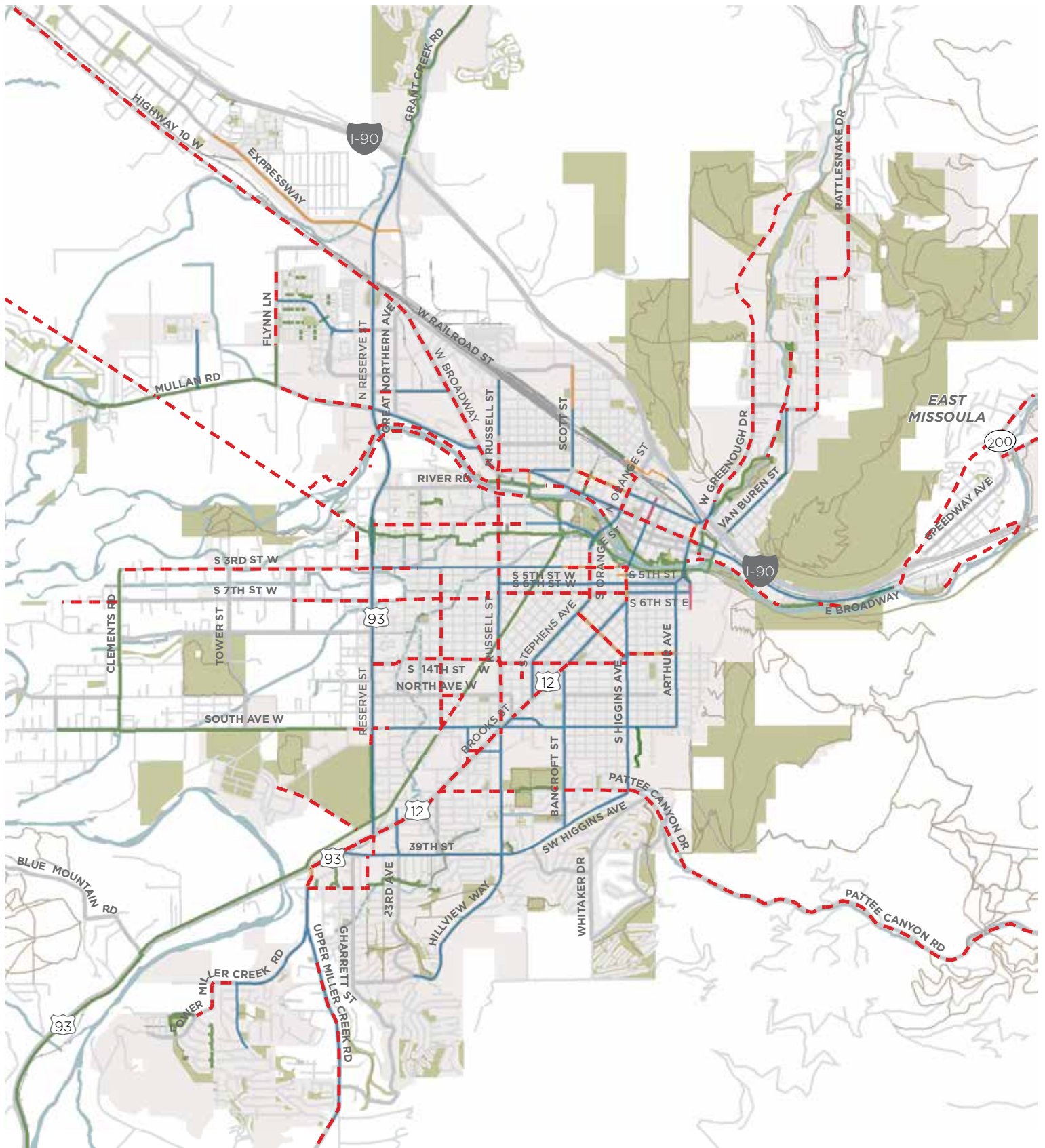
bikeways. As these treatments do not result in a comfortable solution for most bicyclists, they are identified as gaps in Figure 19. While it should not be considered comprehensive, this figure does show many of the more significant opportunities/gaps that exist in Missoula.



South 14th Street is designated as a bike route but carries heavy traffic and is uncomfortable for many bicyclists.



This bicycle crossing treatment along Burton Street across West Broadway Street represents what some of the seventy comments about new crossing treatments may be seeking.



IDENTIFIED NETWORK GAPS
FIGURE 19



- | | | |
|---|---|--|
| <ul style="list-style-type: none"> - - - - Network Gap | <p>EXISTING BICYCLE NETWORK</p> <ul style="list-style-type: none"> — Bicycle Route — Bicycle Lane — Protected Bicycle Lane — Unpaved Trail — Paved Trail | <p>OTHER EXISTING FEATURES</p> <ul style="list-style-type: none"> — Road — Rail — Water Body Park City Limits |
|---|---|--|

Level of Traffic Stress Model

The Level of Traffic Stress (LTS) Analysis was adapted from the 2012 Mineta Transportation Institute Report 11-19: *Low-Stress Bicycling and Network Connectivity*. A level of comfort for bicyclists is determined based on factors including posted speed limit, traffic volume, street width, and the presence and character of bicycle lanes or shoulders of sufficient width. The combination of this criteria separates the bicycle network into one of four scores:

- LTS 1: Low-stress roadway suitable for all ages and abilities
- LTS 2: Roadway comfortably ridden by the mainstream adult population
- LTS 3: Roadway ridden by “enthused and confident” bicyclists
- LTS 4: Roadway only ridden by the “strong and fearless” bicyclists

In general, streets with separated bicycle facilities or streets with extremely low volume and speeds would qualify as a low-stress (LTS 1) bikeway, while roadway shared with motor vehicle traffic operating at high speeds and volumes would receive a higher-stress score. The results of the LTS analysis helps identify existing areas with a high level of service as well as focus areas for improvement. Local streets with low traffic and low volume can be quite comfortable to most bicyclists despite being a shared lane environment. The LTS analysis is specifically focused on the street environment, adjacent shared-use paths (if present) offer a more comfortable facility type that is not reflected in the LTS score. Shared-use paths and trails are shown in Figure 20 for additional context. The City of Missoula assisted with considerable data collection to make this analysis possible. As part of a larger data collection effort, streets with bicycle lanes were measured by hand to determine travel lane width, bicycle lane width, and parking lane width (if present).

LTS provides an intuitive framework to describe the benefits of bicycle infrastructure, and demonstrates that some roadways may require more intervention than others to provide a truly comfortable experience. For example, the only time a standard bike lane is considered all ages and abilities is a 6 foot wide facility on a roadway with posted speed of 30 mph or lower, and the best score achievable on a roadway with four or more travel lanes without installing a separated bike lane is LTS 3.

Figure 21 depicts clusters of streets within Missoula suitable for all ages and abilities that are connected. In general, existing roadways that are considered comfortable do not provide access across areas. Clusters are fragmented and often break at major roadways. It is possible that enhanced intersections, new crossing opportunities, and improved lineal facilities could link many of these clusters, enabling a larger percentage of Missoula residents to feel comfortable bicycling for transportation and recreation. This analysis leans more heavily on the additional role that shared-use paths and trails can play in low-stress connectivity.



Local streets with low traffic volumes and speeds rank as LTS 1.



Fully separated bike lanes like Higgins Avenue and Maurice Avenue also qualify as LTS 1.



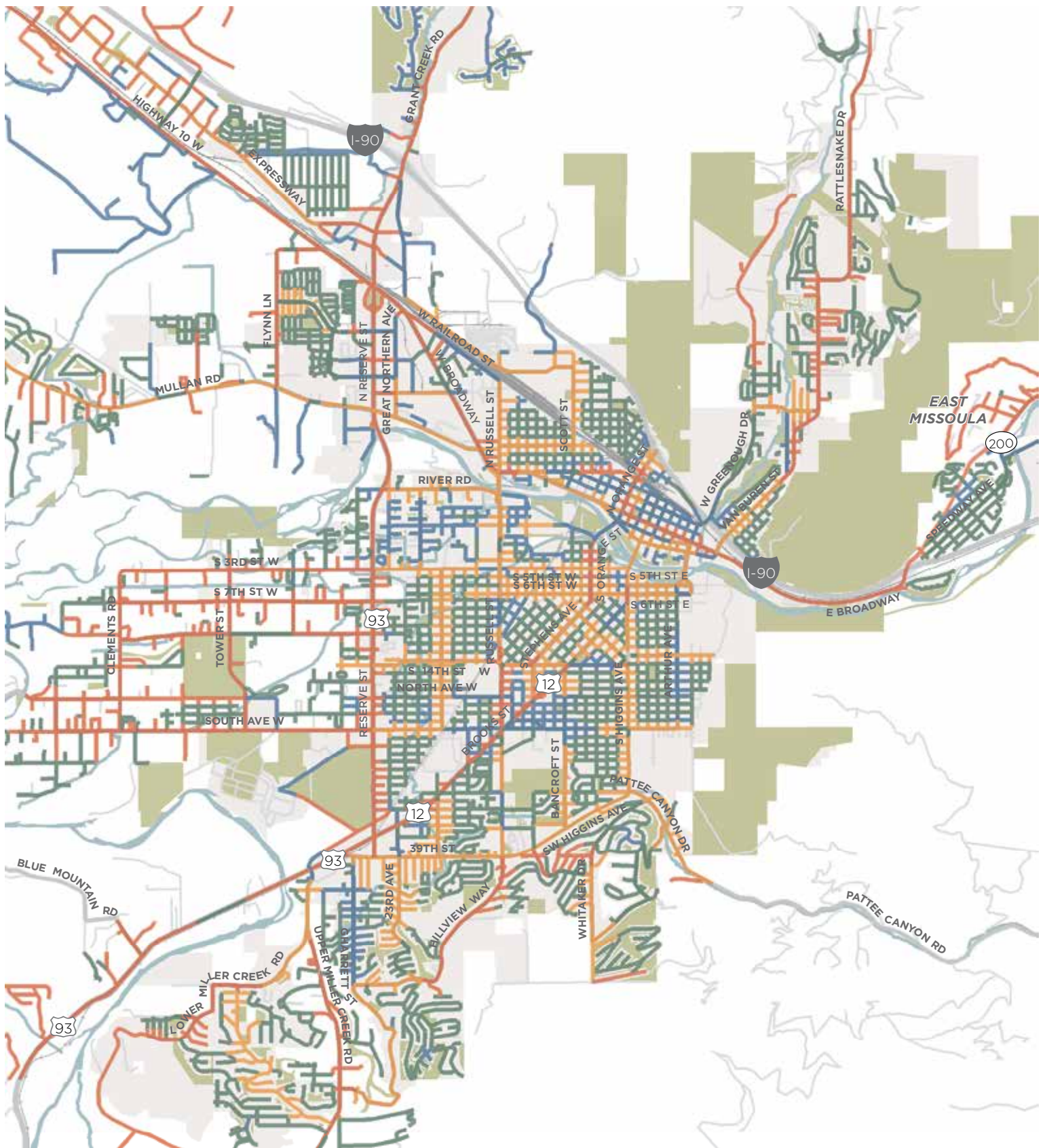
Bicycle lanes with no on-street parking and moderate speeds/volumes can be attractive for the mainstream population, as in this example on North 2nd Street near Greenough Drive).



Bike lanes where traffic speeds and volumes are higher and on-street parking is present can be more stressful and may only be utilized by more experienced bicyclists.



Sharing the traffic lane or riding on streets with high traffic volumes and speeds is not comfortable for the majority of residents.



BICYCLE LEVEL OF TRAFFIC STRESS

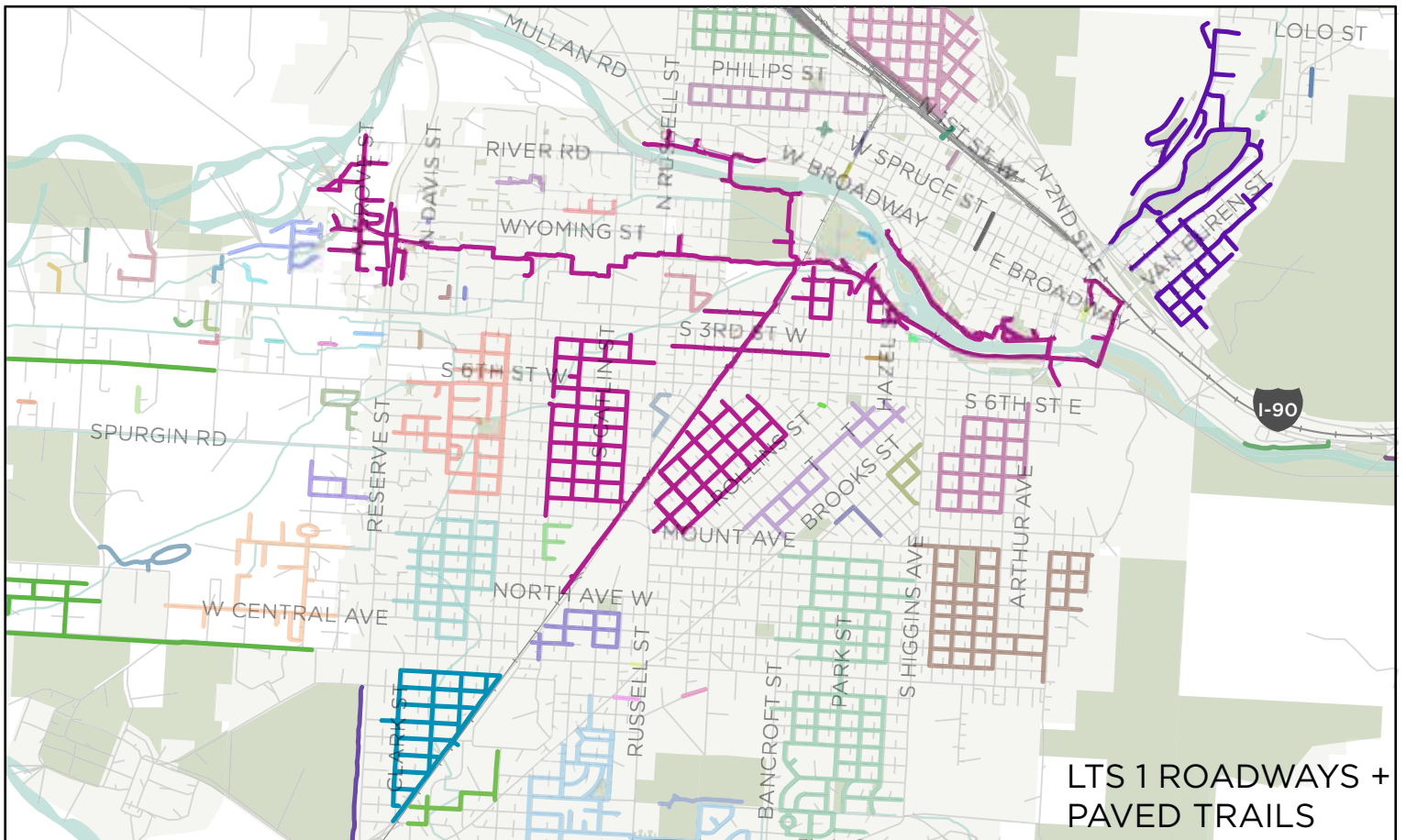
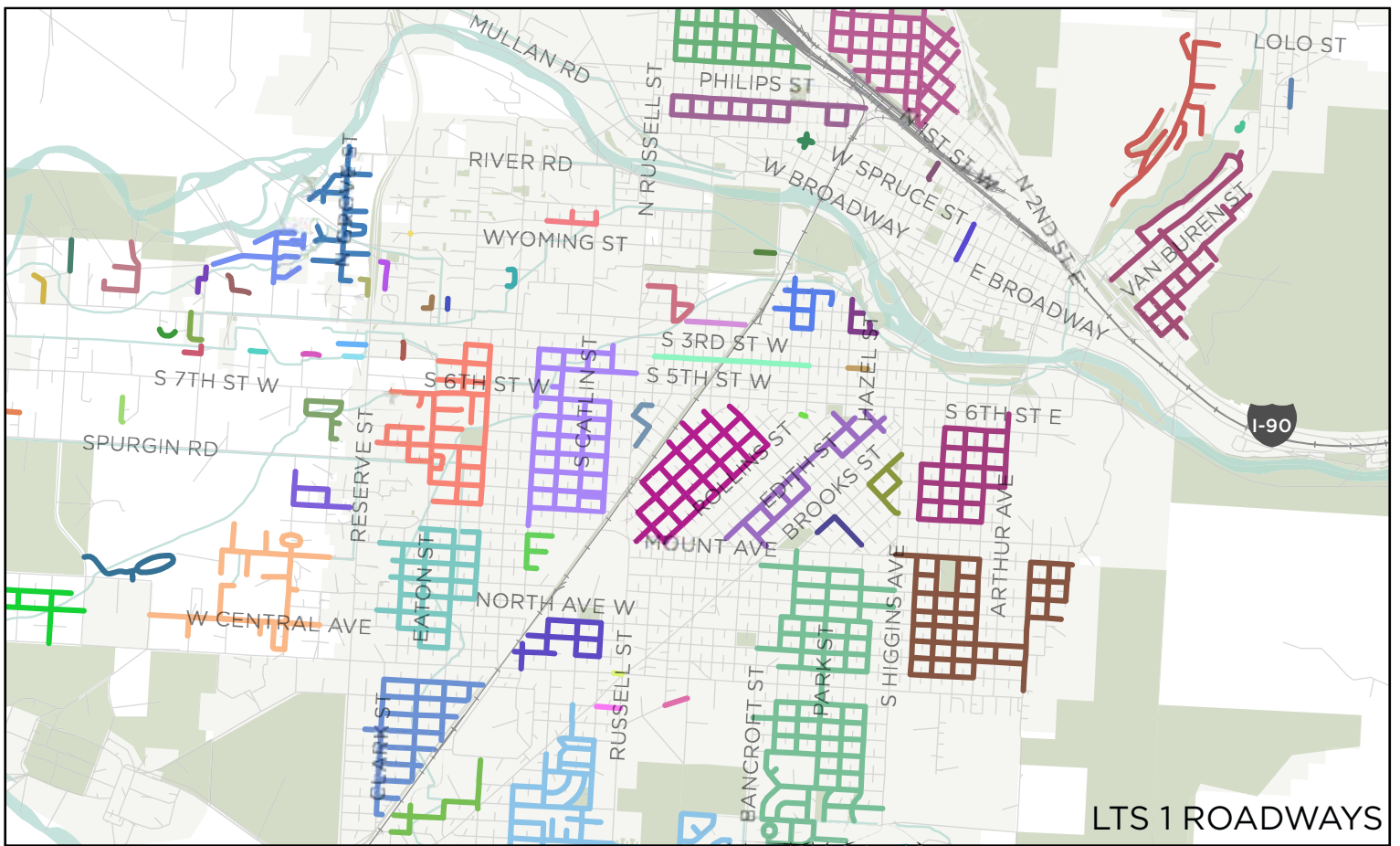
FIGURE 20

- 1: All Ages and Abilities
- 2: Average Adult
- 3: Intrepid Adult
- 4: Not Comfortable

OTHER EXISTING FEATURES

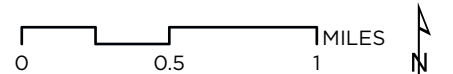
- Road
- |— Rail
- Water Body
- Park
- City Limits





LOW-STRESS NETWORK CONNECTIVITY
FIGURE 21

Connectivity clusters depict connectivity of roadways classified as suitable for all ages and abilities (LTS1). Clusters isolated from each other are identified through different colors. The top map depicts only public roadways that score as LTS 1. The bottom map includes paved shared use paths in addition to the LTS 1 roadways. Trails increase network connectivity and result in fewer disconnected clusters.

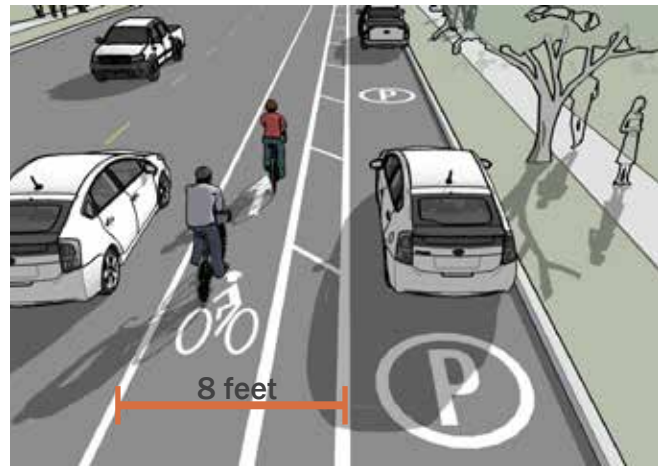


Facility Selection

Selecting the best bikeway facility type for a given roadway can be challenging, due to the range of factors that influence bicycle users' comfort and safety. One of the most important factors to consider when designing for bicyclists is determining the type of bicycle user the facility is meant to attract. User preference varies with bicyclist's skill level, trip purpose, and individual characteristics, and no simple rule exists for determining what users prefer. Nationwide, there is an increasing trend toward reducing the stress level of bicycling, thereby making it a more attractive activity for a larger percentage of the population.

There is no standard national approach for formulaic bicycle facility selection. Figure 22 demonstrates how multiple bicycle facility types are typically possible within the same amount of road space. Most agencies work to craft a customized set of criteria unique to local conditions.

Figure 23 represents a broad overview whereby roadway speed, volume and the number of vehicle travel lanes can provide some insight into what types of bicycle facility may be appropriate. This figure is based on collaboration with many US cities and subject matter experts. Additional factors may influence the decision to select one facility type over another beyond looking at speed and volume characteristics by themselves. For example, high frequency bus service could suggest that an alternate corridor be considered. Similarly, under utilized curb parking, or curb parking adjacent to large surface parking lots could be substituted for bike lanes on their own. Bicycle facilities can be upgraded over time as opportunities arise to provide a greater level of comfort.



A parking buffered bike lane (above) consumes the same amount of road space as a parking protected separated bike lane (below). Bike facilities can be upgraded over time as local resources increase in sophistication and resources.

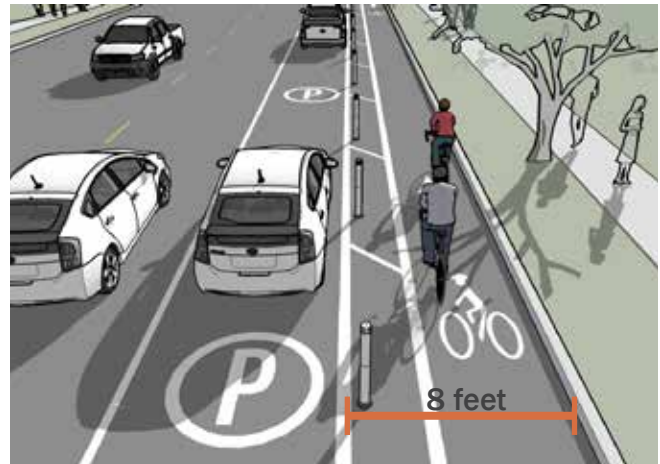
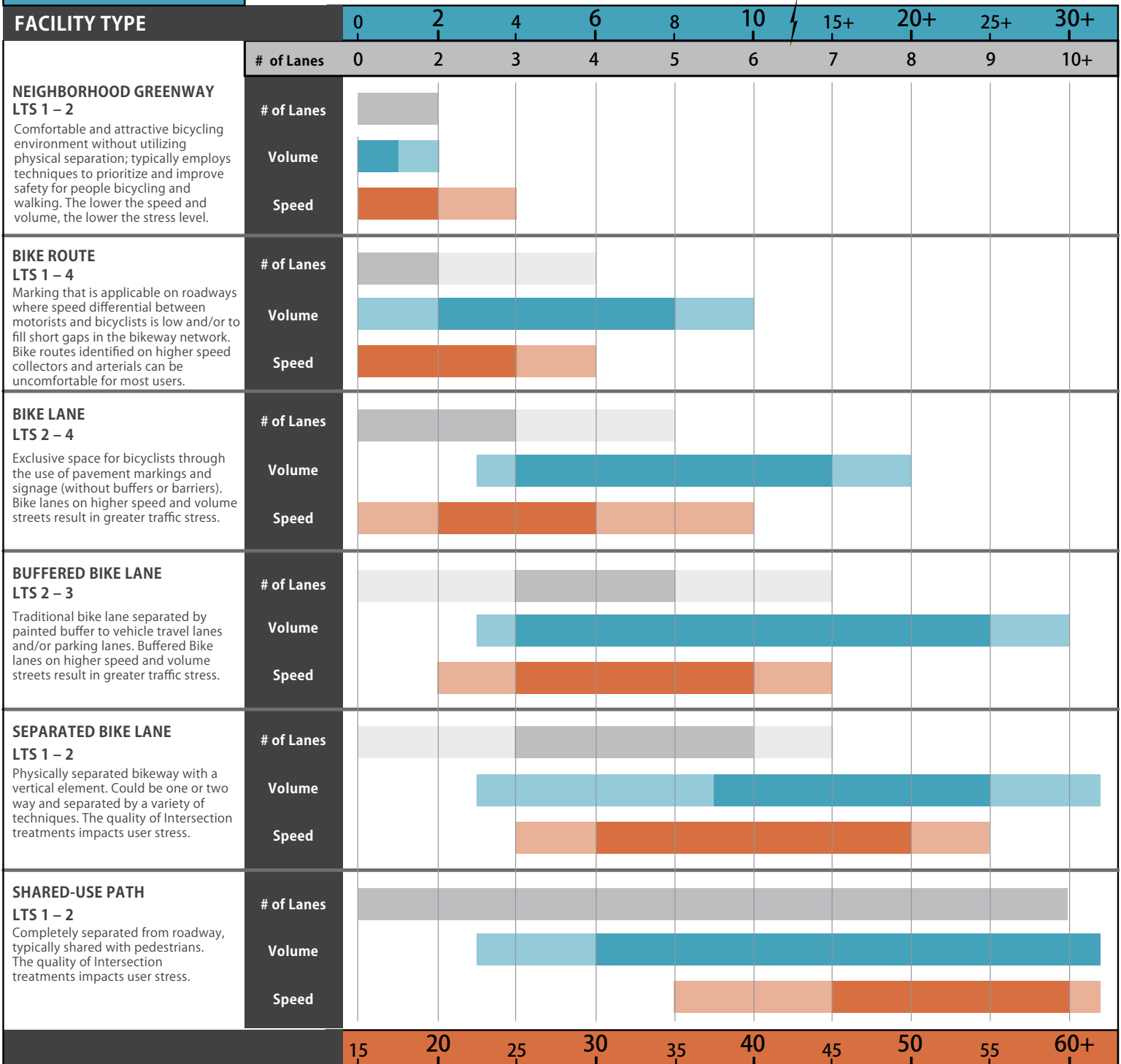


Figure 22. Example Bikeway Configuration Alternatives

BICYCLE FACILITY CONTEXTUAL GUIDANCE

AVERAGE ANNUAL DAILY TRAFFIC (1,000 veh/day or 100 veh/peak hr)



LEGEND

Level of Traffic Stress (LTS)

LTS 4 - Strong & Fearless Adult

LTS 3 - Intrepid Adult

LTS 2 - Average Adult

LTS 1 - All Ages & Abilities

min	LANES	max
min	VOLUME	max
min	SPEED	max

Acceptable Desired Acceptable

FACILITY SELECTION CHART
 FIGURE 23



Section 4: Recommendations



Recommendations

People who ride bicycles vary in their physical abilities, experience levels and the types of bicycles that they ride much more than users of other modes of transportation. A network of bicycle facilities designed in a way that accommodates these different types of bicyclists will result in a more connected city with higher bicycle use for all trip types.

This plan’s proposed bicycle network seeks to provide Missoula residents and visitors with viable, convenient, safe, and healthy transportation choices.

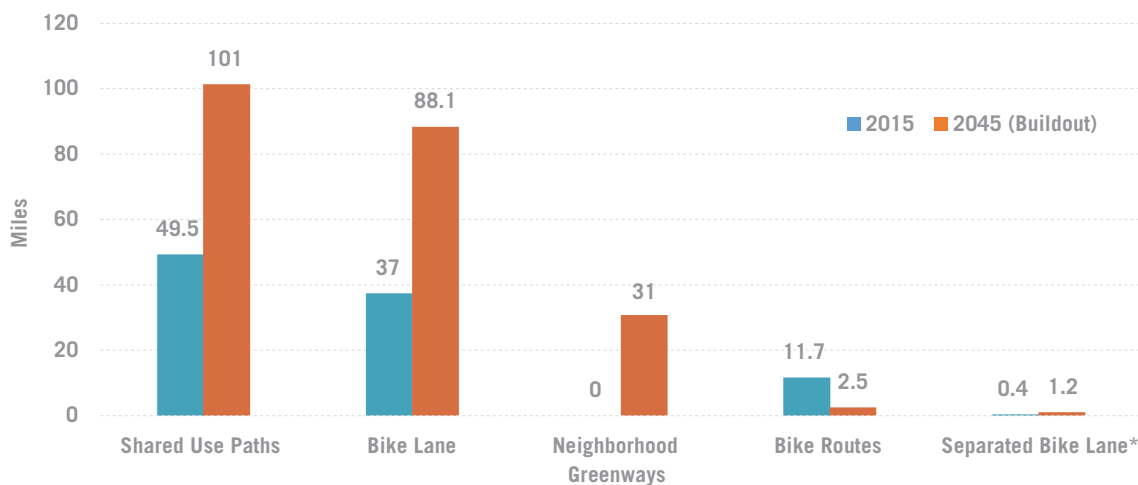
Recommendations Development

The recommendations provided in this chapter are based on a number of sources that include:

- Analysis and validation/modification of recommendations contained in the 2012 Long Range Transportation Plan
- Analysis and validation/modification of recommendations contained in the 2011 Active Transportation Master Plan
- Public input for the 2016 Long Range Transportation (public meetings and online feedback)

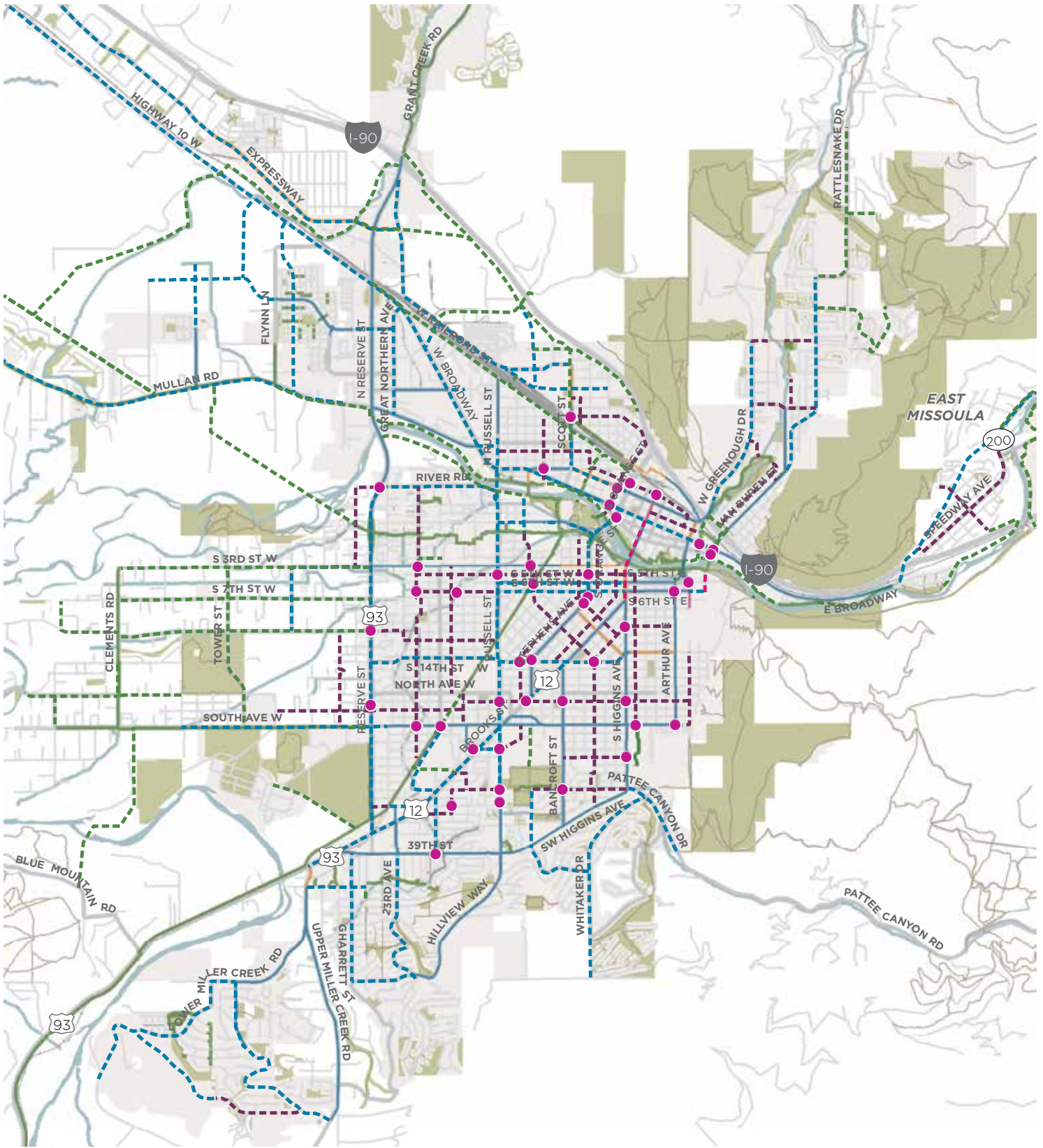
- Stakeholder Input. Projects were vetted with City, County and MPO staff. System ideas, concerns and preferences were also collected during other meetings and stakeholder interviews.
- Field Analysis. Field work was conducted throughout the planning process by project consultants and MPO staff.
- Connectivity/Gap analysis contained in the Needs Analysis Chapter
- Level of Traffic Stress. Recommendations were generated with the intent of making more of the Missoula area accessible by a larger portion of residents.
- Other recent planning efforts such as the Mall redevelopment plans and the North Reserve / Scott Street Master Plan.
- National Bicycle Facility Design Guides such as the AASHTO Guide for the Development of Bicycle Facilities and the NACTO Urban Bikeway Design Guide

In many cases the project descriptions in Appendix A list multiple options for implementation which could have varying levels of comfort. For example a bike lane could be implemented conventionally, or with lane narrowing or parking reconfiguration could be buffered or separated.



* Many bike lanes may be configured as separated bike lanes

Figure 24. Mileage of Existing and Proposed Facilities in the Missoula Urban Area



PROPOSED BIKEWAYS
FIGURE 25



PROPOSED BICYCLE NETWORK

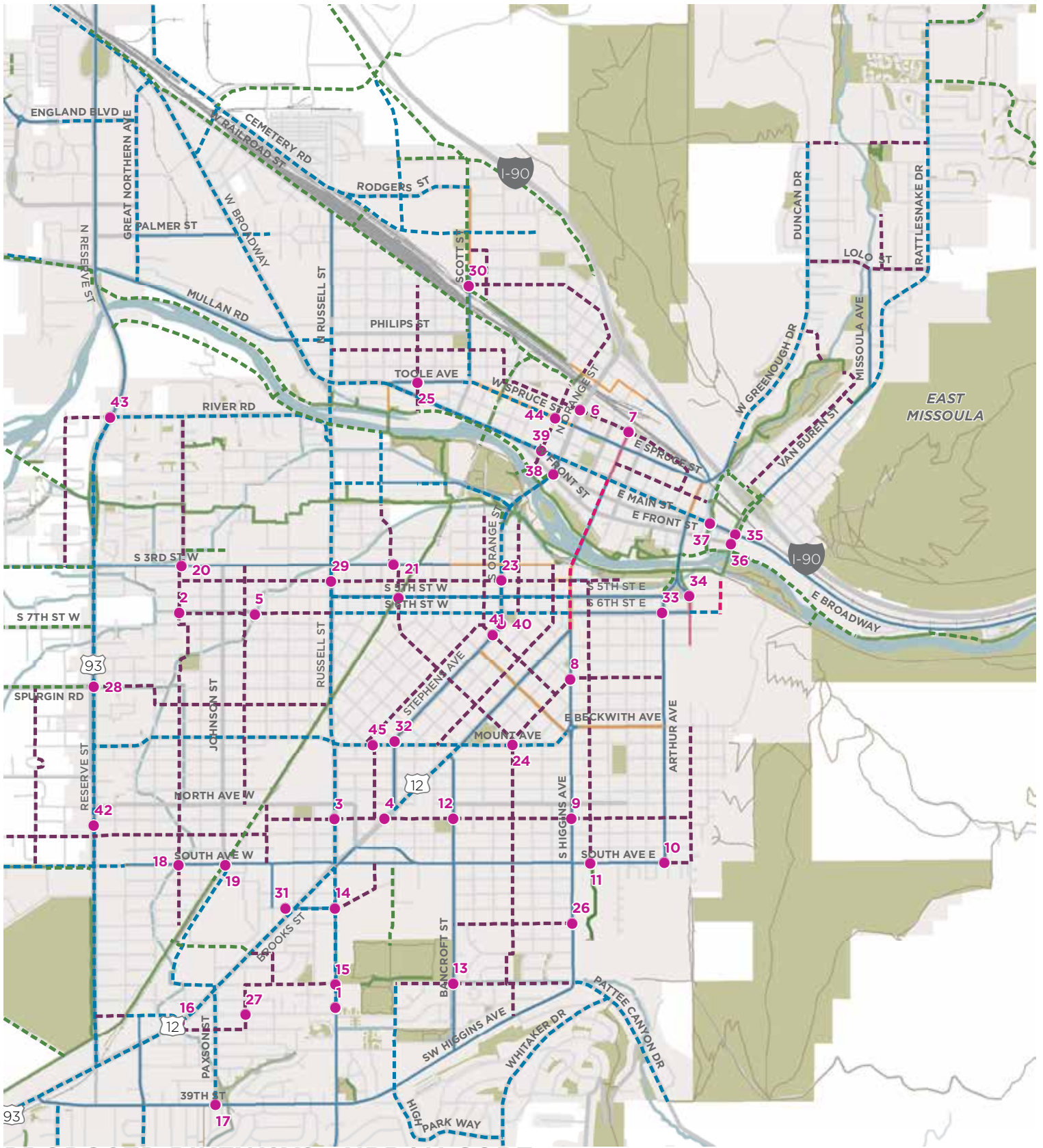
- Spot Improvements
- Neighborhood Greenway
- Bike Lane
- Protected Bike Lane
- Shared Use Paths

EXISTING BICYCLE NETWORK

- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

- Road
- Rail
- Water Body
- Park
- City Limits



PROPOSED BIKEWAYS - URBAN CORE
FIGURE 26



PROPOSED BICYCLE NETWORK

- Spot Improvements
- Neighborhood Greenway
- Bike Lane
- Protected Bike Lane
- Shared Use Paths

EXISTING BICYCLE NETWORK

- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

- Road
- Rail
- Water Body
- Park
- City Limits

Some recommendations; however, are more conceptual and additional coordination will be needed for implementation. All recommendations are subject to change and refinement as site conditions and development patterns change and as other adjacent or intersecting projects are implemented. Some projects may require feasibility studies to verify routing or applicability.

Many of this plan's recommendations focus on routine pavement preservation operations as the mechanism for on-street bikeway striping improvements. In the case of capital roadway projects the highest possible level of pedestrian and bicycle comfort should be incorporated into the design. For streets meant to carry traffic at higher speeds, a separated shared use path should be provided in rural contexts and separated bike lanes and sidewalks should be provided in urban contexts. Such opportunities may supersede the recommendations contained in this plan and be evaluated on a case-by-case basis.

Bicycle Facility Recommendations

Overall recommendations are classified into several categories and sub-categories:

Off-Street - Includes shared-use paths and neighborhood connections. Within this category, off-street facilities are classified whether they may be implemented as:

- Part of a complete street or reconstruction project.
- A stand-alone project that will require specific project funding and support for implementation.

On-Street - Includes bike lanes, buffered bike lanes, separated bike lanes and neighborhood greenways. Within the bike lane category (includes conventional buffered and separated), projects are further distinguished in two sub-categories:

- Project to be completed as part of more extensive complete street or reconstruction project or as part of existing pavement preservation program.
- Stand-alone on-street project that requires bicycle specific funding and support for implementation

Spot Improvements - Intersection and crossing improvements that may include signals, beacons, grade separation, bridges, or tunnels. Spot improvements will be needed to support existing bikeways as well as improve travel along new bikeways. Crash analysis showed that 67 percent of crashes involving bicycles took place within 100 feet of intersections. Improving safety network-wide will require additional safety improvements and the utilization of national best practices. Common design principles leading to comfortable and safe intersections for bicyclists include the following:

- Increase Conspicuity - of bicyclists, by positioning them in highly visible locations.
- Increase Awareness - of potential conflicts through defined conflict areas, markings and signs
- Isolate Conflicts - so that they can be negotiated separately from the intersection itself. Also, Reduce or remove conflicts through geometry, signaling and other treatments
- Clearly Assign Priority - so that all road users understand who has the right-of-way
- Minimize Speed - to increase reaction times and reduce the consequences of mistakes.

A table detailing the recommended improvements and associated planning level cost estimates can be found in Appendix A.

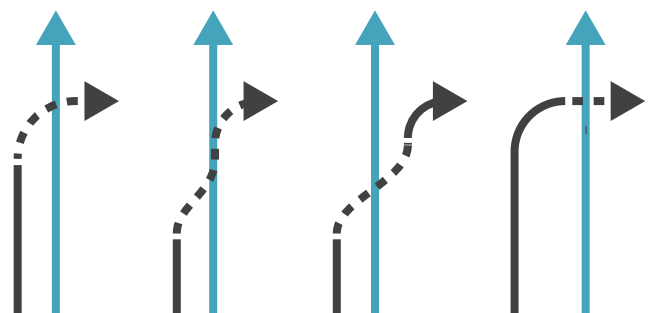


Diagram of various right turn conflicts between turning vehicles and through moving bicyclists.

Neighborhood Greenway Network

Throughout the planning process one of the facility types with the highest potential to quickly and cost effectively expand the low-stress bikeway network is a system of Neighborhood Greenways.

Neighborhood Greenways are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle and pedestrian travel priority. Neighborhood Greenways use signs, pavement markings, and speed and volume management measures to discourage through trips by motor vehicles and create safe, convenient crossings of busy arterial streets.

Many local streets with low existing speeds and volumes offer the basic components of a safe bicycling and walking environment. These streets can be enhanced using a range of design treatments, tailored to existing conditions and desired outcomes. As the streets themselves are not expensive to designate as neighborhood greenways, it is recommended that the City of Missoula designate the entire (or vast majority of the) recommended network as a single project. The city can then continue to improve the network through implementation of many of the spot improvements as resources permit.



This spot treatment in Palo Alto, CA allows bicyclists to cross a major street without allowing through vehicle traffic on the local street network.

Metrics

It is recommended that the City of Missoula adopt performance metrics such that the 85th percentile speeds along neighborhood greenways do not exceed 25 mph, and that the number of vehicles per day travelling over them does not exceed 1,500. The City should periodically conduct observations to check if these conditions are met. If speeds and volumes exceed the desired range, the city should explore implementation of various speed and volume management treatments to 'correct' the conditions so that they provide a high-quality experience for bicyclists and pedestrians.

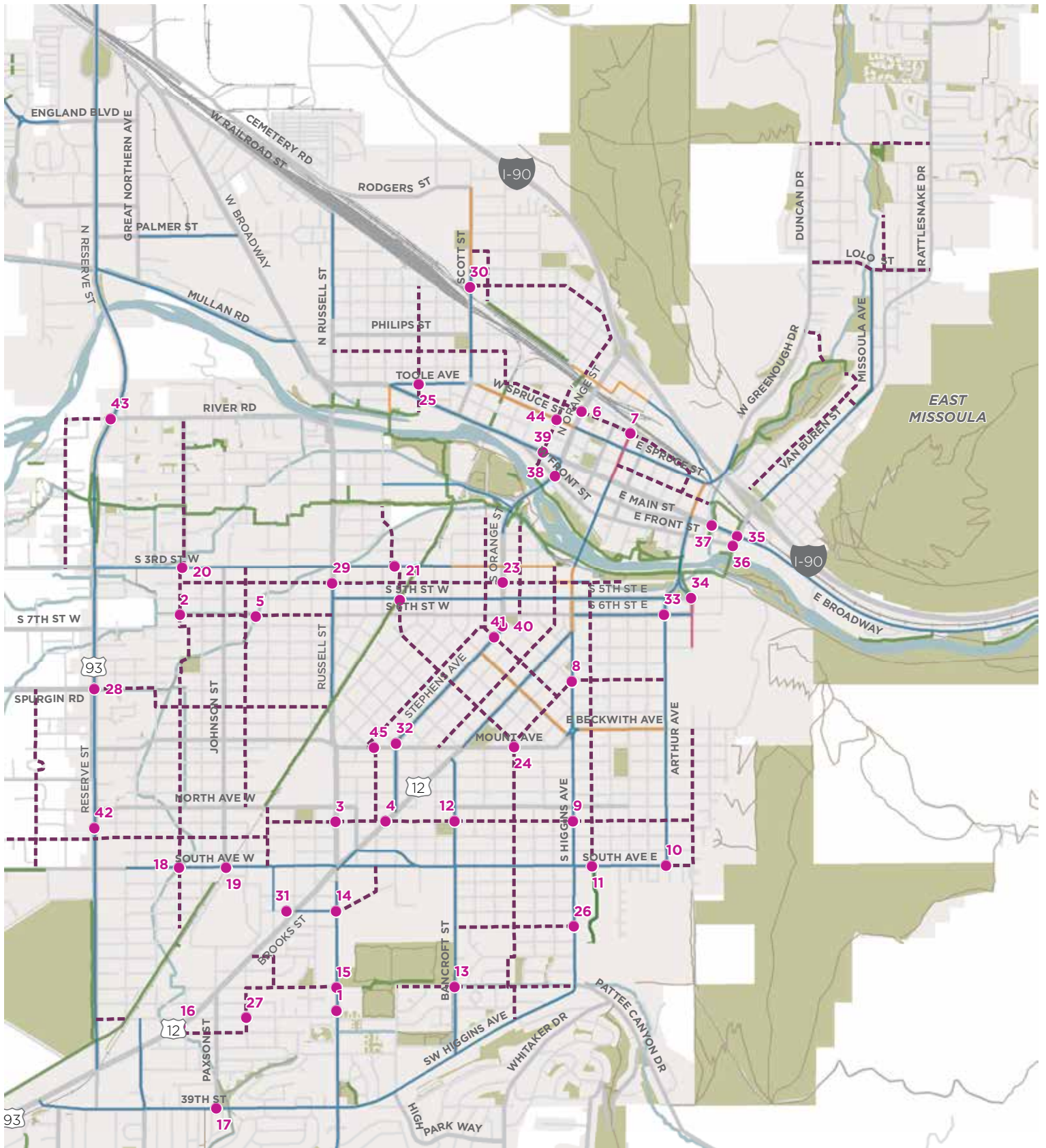


Existing speed hump along Pattee Creek Drive

Needed City Policy Changes

Creating a network of neighborhood greenways requires a series of changes to City policies. The following actions may be required before work can begin on design and construction of the greenway network.

Modification of Administrative Rule No. 415. This rule established by the Engineering Division provides good guidance on adding bicycle facilities to collector and arterial roadways. However, there is currently no mention of local streets being designated as bike routes, or, as is recommended here, Neighborhood Greenways. This rule should be modified to include guidelines for the addition of bike facilities to local streets along the neighborhood greenway network or that fulfill a short connection with other advantages to the bikeway network.



PROPOSED NEIGHBORHOOD GREENWAY NETWORK

FIGURE 27



PROPOSED BICYCLE NETWORK

- Spot Improvements
- Neighborhood Greenway

EXISTING BICYCLE NETWORK

- Bicycle Route
- Bicycle Lane
- Protected Bicycle Lane
- Unpaved Trail
- Paved Trail

OTHER EXISTING FEATURES

- Road
- Rail
- Water Body
- Park
- City Limits

Neighborhood Greenway Speed Limit. National best practice for neighborhood greenway implementation attempts to reduce the speed limit along streets with this designation. It is recommended that the City of Missoula establish an official designation for neighborhood greenways which allows a 20 mph statutory speed.

Wayfinding System

In 2015, Destination Missoula in association with the City and other stakeholders, completed an extensive planning process that covered development of a wide variety of wayfinding sign types and purposes. Within this effort trail and on-street bikeway sign family types were completed. These signs ultimately should be a familiar component of the entire Missoula bikeway network. These signs have particular utility along the neighborhood greenway network as many residents are not familiar navigating the city on local streets.



In Oregon, a bill was passed at the state legislature allowing 20 mph local street designations



Approved Missoula On-Street Bikeway Wayfinding Sign Types



Existing bicycle system signage should be removed and replaced with wayfinding signs

Implementation

Bicycle wayfinding sign designs were created; however, no destination lists were created or signs located. Implementing a wayfinding system typically has several key steps:

1. Create Destination Hierarchy - Destinations for inclusion in the system must be selected. Typically destinations must be open to the public and should not for profit. Tiers of destinations are typically defined to help guide the process.
2. Route Prioritization - A potential first phase of implementation could be in conjunction with the neighborhood greenway network. The supplemental identifier sign of an adult bicyclist pulling a trailer was intended to identify 'family friendly' routes. These signs should be a part of every future bikeway project and be retrofitted to existing bikeways as resources allow. Additional phases could include other on-street bikeways.



Directional shared lane markings in Jackson, WY link this neighborhood bike route to a trailhead.

3. Sign Placement Guidelines - Consistency is important so that signs are located in a consistent manner which creates a familiar experience along any signed route.
4. Sign Programming - This phase identifies the custom destinations to be included on each sign.

The existing 'Missoula bike system' signs should be removed as they do not serve a significant functional purpose and will conflict with the design of the wayfinding signs as they are installed. Bike lane signs are also now optional and may be removed if desired.

Additional wayfinding elements integrated into the neighborhood greenway network could include directional shared lane markings which use their chevrons to indicate the intended direction of travel.

Program Recommendations

Education, Outreach and Enforcement Initiatives are provided in Chapter 7 of the 2011 Active Transportation Plan. This Bicycle Facilities Master Plan supports those recommendations and focuses on achieving a more complete physical network.

Evaluation

Historically, Missoula has been proactive with regards to monitoring bicycle and pedestrian usage of the system. The six permanent automatic counters along various shared use paths along with the semi-annual manual count programs have produced a useful information. These sources should be expanded upon with additional full time counters both on and off-street. Full time automatic counters will provide the City and MPO with a continuous data stream to better appreciate seasonality of system usage and changes over time. As new routes are added or improvements are made usage of the system will change as bicyclists seek out safer and more comfortable routes. For example, if the full network of neighborhood greenways is implemented, bicycle circulation throughout the area will likely change significantly. As the 2014 and 2015 manual counts have shown, weather has a significant impact on bicyclist usage.



Temporary pneumatic tube counter with optional LED screen (www.waycount.com)

Phasing out the manual count program for a system of automatic counters is recommended so that data can be better compared year-over-year, and not skewed by a single storm or poor air quality.

Additional Trail Counters

Additional counters should be installed throughout Missoula. High value locations include the Milwaukee Road Trail, the Grant Creek Trail, the Bitterroot Branch Trail and the Riverfront Trails.

On-Street Counters

While off-street trail counters yield reliable count data for years in a controlled environment, little equivalent data exists for the on-street bikeway network beyond a snapshot two-hour manual count, or specific traffic study. Fortunately there are a variety of technologies that have come to market that make counting bicyclists and pedestrians using the street cheaper and more user friendly. There are two families of automatic counters.

Temporary Installations involve a counter installed for a short period of time. This family includes pneumatic tube counters, video, radio, and infrared devices. Such devices can be set up for a week or more at a time on a regular schedule to better understand usage over time.



Traffic signal with video detection upgraded to detect and count bicyclists. SmartCycle software shown (www.iteris.com)

Because the installation is temporary, the same hardware can be used to count dozens of on-street locations per year at a lower cost.

Permanent Installations are intended to collect data continuously year-round. These technologies include inductive loops, in-ground radar, stand alone additions to and in some cases potential modifications to a range of existing city traffic detection equipment with a simple software update. Based on the supplier of video detection utilized within the City of Missoula, the technology compatible with this upgrade and could be used to detect and count bicyclists.



In Boulder, this permanent counter displays the number of bicyclists per day and for the year to showcase the level of bicycling in its downtown. Higgins Avenue could be a potential location for a similar device.

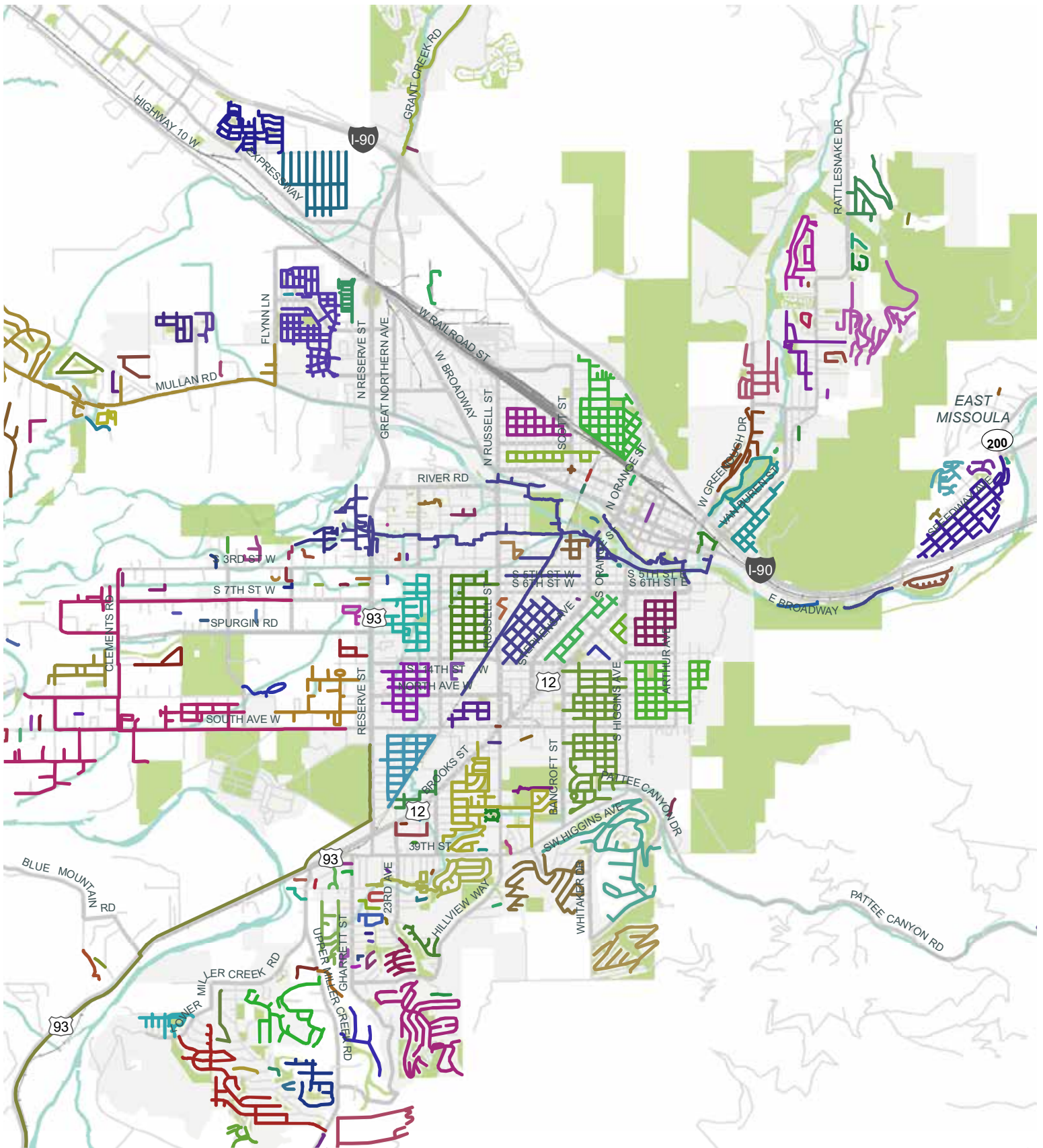
Missoula should stay aware of additional technological advancements in counting technologies, which may lower the cost and expand the abilities of the city to collect meaningful data. A 2016 resource summarizing the state of the practice can be found online¹.

Future Network Accessibility

Section 3 - Needs Assessment introduced the different types of Missoula area residents and the value of a low-stress bikeway network, which includes trails, neighborhood greenways and separated bike lanes. The reach of this bikeway network is one critical measurement of how well the physical bikeway network serves Missoula's residents and visitors. Figures 28 and 29 show the 2015 low-stress bikeway network and the ultimate buildout of this plan. It is evident that as projects are completed the accessibility of the network to less confident bicyclists will improve. The proposed network of neighborhood greenways and associated spot improvements will have a substantial impact on the connectivity of the low-stress network. Key shared use path connections will also allow isolated communities such as East Missoula, Rattlesnake Canyon and other more isolated residential areas to join the low-stress network.

Low-stress connectivity can be monitored over time as one metric to evaluate the success of bikeway implementation.

¹ <http://altaplanning.com/wp-content/uploads/Innovative-Ped-and-Bike-Counts-White-Paper-Alt.pdf>



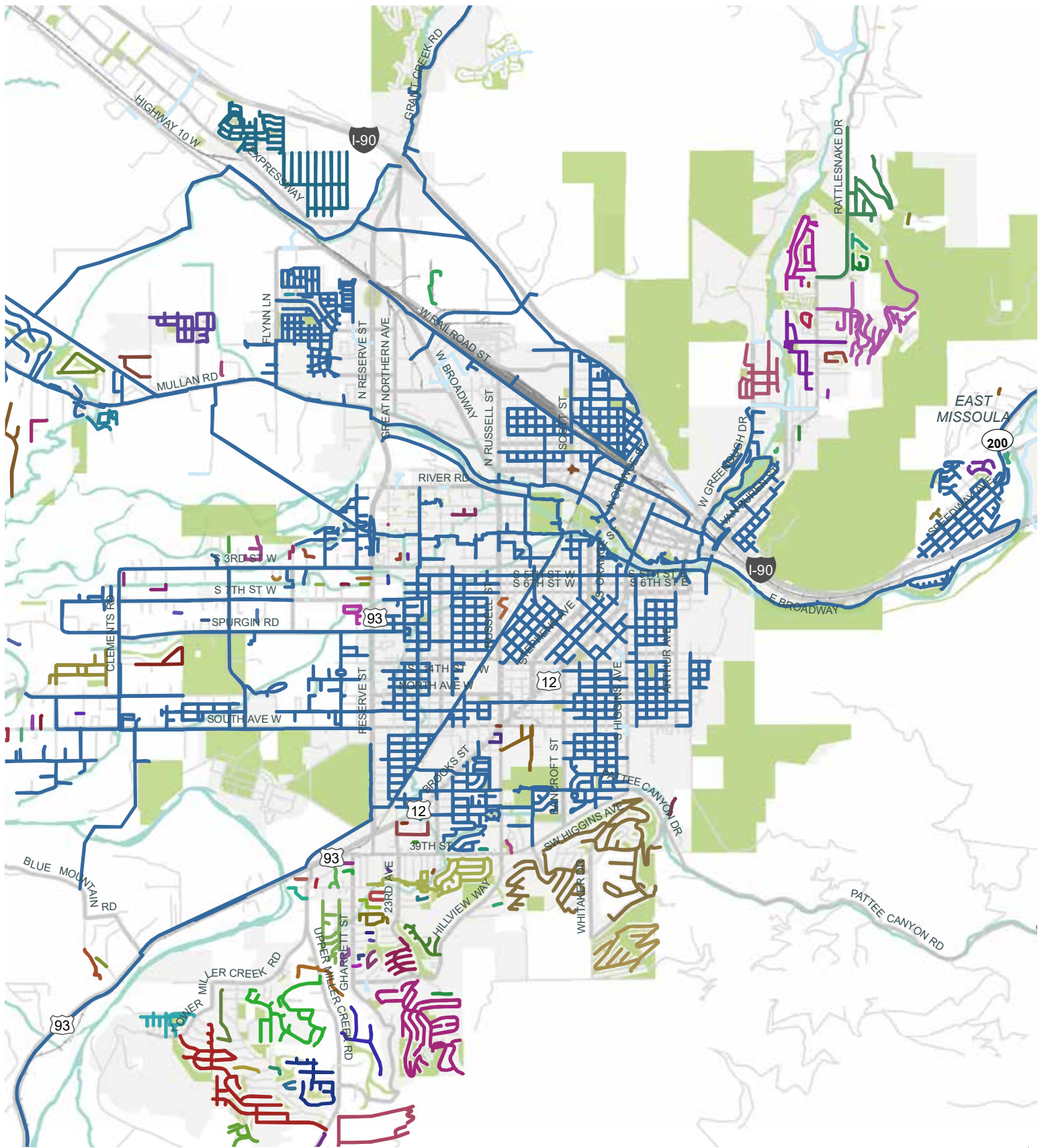
BICYCLE LEVEL OF TRAFFIC STRESS: EXISTING CONDITIONS

FIGURE 28

- Road
- Water Body
- Rail
- Park
- City Limits



Connectivity clusters depict connectivity of roadways classified as suitable for all ages and abilities (LTS1). Clusters isolated from each other are identified through different colors. This map includes existing paved shared use paths in addition to the existing LTS 1 roadways. Trails increase network connectivity and result in fewer disconnected clusters.



BICYCLE LEVEL OF TRAFFIC STRESS: PROPOSED NETWORK

FIGURE 29

- Road
- Rail
- Water Body
- Park
- City Limits

Connectivity clusters depict connectivity of roadways classified as suitable for all ages and abilities (LTS1). Clusters isolated from each other are identified through different colors. This map includes existing and proposed paved shared use paths in addition to the existing and proposed LTS 1 roadways at the buildout of this plan.



Section 5: Implementation



Implementation

The projects, programs and policies recommended in Chapters 5, and the appendices of this document represent a visionary plan for Missoula and the surrounding area. All of these improvements cannot be made quickly; moreover, it will take many years of steady incremental progress to achieve this vision.

Implementation Goals

The 2016 Long Range Transportation Plan establishes the first mode share goals as a part of transportation planning in Missoula. In the year 2045, this goal calls for a reduction in drive-alone commuting from 70 to 34

percent of commute trips while generally tripling bike, walk and transit commute mode shares. Implementation of the Bicycle Facilities Master Plan will play a significant role in achieving this goal along with programmatic recommendations contained in the 2011 Active Transportation Plan.

To support the mode share goal, the 2016 LRTP recommends a funding scenario which distributes discretionary transportation funding sources more evenly between all modes. This funding scenario, in theory, contains substantial increases in non-motorized transportation, complete streets and transit improvements. Sources of funding include city impact fees, Missoula Redevelopment Authority (MRA) funding and other local



Missoula's 2045 transportation goals and funding priorities support a diverse transportation system

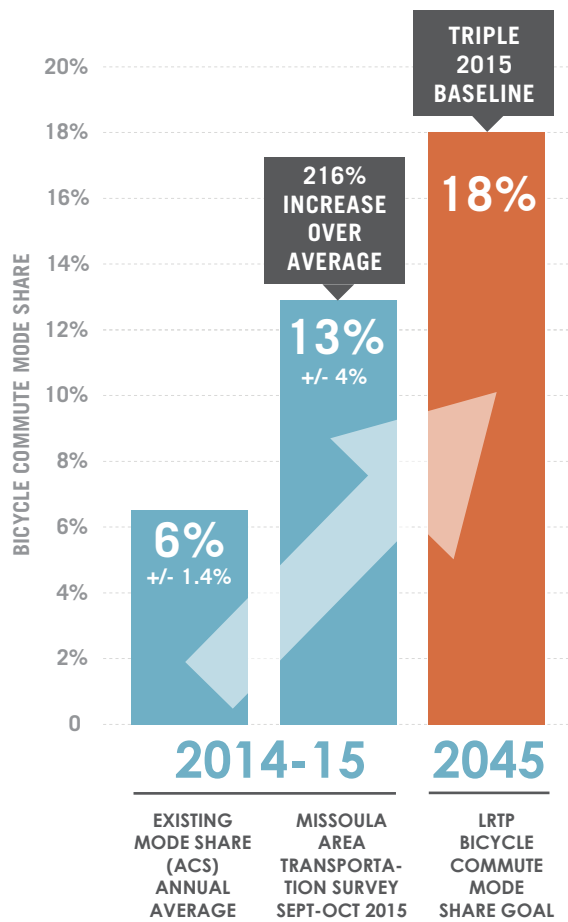


Figure 30. LRTP bicycle commute mode share goal

sources; however, prior commitments and uncertainty in federal funding will mean that the proposed level of funding alone will not achieve the mode share goals.

Implementation Strategies

Implementation of this Plan will take place in small steps over many years and involve a number of critical partners. The City of Missoula, Missoula County, MDT, MRA and the private development community will all make critical contributions to the bicycle network. As a companion document to the 2016 Long Range Transportation Plan, each of this Plan’s recommended projects has been prioritized within a common framework with other complete streets projects, transit projects and other roadway projects. Using these prioritization results should only be one of several factors that may determine the order of project implementation. Bikeway implementation can often be based on opportunities, which should not be overlooked even if they did not rate near the top of the scoring

exercise. The following strategies and actions can guide Missoula toward completing the vision network identified in the Plan.

Complete Inexpensive ‘Low-Hanging Fruit’

Many projects in this Plan may be accomplished with relative value without major roadway reconstruction or resurfacing. Potential projects should be reviewed annually to determine how many of these projects can be completed. Projects that may be low-hanging fruit include, bike lanes that require striping only to complete, wayfinding, and the neighborhood greenway network.

Leverage Resurfacing Projects

Missoula streets are subjected to hundreds of freeze-thaw cycles annually, snow tires, heavy vehicles, plowing operations and other stresses. These influences reduce the life of the pavement surface requiring more frequent pavement surface preservation than in other US Cities. Each chip seal, or mill and overlay project should reference relevant transportation plan documents and serve as an opportunity to implement bike lanes with little incremental cost.

Leverage Other Roadway Projects

Projects such as the Russell Street reconstruction and other future City, County and MDT projects should include bicycle, pedestrian, transit and crossing improvements called for in the various local plans.

Pursue Visionary Projects

In the 2012 Long Range Transportation Plan the Missoula to Lolo Trail was classified as an ‘illustrative’ project with no funding prospects over the planning horizon. Just four years later, the project is complete thanks to a federal TIGER grant and partnership with the Missoula Redevelopment Authority, which funded a signature overpass of Reserve Street.

Establish Dedicated Local Funding

Bikeway funding in Missoula is typically an opportunistic mix of funding sources from the Federal, State

and Local levels. In recent years with the passage of the Federal transportation bills, MAP-21 and the FAST Act, dedicated funding for non-motorized transportation has been reduced and become more competitive with other Montana communities. The Missoula area has received only one Transportation Alternatives grant from 2012-2016 versus annual dedicated funding under the previous transportation bill through the Community Transportation Enhancements Program (CTEP). Missoula County also has a Trail Bond Program, which provides \$3 million for trail projects.

It is recommended that the City of Missoula establish a sustainable annual source of local funding to implement the Bicycle Facilities Master Plan, support the mode share goals of the region and supplement existing sources of discretionary transportation funding. This can be accomplished in a number of different ways.

- Creation of City Bicycle Account with the objective of safety improvements, enhancements and targeted expansions of the city's bikeway network. The bicycle account could be similar in scope to the sidewalk subsidy (up to \$600,000 per year) being used to subsidize repairs and expand sidewalk coverage in the area on an individual property owner basis. The bicycle account funding would need to be allocated as an amount within the City's annual budget. Likely candidate projects would include intersection improvements, or short sections of trail or bike lane that could not be implemented through road or resurfacing projects.
- Pursue Non-Motorized Transportation District. This would be a voter approved initiative that would provide annual funding towards pedestrian and bicycle improvements.
- Pursue increase in local gas tax with portion of proceeds going to non-motorized projects. The 2015 Missoula Area Transportation Survey found that over 40 percent of area respondents were supportive of increasing the gas tax, and additional 18 percent

were favorable towards increases in development fees. These results show a greater willingness to fund improvements locally by expanding financial contributions beyond local property owners. An increase in the gas tax would also generate revenue from students, renters and visitors to the area.

Cost Estimates

Planning level construction cost estimates for each project are provided in Appendix A. As unknowns are still high a range of potential cost from low to high is provided. This broad range of potential costs is appropriate given the level of uncertainty in the design at this point in the implementation process. Engineering costs and any property acquisition costs (if applicable) are not included in the cost estimate. The following provides greater detail on some of the associated costs.

Shared Use Paths

Path construction can require a high level of preparation – purchasing property, engineering design, and coordination with many stakeholders. Costs for a new shared use path typically range from \$80-\$140 per linear foot, depending on complexity. Projects that just need minimal grading and pavement will run at the lower end of the range, where projects that require culverts, bridges, retaining walls or other expensive amenities will fall toward the upper end of the estimate.

Neighborhood Greenways

The costs assume that the project consists of wayfinding signs every quarter-mile and roadway markings about every 200 feet. At about \$400 per installed sign and \$200 per marking, the per mile cost is roughly \$17,000. Thermoplastic markings are recommended as paint markings will typically wear out completely in less than one year. Intersection improvements are estimated based on the level of complexity. In general, the more concrete and signal work is required, the more expensive the improvement.

Bicycle Lanes

Painting a bicycle lane on a road with sufficient width costs roughly \$10,000 per linear mile (\$5,000 in one direction) for paint striping and thermoplastic stencils. For such retrofit projects, some may require few or no other changes to the roadway configuration, however some may require lane configuration or orientation changes. This can be done by removing the existing road markings and applying new ones, or it also may be included as part of a routine resurfacing. When bike lanes are added as part of a resurfacing project. Additional features such as buffers or separated bike lanes increase the cost further.



Bike lanes, if applied during routine pavement preservation projects or reconstructions carry very little cost

Rectangular Rapid Flash Beacons (RRFBs)

These cost about \$15,000 for a pair of solar powered beacons and pedestrian buttons.

Median Refuges

Median cost will vary depending on the overall design, Typically a Bicycle crossing median with pedestrian accommodations will range from \$8,000 to \$25,000.

Curb Extensions

Curb Extensions vary depending on size, however a good rule of thumb amounts to approximately \$5,000 per extension in each direction.

Hybrid Beacons

Hybrid Beacons cost substantially more than a RRFB, however less than a full signal. Costs can range from \$40,000 to \$70,000 for a Hybrid Beacon.

Performance Measures

It is recommended that the Missoula MPO create a bi-annual Bikeways and Trails Report Card document that reviews key metrics and evaluates progress over time in implementing the bikeway network and also the mode share goals established in the LRTP. This could be an overall complete streets report card to expand into other transit and pedestrian metrics as well. From a bicycle perspective, the key data to include is mileage of facilities added, a summary of the count program (which has historically been done by the MPO), results from statistically valid local travel survey (if repeated at regular intervals), low-stress network connectivity, bicycle involved crash analysis, and any other relevant local data. This report card should be shared with funders, stakeholders, decision makers the media and the general public.

Plan Adoption

Adoption involves review by partner local, state and federal agencies, the TTAC and TPCC, as well as the conclusion of the successful community involvement process. Once adopted, this plan should become a document referenced in association with the Long Range Transportation Plan to guide future roadway maintenance and construction/reconstruction planning. City and County planning and engineering staff will refer to the Bicycle Facilities Master Plan during any development review process. Deviations from this plan should conform to the exceptions process contained within the Missoula Complete Streets Policy. This plan should be updated periodically, ideally every five years.

WOMEN REPRESENT

NATIONALLY

% population
walking trips
% biking trips



ources: ACS 2013, 1-yr est; NHTS 200

Appendix - Project Tables



Table 5. Lineal Improvements

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
1	Neighborhood Greenway	Plymouth St Neighborhood Greenway	Mt Ave	S Higgins Ave	1942		\$5,000	\$6,000
2	Neighborhood Greenway	University Ave Neighborhood Greenway	S Higgins Ave	Arthur Ave	2053		\$5,000	\$6,000
3	Neighborhood Greenway	Park St Neighborhood Greenway	SW Higgins Ave	Mt Ave	6274		\$16,000	\$18,000
4	Neighborhood Greenway	Florence/ Cottonwood St Neighborhood Greenway	Plymouth St	River St	4642		\$12,000	\$13,000
5	Neighborhood Greenway	4th St Neighborhood Greenway	Shilling St	Toole Park	9808		\$24,000	\$28,000
6	Neighborhood Greenway	Grant St Neighborhood Greenway	North Ave W	S 3rd St W	5318		\$13,000	\$15,000
7	Neighborhood Greenway	Franklin St Neighborhood Greenway	Plymouth St	Marshall St	3439		\$9,000	\$10,000
8	Neighborhood Greenway	Ivy St Neighborhood Greenway	Marshall St	S 3rd St W	1523		\$4,000	\$5,000
9	Neighborhood Greenway	California St Neighborhood Greenway	S 3rd St W	Dakota St	1400		\$4,000	\$4,000
10	Neighborhood Greenway	Maurice Ave Neighborhood Greenway	Arthur Ave	E Beckwith Ave	3585		\$9,000	\$11,000
11	Neighborhood Greenway	Myrtle/ Woodford St Neighborhood Greenway	Mt Ave	S 3rd St W	5022		\$13,000	\$15,000
12	Neighborhood Greenway	S 3rd St W	South Ave E	S 4th St E	6259		\$16,000	\$18,000
13	Neighborhood Greenway	Pattee Creek Neighborhood Greenway	Stephens Ave S	S Higgins Ave	3922		\$10,000	\$11,000
14	Neighborhood Greenway	Ernest/ McDonald Neighborhood Greenway	Brooks St	S Russell St	4516		\$11,000	\$13,000
15	Neighborhood Greenway	Fair Way Neighborhood Greenway	S Russell St	South Ave W	1546		\$4,000	\$5,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
16	Neighborhood Greenway	Benton Ave Neighborhood Greenway	Bancroft St	S Higgins Ave	2603		\$7,000	\$8,000
17	Neighborhood Greenway	Curtis St Neighborhood Greenway	S 3rd St W	River Rd	3308		\$8,000	\$10,000
18	Neighborhood Greenway	Schilling St Neighborhood Greenway	Benton Ave	S 3rd St W	8255		\$20,000	\$24,000
19	Neighborhood Greenway	Central Ave Neighborhood Greenway	S Reserve St	S Garfield St	3818		\$10,000	\$11,000
20	Neighborhood Greenway	Central Ave (county) Neighborhood Greenway	31st Ave	S Reserve St	3980		\$10,000	\$12,000
21	Neighborhood Greenway	Garfield St Neighborhood Greenway	South Ave W	North Ave W	1292		\$4,000	\$4,000
22	Neighborhood Greenway	Kent Ave Neighborhood Greenway	S Garfield St	Maurice Ave	9378		\$23,000	\$27,000
23	Neighborhood Greenway	6th St W Neighborhood Greenway Extension	Schilling St	Russell St	3370		\$9,000	\$10,000
24	Neighborhood Greenway	Spurgin/ 12th St Neighborhood Greenway	S Reserve St	Bitterroot Trail	5554		\$14,000	\$16,000
25	Neighborhood Greenway	Burton St Neighborhood Greenway	Beaver St	Stoddard St	2787		\$7,000	\$8,000
26	Neighborhood Greenway	Sherwood / Alder Neighborhood Greenway	N Russell St	E Pine St	9552		\$23,000	\$27,000
27	Neighborhood Greenway	Owen St Neighborhood Greenway	Milwaukee Trail	Toole Ave	2041		\$5,000	\$6,000
28	Neighborhood Greenway	Pine St Neighborhood Greenway	N Higgins Ave	Monroe St	2202		\$6,000	\$7,000
29	Neighborhood Greenway	Jackson / Holly Neighborhood Greenway	N Van Buren St	Monroe St	1079		\$3,000	\$4,000
30	Neighborhood Greenway	Waverly St Neighborhood Greenway	Defoe St	Turner St	1498		\$4,000	\$5,000
31	Neighborhood Greenway	Wylie Ave Neighborhood Greenway	Lolo St		1215		\$3,000	\$4,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
32	Neighborhood Greenway	Grand Ave Neighborhood Greenway	Scott St	Worden Ave	5048		\$13,000	\$15,000
33	Neighborhood Greenway	Jackson Neighborhood Greenway	Vine St	Holly St	2968		\$8,000	\$9,000
34	Neighborhood Greenway	Alvina Path Neighborhood Greenway	City Dr	Duncan Dr	963		\$3,000	\$3,000
35	Neighborhood Greenway	Agnes / Garfield Neighborhood Greenway	Ernest Ave	Brooks Ave	1163		\$3,000	\$4,000
36	Neighborhood Greenway	McDonald Neighborhood Greenway	S Reserve St	S Clark St	668		\$2,000	\$2,000
37	Neighborhood Greenway	27th Ave Neighborhood Greenway	South Ave W	Spurgin Rd	4421		\$11,000	\$6,000
38	Neighborhood Greenway	Mountain View Dr Neighborhood Greenway	Duncan Dr	Woodland Ave	676		\$2,000	\$2,000
39	Neighborhood Greenway	Mountain View Dr Neighborhood Greenway	Old Pond Rd	Rattlesnake Dr	1291		\$4,000	\$4,000
40	Neighborhood Greenway	Lolo St Neighborhood Greenway	W Greenough Dr	Rattlesnake Dr	2703	If street has less than 6,000 vehicles per day remove centerline stripe on street and install shared lane markings and wayfinding signage. Bike lanes previously recommended, but infeasible. May need additional treatment(s) to keep at a LTS 1.	\$7,000	\$8,000
41	Neighborhood Greenway	Chestnut St Neighborhood Greenway	S 6th St W	Milwaukee Trail	1955		\$5,000	\$6,000
42	Neighborhood Greenway	Grove St Neighborhood Greenway	S 3rd St W	River Rd	3289		\$8,000	\$10,000
43	Neighborhood Greenway	Speedway Ave Neighborhood Greenway	MT 200	MT 200	6672	In East Missoula.	\$17,000	\$19,000
44	Neighborhood Greenway	Christian Dr Neighborhood Greenway	Kelsey Ct	Linda Vista Dr	3737		\$9,000	\$11,000
45	Neighborhood Greenway	Rollins/ Regent St Neighborhood Greenway	Kent Ave	Cottonwood St	5578		\$14,000	\$16,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
46	Shared use Paths with Road Projects	Otis St Shared Use Path	Otis	Scott St	1492	As proposed in the North Reserve / Scott Street Master Plan.	n/a	n/a
47	Shared use Paths with Road Projects	Future Shared Use Path	Van Buren St	Monroe St	707	With MDT roundabout Van Buren Project.	n/a	n/a
48	Shared use Paths with Road Projects	South Ave Shared Use Path	Old Fort Rd	Reserve St	984	Missing link to reserve.	n/a	n/a
49	Shared use Paths with Road Projects	North End of Orange Street Bridge to the Bike Trail on the River (Signage)	Trail	W Front St	286	North End of Orange Street Bridge to the Bike Trail on the River. Final project to be as part of development agreements between the City and the developer.	n/a	n/a
50	Shared use Paths with Road Projects	Van Burren westside St Shared Use Path	RUX Trail	Poplar St	740	As part of future MDT interchange improvements.	n/a	n/a
51	Shared use Paths with Road Projects	Howard Raser Ave Connector Shared Use Path	Grant Creek	Trail	4895	Connects Grant Creek to other trails and as proposed in the North Reserve / Scott Street Master Plan. May include a grade separated crossing of reserve at Howard Raser Ave/Expressway.	n/a	n/a
52	Shared use Paths with Road Projects	Howard Raser Greenway Shared Use Path	N Reserve St	Otis St	10972	As proposed in the North Reserve / Scott Street Master Plan. Will require a undercrossing of the interstate near the Reserve St interchange.	n/a	n/a
53	Shared use Paths with Road Projects	Van Burren St eastside Shared Use Path	E Broadway St	Poplar St	1008	As designed per MDT interchange improvements.	n/a	n/a
54	Shared use Paths with Road Projects	Northside Greenway Extension	Waverly St	Cooley St	758	Incorporate into Scott Street Underpass Improvements.	n/a	n/a
55	Shared use Paths with Road Projects	Southbank Riverfront, Russell to Reserve Shared Use Path	N Reserve St	N California St	6720	Assumes that the MonRock Site is acquired by the City as a public park.	n/a	n/a
56	Shared use Paths with Road Projects	Mullan Rd Shared Use Path	Flynn St	N Reserve St	4421	Construct 10' shared use path to connect existing and future shared use paths.	n/a	n/a
57	Shared use Paths with Road Projects	Raser Dr Shared Use Path	Rodgers St	Spurlock Rd	4627	Extension of Raser Dr proposed in North Reserve / Scott Street Master Plan. Would include a side path.	n/a	n/a

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
58	Shared use Paths with Road Projects	Southgate Mall redevelopment Shared Use Path	Mary Ave	Agnes Ave	1842	Proposed as part of Southgate Mall Redevelopment to parallel extension of Agnes/Mary Ave.	n/a	n/a
59	Shared use Paths with Road Projects	Mullan Road Shared Use Path	Cote Ln	Deschamps Ln	12350	As part of MDT reconstruction project.	n/a	n/a
60	Shared Use Paths - Standalone	Milwaukee Extension to Canyon River and Clark Fork Subdivisions	Canyon River Golf Course Trail	Milwaukee Trail	12234	Acquire ROW from MRL & MDT to create a trail from the east end of the Milwaukee to the trail at Canyon River Golf Course and to the proposed Clark Fork Subdivisions. These trails will connection existing and future trails to the east end of the Milwaukee Trail.	\$979,000	\$1,346,000
61	Shared Use Paths - Standalone	East Missoula to Bonner Bike/Ped Trail	Speedway Ave	MT 200	18131	Install trail from the bottom of Brickyard Hill to Bonner. Completes connection from East Missoula to Turah.	\$1,451,000	\$1,995,000
62	Shared Use Paths - Standalone	Fort Missoula to McClay Flats - including bridge over Bitterroot River	Blue Mountain Rd	South Ave W	8071	Trails connecting Fort Missoula, Target Range School on 40th Ave., McClay Flats and Blue Mountain Road. Need bridge over Bitterroot River. Need to acquire easement and trail in McCauley Butte subdivision. This is mostly in Missoula County.	\$796,000	\$1,138,000
63	Shared Use Paths - Standalone	Milwaukee Trail - Reserve to Mullan	Mullan Rd	N Grove St	9178	Extend Milwaukee from Reserve to Mullan including ROW acquisition and several bridges over the Clark Fork River.	\$885,000	\$1,260,000
64	Shared Use Paths - Standalone	Spurgin Rd Shared Use Path	Tower St	S Reserve St	5913	Street is too fast for a neighborhood greenway, a shared use path would be more comfortable for users. One side of the road. Project may have significant constraints within the right of way.	\$474,000	\$651,000
65	Shared Use Paths - Standalone	Wye Mullan Neighborhood Trails (excluding Milwaukee and Mullan Rd.)	Hawartha Rd	N Reserve St	21092	1. Grant Creek drainage from I-90 to Mullan 2. Siren's Rd. trail from Flynn Ln. to Milwaukee - connection to Hellgate Elementary 3. Grant Creek drainage, Broadway to Milwaukee 4. Trails in other drainages near Deschamps Ln. and Rollercoaster Rd.	\$979,000	\$2,321,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
66	Shared Use Paths - Standalone	Ron's River Trail	N Reserve St	N Russell St	5630	Acquire ROW from landowners along the riverfront as necessary, construct a 10' paved trail between the proposed Russell St. Bridge undercrossing and Reserve St. Include a connection from the Reserve St. bike lanes and sidewalks to the trail.	\$451,000	\$620,000
67	Shared Use Paths - Standalone	Milwaukee Trail Mullan to Deschamps Ln.	Deschamps Ln	Mullan St	20973	Milwaukee Trail Mullan to Deschamps Ln.	\$1,678,000	\$2,308,000
68	Shared Use Paths - Standalone	Bitterroot Trail Extension	Livingston Rd	North Ave W	2003	Closure of critical gap in Bitterroot Branch Trail. Will occur in two stages, from Livingston Ave to South Ave and from South Ave to North Ave.	\$161,000	\$221,000
69	Shared Use Paths - Standalone	Ron's River Trail per West Broadway Corridor Plan	Burton St	Owen St	2905	Create trails that extend the Shady Grove Trail west Burton to the Fox Site. Keep trail along the riverfront as much as possible. Some use of widened sidewalk may be necessary. Develop trails and river access points on the island in the river.	\$233,000	\$320,000
70	Shared Use Paths - Standalone	Emma Dickinson Learning Center- Council Grove Apartments bike-ped connection	Augusta Dr	S Johnson St	985	Provide a shared use path between the Emma Dickinson Learning Center, the Council Grove Apartments, and a future segment of Johnson Street if and when Johnson is extended north from Third Street.	\$79,000	\$109,000
71	Shared Use Paths - Standalone	3rd St W	Clements Rd	Hiberta St	7125	Boulevard separated shared use path	\$570,000	\$784,000
72	Shared Use Paths - Standalone	Spurgin Rd Shared Use Path	Clements Rd	Tower St	4587	Street is too fast for a neighborhood greenway, a shared use path would be more comfortable for users. One side of the road. Project may have significant constraints within the right of way.	\$367,000	\$505,000
73	Shared Use Paths - Standalone	Clements Rd	North Ave W	Mt Ave	1296	Duplicate shared use pathway to reduce crossings for school age students.	\$104,000	\$143,000
74	Shared Use Paths - Standalone	North Ave Shared Use Path	Clements Rd	37th Ave	2589	Connects Clements Rd paths to trails.	\$208,000	\$285,000
75	Shared Use Paths - Standalone	33rd Ave & Tower St Shared Use Path	South Ave W	S 3rd St W	6850	Connects South Ave to 3rd St.	\$548,000	\$754,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
76	Shared Use Paths - Standalone	Madison St. underbridge to Arthur Street Shared Use Path	Arhur Ave	Trail	531	Connection from underbridge to Arthur St. (Southbound)	\$43,000	\$59,000
77	Shared Use Paths - Standalone	Ron's River Trail - west side	Eastgate	Easy St	3427	Complete Ron's River Trail from Eastgate to Easy St.	\$275,000	\$377,000
78	Shared Use Paths - Standalone	Ron's River Trail - east side	Eastgate	Easy St	1160	Complete Ron's Riverfront Trail from Eastgate to Easy St.	\$93,000	\$128,000
79	Shared Use Paths - Standalone	Westside Railroad Shared Use Path	Cooper St	N Reserve St	12218	Westside Greenway System. There is minimal existing space along the tracks in some sections and many properties have structures abutting the railroad. Route will be challenging to develop and will require significant cooperation of Montana Rail Link. Could be a more feasible project if the rail yard is ever redeveloped. Will also connect to Grant Creek Trail via Reserve St.	\$978,000	\$1,344,000
80	Shared Use Paths - Standalone	Northside Shared Use Path	Toole Ave	Northside Overpass	1890	Protected bikeway or shared use path along the northside of the railway connecting with the northshore Bitterroot trail extension to the west and Van Buren foot bridge. this portion of the Northside Greenway may not be limited to the redevelopment of the railyards and could be implemented as a stand alone project.	\$152,000	\$208,000
81	Shared Use Paths - Standalone	Greenough Park Connector	Trail	Vine St	808	Could close gap between Greenough Park paths and the RUX trail.	\$65,000	\$89,000
82	Shared Use Paths - Standalone	Grant Creek Share Use Path	Grant Creek Rd	Snow Bowl Road	6852	Extension of recently completed trail to Snow Bowl Road.	\$549,000	\$754,000
83	Shared Use Paths - Standalone	Tamarak Shared Use Path	Rattlesnake Dr	Lincoln Hills Dr	1131	As detailed in the 2011 Active Transportation Plan.	\$91,000	\$125,000
84	Shared Use Paths - Standalone	Rattlesnake Dr Shared Use Path	Rattlesnake Dr	Wildcat Rd	7260	As outlined in 2011 Active Transportation Plan. Improve single track trail into paved shared use path for the majority of the route.	\$581,000	\$799,000
85	Shared Use Paths - Standalone	Lincoln Hills Dr Shared Use Path	Rattlesnake Dr	Lincoln Hills Pt	5996	As noted in the 2011 Active Transportation Plan. This project will be extremely challenging due to grades and right of way, may not be consistent from one end to end. May take form of small asphalt sidewalk and sharrows.	\$480,000	\$660,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
86	Shared Use Paths - Standalone	Northside Park Greenway Loop Shared Use Path	Phillips St	Butte Ave	7780	Interstate greenway system between Northside Park and Scott Street on the south side of I-90 with connecting access to the North Hills via Coal Mine Road. A loop trail system could be created depending on cooperation of property owners. This project will be difficult to implement due to grades, private property and Interstate access management. Overpass inclusion was proposed in the North Reserve / Scott Street Master Plan.	\$623,000	\$856,000
87	Shared Use Paths - Standalone	Rattlesnake Greenway Shared Use Path	River	E Front St	314	Last missing segment to Clark Fork River. Would make sense only if Ron's River Trail were completed first or with this project.	\$26,000	\$35,000
88	Shared Use Paths - Standalone	Orange Street Shared Use Path	S Orange St	Milwaukee Trail	366	Connector from Milwaukee Trail to southbound Orange bike lanes.	\$30,000	\$41,000
89	Shared Use Paths - Standalone	Railroad Overcrossing	Palmer St	Rodgers St	528	Bike/Ped overcrossing proposed in the North Reserve / Scott Street Master Plan.	\$193,000	\$309,000
90	Shared Use Paths - Standalone	Ron's Riverfront Trail	Madison St	Pedestrian Walkway	780	If hotel is ever redeveloped or if trail can be installed elevated.	\$63,000	\$59,000
91	Shared Use Paths - Standalone	Bitterroot Trail Shared Use Path	W Pine St	Alley	175	Missing link on north side of river.	\$14,000	\$20,000
92	Shared Use Paths - Standalone	East Missoula Riverfront Shared Use Path	Trail	Sommers St	5860	Would be part of an alternate connection between East Missoula and Missoula along the Clark Fork River avoiding Highway 200.	\$469,000	\$645,000
93	Shared Use Paths - Standalone	Milwaukee Trail Extension to Confluence State Park	Deer Creek Rd	Confluence State Park	9666	Will require new bridge over Clark Fork River and utilization of Milwaukee Road Railroad alignment.	\$924,000	\$1,314,000
94	Shared Use Paths - Standalone	Fairgrounds Connector Shared Use Path	Trail	South Ave W	1775	links existing trails to the north side of the fairgrounds.	\$142,000	\$1,064,000
95	Shared Use Paths - Standalone	Reserve St Shared Use Path	Briggs St	Floral Ct	475	South Hills trail which exists, but is currently gravel. This project would pave it and improve usability for a safe route to school to Meadow Hill Middle School.	\$38,000	\$48,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
96	Shared Use Paths - Standalone	7th St W Shared Use Path	Clements Rd	Reserve St	10477	There is an existing 7 foot shoulder on the south side of the road. This is confusing for west-bound bicyclists and motorists. The roadbed should be widened by 6 feet to accommodate a 8 foot path separated by 5 feet from the edge of the travel lane. This may be complicated where ditches run alongside the road.	\$1,153,000	\$1,886,000
97	Shared Use Paths - Standalone	Post Siding Rd	Old Highway 93	Fort Missoula	3884	Would add a high comfort connection into Fort Missoula Park from the Bitterroot Trail.	\$428,000	\$700,000
98	Shared Use Paths - Standalone	Spurgin/ Humble Rd Shared use path	7th St W	Clements Rd	3588	There is an existing 8 foot shoulder on the north and west sides of these roads. This is confusing for north and east-bound bicyclists and motorists. The roadbed should be widened by 6 feet to accommodate a 8 foot path separated by 5 feet from the edge of the travel lane. This may be complicated where ditches run alongside the road.	\$395,000	\$646,000
99	Shared Use Paths - Standalone	River Pines Rd	Bridge	Clements Rd	3897	There is an existing 8 foot shoulder on the south side of this road. This is confusing for west-bound bicyclists and motorists. The roadbed should be widened by 6 feet to accommodate a 8 foot path separated by 5 feet from the edge of the travel lane.	\$429,000	\$702,000
100	Shared Use Paths - Standalone	Humble Rd	River Pines Rd	South Ave W	1276	There is an existing 8 foot shoulder on the east side of this road. This is confusing for south-bound bicyclists and motorists. The roadbed should be widened by 6 feet to accommodate a 8 foot path separated by 5 feet from the edge of the travel lane.	\$141,000	\$230,000
101	Bike Lanes with Road Projects	River Road Bike Lanes	N Reserve St	N Russell St	5191	If street is reconstructed, add bike lanes as a key component of the design.	\$7,000	\$10,000
102	Bike Lanes with Road Projects	Brooks St Bike Lanes	Stephens Ave S	Mt Ave	2059	LRTP recommends lane reconfiguration of the roadway section to 2 travel lanes plus a center turn lane including bike lanes in both directions.	\$3,000	\$4,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
103	Bike Lanes with Road Projects	Mall Bike Lane	Paxson St	South Ave W	3879	Northern section (existing) can be added now, road is 34 feet wide. 11' travel lanes, 6' bike lanes. Roundabout to be added with Southgate Mall Redevelopment at Mary Ave, future road will continue south, link to existing streets not yet established.	n/a	n/a
104	Bike Lanes with Road Projects	Russell St Bike Lanes	Mt Ave	W Broadway St	7956	From Broadway to Mount Ave/14th. To be provided with two phases of Russell Street Project. Bike lanes will have transit stop bypasses where applicable.	n/a	n/a
105	Bike Lanes with Road Projects	George Elmer Dr Bike Lane extension	Cattle Dr	to be developed	2711	Construct with new sections of street and extend to north if additional land is developed.	n/a	n/a
106	Bike Lanes with Road Projects	England Blvd Bike Lane Extension	to be developed	England Blvd	5652	Construct with new street construction.	n/a	n/a
107	Bike Lanes with Road Projects	Wye Bike Lanes	to be developed	W Broadway St	3455	Construct with new street construction.	n/a	n/a
108	Bike Lanes with Road Projects	South Ave Bike Lane	37th Ave	Clark St	8538	Road will get improved from 36th to Reserve, Bike lane in WB direction. Roundabout at 36th. EB bike traffic will use shared use path. East of Reserve St lane widths are large and bike lanes could be restriped with 11 foot travel lanes. This would fill a key gap.	n/a	n/a
109	Bike Lanes with Road Projects	Bulwer St Bike Lanes			3520	As proposed in the North Reserve / Scott Street Master Plan.	n/a	n/a
110	Bike Lanes with Road Projects	Palmer St Bike Lanes	Rodgers St	Holmes St	4470	As proposed in the North Reserve / Scott Street Master Plan.	n/a	n/a
111	Bike Lanes with Road Projects	Raser Dr Bike Lanes	W Broadway St	Rodgers St	1184	As proposed in the North Reserve / Scott Street Master Plan. Will involve a new overcrossing of the railroad.	n/a	n/a
112	Bike Lanes with Road Projects	N Russell St Bike Lanes	W Broadway St	Maple St	1250	Complete bike lanes on N Russell Street. South of Maple (40 feet of width) this yields two options. 1) prohibit parking on one side then provide one 8' parking lane, two 11' travel lanes and two 5' bike lanes. 2) eliminate all parking as there are no significant business or residential frontages present. Buffered bike lanes with 6' bike lanes and 3' buffers would be possible.	n/a	n/a

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
113	Bike Lanes with Road Projects	Rodgers/ Raser/ Grant Creek Rd Bike Lanes	N Reserve St	Scott St	12927	If/when the County improves Rodgers St., rideable shoulders/ bike lanes should be installed. this is a popular route and there are concerns with heavy vehicles and the current width of the road.	n/a	n/a
114	Bike Lanes with Road Projects	Mary Jane Blvd Bike Lanes	Mullan Rd	W Broadway St	7254	TO be constructed as a part of full road construction.	n/a	n/a
115	Bike Lanes with Road Projects	Linda Vista Blvd Bike Lanes	Upper Miller Creek Rd	Lower Miller Creek Rd	9582	From Lower Miller Creek to Paul Ln a resurfacing project can provide the bike lanes. Parking is recommended to be removed from the west side of the street. Street is 40 feet wide. 8 foot parking lane on one side, 5 foot bike lanes and 11 foot travel lanes.	n/a	n/a
116	Bike Lanes with Road Projects	California St	River Rd	Dakota St	1604	To be constructed as a part of full road reconstruction that MRA is coordinating.	n/a	n/a
117	Bike Lanes with Road Projects	Lower Miller Creek Rd Bike Lanes	Linda Vista Blvd	City Limit	9085	"Part of corridor requires reconstruction, part can be implemented through restriping. Between Jordan Ct and Avon Ln the street can be restriped. The street is 36 feet in width. Option A) A parking lane may be maintained on the south side with downhill shared lane markings and an uphill bike lane on the north side of the street. Option B) All parking is removed and 7 foot buffered or conventional bike lanes be striped. "	n/a	n/a
118	Bike Lanes with Road Projects	Christian Dr Bike Lanes	Lower Miller Creek Road	Kelsey Ct	4564	This street is not yet constructed.	n/a	n/a
119	Bike Lanes with Road Projects	Wyoming Street Bike Lanes	Russell St	California St	1094	Retrofit 3 blocks between California to Russell. Will tie into Russel Street Reconstruction.	n/a	n/a
120	Bike Lanes with Road Projects	3rd St	Hiberta St	Reserve St	3285	Bike lanes will be constructed as part of a complete streets project.	n/a	n/a

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
121	Distinct Bike Projects	England Blvd Bike Lanes	Tina Ave	Great Northern Ave	1726	Extend to and through Reserve Street. On the west, this will include narrowing travel and turning lanes, 44 feet available, provide 6 foot bike lanes, 11 foot travel lanes and a 10 foot turn lane. On the east side of Reserve, sharrows may be the only feasible option at the intersection however once the 3-lane cross-section returns bike lanes can be added as on the west side.	n/a	n/a
122	Distinct Bike Projects	Expressway Bike Lanes	Butler Creek Rd	Grant Creek Rd	18384	Part of this long corridor is currently designated as a 'bike route' however it could be improved through a continuous and designated facility. Expressway links many areas of housing and jobs and offers a less busy alternative to Broadway. It is recommended that parking be prohibited for the entirety of the route as all existing businesses and uses have substantial off-street lots. This approach would allow for buffered bike lanes to be feasible for the majority of the route.	\$48,000	\$59,000
123	Distinct Bike Projects	McDonald Bike Lanes	S Clark St	Brooks St	1272	All businesses have surface parking, remove on-street parking to add bike lanes. Street is 40 feet wide. 12 ' travel lanes, 6'ef bike lanes with 3 foot buffers.	\$4,000	\$5,000
124	Distinct Bike Projects	Highway 200 Bike Lanes	N Easy St	W Riverside Dr	1974	The railroad underpass is narrow and should include widening for bike and pedestrian facilities if it is ever improved. consider reducing lane with at this location to achieve as large of a shoulder as possible. Place warning signs at this location.	\$5,000	\$6,000
125	Distinct Bike Projects	Whitiker Dr Bike Lanes	Spanish Peak Dr	Fas 533	8579	From Spanish Peak Dr to 500 feet north of Ben Hogan Dr the street is 36 feet wide. Wide 7' bike lanes are possible in this section. North of this location homes have large driveways, and the street is not wide enough to maintain car parking and bike lanes. There are two options here, 1) prohibit all on-street parking and continue the bike lanes, or 2) provide bike lane in uphill direction only and have downhill bicyclists share the lane where the speed differential is lower.	\$17,000	\$19,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
126	Distinct Bike Projects	Spruce Street Bike Lanes	Scott St	N Orange St	2616	Spruce Street is 40 feet curb to curb with parking on both sides. To add bike lanes a lane or parking will need to be removed. The resultant cross-section should be 8 foot parking lane, 6 foot bike lane, two 10.5 foot travel lanes and a 5 foot bike lane. At Nora Street a pedestrian bulb out will need to be removed to allow for bicycle passage.	\$9,000	\$10,000
127	Distinct Bike Projects	Mulan Road Bike Lanes	Cote Ln	Clark Fork Ln	17066	Short Term - Install bike pavement symbols where shoulder width is sufficient, if possible improve cross street approaches to maintain width. Long Term - If Mulan Rd is improved to a 3-lane section, formalize bike lanes in the design.	\$11,000	Part of road expansion project (n/a)
128	Distinct Bike Projects	Paxon St Bike Lanes	39th St	Ernest Ave	2657	Paxon Street is 40 feet wide, bike lanes will be provided by removing the eastern lane of parking. The proposed cross section will be an 8 foot parking lane, a 6 foot bike lane, two 10.5 foot travel lanes and a 5 foot bike lane on the east side of the street.	\$6,000	\$6,000
129	Distinct Bike Projects	High Park Rd Bike Lanes	SW Higgins Ave	Whitaker Dr	3233	High Park Road is a steep residential collector that is 34 feet wide. There are two options: Option 1: provide 11 foot travel lanes and 6 foot bike lanes in both directions. Option 2: provide a 7 foot bike lane with frequent markings and no parking signs in the uphill direction with shared lane markings in the downhill direction.	\$8,000	\$12,000
130	Distinct Bike Projects	23rd Ave Bike Lanes	Hillview Way	39th St	6346	Street is 38 feet wide. There are three options, 1) 8 foot parking lane on one side, 5 foot bike lanes and 10 foot travel lanes; 2) Remove parking and install buffered bike lanes; 3) Install uphill bike lane and downhill sharrow, parking remains on one side- uphill bike lane should be 7 feet wide.	\$16,000	\$23,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
131	Distinct Bike Projects	Pattee Canyon Bike Lanes	SW Higgins Ave	Canyon Gate Dr	3563	Street fluctuates between 35-44 feet, some sections may have need for on-street parking, some do not. Parking should be maintained where possible, where no residential frontage exists, bike lanes should be provided in both directions, where width is constrained, limit parking to one side of the street.	\$9,000	\$11,000
132	Distinct Bike Projects	Stephens Ave Bike Lanes	SW Higgins Ave	Pattee Creek Dr	2293	Stephens Ave is 40 feet wide. One lane of parking needs to be removed to accommodate bike lanes. This lane could switch by block where the parking is needed if necessary. 8 foot parking lane, 6 foot bike lane, 10.5 foot travel lanes and a 5 foot bike lane.	\$6,000	\$7,000
133	Distinct Bike Projects	Mount Ave Bike Lanes	S Reserve St	S Higgins Ave	10651	Street is approximately 40 feet wide. The LRTP calls for a 3-lane section with parking removal from Reserve to Russell. In this section a bike lane could be feasible with 10 foot travel and a 9 foot turn lane. In areas that will stay two-lane on-street parking could be removed on one side of the street to result in an 8 foot parking lane, two 6 foot bike lanes and two 10 foot travel lanes. Some sections such as at arterial street approaches do get tight, if any curb line changes could be made in a targeted fashion, they would be the most beneficial in these contexts. Sharrows could be used at intersections as shared right turn lanes in the interim. East of Brooks one lane of parking would need to be removed to allow the bike lane to fit within the curb to curb width. This should be done on the north side of the street as the slant streets have fewer residential frontages.	\$7,000	\$127,000
134	Distinct Bike Projects	Briggs St Bike Lanes	Miller Creek Rd	S Reserve St	2489	Street is 38 feet wide with most of it lacking residential frontages. Options include 1)Buffered bike lanes and parking removal; 2) Parking on one side of the street with 5' bike lanes.	\$6,000	\$8,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
135	Distinct Bike Projects	Charrett St Bike Lanes	Briggs St	55th St	5322	Street is 38 feet wide. There are two options, 1) 8 foot parking lane on one side, 5 foot bike lanes and 10 foot travel lanes; 2) Remove parking and install buffered bike lanes.	\$12,000	\$18,000
136	Distinct Bike Projects	Hiberta St Bike Lanes	Spurgin Rd	S 3rd St W	2644	Pavement width inconsistent and averages 26 feet. Bike lanes cannot be installed in both directions without an advisory bike lane configuration (shared two-way travel lane with no centerline in the middle) could work, or widening would be needed.	\$5,000	\$5,000
137	Distinct Bike Projects	Great Northern Ave Bike Lanes	Mullan Rd	W Broadway St	4577	Street is 44 feet wide and all destinations have off-street lots. A parallel alternative to Reserve could be established as a buffered bike lane. Option 1: Buffered bike lane. 12 foot travel lanes and 7 foot bike lanes with 3' buffers. Option 2: Parking on one side. 6.5 foot bike lanes and 11 foot travel lanes.	\$10,000	\$15,000
138	Distinct Bike Projects	Palmer St Bike Lanes	W Broadway St	N Travois	730	Street is massive on the west end. There is room for substantial buffered lanes on the west end and a single bike lane on S Palmer St going eastbound and a single bike lane going westbound on N Palmer.	\$2,000	\$4,000
139	Distinct Bike Projects	Duncan Dr Bike Lanes	Minckler Loop	Mountain View Dr	7084	Formally designate shoulders as bike lanes, where on-street parking is absolutely necessary, explore opportunities to increase cross-section width at those locations only.	\$9,000	\$13,000
140	Distinct Bike Projects	Broadway Bike Lane Upgrade	N California St	Butler Creek Rd	28516	Most of Broadway out to the airport has 12 foot wide shoulders. This project would add a 4-5 foot buffer and establish a formal bike lane. Due to the high speeds, driveways should be treated with a dashed bike lane extension line and warning signage to raise awareness. This project can be accomplished without a restriping project.	\$55,000	\$63,000
141	Distinct Bike Projects	6th St Bike Lanes	Russell St	S Higgins Ave	5270	Provide buffered bike lanes by removing a travel lane.	\$11,000	\$12,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
142	Distinct Bike Projects	Broadway Bike Lanes	N Orange St	Madison St	3490	This section of Broadway through Downtown is very difficult to get bike lanes accommodated. The only two options are for parking removal on at least one side of the street, or to convert the street to a 3-lane section to provide space for a bike lane, buffered bike lane or protected bike lane. Existing volumes are in the upper limits of consideration for a 3-lane section.	\$7,000	\$12,000
143	Distinct Bike Projects	Brooks St Buffered Bike Lanes	Miller Creek Rd	Dixon Ave	5821	Eliminate underutilized on-street parking and provide buffered bike lanes where possible. Minor striping and stenciling changes. Shoulder/parking lanes are currently approximately 10 feet wide, provide a 7 foot bike lane and 3' buffer. Dash lane line across minor side streets.	\$16,000	\$19,000
144	Distinct Bike Projects	5th St Buffered Bike Lanes	Russell St	S Higgins Ave	5272	Provide Buffered Bike Lanes by removing a travel lane.	\$17,000	\$19,000
145	Distinct Bike Projects	Brooks St Bike Lanes	Dixon Ave	S Russell St	4103	This section of Brookes through Midtown is very difficult to get bike lanes accommodated. The only two options are for a full roadway reconstruction that would likely require acquiring right of way, or to remove a travel lane in each direction to provide space for a bike lane, buffered bike lane or protected bike lane. Based on the existing volumes this would be difficult to justify.	unknown	unknown
146	Distinct Bike Projects	Russell St Buffered Bike Lanes	W Kent Ave	S 14th St W	1669	From 14th to Kent, MDT traffic counts show 12,000 ADT north of Brooks and 13,000 ADT south of Brooks. These volumes would likely function well with a 3-lane section. Three lane sections function well up to 18,000 ADT with some examples exceeding 20,000 ADT. Buffered bike lanes can be designated in the current outside lanes. Shared bike lane/turn lanes can be added where right turns warrant a separate lane.	\$4,000	\$4,000
147	Distinct Bike Projects	Russell Street Bike Lanes	Livingston Rd	W Kent Ave	1317	Russell is 4 lanes from Kent Ave to Brooks St. Street is 50 feet wide, so 5 foot bike lanes are possible with 10 foot travel lanes.	\$2,000	\$3,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
148	Distinct Bike Projects	Rattlesnake Drive Bike Lanes	Missoula Ave	Creek Crossing Rd	8610	Convert the shoulders to formal bike lanes, where parking is absolutely necessary, explore opportunities for increasing cross-section width just at those locations.	\$11,000	\$16,000
149	Distinct Bike Projects	Birch St Bike Lanes	W Broadway St	N Russell St	810	Street is 40 feet wide. Heavy parking demand at industrial site on south side of street. Recommend removing parking on north side of the street, or shifting the parking lane from industrial (south) to residential (north) half way down the street. 8 foot parking lane, 6 foot bike lane, two 10.5 foot travel lanes and a 5 foot bike lane.	\$2,000	\$2,000
150	Distinct Bike Projects	55th St Bike Lanes	Charrett Ave	23rd Ave	2570	Street is 40 feet wide. There are two options, 1) 8 foot parking lane on one side, 5 or 6 foot bike lanes and 10 or 11 foot travel lanes; 2) Remove all parking and install buffered bike lanes.	\$5,000	\$6,000
151	Bike Lane Upgrades	Russell Street Bike Lane upgrade	Ernest Ave	Livingston Ave	2985	From Brooks south to Ernst Ave, Russell is a 3-lane configuration with on-street parking. The street is 64 feet wide. With 8 foot parking lanes, 11 foot travel and turn lanes, 7.5 feet is left for bike lanes in both directions. Add 2.5' buffer to travel lane and narrow center turn lane. From Ernst Ave to McDonald, the curb to curb width is 62 feet. 7.5 foot bike lane areas could be maintained if travel lanes and parking lanes narrow by half a foot on each side. This last block would be nice to have due to Russell School.	\$6,000	\$12,000
152	Bike Lane Upgrades	Reserve St Bike lane Upgrades	Brooks St	River Rd	14446	This section of Reserve from approximately River Road to Brooks Street has extremely wide 10 foot bike lanes. These will need stencils removed and replaced by the curb and 3' buffers added. Add dashed lane lines across minor street intersections.	\$28,000	\$32,000
153	Bike Lane Upgrades	Fairview Ave Bike Lane Upgrade	S Catlin St	Russell St	913	Street has narrow bike lanes and a wide center turn lane. When resurfaced it should balance out better to provide at least 5.5' bike lanes.	\$2,000	\$2,000
154	Bike Lane Upgrades	Scott St Bike Lane Upgrade	Toole Ave	Philips St	953	Parking lanes are 9 feet. Provide a 2' buffer stripe between parking and the bike lane.	\$3,000	\$4,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
155	Bike Lane Upgrades	Broadway Bike Lane Upgrade	N California St	May St	2418	The previous road diet has left the bike lane/shoulder area at 10-11 feet. Curb extensions have narrowed the section at several points. The bike lane should be buffered to the travel lane at 7 feet with a 3-4 foot buffer. where the section narrows due to curb extensions, the bike lane should shift to the left to return to it's current location.	\$5,000	\$6,000
156	Bike Lane Upgrades	Broadway Bike Lane Upgrade	May St	N Orange St	1711	Short term: A second white line should be added to buffer the parking lane from the bike lane. The current parking lanes are approximately 9-10 feet in width. Stripe parking lanes at 7 feet with the remainder consisting of a buffer. Long term: If the street is resurfaced narrow the 14 center turn lane to 12 feet from over 14 feet and provide a small travel lane buffer as well.	\$6,000	\$7,000
157	Bike Lane Upgrades	Wyoming Street Bike Lane Upgrade	N California St	Milwaukee Trail	658	For this short two-block section, bike lanes were installed connected to front-in angled parking. This configuration is not recommended by AASHTO. Parking stalls should be repainted to convert to reverse or back-in angled parking.	\$11,000	\$15,000
158	Bike Lane Upgrades	Cregg Ln Bike Lane Upgrade	Hickory St	S Orange St	1062	Current city bike maps show Cregg Ln as a bike lane, however it does not have bike lanes. The intersection with Hickory St narrows and blocks bicycle traffic. Eastbound bike traffic must merge with the travel lane within the Hickory St intersection. Where the section stabilizes again it is 44 feet from curb to curb. This represents a minimal dimensions where bike lanes can be added with 7' parking, 5' bike lanes and 10' travel lanes. If parking can be eliminated from the south side of the roadway dimensions can relax and become wider.	\$2,000	\$4,000

ID	Type	Name	From	To	Dist (ft)	Comments	Cost (low)	Cost (high)
159	Bike Lane Upgrades	Orange St Bike Lane Upgrade	S 1st St	W Front St	1710	In this section travel lanes are 12 feet with 5 foot bike lanes. 12' travel lanes are wider than needed in an urban context. If these lanes could be narrowed to 11 feet the bike lane could be better accommodated. Improve with future restriping project.	No additional cost if done with resurfacing	\$33,000
160	Bike Lane Upgrades	6th St Bike Lane Improvements	Maurice Ave	S Van Buren Ave	656	Convert front-in angled parking to back-in angled parking. This was done on Harrison St in Bozeman at MSU in recent years.	\$9,000	\$12,000
161	Bike Lane Upgrades	Orange Street Bike Lane Upgrade	Tremont St	S 1st St	2071	Street is 60 feet curb to curb with small shoulders currently. This is creating confusion with bicyclists and motorists as the shoulder is not wide enough to be a bike lane. Restripe with 10 foot travel lanes and turn lane and AASHTO MUTCD compliant 5' bike lanes.	No additional cost if done with resurfacing	\$18,000 if existing markings are removed and replaced
162	Protected Bike Lane	Higgins Protected Bike Lane	Brooks St	E Broadway St	3500	Extend protected bike lane to the Hip Strip over the Clark Fork River.	\$2,400,000 includes streetscape portion similar to existing sections,	\$3,100,000
163	Protected Bike Lane	S Van Burren Ave Protected Bike Lane	S 6th St E	Milwaukee Trail	798	Some recent improvements with U of M. Additional improvements would include curb changes, striping, bollards, raised medians etc to formalize more secure path.	\$44,000	\$60,000

Table 6. Spot Improvements

ID	Location	Name	Comments	Cost (low)	Cost (high)
1	McDonald & Russell St	Convert Signal to RRFB	Convert full signal to RRFB and install median refuge.	\$20,000	\$35,000
2	6th St W & Schilling St	Greenway Intersection Improvement	Improve bike access at ramps	\$6,000	\$15,000
3	Kent Ave & Russell St	Greenway Intersection Improvement	Add RRFBs and bike cut throughs.	\$30,000	\$40,000
4	Kent Ave & Brooks St	Greenway Intersection Improvement	Could be RRFB or Hawk, provide short shared use paths on NW and SE Corners and connect through new crosswalk using median as refuge. Provide curb extension on SW corner of Stephens as part of this project.	\$50,000	\$150,000
5	6th St W & Creek west of Garfield St	New bridge	Would extend 6th St bikeway	\$50,000	\$150,000
6	Alder St & Orange St	Greenway Intersection Improvement	New RRFB with bicycle median refuge and center waiting areas on Alder St. Consider making the elevated portion of Orange St a right only onto Alder St.	\$20,000	\$40,000
7	Alder St & Higgins Ave	Greenway Intersection Improvement	Install bike ramps and a through bike lane in the both directions on Alder St to the left of the splitter island.	\$9,000	\$12,000
8	Higgins Ave & University Ave	Greenway Intersection Improvement	Expand corner at slant streets to align with south leg of University Ave. Make bike mountable. RRFB optional.	\$15,000	\$25,000
9	Kent Ave & Higgins Ave	Greenway Intersection Improvement	Add corner curb extensions on all four corners. Provide bicycle forward stop bars on greenway at edge of bike lane.	\$25,000	\$34,000
10	Arthur Ave & South Ave	Greenway Intersection Improvement	Bus Stop and free right from Arthur causes difficulty for peds and bikes. Create protected intersection on north leg of intersection by taking partial parking lane. This could give WB bikes and peds on the north leg priority over the free right while still stopping WB cars.	\$25,000	\$35,000
11	Gerald Ave & South Ave	Greenway Intersection Improvement	Bus stop on NE corner. Make bus stop in-lane. Add a porkchop to force SB traffic into a right turn, make the porkchop mountable by bikes and peds to align them with the parking lot on the far side. Align face of porkchop with edge of parking lane to reduce crossing distance. Add pedestrian bulbout on NW corner and add ped crossing on west leg.	\$25,000	\$35,000
12	Kent Ave & Bancroft St	Greenway Intersection Improvement	Add high visibility crosswalks on north and south legs with bike/ped warning signs.	\$4,000	\$5,000
13	Pattee Creek Dr & Bancroft St	Greenway Intersection Improvement	Add curb extensions on each corner with diagonal bicycle ramps up to them. Provide a RRFB for crossings that can be activated by bikes or peds on the curb extension.	\$41,000	\$69,000
14	Fairview Ave & Russell St	Greenway Intersection Improvement	Add bulbouts to shorten pedestrian crossing distance, add crosswalks. Add a through bicycle lane in the east-west direction for bicycles only.	\$25,000	\$30,000
15	Ernest Ave & Russell St	Greenway Intersection Improvement	Establish bike-ped crossing on south leg of intersection. Widen sidewalk on SW corner with advance bike ramp. RRFB recommended for school crossing, as a school crossing this will compliment crossing to the south.	\$30,000	\$40,000
16	McDonald Ave & Brooks St	Greenway Intersection Improvement	If no signal is developed with Mall, make cross-street right in-right out with a full traffic signal. Establish new crosswalk in porkchop island. Signal could be conventional signal or be a hybrid beacon.	\$65,000	\$85,000

ID	Location	Name	Comments	Cost (low)	Cost (high)
17	39th St & Paxson St	Bikeway Intersection Improvement	Accommodation for SB bikes is difficult due to bus stop and turn bay locations. Could provide ramp up onto sidewalk in SB direction to allow bikes to dismount and orient to existing crossing with median refuge.	\$8,000	\$12,000
18	South Ave & Schilling St	Greenway Intersection Improvement	If turning volumes from South Ave are low, a Minneapolis style median treatment could be applied. This involves a raised median consuming the turn lane with pedestrian crossings on both the east and west legs. The raised median would return to grade through the middle of the intersection, bicyclists would use the medians as refuges, but be on the sides of them. A single vehicle could still queue in the turn area and not block through traffic.	\$20,000	\$25,000
19	South Ave & Johnson St	Trail Crossing Improvement	Provide diagonal trail crossing parallel to tracks and use bicycle signal. Peds would cross as they do now.	\$15,000	\$20,000
20	3rd St W & Schilling St	Greenway Intersection Improvement	Add new bike/ped crossing in small area of opportunity between T Intersections. There is a drainage inlet on the north side that will need to be moved. Sidewalks on the west side of Curtis and the east side of Schilling St should be widened to 8-10 feet. Bikes would cross the centerline of each street to access the wide sidewalk, cross 3rd and then resume in-street. RRFB is recommended.	\$50,000	\$70,000
21	3rd St W & California St	Greenway Intersection Improvement	Add curb extensions into parking lane with bicycle forward stop bars just prior to bike lanes on 3rd. One of the two T-intersections should have a pedestrian crossing installed as well.	\$25,000	\$30,000
22	5th St W & Ivy St	Direct users to BBT crossing improvements	Install wayfinding	\$1,000	\$1,500
23	4th St W & Orange St.	Greenway Intersection Improvement	Challenging intersection due to 3 adjacent signals. Recommend studying feasibility of new bike/ped only signal here with east-west traffic being forced right onto Orange St. Signal would need to be coordinated with adjacent signals. Alternate option is to create a solid raised median and use RRFBs to cross each direction of Orange.	\$40,000	\$120,000
24	Mt Ave & Park St	Greenway Intersection Improvement	Difficult to make geometric changes here due to fire station on the SE corner. Install pedestrian crosswalks on all four legs with high visibility crossing MT Ave. Place bike/ped warning signs.	\$9,000	\$15,000
25	Toole Ave & Burton St	Greenway Intersection Improvement	Install curb extensions at all four corners to reduce crossing distances. Install pedestrian crossings and bike/ped warning signs.	\$28,000	\$40,000
26	Benton Ave & Higgins Ave	Greenway Intersection Improvement	Curb extensions on west leg, crosswalks and warning signage.	\$25,000	\$32,000
27	McDonald Ave & Grant St	Greenway Intersection Improvement	Complete sidewalk at SW corner, provide pedestrian crossings and bike/ped warning signs.	\$9,000	\$12,000
28	Spurgin Rd & Reserve St	Greenway Intersection Improvement	Past plans have called for at-grade intersection improvements here including suggesting grade separation. Crossing would need to be signalized to offer a safe bike-ped crossing. It is possible that a refuge island on both sides could be created between a right turn and left turn only. Through crossings across Reserve would be prohibited.	\$100,000	\$150,000
29	4th St W & Russell St	Greenway Intersection Improvement	Hybrid Beacon or Signal to assist bicyclists and pedestrians crossing Russell. May be coordinated with adjacent signals. To be integrated with Russell phase II improvements.	\$50,000	\$90,000
30	Stoddard St & Scott St	Scott Street Underpass Improvements	Improve lighting to LED, paint murals and color up the underpass area, improve bike/ped connections to scott street. Develop recreational or park like features to make underpass more inviting. Add surveillance cameras. Remove junk and stored materials.	\$25,000	\$10,000
31	Fairview Ave & Brooks St	Add Sharrows	On west leg of intersection bike lane drops. Add several sharrows in the outside lane in both directions to maintain continuity.	\$2,500	\$2,500

ID	Location	Name	Comments	Cost (low)	Cost (high)
32	Mt Ave & Stephens	Add Sharrows	Bike lanes drop along Orange/Stephens at the intersection with Mt Ave. The street is 60' wide with 5 travel lanes present. If 10' lanes were used bike lanes can be added. If this is not supported, add sharrows spaced at 75' within areas where bike lanes are absent and bikes may use full lane signage.	\$5,000	\$15,000
33	6th St & Arthur Ave	On-Street Improvement	Remove Bike Box and install two stage turn box to facilitate SB to EB turns.	\$2,500	\$6,000
34	Campus Dr and Maurice Ave	On-Street Improvement	Install Two Stage Turn Box to facilitate NB and SB to WB turns at 5th.	\$1,500	\$2,000
35	Broadway St & Van Buren St	Intersection Improvements	Provide leading pedestrian interval for RUX trail users to get them out in front of turning traffic. Include Blank-out sign for cars to reinforce no right turn when leading interval is active. Leading interval should be at least 7 seconds.	\$3,000	\$5,000
36	Front St & Van Buren St	Intersection Improvement	RUX transition here needs redesign. Stop sign to be restored in the EB direction. Better crossing markings installed. Ideally some geometry would be improved to better match existing use.	\$1,500	\$15,000
37	Broadway & Monroe St	Bike/Ped Crossing	Mid-block crossing for pedestrians and bicyclists to use to link existing sections of pathway along Rattlesnake creek. Likely would be Hybrid Beacon that could be coordinated with adjacent signals.	\$45,000	\$60,000
38	Front St & Orange St	Intersection Improvement	For northbound bikes, add two stage left turn box at intersection to direct to Front St and eventually Owen St. Add wayfinding to support this movement.	\$2,500	\$4,000
39	Broadway St & Owen St	Greenway Intersection Improvement	Force right turn for cars along Owen St, create through bike lane pocket that extends into the shadow of the parking lane along Broadway on the south side and to the bulb out edge on the north side. this will shorten crossing distance and reduce conflicts. Add warning signs for bikes/peds.	\$15,000	\$20,000
40	Stephens Ave & Tremont St	Spot Improvement	Stripe bike lane through corner short term. Long term make curb line adjustments to provide additional room. If bike lane can be raised through corner to protect it before dropping back to street level that would be a desirable design.	\$2,000	\$30,000
41	Stephens Ave & Florence St	Greenway Intersection Improvement	Create pass through in median for bikes. Provide through bike lanes on approaches, warning signage and pedestrian crosswalks.	\$15,000	\$20,000
42	Reserve St & CS Porter Middle School	Crossing Improvement	Study should be undertaken to examine performance of this pedestrian signal. Review signal coordination with adjacent signals, crossing timing and safety. Consider converting to a Pedestrian Hybrid Beacon with on-demand actuation.	\$7,500	\$15,000
43	River Rd & Reserve St	Greenway Intersection Improvement	Full signal with pedestrian crossings	\$250,000	\$500,000
44	Spruce St & Owen St	Greenway Intersection Improvement	Add RRFBs for Owen crossing	\$15,000	\$25,000
45	Mt Ave & Regent St	Greenway Intersection Improvement	Use left side of Regent St center turn lane for refuge, add RRFBs. Also construct 10 foot path along north side of Mt. Ave to Rollins St.	\$75,000	\$125,000
46	n/a	Riverfront Triangle Bike/Ped Bridge	With improvements associated with Riverfront Triangle project.	\$1,500,000	\$3,000,000
47	n/a	Bike/Ped Bridge	Add a bicycle/pedestrian bridge from Mullan Road over the Clark Fork River to the Missoula Ready Mix site, preferably somewhere about halfway between Reserve and Russell Streets. The exact location of the bridge will depend on development and design	\$1,500,000	\$3,000,000

ID	Location	Name	Comments	Cost (low)	Cost (high)
48	n/a	Missoula College Shared Use Path Bridge	Bike/Ped bridge over Clark Fork River from Missoula College to the Kim Williams Trail and the University of Montana.	\$1,500,000	\$3,000,000
49	n/a	Bitterroot Branch Trail River Crossing	Bitterroot Branch Trail Bike/Pedestrian Crossing – On or next to existing RR Bridge.	\$250,000	\$3,000,000

