



# Denver Regional *Active Transportation Plan*

January 2019

*Adopted by the Board of Directors on January 16, 2019*

*Special thanks to the Active Transportation Stakeholder Committee, local government staff and elected officials and members of the public who participated in the plan development process.*

# Table of Contents

**Chapter 1:**  
*Introduction* ..... 1

**Chapter 2:**  
*Regional Active Transportation Network* .....27

**Chapter 3:**  
*Emerging Trends and Approaches for Local Implementation*.....43

**Chapter 4:**  
*Taking Action* .....75

## Appendices:

- A: *County Profiles*
- B: *Survey of Residents about Active Transportation: Report of Results*
- C: *Technical Documentation*
- D: *Bicycle and Pedestrian Crash Report*
- E: *Stakeholder Engagement Process*
- F: *Local Plan Inventory*

*All images copyright Toole Design, unless otherwise indicated.*





# Chapter 1: Introduction

In 2017, the Denver Regional Council of Governments (DRCOG) initiated the development of the Denver region's first active transportation plan. The purpose of the plan is to establish a common vision for bicycling and walking in the region and to provide inspiration and tools for local agencies to implement projects in their respective jurisdictions.

The *Denver Regional Active Transportation Plan (ATP)* supports DRCOG's *Metro Vision* plan and will foster collaboration among local agencies across boundaries. DRCOG worked with partners throughout the region to develop a regional active transportation vision, tools and products to support the development of a robust active transportation network in the Denver region. The ATP envisions a safe, comfortable and connected network and highlights opportunities and implementation strategies to improve active transportation across the Denver region.

## REGIONAL TRANSPORTATION CONTEXT

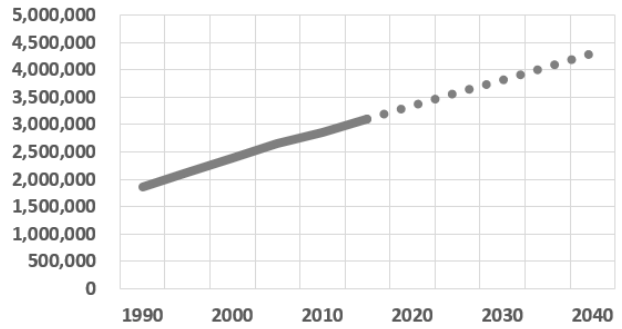
The Denver region spans all or parts of 10 counties and is home to over three million people. With a strong economy, access to countless outdoor recreation opportunities, and sunshine throughout the year, it's no surprise the region's population is expected to increase by approximately 1.3 million people by 2040 (Figure 1).<sup>1</sup>

Much of the recent growth in the region can be attributed to younger people who have moved to Colorado. The Colorado Department of Local Affairs estimates that people aged 15 to 39 will account for 75 percent of net migration in the Denver region from 2010 to 2020 (Figure 2).<sup>2</sup> Similarly, a 2016 New York Times article found millennials are attracted to Denver for its access to jobs and recreation, availability of rail transit, the walkability of its neighborhoods and a startup-friendly business climate.<sup>3</sup>

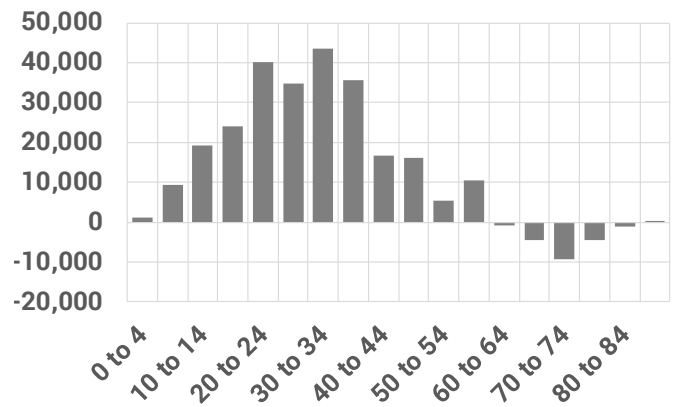
While the Denver region is experiencing an influx of younger people, the projected increase in the population of older adults over the next few decades will also increase. The region's 60-plus population is growing at a faster rate than the rest of the population as a whole—by 2040, more than 1 million residents will be 60 or older.<sup>4</sup> All counties in the region will see substantial growth in this age group, and by 2040 one in four residents of the region will be 60 or older (Figure 3).<sup>5,6</sup>

The role of DRCOG and its partners is to preserve and enhance quality of life, even as population growth places additional stress on the transportation system. DRCOG has developed the region's first ATP with these challenges and opportunities in mind. Previous bicycle and pedestrian elements of the *Metro Vision Regional Transportation Plan* (MVRTP) included an active transportation component of the 2040 MVRTP and the pedestrian and bicycle element of the 2035 MVRTP.<sup>7,8</sup>

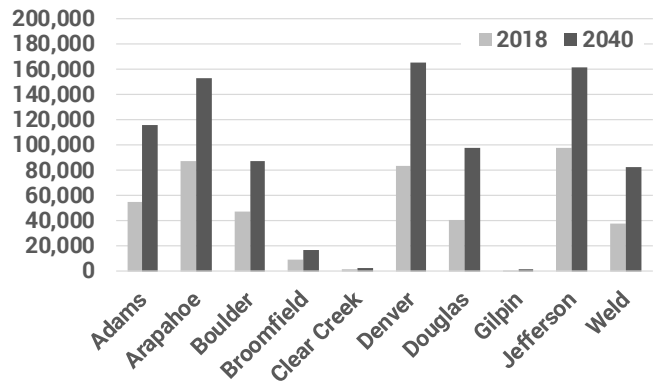
**Figure 1. Estimated and Projected Population, 1990 to 2040**



**Figure 2. Estimated Net Migration by Age Group, 2010 to 2020**



**Figure 3. Projected Older Adult (60-plus) Population by County, 2018 to 2040**



## Mobility

The Denver region is highly mobile and interconnected. There are numerous downtowns, activity centers, major employers and other significant destinations that attract people from nearby cities and counties. Apart from Boulder County, over half of the workers in every county within the region work in a different county than they live (Figure 4).<sup>9</sup>

The DRCOG Board of Directors adopted a mode-shift target, aiming to decrease the percentage of workers driving alone from around 75 percent to 65 percent by 2040.<sup>10</sup> There is a substantial opportunity to shift the way that the Denver region gets around, reducing driving alone and increasing travel by transit, foot and bicycle. The ATP is one such related initiative to making progress towards the adopted target.

As in many places around the country, driving alone is the most common way people get to work in the Denver region. Driving alone is the chosen mode for nearly three quarters of commute trips in the region (Figure 5).

**A survey conducted for this project found that the primary reason people drive alone is because driving is the quickest and most convenient mode of transportation. See Appendix B for more information.**

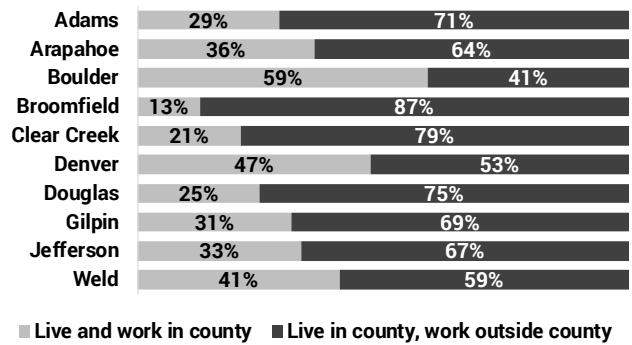
In the Denver region, over 1 million drive-alone trips of two miles or less are made each day. Since the average length of a bicycle trip is approximately 1.8 miles and over a third are less than two miles, these trips offer strong potential to be converted from driving to bicycling.<sup>11</sup>

Similarly, the average length for a walking trip is around 0.4 miles.<sup>12</sup> Each day, around 100,000 driving alone trips less than 0.4 miles are made in the Denver region.<sup>13</sup>

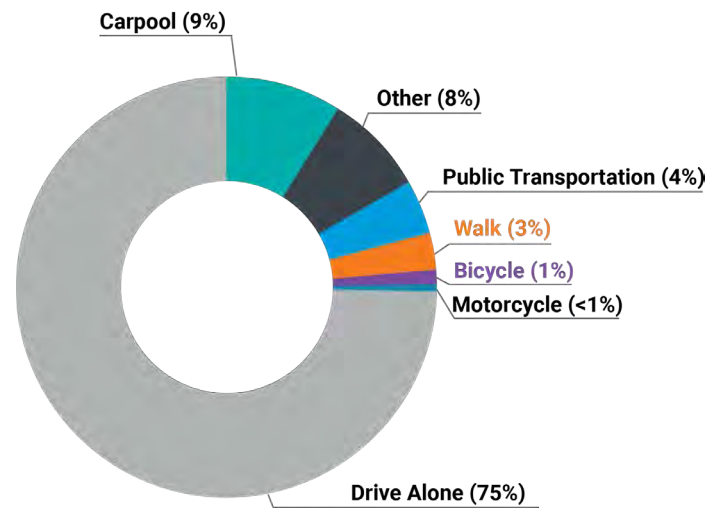
Residents of the Denver region are already bicycling and walking for a significant number of trips. Nearly 140,000 bike trips were made in the region daily in 2015, and walking accounted for over 1.9 million daily trips, including trips to or from transit. Walking also occurs as part of trips using other modes.

Public transit services provided by the Regional Transportation District (RTD) are a critical part of the region's multimodal transportation system. The system has expanded substantially with the introduction of several new rail lines over the past few years. Ridership across RTD's system increased from 2000 to 2015, but has since declined slightly.<sup>14,15</sup>

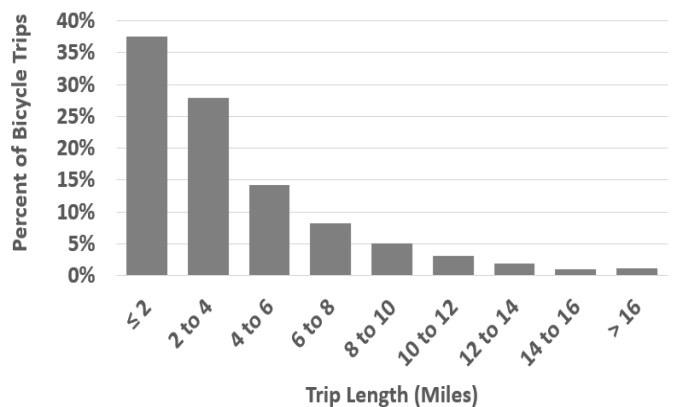
**Figure 4. Percentage of Workers by County of Residence and Workplace**



**Figure 5. Denver Region Commute Mode Share**



**Figure 6. Distribution of Bike Trips by Length, 2015**



## Traffic safety

Reducing traffic crashes and saving lives is a primary motivating factor for the Colorado Department of Transportation (CDOT), DRCOG and other transportation and public works departments as they develop and implement projects across the Denver region. Several communities, in addition to CDOT, have adopted Vision Zero or Towards Zero Deaths initiatives which highlight the importance of traffic safety at all levels of the transportation planning process.

As shown in Figure 7, between 2000 and 2008, traffic fatalities in the region declined for all modes except motorcycles.<sup>16</sup> However, beginning in 2008 the number of fatalities in the Denver region plateaued and has steadily increased since 2011. This pattern roughly mirrors national trends.<sup>17</sup>

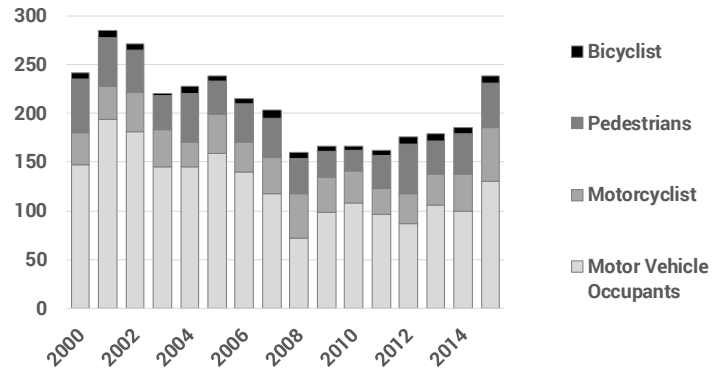
The DRCOG Board of Directors adopted short- and long-term targets to reduce traffic-related serious injuries and fatalities. The long-term goal is to reduce traffic fatalities from 185 in 2014 to fewer than 100 annually by 2040.

*Only about 30 percent of survey respondents felt they could safely bicycle to work from their home. See Appendix B for more information.*

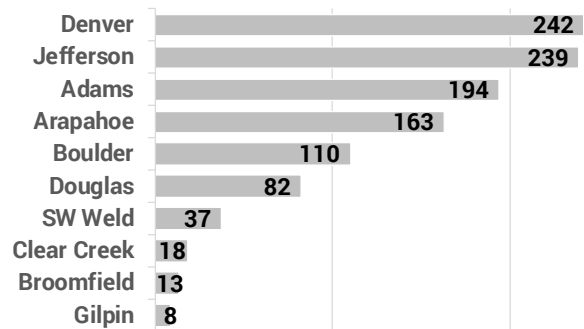
The distribution of traffic fatalities across counties in the Denver region is shown in Figure 8.<sup>18</sup> As the most vulnerable road users, bicyclists and pedestrians are substantially over-represented among traffic deaths in the region compared with commute mode share (Figure 9).<sup>19</sup>

The ATP is influenced by regional mobility and safety trends and recognizes the vulnerability of people walking and bicycling. To learn more about bicycle and pedestrian crashes in the Denver region, please see Appendix D, Bicycle and Pedestrian Crash Report.

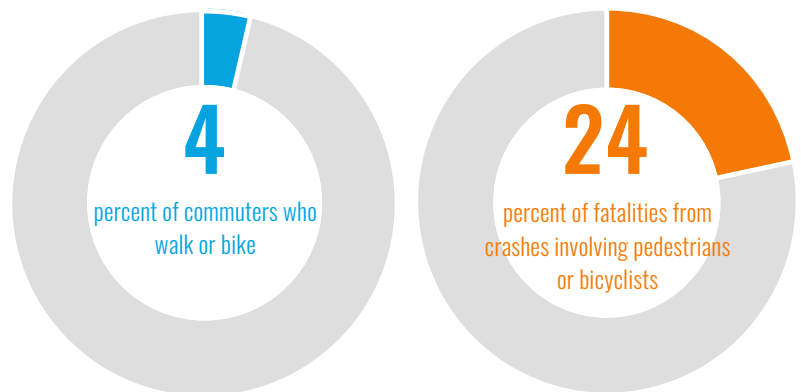
**Figure 7. Traffic Fatalities in the Denver Region, 2000 to 2015**



**Figure 8. Traffic Fatalities by County, 2010 to 2015**



**Figure 9. Pedestrian and Bicycle Mode Share vs. Fatalities**





## METRO VISION

Regional planning partners recognized the challenges and opportunities facing the Denver region and, in response, crafted a vision. Communities in the Denver region have been working together to advance a shared aspirational vision of the future of the metro area for more than 60 years, the first *Metro Vision* plan was adopted by the DRCOG Board of Directors in 1997. DRCOG's *Metro Vision* establishes a shared, aspirational vision among DRCOG's many partners across the Denver region. It outlines the region's high-level priorities (themes) and regional and local actions needed to accomplish the vision (strategic initiatives). DRCOG works with partners throughout the region to implement *Metro Vision*.

*Metro Vision's* five overarching themes describe the region's desired future (outcomes):

### **An Efficient and Predictable Development Pattern**

- » The region is comprised of diverse, livable communities.
- » Through a coordinated effort between DRCOG and local communities, new urban development occurs in an orderly and compact pattern within regionally designated growth areas.
- » Connected urban centers and multimodal corridors throughout the region accommodate a growing share of the region's housing and employment

### **A Connected Multimodal Region**

- » The regional transportation system is well-connected and serves all modes of travel.
- » The transportation system is safe, reliable and well-maintained.

### **A Safe and Resilient Natural and Built Environment**

- » The region has clean water and air, and lower greenhouse gas emissions.
- » The region values, protects and connects people to its diverse natural resource areas, open space, parks and trails.
- » The region's working agricultural lands and activities contribute to a strong regional food system.
- » The risk and effects of natural and human-created hazards are reduced.

### **Healthy, Inclusive and Livable Communities**

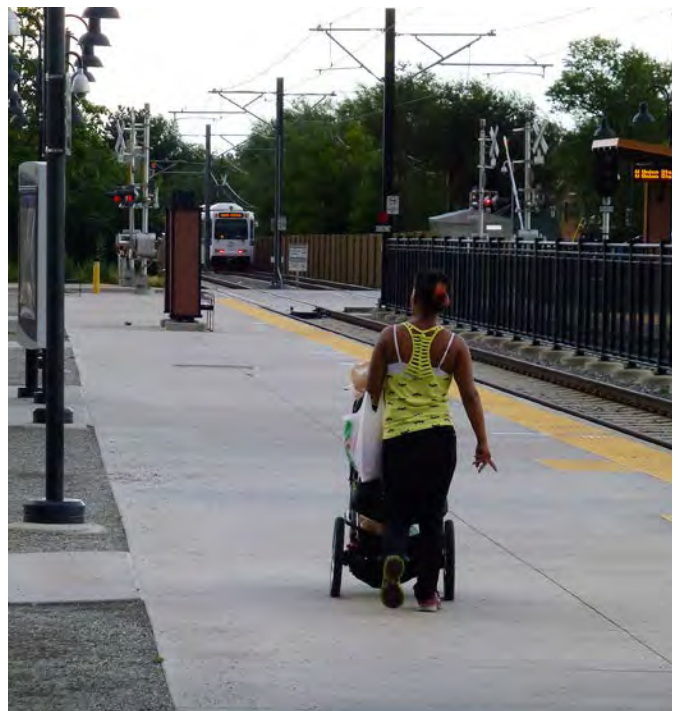
- » The built and natural environment supports healthy and active choices.
- » The region's residents have expanded connections to health services.
- » Diverse housing options meet the needs of residents of all ages, incomes and abilities.

### **A Vibrant Regional Economy**

- » All residents have access to a range of transportation, employment, commerce, housing, educational, cultural and recreational opportunities.
- » Investments in infrastructure and amenities allow people and businesses to thrive and prosper.

## Metro Vision Regional Transportation Plan

The *Metro Vision Regional Transportation Plan* (MVRTP) is the long-range transportation plan for the Denver region.<sup>20</sup> As the federally designated metropolitan planning organization (MPO) for the Denver region, the MVRTP was developed to guide the region's future multimodal transportation system. The MVRTP is closely integrated with *Metro Vision* and highlights opportunities and challenges across all modes of transportation. This ATP is intended to build on the outcomes in *Metro Vision* and serve as the bicycle and pedestrian element of the MVRTP, alongside other modal plans.



## THE CASE FOR A REGIONAL ACTIVE TRANSPORTATION PLAN

*Metro Vision* established performance measures and targets that support fewer people driving single-occupant vehicles (SOVs) to work, improved safety for all users of the transportation system and improved air quality. Considering how active transportation plays into livability and mobility region-wide, an active transportation plan is necessary to establish a shared vision for active transportation in the Denver region.

Active transportation is also a high priority for local governments and residents. DRCOG, as the Denver region's MPO, undertook the development of a regional ATP as a task outlined in the Unified Planning Work Program to supplement the regional transportation planning process, which includes other modal plans like freight and transit.<sup>21</sup>

Bicycling and walking provide access to destinations, and connect people to the regional transit system. Communities throughout the Denver region are developing safe and convenient walking and bicycling routes (and associated infrastructure) to transit and supportive policies to incentivize alternatives to driving.

Active transportation can also help ensure the region's residents maintain a healthy lifestyle and remain active as they age. Many of the strategies identified in the Colorado Strategic Action Plan on Aging support the need for greater investment in walkable communities.<sup>22</sup> A greater diversity of pedestrian- and bicycle-friendly communities across the region will support the Denver region's aging population and fulfill the need and desire for

livable neighborhoods for people of all ages, abilities and incomes.

The ATP provides an aspirational framework for connecting current and future communities and destinations across the region with high-comfort bicycle and pedestrian facilities. The ATP provides ideas and resources for communities to improve active transportation while supporting regional connectivity. Chapter 3 offers information on planning and design approaches as well as bicycle and pedestrian infrastructure implementation.

The ATP showcases recent and ongoing successes in the Denver region and builds off the existing work of local communities. Many communities in the region have adopted local active transportation plans and others have addressed bicycle and pedestrian transportation networks in their transportation master plans, comprehensive plans and parks or open space plans. Implementation of these plans is critically important for improving conditions for people who walk and bicycle in local communities, connecting residents to local destinations and creating a culture of support for healthy and active lifestyles.

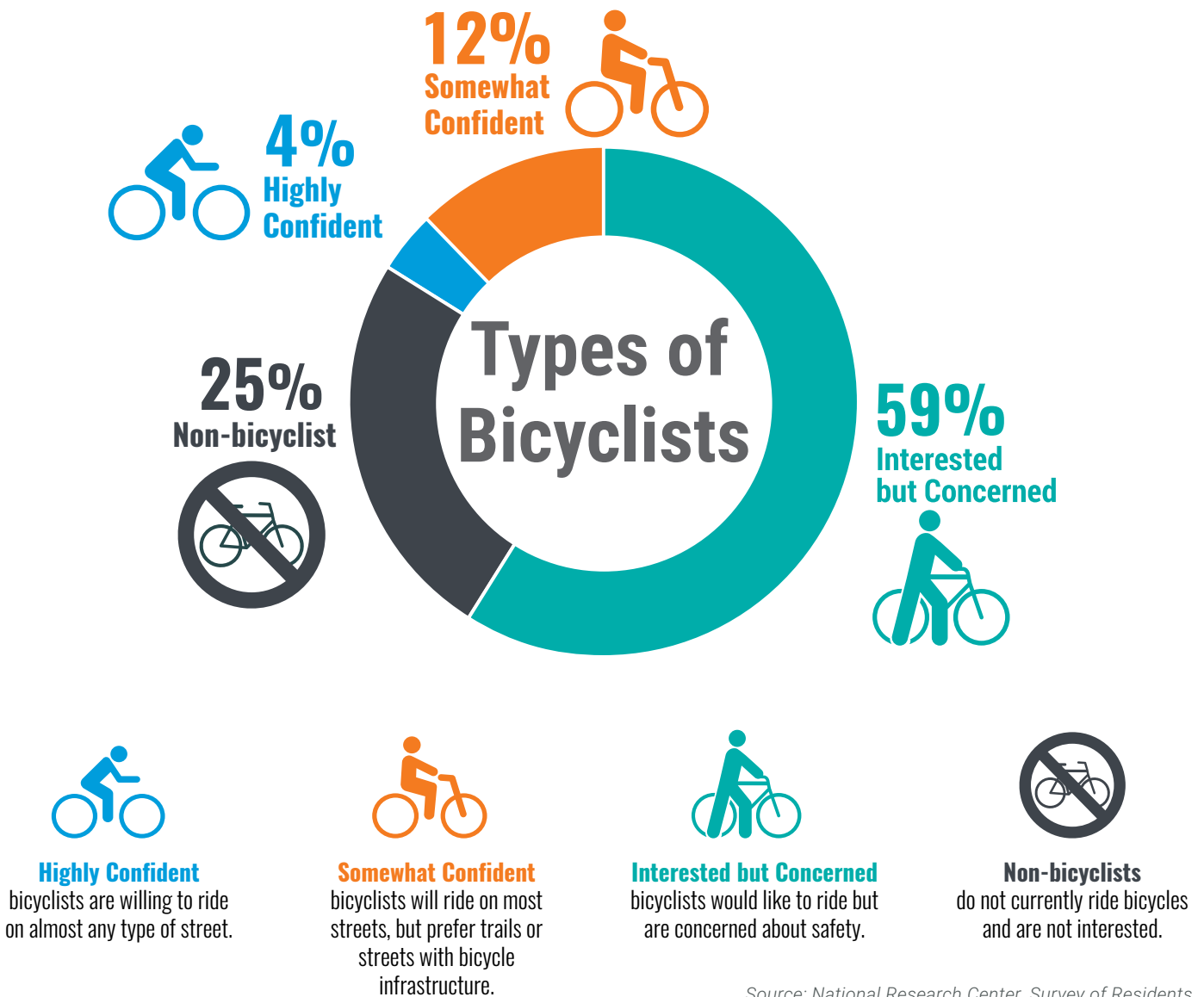
The ATP is a tool to promote regional cooperation on active transportation issues that extend across jurisdictional boundaries. Additionally, the ATP encourages municipalities to share ideas and learn from one another to advance toward a more connected and cohesive active transportation network. By highlighting important cross-jurisdictional routes and areas within local communities where investment is needed to support regional performance targets, the ATP can foster collaboration across boundaries to achieve regional outcomes.

### What is Active Transportation?

For the purposes of this plan, the term active transportation generally refers to pedestrian modes such as walking and wheelchairs; bicycling; and other forms of self-propelled transportation. It encompasses trips made for any purpose including commuting, utility, school, recreation or leisure trips.

While emerging modes like e-bikes and e-scooters do not exclusively rely on human power, people riding them typically use shared-use paths, bike lanes and sidewalks. These devices offer a practical alternative to the use of motor vehicles and contribute to many of the same goals as walking and bicycling.

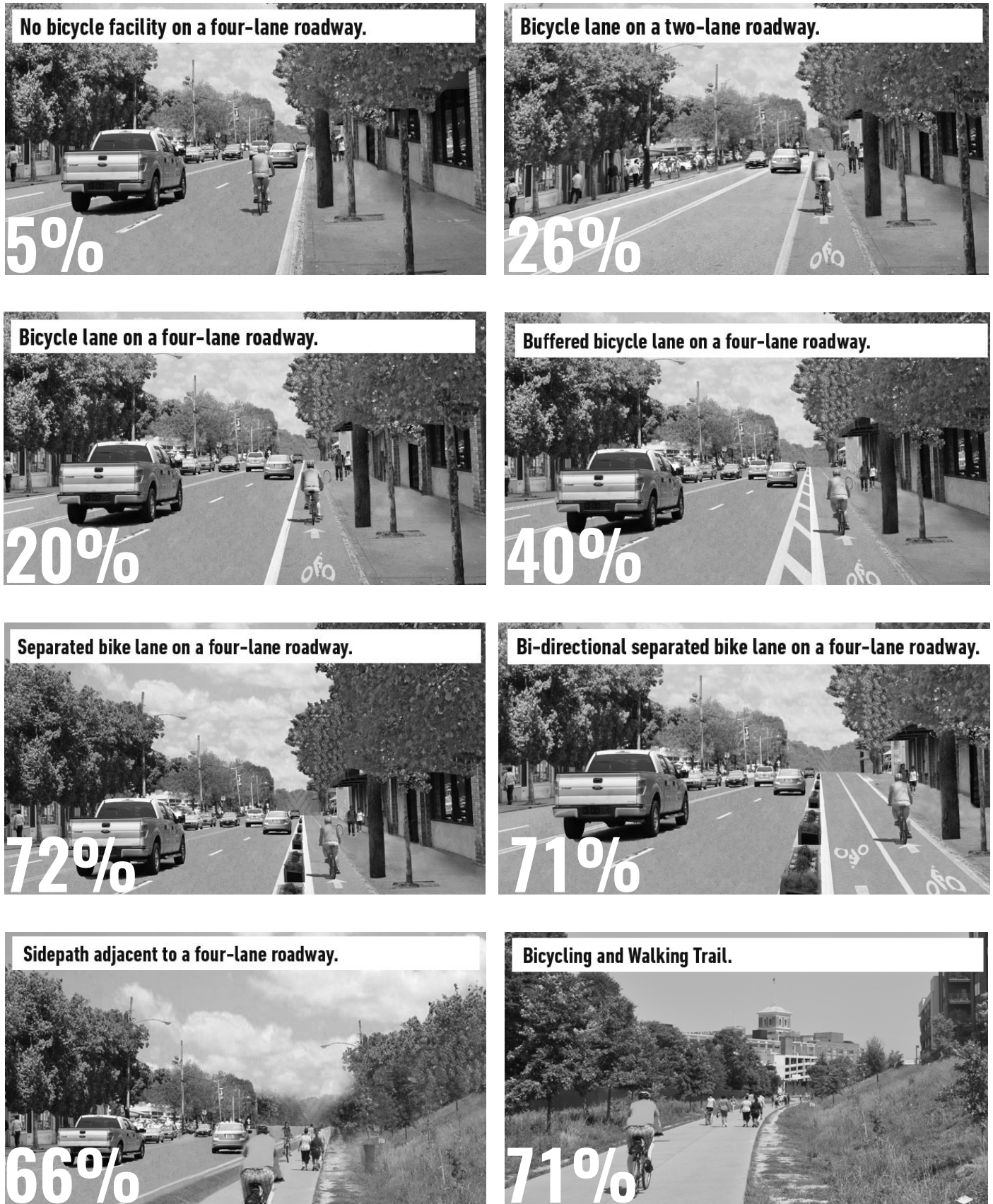
Figure 10. Types of Bicyclists in the Denver Region



Source: National Research Center. Survey of Residents about Active Transportation: Report of Results. 2018.

*In the Denver region, there is a strong user base for bicycling, but even greater potential among the "interested but concerned" population who would bike more if it were safe and convenient. The survey conducted for this project found that 16 percent of the region's adult population is highly confident or somewhat confident bicycling on a street with motor vehicle traffic. A much larger portion (59 percent) are interested but concerned and are unlikely to bike without separated bicycle facilities (Figure 10). This finding points to the potential for increasing bicycling in the region by investing in safe and comfortable bicycle facilities. See Appendix B for more information.*

**Figure 11. Denver region residents who said they would feel comfortable by bicycle facility type.**



Source: National Research Center. Survey of Residents about Active Transportation: Report of Results. 2018;  
Image credit: Watkins et al. NCHRP 08-102: Bicyclist Facility Preferences and Effects on Increasing Bicycle Trips (Research in progress).

## Benefits of Active Transportation

### HEALTH



Being physically active is one of the most important actions that people of all ages can take to improve their health and bicycling and walking for transportation and recreation can help adults and children meet recommended levels of physical activity established by the Centers for Disease Control (CDC). The United States surgeon general and the CDC encourage communities to design streets to make walking and biking safe and easy for people of all ages and abilities.<sup>23</sup> Connecting activity-friendly routes with everyday destinations (such as transit stops, workplaces, schools, parks and libraries) it is easier and more convenient for people to walk and bike.<sup>24</sup>

Even though the Denver region has a low obesity rate compared with other places across the country, several areas in the region have overweight, obesity and asthma rates that are higher than the statewide average. One in four children in Colorado is overweight or obese.<sup>25</sup> Shifting trips from motor vehicles to active modes can increase opportunities for physical activity, reduce air pollution and yield positive health effects.

### ACCESSIBILITY AND MOBILITY



Active transportation options contribute to a more equitable transportation system by reducing accessibility barriers for people who ride a bicycle, walk or use transit. Safe, connected and accessible active transportation networks are especially important for people without motor vehicles (6 percent in the Denver region), senior citizens (11.6 percent in the Denver region) and people with mobility disabilities (9.1 percent in the Denver region).<sup>26</sup> The region's aging population emphasizes the need for safe and accessible alternatives to driving. Older adults who no longer feel safe driving, or who do not have the physical or financial ability to drive, are often limited from performing daily activities if they cannot travel on their own.

### SAFETY



Planning for people who walk or bicycle benefits all users of the transportation system, especially those with the greatest risk of suffering an injury or fatality when involved in a crash. Research has demonstrated that implementing facilities to increase the safety of people who bicycle and walk also improves safety for drivers.<sup>27</sup> In recent years, considerable progress has been made in identifying effective approaches for reducing crash risk for pedestrians and bicyclists.<sup>28 29</sup> Additionally, motorists feel more comfortable driving when bicyclists have a defined space on a road, compared with scenarios in which they share space with bicyclists.<sup>30</sup>

### ECONOMIC VITALITY



In addition to the health and safety benefits of active transportation, bicycling and walking are good for the economy. A 2016 Colorado study estimated that bicycling and walking account for combined health and economic benefits of approximately \$4.8 billion annually (\$3.2 for walking and \$1.6 for bicycling). The study also estimated that the economic benefit of out-of-state tourists that bicycled on their vacation is approximately \$318 million.<sup>31</sup>

## ACTIVE TRANSPORTATION PLAN OBJECTIVES

The ATP identifies several objectives for active transportation in the region that build on the themes and outcomes of *Metro Vision*. These objectives form the basis of the ATP planning framework. The objectives for the ATP are to:

1. Reduce the number and severity of crashes involving pedestrians and bicyclists.
2. Increase bicycling and pedestrian activity.
3. Expand and connect the regional and local bicycle networks.
4. Expand and connect comfortable transportation facilities for people who bike and people who walk.
5. Improve bicycle and pedestrian access to and from transit.
6. Improve the region's multimodal transportation system.
7. Improve and expand equitable access to regional active transportation corridors.

The ATP objectives provide a high-level vision for how infrastructure, policies and programs can be implemented to advance regional performance targets and improve active transportation in the Denver region. Performance measures and benchmarks for each objective are outlined in Chapter 4, Taking Action.

## REGIONAL ACTIVE TRANSPORTATION PLANNING EFFORTS IN THE DENVER REGION

The Denver region has a long history of planning for active transportation that is evident in signature regional trails such as the Cherry Creek Trail, South Platte River Trail, the C-470 Trail, High Line Canal Trail and numerous others. Local communities have begun to prioritize comfortable on-street bicycle facilities in various planning efforts and to participate in Vision Zero-related traffic safety initiatives.

Several ongoing regional active transportation planning efforts are described in this section. Work at the local level is further discussed and explored later in this plan. DRCOG also conducted a regionwide local plan inventory to better understand efforts to improve active transportation and to ensure the regional plan is consistent with local plans.



## Transportation Improvement Program

DRCOG has, and will continue to, support active transportation regionwide through the Transportation Improvement Program (TIP). The DRCOG Board of Directors establishes the TIP policy, which outlines how DRCOG-controlled funding will be allocated to projects in the region through calls for projects.

For the 2016-2019 TIP Call for Projects, 21.4 percent (\$37.4 million) of the projects selected went solely to active transportation projects. In addition, almost all of the funded roadway projects included bicycle and/or pedestrian elements. The large demand for active transportation infrastructure is demonstrated by the high number of bicycle and pedestrian project applications submitted.

For the 2020-2023 TIP, DRCOG introduced a new project selection process, with separate regional and subregional share calls for projects. Active transportation projects, including infrastructure and non-infrastructure projects (marketing, education, outreach) can be funded through both calls for projects.<sup>32</sup> Active transportation projects are eligible in the 2020-2023 TIP as described below:

## Regional call for projects

Projects identified as on, or in proximity of, a regional corridor or key multiuse trail as identified in the TIP policy document or that are identified in a local plan are eligible projects as part of the regional call for projects.<sup>33</sup>

## Sub-regional call for projects

Any bicycle or pedestrian infrastructure project that is eligible for federal funds is eligible as part of the sub-regional call for projects.

## TIP set-asides

In addition to funding through the regional and subregional calls for projects, active transportation projects can be funded through TIP set-asides which are established in the TIP policy. Set-asides from the 2018-2021 TIP and the 2020-2023 TIP are described in Table 1.

**Table 1. TIP Set-Asides**

| Title         | Category   | Big Idea  |
|---------------|--|---|
| 2018-2021 TIP | Regional Transportation Demand Management Set-Aside                | The DRCOG Board of Directors established a TIP Set-Aside to support local governments, transportation management associations (TMAs) and nonprofits in their efforts to expand local and regional transportation demand management (TDM) through small TDM-supportive infrastructure, marketing, education and outreach projects. This set-aside also includes funding for the regional TDM Way to Go partnership. TMA partners that participate in the Way to Go partnership include: Boulder Transportation Connections, Commuting Solutions, Denver South TMA, Downtown Denver Partnership, Northeast Transportation Connections, Smart Commute Metro North and Transportation Solutions. More information about the Way to Go program is detailed on page 20. |
|               | DRCOG Way to Go Program  | This set-aside includes funding for the DRCOG Way to Go program. The Way to Go program includes: trip planning/tracking, ride-matching, vanpool, Schoolpool, employer outreach, Bike to Work Day, commuter assistance, Guaranteed Ride Home, community outreach and advertising/promotions.   |
|               | Station Area Master Plans/ Urban Center Planning Studies Set-Aside | The DRCOG Board of Directors established a TIP set-aside to support local governments in developing small area plans for station areas and urban centers. These projects support local planning to create a vision and accompanying action strategies that contribute to the achievement of regional targets. This set-aside is part of the 2018-2021 TIP.  |
| 2020-2023 TIP | Community Mobility Planning and Implementation                     | The DRCOG Board of Directors established a TIP set-aside that brings together funding for small area planning and transportation studies and funding for small infrastructure that supports implementation of small area plans or studies.  |
|               | TDM Services   | The DRCOG Board of Directors established a TIP set-aside that funds the DRCOG Way to Go program (as described above), the regional Way to Go partnership, and TDM non-infrastructure projects (such as marketing, education and outreach programs).   |

## RELATED DRCOG PROGRAMS AND INITIATIVES

### *Boomer Bond program*

Given the increasing growth of the aging population, DRCOG's Boomer Bond program helps local governments around the region create age-friendly physical and social environments that support aging in place. This initiative includes a comprehensive assessment tool and an online resource directory of age-friendly resources and best practices. To date, 18 diverse communities throughout the region have worked through the process to better understand how to support the older adults they serve. Planning for comfortable active transportation infrastructure, like shared-use paths and accessible sidewalks, supports aging in place. As such, several of the Boomer Bond topic areas are consistent with ATP topics from the design considerations of physical infrastructure to driver safety and travel education.

### *Mobility Choice Blueprint*

In a unique planning and funding partnership, DRCOG, CDOT, RTD and the Denver Metro Chamber of Commerce partnered to develop a Mobility Choice Blueprint. The Mobility Choice Blueprint is a collaborative strategy to help the Denver region identify how to best prepare for the rapidly changing technology that is revolutionizing transportation mobility. The Blueprint, with a horizon year of 2030, will analyze travel trends and technologies in the region, explore and evaluate various technologies and their implications for mobility, align transportation investments of multiple public agencies and create new planning and implementation partnerships.





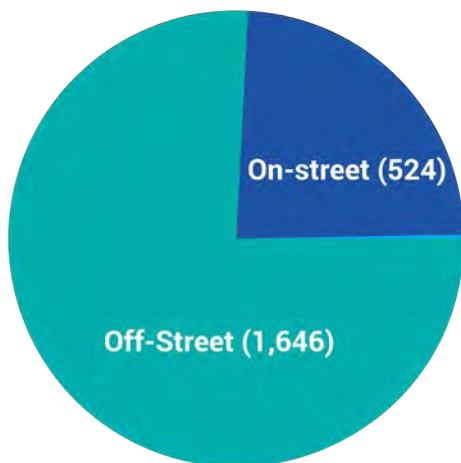
## REGIONAL DATA COLLECTION AND ANALYSIS

DRCOG serves as a regional hub for data collection, management and analysis. Data collection, with the introduction of performance measures and targets in *Metro Vision*, in addition to Fixing America's Surface Transportation (FAST) Act performance-based planning framework, has become a core component of regional planning and collaboration. DRCOG produces a variety of data, information, maps and models in support of regional efforts. There are several key data sets that relate to active transportation in the Denver region.

### Bicycle facility inventory

DRCOG requests bicycle facility data from local government partners annually. DRCOG staff reviews and categorizes each facility according to regional bicycle facility definitions. This information is included in the bicycle facility inventory data set available online<sup>34</sup> and via the Denver Regional Bicycle web map.<sup>35</sup> It includes over 2,000 miles of dedicated bicycle facilities (Figure 12). On-street mileage is reported by road centerline, so the figure below shows that 524 miles of roadway in the Denver region have dedicated on-street facilities. See Figure 13 and Figure 14 for a map of on- and off-street bicycle facilities.

**Figure 12. Regional Bicycle Facilities Mileage**



### Planimetric data

As part of the Regional Planimetric Data Project, DRCOG collects sidewalk and shared-use path data throughout the Denver region (approximately 17,700 miles of sidewalk). This project uses high-resolution imagery to digitize features of the built environment including sidewalks (polygons and lines), sidewalk ramps (points) and trails (lines). These data sets are updated every other year and are available via DRCOG's Regional Data Catalog.

### Bicycle and pedestrian crash data and reports

DRCOG routinely analyzes crashes within the Denver region and prepares summary reports that identify contributing factors and regional trends. As part of the ATP development process, bicycle and pedestrian crashes from the CDOT-DRCOG Crash Database were analyzed. The analysis covers the 2010 to 2015 time period and the findings are included in Appendix D.

### Bicycle and pedestrian counts

DRCOG conducts manual short-duration counts for completed Transportation Improvement Program (TIP) projects and the resulting data is stored in an internal database. DRCOG is considering expansion of its bicycle and pedestrian counting program by developing an online map to share bicycle/pedestrian count data, acquiring equipment to conduct automated short-duration counts and potentially conducting counts as requested by member governments.

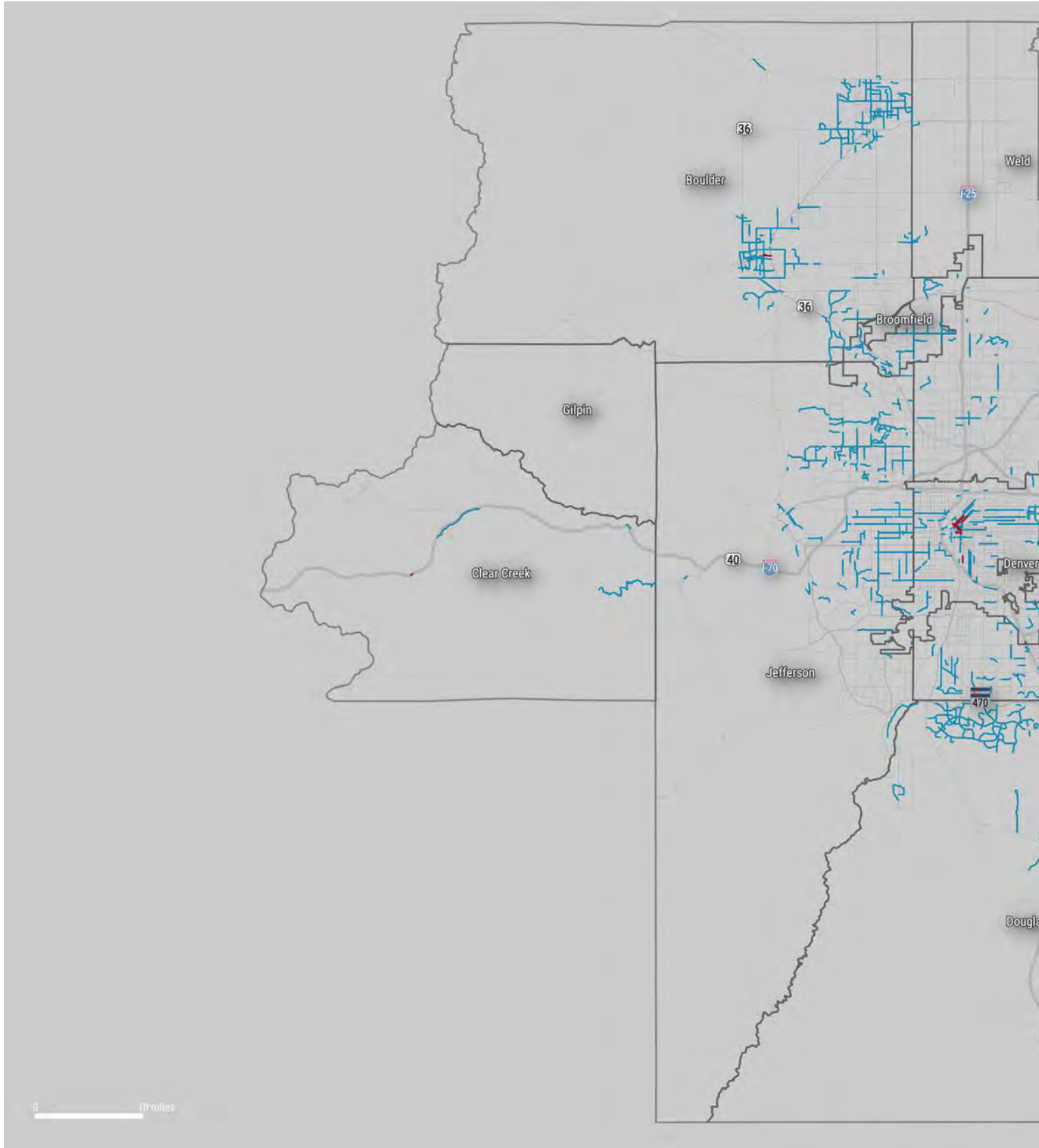
### Regional events

In an effort to evaluate the effectiveness of regional events such as Bike to Work Day and Go-Tober, DRCOG collects and analyzes participation and survey data. In addition to evaluating the effects, DRCOG uses this single-event information to inform future events and opportunities.

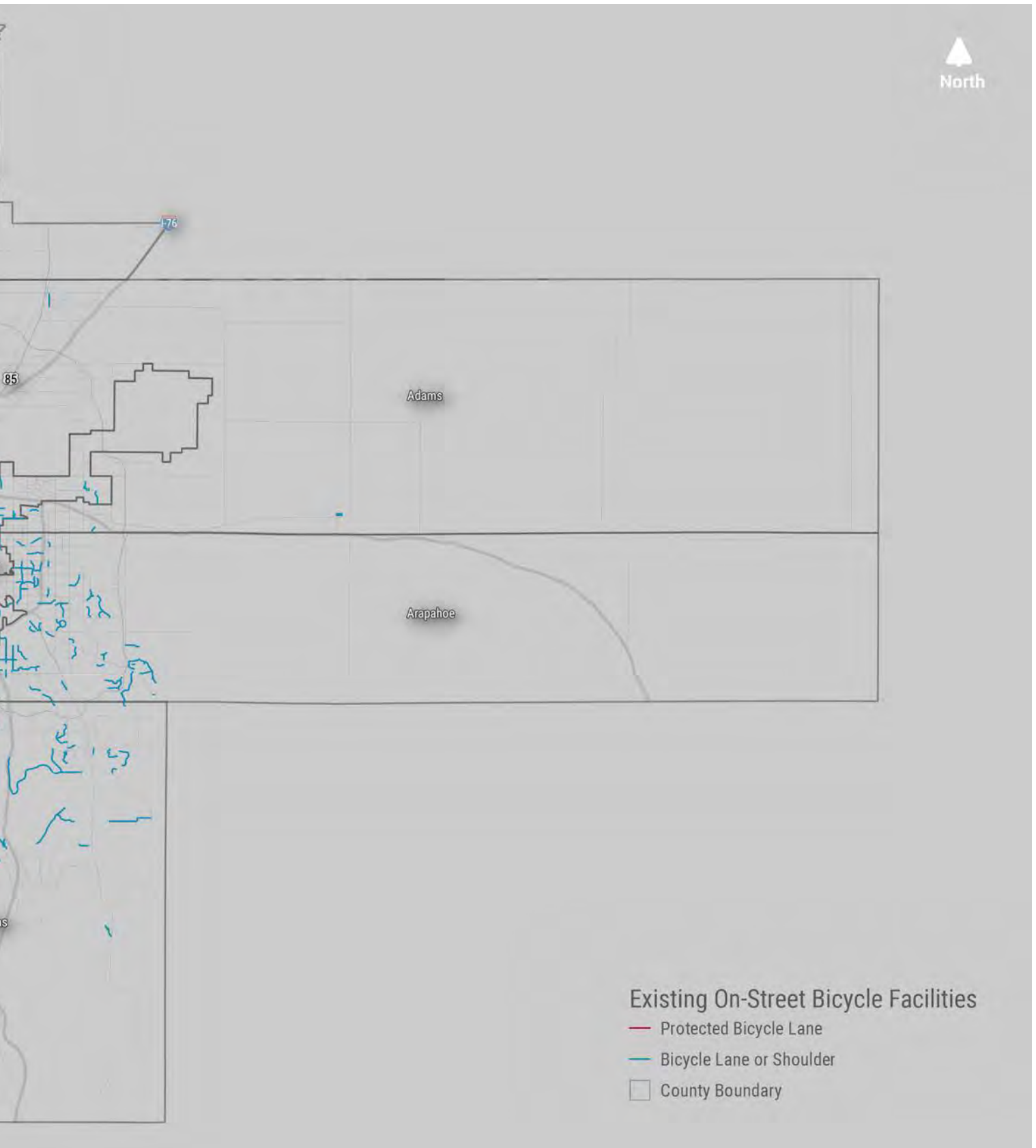
### Resident surveys

DRCOG also uses resident surveys to gain greater insight into transportation-related issues. DRCOG conducted an Active Transportation Survey as part of the development of this plan that evaluated barriers and challenges to active transportation usage across the region. In the past, DRCOG has conducted surveys pertaining to transit-oriented development that engage the region's residents, employees and businesses to learn how experiences with and preference toward high-frequency transit has changed.

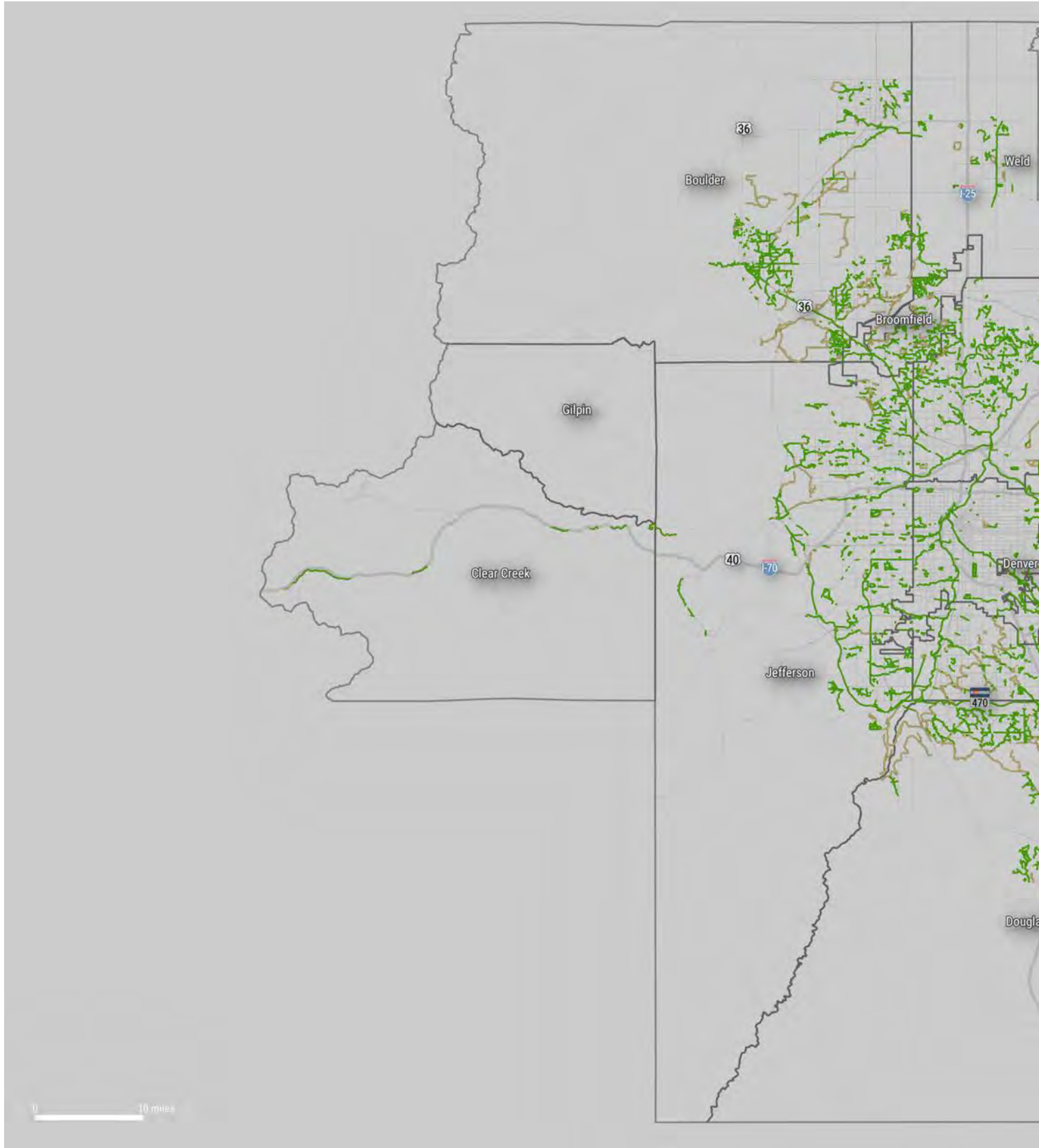
**Figure 13. Existing On-Street Bicycle Facilities**



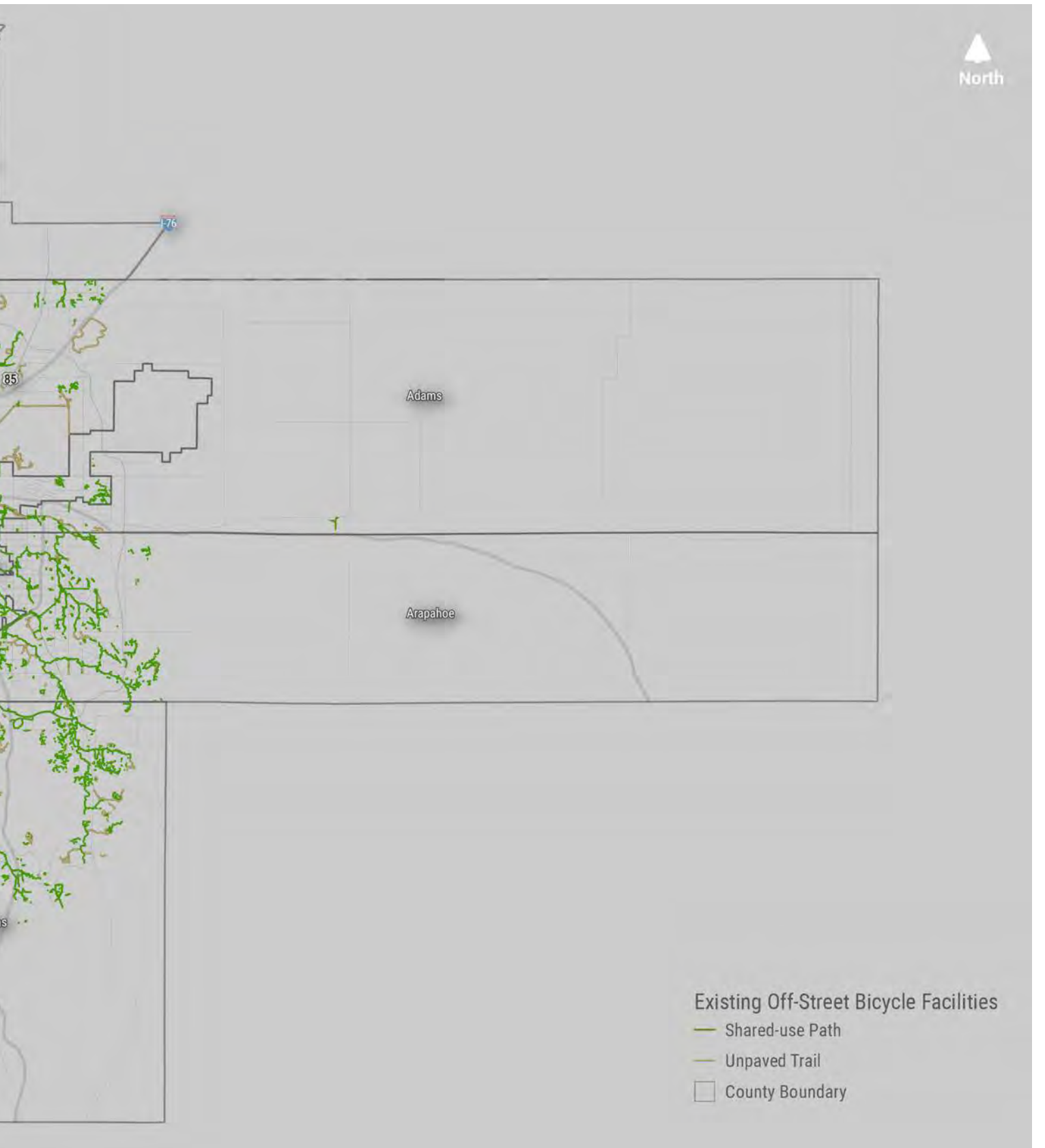
See regional bicycle facility data set here: <https://data.drcog.org/bicycle-facility-inventory>



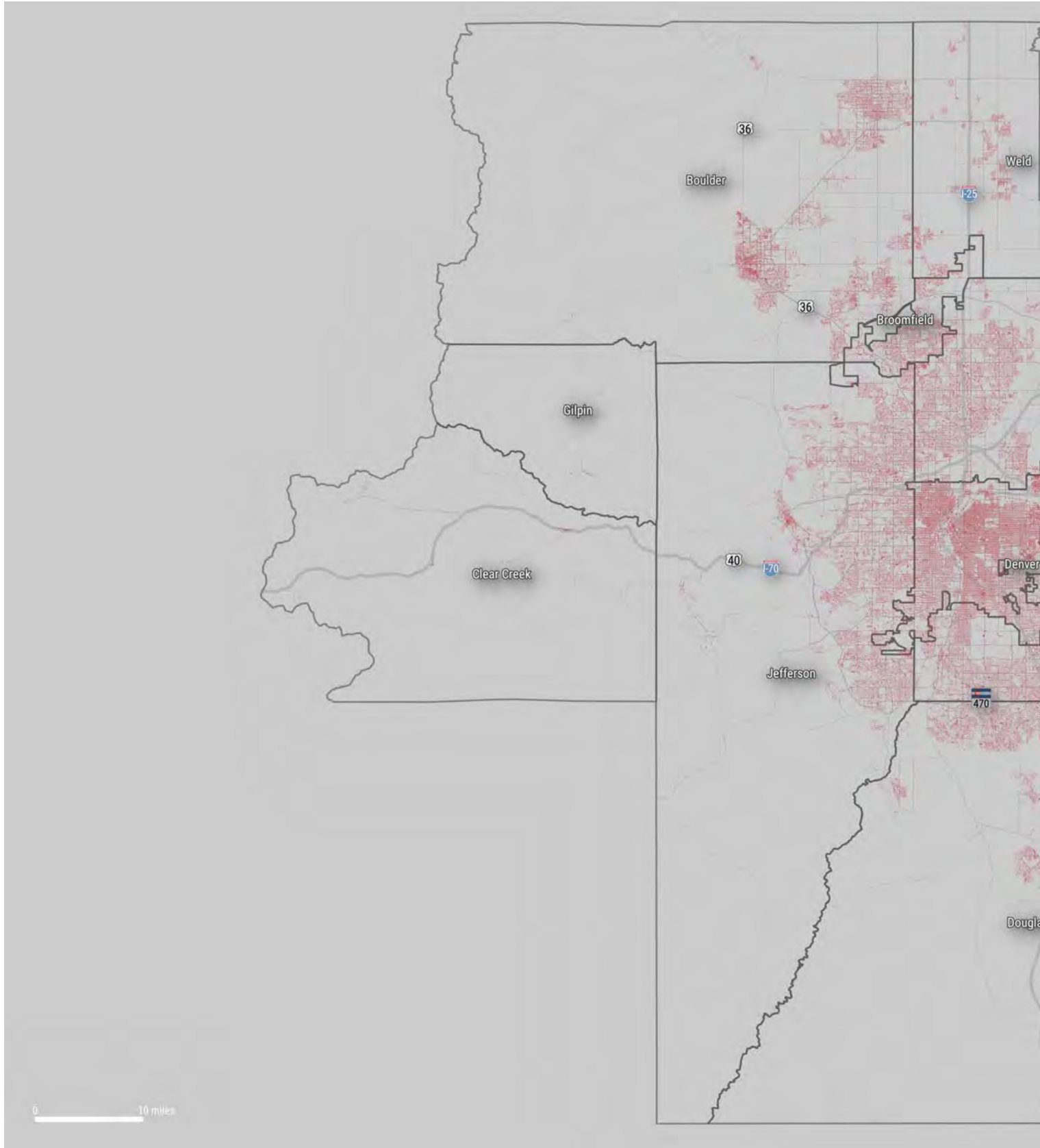
**Figure 14. Existing Off-Street Bicycle Facilities**



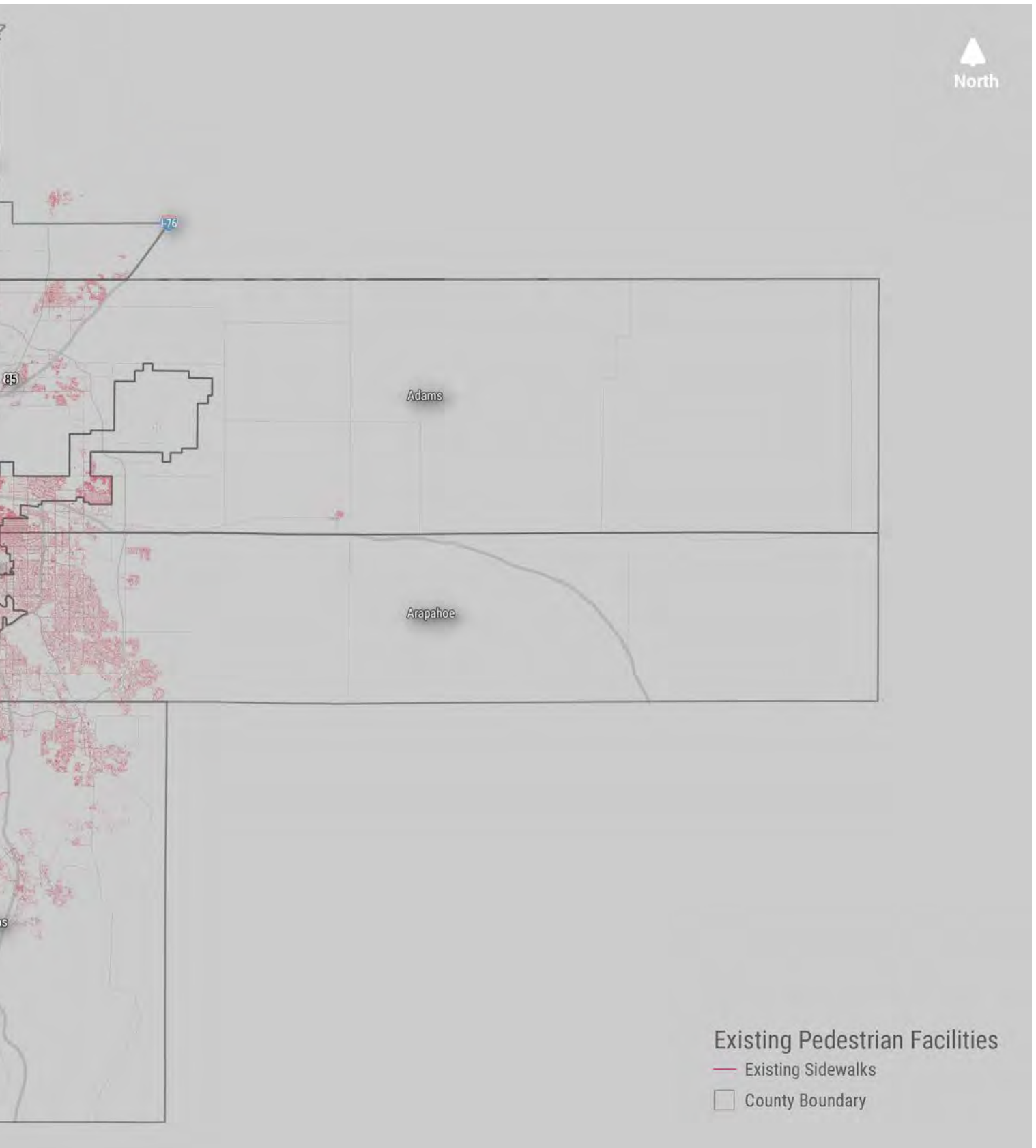
See regional bicycle facility data set here: <https://data.drcog.org/bicycle-facility-inventory>



**Figure 15. Existing Sidewalks**



See regional sidewalk data set here: <http://data.drcog.org/dataset/sidewalk-centerlines-2016>



### Existing Pedestrian Facilities

- Existing Sidewalks
- County Boundary

## TRANSPORTATION DEMAND MANAGEMENT

*Metro Vision* sets a target of 35 percent non-single-occupant vehicle mode share to work by 2040. To help support this target, DRCOG employs marketing, education and outreach activities that promote smart commute options—bicycling, walking, transit, carpool, vanpool, Schoolpool and teleworking. These activities are implemented as part of Way to Go program, which was established in 1975 to serve as a regional ride-sharing program and has since evolved to provide a variety of transportation demand management (TDM) services. Evaluation and measurement of the Denver region’s TDM programs has demonstrated that Way to Go benefits the region and is an efficient use of federal funds. DRCOG evaluates each Way to Go program to measure its impact on travel behavior and air quality.

### Way to Go TMA partnership

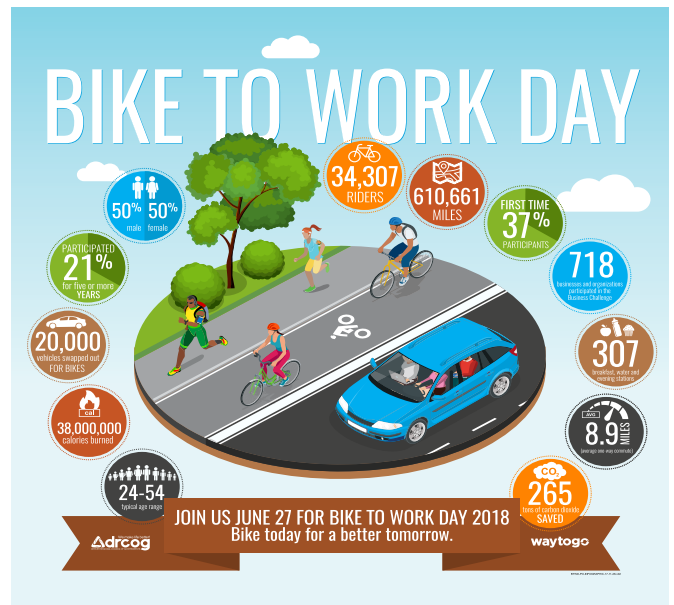
Way to Go is a regional partnership between DRCOG and a group of transportation management associations (TMAs). Working together they reduce traffic congestion, improve air quality and work with the region’s residents to identify alternatives to driving alone. TMAs offer real-life solutions helping commuters throughout the Denver metro area save money, experience less stress and save time. By promoting and marketing their free-of-charge TDM services, TMAs conduct outreach to employers and communities and administer employee surveys to evaluate travel behavior. In 2018, there are seven local TMAs that are part of the Way to Go partnership:

- » Boulder Transportation Connections
- » Commuting Solutions
- » Denver South Transportation Management Association
- » Downtown Denver Partnership
- » Northeast Transportation Connections
- » Smart Commute Metro North
- » Transportation Solutions Foundation

## Bike to Work Day

DRCOG’s Way to Go team coordinates and hosts the Denver region’s Bike to Work Day, which is the second largest Bike to Work Day in the U.S. The Denver region’s 2018 Bike to Work Day drew over 35,000 participants. Past evaluation of Bike to Work Day in the Denver region has shown that these annual events “draw participants from across a wide spectrum of bicycling behavior.”<sup>36</sup> Figure 16 shows an infographic from 2017 that reports the outcome and benefits of Bike to Work Day in the Denver region.

**Figure 16. 2017 Bike to Work Day Statistics**



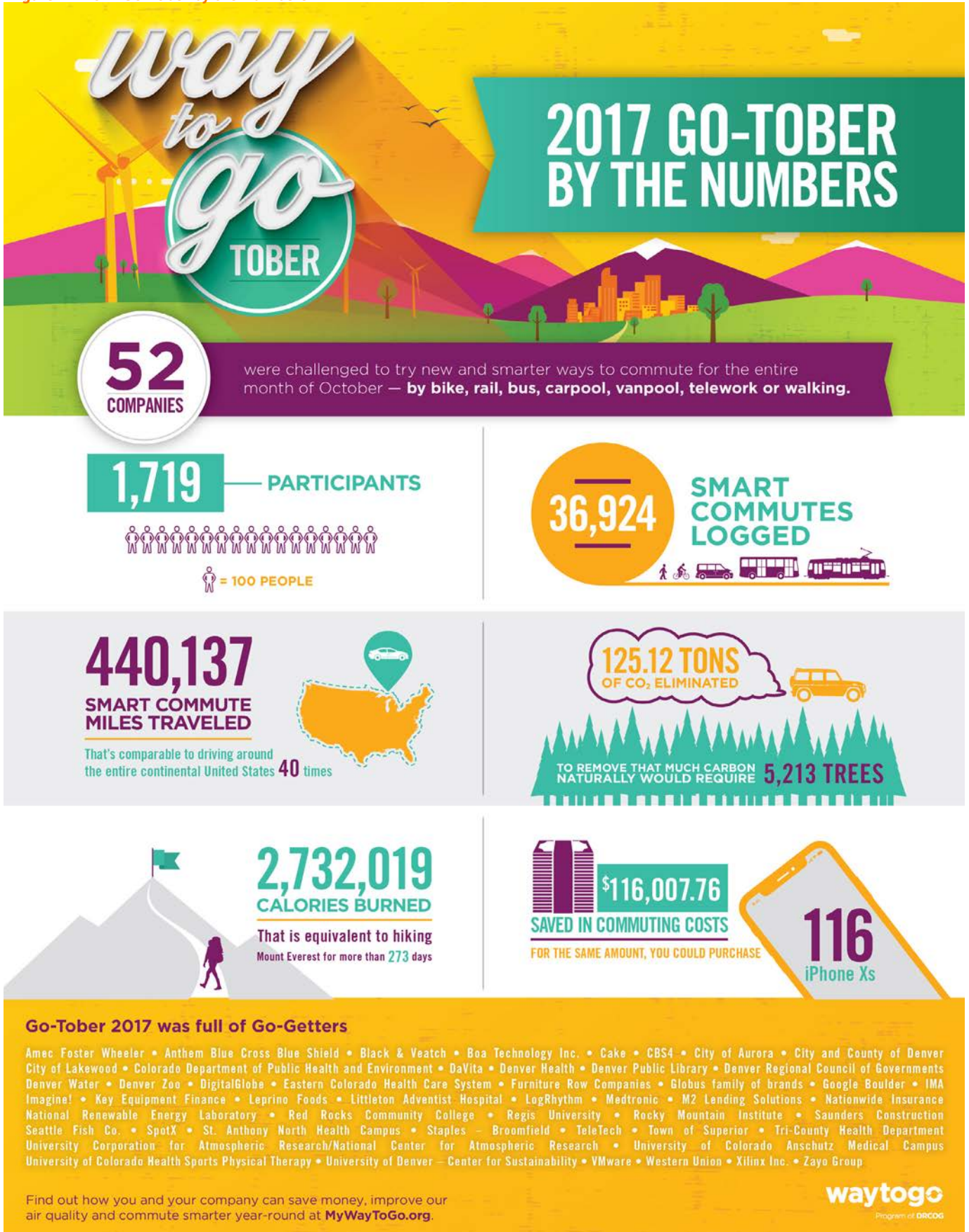
## Go-Tober

Go-Tober is an annual, employer-based commuting challenge hosted by Way to Go. Participating employers are grouped according to RTD service level area and compete by recording non-single-occupant vehicle trips taken during the month of October. The challenge encourages employees to try different methods of getting to and from work whether it be carpool, vanpool, riding rail or bus, biking, walking or telecommuting. The event is evaluated annually, the 2017 results are shown in Figure 17.

*Many survey respondents indicated that they used more than one mode for their work commute in the previous week. Some may have used multiple modes for a single one-way commute; for example, by walking to a bus stop or rail station and riding transit. For more information on the survey, see Appendix B.*



Figure 17. 2017 Go-Tober by the Numbers



## REGIONAL PARTNERS

Improving conditions for bicycling and walking in the region requires a coordinated effort across partner agencies. Agencies operating at various levels of government influence decision-making in many ways and each has a key role to play.

### Local agencies

Communities across the Denver region are actively improving conditions for bicycling and walking by planning for and implementing active transportation infrastructure, programs and policies. DRCOG's member governments are responsible for providing local facilities and improving bicycling and walking for residents and visitors alike. These efforts are critical to creating a more connected and livable region and providing access to local destinations.

DRCOG reviewed existing plans and policies related to active transportation in the Denver region as part of the ATP development process. The types of planning documents reviewed include active transportation plans (for example, the *Arapahoe County Bicycle and Pedestrian Master Plan*), trail corridor master plans (for example, the *Clear Creek Corridor Master Plan*) as well as land use, transportation, comprehensive and master plans. A complete inventory of active transportation-related plans in the Denver region is included in Appendix F.

### Colorado Department of Transportation

The Colorado Department of Transportation (CDOT) influences bicycling and walking in the Denver region and across the state. CDOT sets the stage for active transportation planning in Colorado as it works with communities throughout the state on multimodal transportation projects. Chapter 14 of the *CDOT Roadway Design Guide* establishes guidance which agencies in Colorado may use to design and implement bicycle and pedestrian facilities.

A 2017 CDOT procedural directive, *Elevating Bicycle and Pedestrian Opportunities in Colorado* requires that CDOT must accommodate bicyclists and pedestrians in its transportation facilities. Additionally, CDOT's Bicycle and Pedestrian Program provides resources and administers programs at the statewide level to improve bicycling and walking. CDOT's recent and ongoing active transportation planning efforts include updating its report on the *Economic and Health Benefits of Bicycling and Walking in Colorado*, developing a five-year strategic plan for the Colorado Safe Routes to School program, developing

*Colorado Downtown Streets – A Tool for Communities, Planners and Engineers*, expanding its nonmotorized count program and prioritizing statewide bicycle routes. Additional resources can be found on the CDOT Bicycle and Pedestrian webpage.

### Regional Transportation District

RTD operates public transit services across the Denver region, including bus, light rail and commuter rail. In 2004, voters in the Denver region approved FasTracks, a capital investment program, to fund a significant expansion of transit infrastructure and services in the region. FasTracks continues to serve as a national model for regional collaboration related to transit investment. Many of the rail lines and other improvements included in the program have begun revenue service within the last few years or are scheduled to be completed in the coming years.

The emerging regional transit system is catalyzing transit-oriented development (TOD) near stations and will continue to influence investment decisions for decades to come. Integration of bicycling and walking facilities with FasTracks investments, other stations and stops is an important strategy for creating a robust multimodal transportation system.

RTD is currently developing a *First and Last Mile Strategic Plan* to establish priorities for improving station accessibility for all transit riders. This plan will provide a framework for local agencies and other regional partners to work together to improve access to RTD's light rail stations, commuter rail stations and Park-n-Rides.



## Transportation management associations

As mentioned earlier, DRCOG has partnered with seven local transportation management associations that promote non-SOV commute options, reduce congestion and improve air quality. The local TMAs partner in regionwide campaigns and promote local events, such as Bike to Work Day.

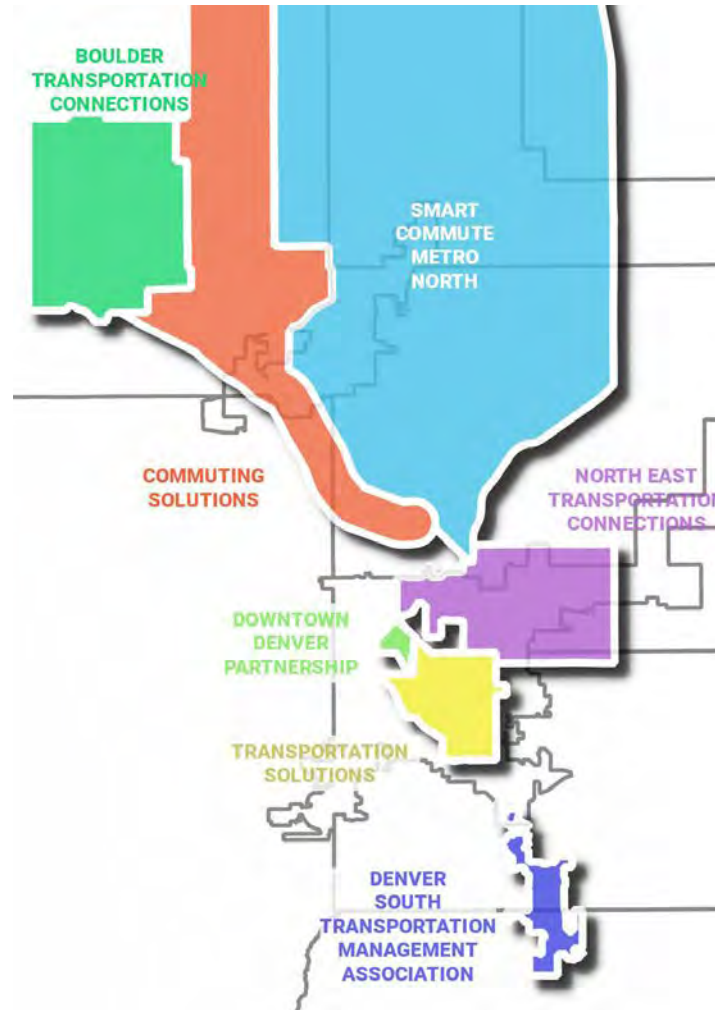
Additionally, TMAs work on local initiatives related to walking and bicycling. For example, in 2018, Commuting Solutions had a Bike Wednesday campaign that encouraged residents to leave their cars at home and take their bicycle on Wednesdays.

TMAs routinely participate in local and regional transportation planning processes and are partners on planning and implementation. For instance, Northeast Transportation Connections operates two bike libraries, at Prodigy Coffee House and Focus Points Family Resource Center.

## Regional trail partnerships

Agencies in the Denver region and across Colorado have a long history of working together to advance complex, cross-jurisdictional trail projects. Notable ongoing efforts include the Colorado Front Range Trail, Peaks to Plains Trail and the Rocky Mountain Greenway.

- » **Colorado Front Range Trail (CFRT):** Colorado's Department of Natural Resources has a vision to connect Wyoming to New Mexico along the Front Range with a multiuse trail. The CFRT will connect urban, rural and suburban communities throughout the Front Range, including within the Denver region. It was included in Gov. John Hickenlooper's 2016 "Colorado 16" list of priority trails.
- » **Peaks to Plains Trail:** The 65-mile Peaks to Plains Trail is another initiative from the governor's list of priority trails. It will extend from the Continental Divide at Loveland Pass to the South Platte River Trail in Denver and Adams County.
- » **Rocky Mountain Greenway:** The vision for the Rocky Mountain Greenway is to create an uninterrupted trail and transportation link between the three national wildlife refuges in the Denver metro area (Rocky Flats, Two Ponds and Rocky Mountain Arsenal national wildlife refuges) with Rocky Mountain National Park. A variety of agencies are working together to identify possible trail alignments and implement projects.



## Advocacy organizations

Organizations that advocate for bicycling and walking infrastructure and for better policies and practices related to bicycling and walking are important partners in the overall effort to improve conditions for bicycling and walking throughout the region. There are several active bicycling and walking organizations in the region, such as Bicycle Colorado, Bicycle Aurora, PeopleForBikes, Bike Jeffco, BikeDenver, WalkDenver, Denver Streets Partnership, Denver Vision Zero Coalition, Wheat Ridge Active Transportation Advisory Team and other organizations including many local bike clubs.

## PLAN DEVELOPMENT PROCESS

The ATP was developed with input from many regional stakeholders. The process was guided by an Active Transportation Stakeholder Committee (ATSC), consisting of representatives from local communities, as well as from CDOT, RTD, TMAs, local advocacy organizations and DRCOG. In addition to stakeholder representation on the ATSC, DRCOG invited local governments to participate in the process through a member agency survey, data sharing, stakeholder meetings across the region and an online interactive map. Additionally, DRCOG obtained planned and proposed bicycle facility data from local governments for use in the project.

DRCOG staff solicited input from DRCOG’s Transportation Advisory Committee, Regional Transportation Committee and Board of Directors throughout the process, in addition to presenting and receiving feedback at several regional events including: Denver Regional Data Consortium, TMA quarterly meeting and a Women’s Transportation Seminar event.

The broader public was engaged with the planning process through two primary channels. First, a scientific survey was used to gain an unbiased understanding of attitudes, preferences and experiences related to active transportation across the region. In addition to the scientific survey, an opt-in version of the survey was created to obtain input from active transportation stakeholders. The full results of both versions of the survey are presented in Appendix B. To spread awareness of the planning effort, DRCOG conducted outreach on Bike to Work Day at 10 stations throughout the region. Staff spoke to several hundred people and encouraged them to fill out the online opt-in survey.



## KEY PLAN ELEMENTS

The ATP provides a blueprint for creating a safer, more comfortable and more effective regional transportation system for people who walk and bicycle. By identifying significant regional active transportation corridors and local areas with greater potential for bicycling and walking activity, the ATP can help communities plan for and promote healthy transportation choices to meet local and regional outcomes.

The planning framework for the ATP recognizes four distinct geographies that work together to create a comprehensive active transportation network (Table 2). The ATP identifies regional active transportation corridors, pedestrian focus areas and short-trip opportunity zones, while referencing and deferring to local plans and partners to identify local active transportation networks.

In addition to identifying the three geographic areas noted above, recommendations and are provided for policies, programs and facilities that will help the Denver region fulfill of the vision outlined in *Metro Vision*. The ATP presents a regional active transportation vision and outlines strategies for DRCOG and its partners to realize the vision.

The remainder of this document is organized into the following chapters:

- » **Chapter 2:** Regional Active Transportation Network – key features of the regional active transportation network and how it can be used
- » **Chapter 3:** Emerging Trends and Approaches for Local Implementation– ideas and recommendations to implement policies, programs and facilities to advance active transportation
- » **Chapter 4:** Taking Action – opportunities for regional and local partners to implement the ATP, case studies and performance measures
- » **Appendices**
  - » A: County Profiles
  - » B: Resident Survey Results
  - » C: Technical Documentation
  - » D: Bicycle and Pedestrian Crash Report
  - » E: Stakeholder Engagement Process
  - » F: Local Plan Inventory

**Table 2. Active Transportation Plan Framework**

| Planning Area                                   | Description  | What does it mean for the region?  |
|---|--|--|
| <b>Regional active transportation corridors</b> | Corridors that connect significant regional destinations and may serve longer distance bicycle trips, as well as local walking and biking trips. | The regional active transportation corridors are intended to allow safe and comfortable access to existing and future regional destinations for people of all ages, incomes and abilities. Development of these corridors supports <i>Metro Vision</i> outcomes related to creating a connected multimodal region and a vibrant regional economy. The regional network can facilitate cross-jurisdictional collaboration toward a common vision for a regional active transportation network. Local facilities that connect to the regional network are critical to connect residents to the regional network and are an important component of the network as well. |
| <b>Pedestrian focus areas</b>                   | Areas with a high concentration of existing or potential pedestrian activity.  | Efforts to improve pedestrian safety and convenience in pedestrian focus areas will help the region achieve <i>Metro Vision</i> outcomes related to livable communities, safety, health and transit integration.   |
| <b>Short-trip opportunity zones</b>             | Areas with a high concentration of short trips (2 miles or less).  | The average bicycle trip distance in the Denver region is 1.8 miles. Areas with a large number of trips 2 miles or less hold potential for converting car trips to bicycle trips, which will help fulfill a key <i>Metro Vision</i> target (reduce single-occupant vehicle mode share).  |
| <b>Local active transportation networks</b>     | Routes that connect residents to local destinations and to the regional network.   | Local active transportation networks are the primary means by which people get around by foot or bike. These networks carry the bulk of active transportation trips and should connect to regional active transportation corridors where possible. Additionally, local facilities are the primary implementation mechanism within pedestrian focus areas and short-trip opportunity zones. Local bicycling and walking networks are defined by local agencies and are not addressed in detail in the ATP.  |





# Chapter 2: Regional Active Transportation Network

A regional active transportation network is a key element identified in the ATP. The network components outlined in this plan was informed by stakeholder input, technical analysis and a review of best practices from other regions. The result is a regional network that includes four elements:

1. regional active transportation corridors
2. pedestrian focus areas
3. short-trip opportunity zones
4. local active transportation networks

This plan identifies the first three elements, whereas local active transportation networks are identified through local planning processes.

## WHY IS A REGIONAL ACTIVE TRANSPORTATION NETWORK NEEDED?

The Denver region is known for its extensive off-street shared-use path and trail system. This system provides a backbone for active transportation but includes significant gaps and connection barriers. An integrated network of on- and off-street facilities is needed to facilitate active transportation throughout the region.

At the regional scale, the active transportation network should seamlessly cross jurisdictional boundaries, connect residents to important destinations and improve quality of life for both residents and visitors of the region. The regional active transportation corridors identified in the ATP are intended to fill this need. They include 684 miles of existing corridors and 715 miles of future corridors.

*When DRCOG asked local governments which ATP elements would provide the most value, a regional bicycle network was the top-ranked answer. Coordination with adjacent communities was cited as the greatest benefit a regional bicycle network would provide.*

Pedestrian focus areas and short-trip opportunity zones are included in the plan because investments in these areas will help the region achieve the targets identified in *Metro Vision*, enhancing connectivity and livability and improving walkability and bikeability of the region. Providing comfortable walking environments in pedestrian focus areas, including safe and convenient crossings, will

encourage greater use of transit, could reduce drive-alone trips and could reduce crashes involving pedestrians.

Similarly, short-trip opportunity zones represent areas with the greatest potential to encourage local bicycling trips. Establishing dense networks of comfortable bicycle facilities in these areas will encourage people to replace short vehicle trips with bicycle trips, in support of the region's target to increase non-single-occupant vehicle use, improve air quality and reduce congestion.

The connectivity of local active transportation networks is a critical piece of a robust active transportation network. Local connections to and from the regional network can provide residents and visitors with access to regional shared-use paths and other low-stress facilities. While the ATP does not specifically identify all local active transportation networks, local plans and existing inventories were consulted during the development of this plan.

Regional active transportation corridors, pedestrian focus areas, short-trip opportunity zones and local active transportation networks will work together to create the conditions necessary to make bicycling and walking viable for routine trips. Facilities and services not included as part of a regional corridor, pedestrian focus area or short-trip opportunity zone are important components of the overall active transportation network and play a critical role in connecting and enhancing local active transportation networks. Figure 18 illustrates the integration of these elements, along with the types of design considerations needed to make bicycling and walking safe and comfortable. Chapter 3 includes more detail on facility recommendations.

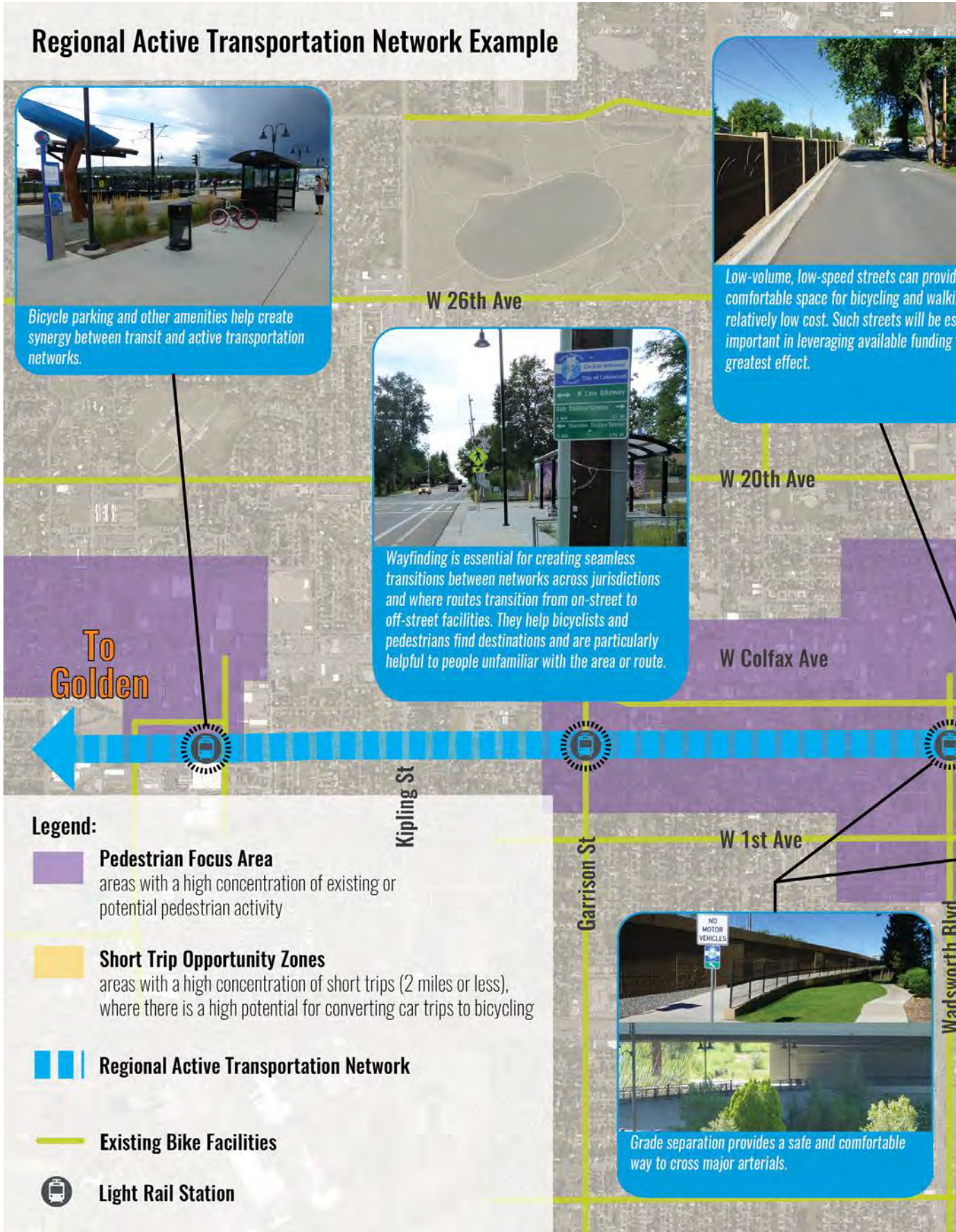


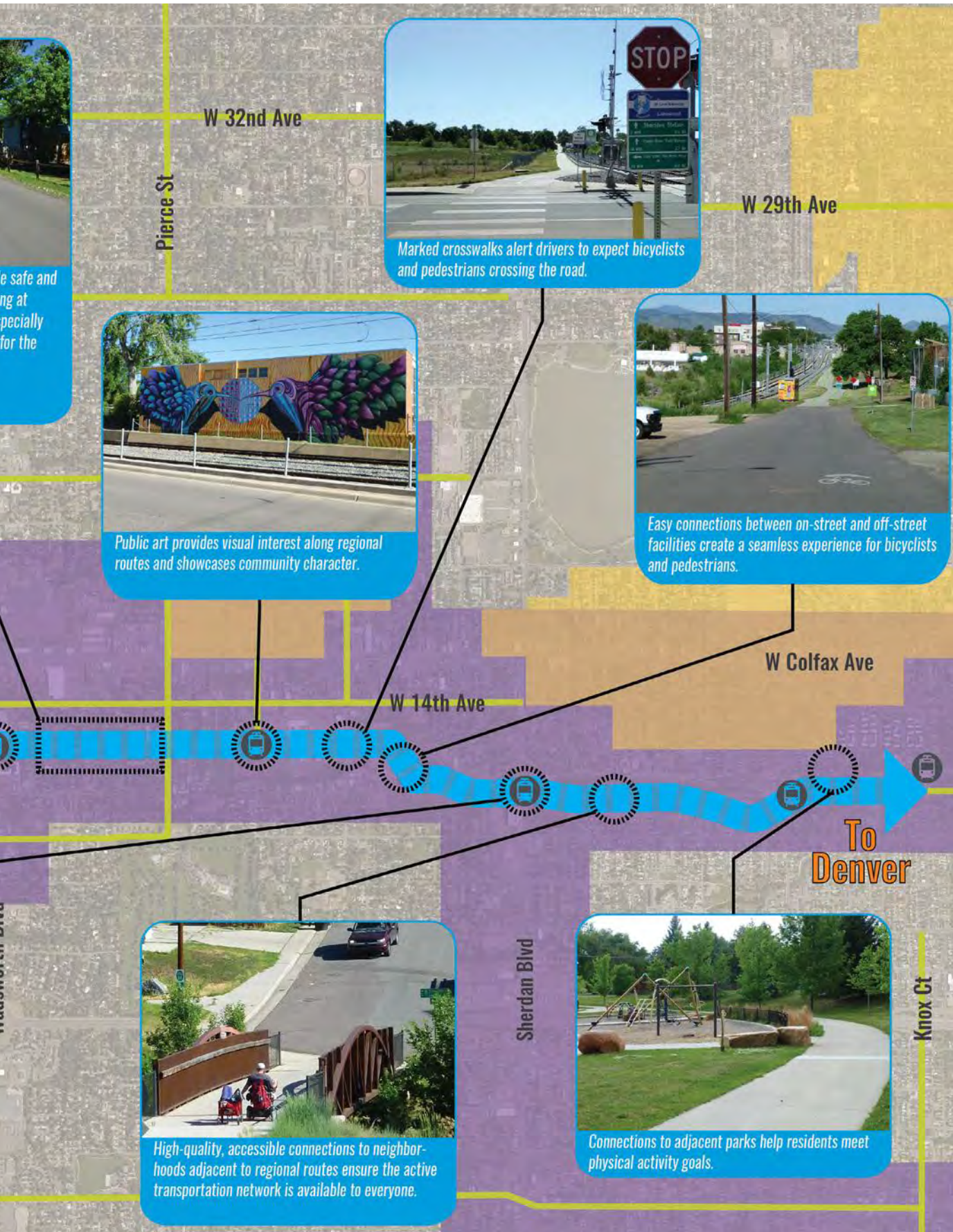
Source: City and County of Broomfield





**Figure 18. Regional Active Transportation Network Example**





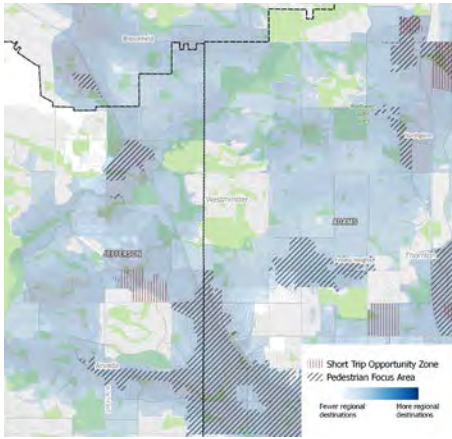
# REGIONAL ACTIVE TRANSPORTATION NETWORK COMPONENTS

The project team used separated processes to identify regional active transportation corridors, pedestrian focus areas and short-trip opportunity zones. The key steps are described in this section. See Appendix C for a more detailed description.

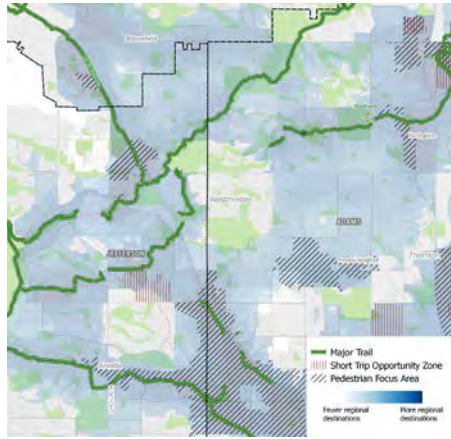
## Regional active transportation corridors

Identification of regional active transportation corridors was an iterative and data-driven process. The process included the steps shown below. The resulting network is illustrated in Figure 19.

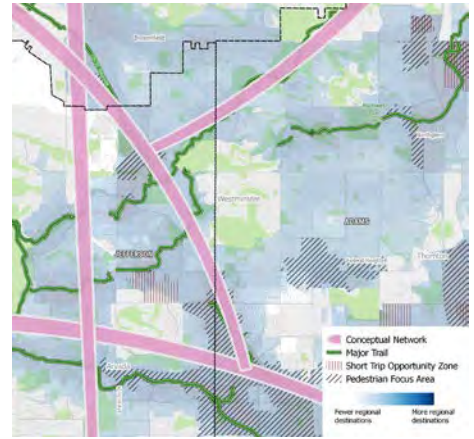
### 1. Identify regional origins and destinations



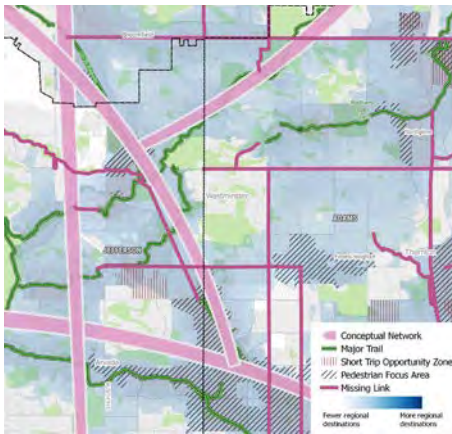
### 2. Identify and map major trails



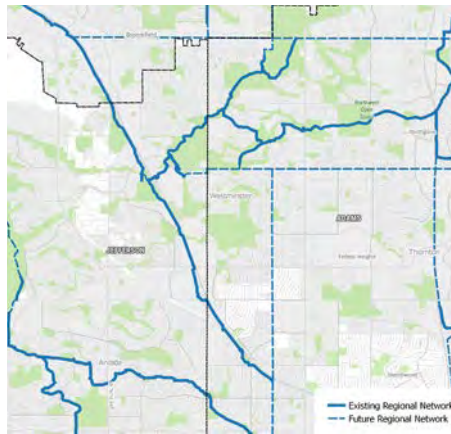
### 3. Create a conceptual network



### 4. Gather and map input from stakeholders (while considering population and employment forecasts)



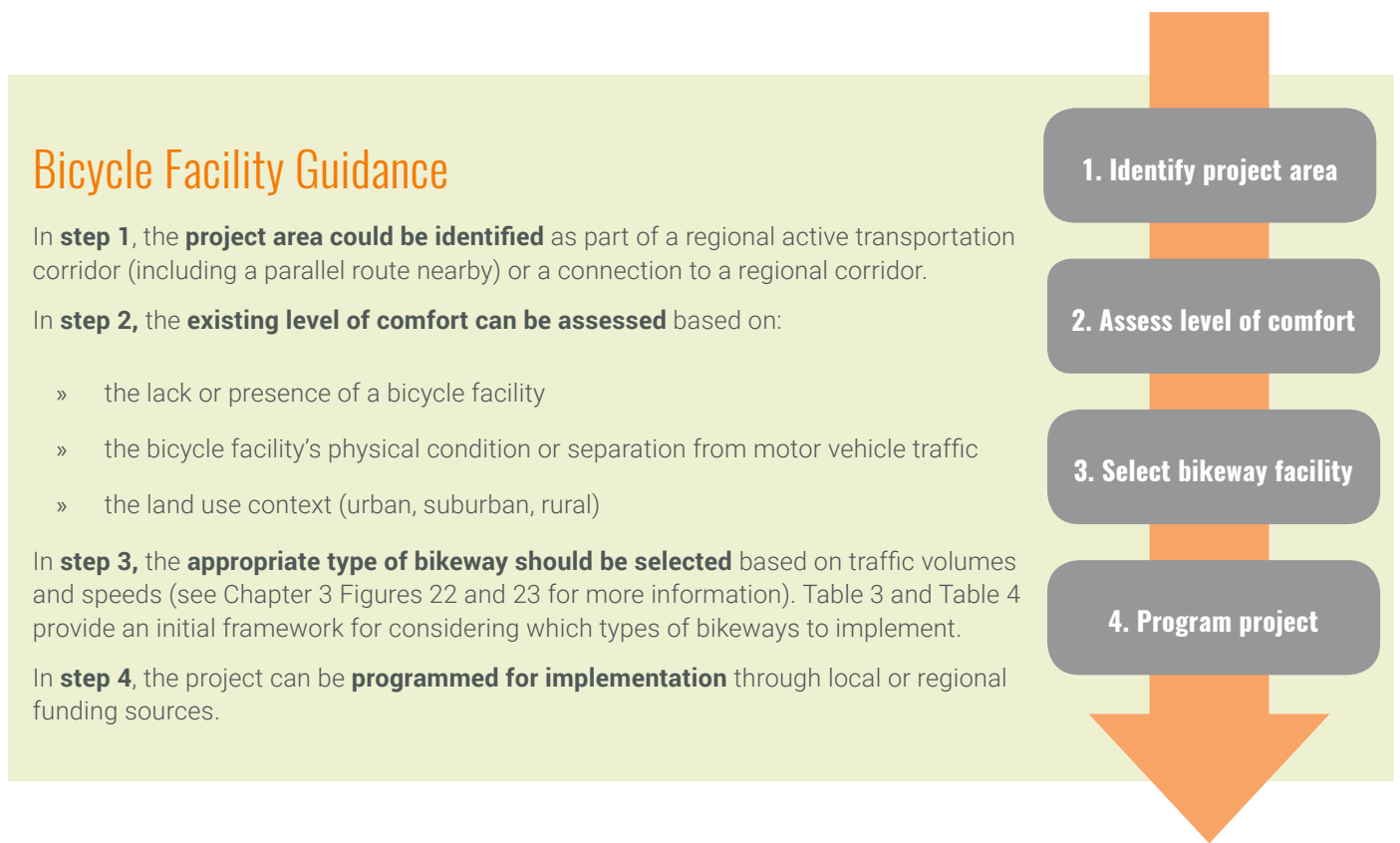
### 5. Refine the regional active transportation corridor map



### Potential uses for regional active transportation corridors

The regional active transportation corridors included in the ATP cover 1,353 miles and span a variety of land use contexts. There are a range of existing facility types as well as gaps where there are currently no facilities. Though parts of the regional active transportation corridor are built, some existing sections may benefit from enhanced treatments. Regional active transportation corridors generally address longer-distance bicycle travel, though several high-comfort bicycle facility types also serve shorter bicycling and walking trips. This section recommends a high-level process for local jurisdictions to identify appropriate projects and facility types to implement bicycle facility infrastructure within regional active transportation corridors.

Local agencies are responsible for identifying the most appropriate facility type to safely and comfortably accommodate active transportation in their jurisdictions. The ATP envisions regional active transportation corridors consisting primarily of high-comfort bikeways such as shared-use paths and separated bike lanes, but facilities should always be matched to the appropriate context. Accordingly, the project implementation process below is intended to offer general guidance and specific conditions should further guide bicycle facility selection at the local level.



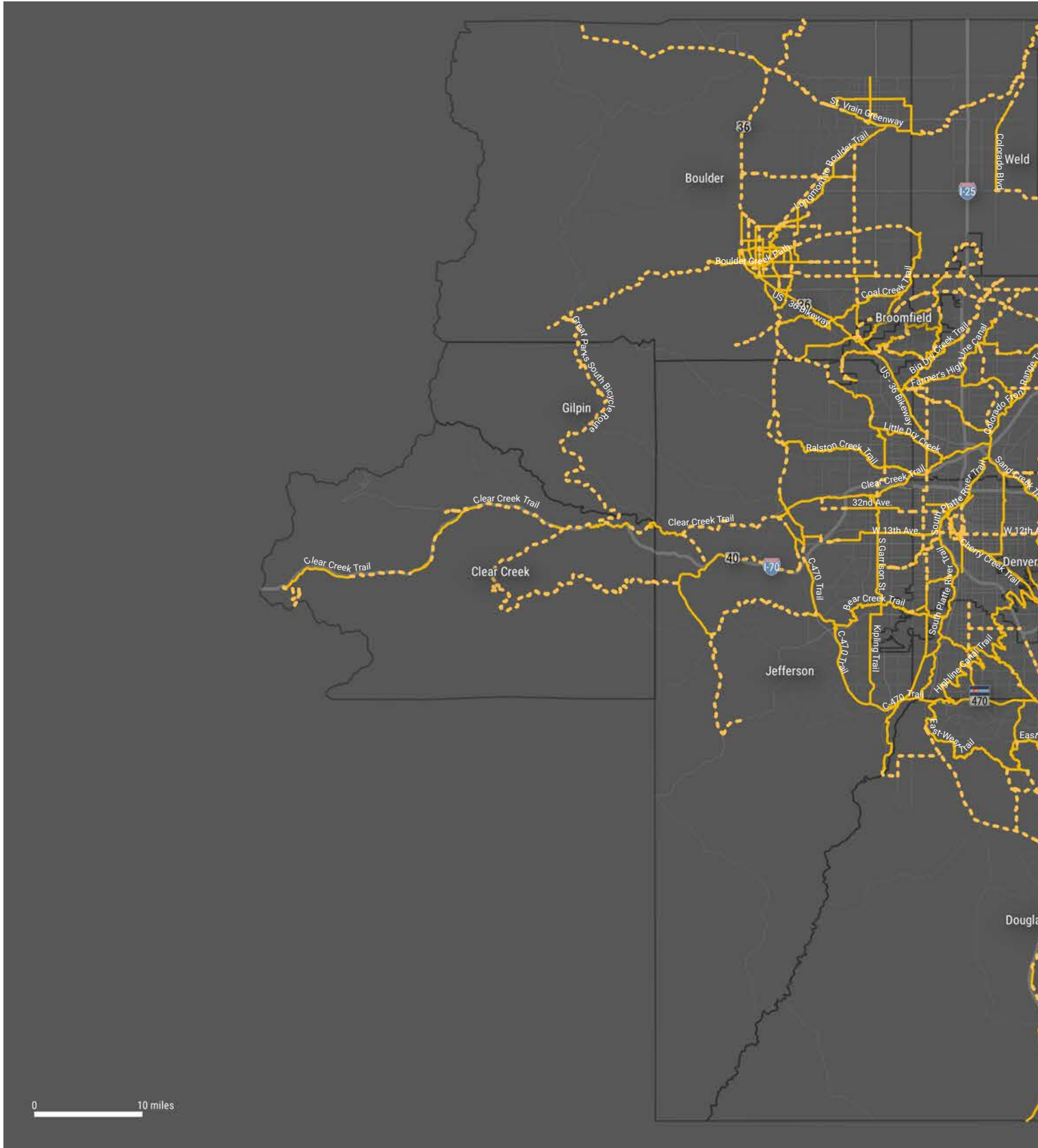
**Table 3. General Facility Selection Recommendations Based on Land Use**

| If the land use context is urban/suburban, consider: | If the land use context is rural/suburban, consider: |
|--|--|
| bike lanes (buffer preferred)                        | paved shoulders                                      |
| separated bike lane, sidepath or shared-use path     | sidepath or shared-use path                          |

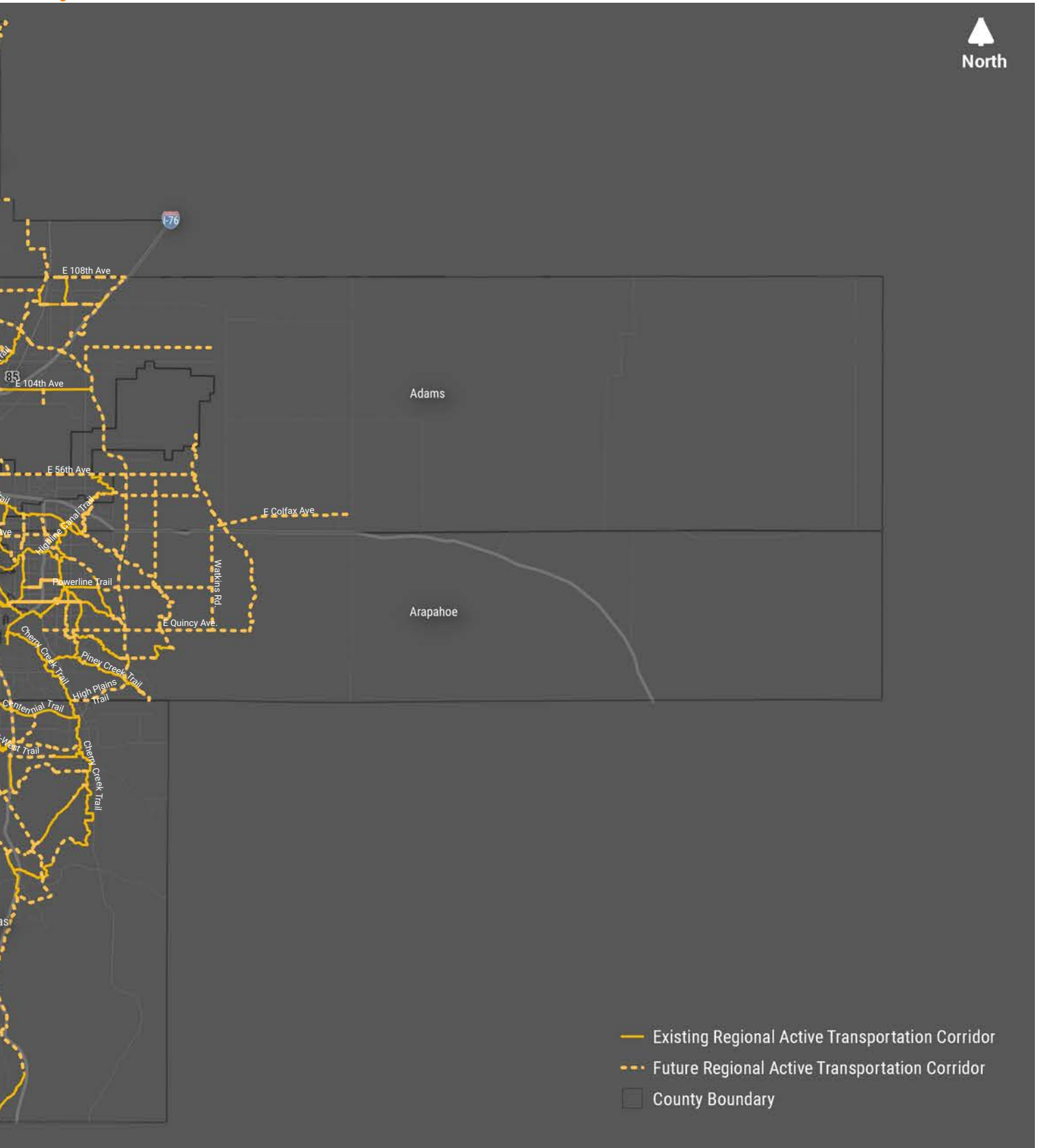
**Table 4. General Facility Selection Recommendations Based on Existing Facility**

| If the existing project route’s facility is:     | Then consider:  |
|--|---|
| no facility                                      | separated bike lane, sidepath, or shared-use path         |
| paved shoulders or bike lanes                    | separated bike lane, sidepath or shared-use path          |
| separated bike lane, sidepath or shared-use path | upgrading with lighting, signage, benches or bike parking |

**Figure 19. Existing and Future Regional Active Transportation Corridors - once plan is finalized this will be accompanied by an online map for interactive**



live viewing.



## Pedestrian Focus Areas and Short-Trip Opportunity Zones

Pedestrian focus areas and short-trip opportunity zones represent places where a high level of bicycling or walking currently occurs or where it would likely occur if comfortable and safe walking facilities were present. Investment within these areas is essential to increasing the number of people who walk or bicycle and to improve the safety of active transportation.

### Pedestrian focus areas

The process to identify pedestrian focus areas at the regional scale was similar to Step 1 of the regional active transportation corridor identification process. Each census block in the Denver region was assigned a score based on several factors associated with walking (see Appendix C for more information). Census blocks ranking within the top 10th percentile of the scores were identified as pedestrian focus areas. Additionally, the top five percent of census blocks within each county were identified as pedestrian focus areas. Stakeholder input was also considered. The pedestrian focus areas are largely based on current data, but also account for emerging urban centers. The results of the pedestrian focus area analysis are shown in Figure 20 and for each county in Appendix A.

### Short-trip opportunity zones

Short-trip opportunity zones are areas with a high percentage of trips 2 miles or less. Short trips are much more likely than longer trips to be converted from vehicle trips to bicycling; the average bicycle trip length in the Denver region is 1.8 miles.

The project team identified short-trip opportunity zones using data from DRCOG's regional travel demand model. Trips of 2 miles or less were aggregated by traffic analysis zones (TAZs). A short trip was assigned to a zone if it began or ended within the zone. For consistency with other geographic areas used in the ATP, the results were aggregated by census block and those within the top 10th percentile for the number of short trips were identified as short-trip opportunity zones. In addition, census

**Local governments can encourage people to bike by building separated or protected bike lanes. Almost two-thirds of survey respondents (64 percent) indicated they would bicycle more if there were more barrier-separated bicycle lanes. Similarly, 72 percent said they would feel very comfortable riding a bicycle in separated bicycle lane. For more information, see Appendix B.**

blocks contiguous to the region's largest urban parks were identified as short-trip opportunity zones. Short-trip opportunity zones are shown in Figure 21 and for each county in Appendix A.

### Potential local uses for pedestrian focus areas and short-trip opportunity zones

Pedestrian focus areas and short-trip opportunity zones do not identify specific corridors where facilities should be implemented. Rather, they highlight areas that could be prioritized for investment in safe and comfortable pedestrian and bicycle infrastructure such as sidewalks, crosswalks, shared-use paths or other bikeways.

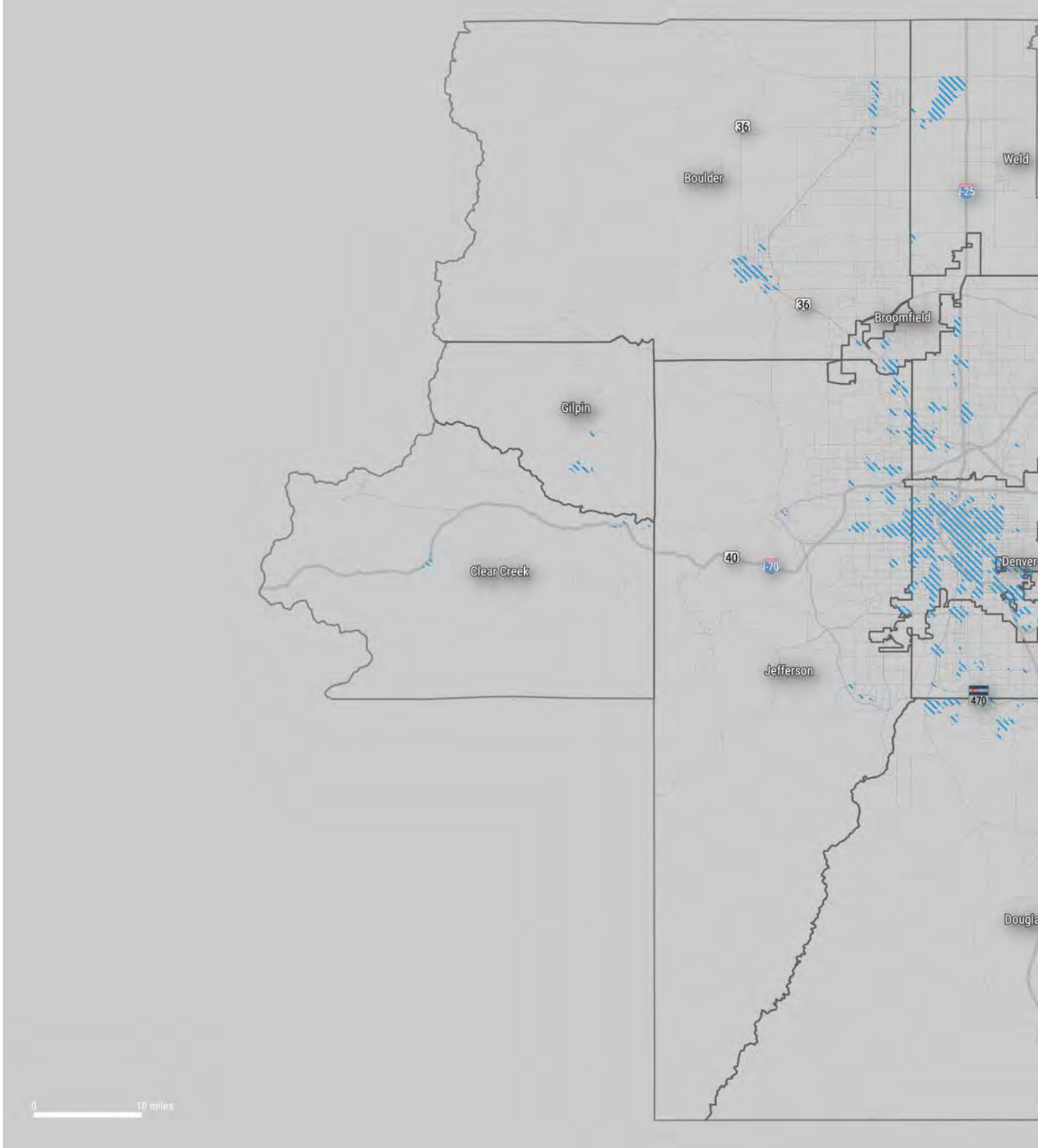
As project opportunities arise and funding becomes available, agencies within the region could use the following approach to identify and implement projects in pedestrian focus areas and short-trip opportunity zones:

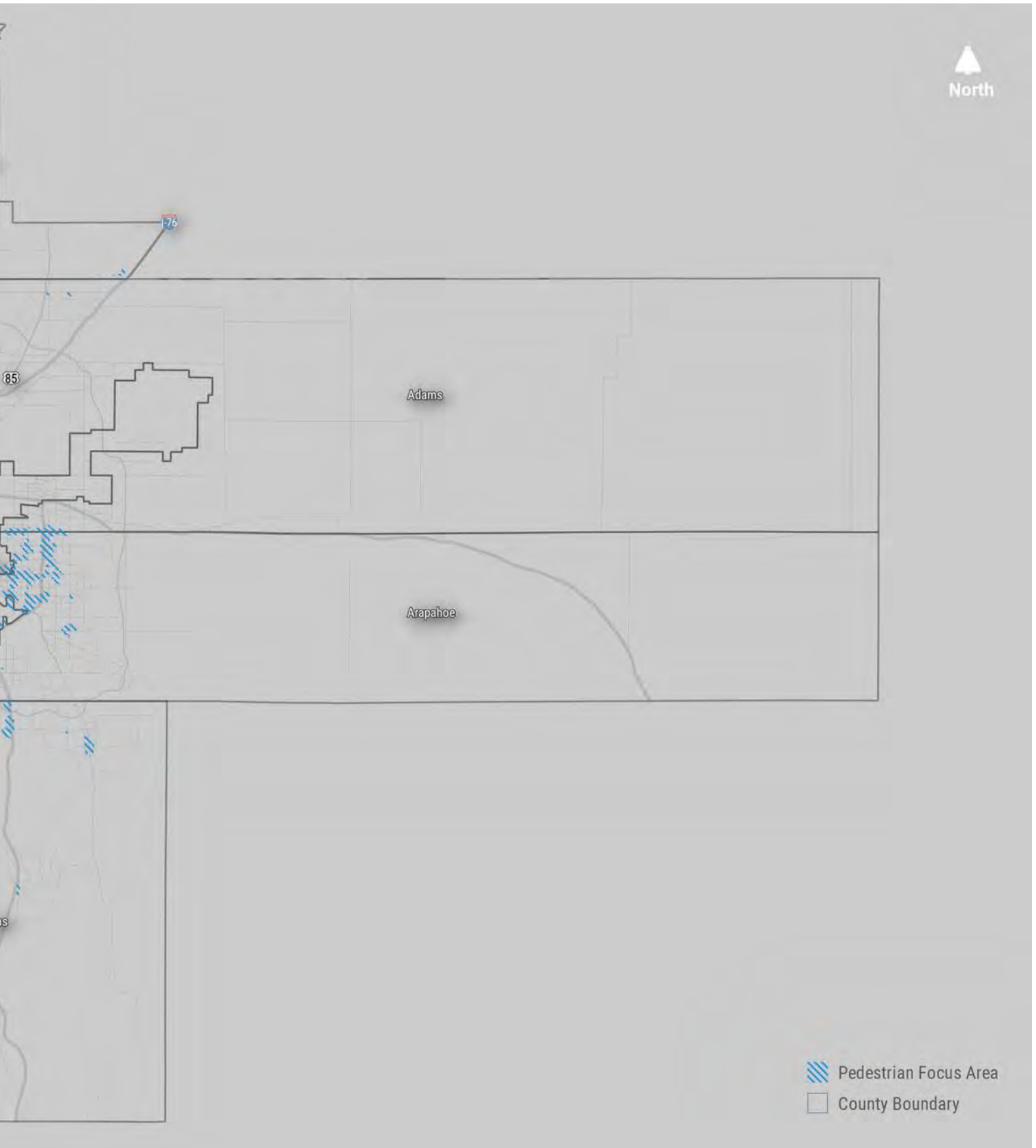
1. Identify safety concerns based on crash patterns or other engineering observations and judgment. Since crashes were used to identify pedestrian focus areas, many of these areas may have safety problems that should be evaluated and addressed.
2. Close sidewalk and bikeway network gaps:
  - » Leverage opportunities through private development, public utilities projects and major roadway projects to construct or reconstruct sidewalks and to build new bikeways.
  - » Identify and fill sidewalk gaps that don't require detailed engineering or environmental analyses, major grading or clearing of vegetation, or right-of-way acquisition.
  - » Program capital funding to address major capital projects and associated analyses.
3. Improve crossings using the tools included in Chapter 3, along with guidance provided by the Federal Highway Administration (FHWA) and in the Manual on Uniform Traffic Control Devices (MUTCD).
4. Consider areawide measures such as: restrictions on right turn on red, leading pedestrian intervals, countdown timers and elimination of permissive left turn signal phases.
5. Implement context-specific enhancements, especially around schools, parks and within transit corridors.



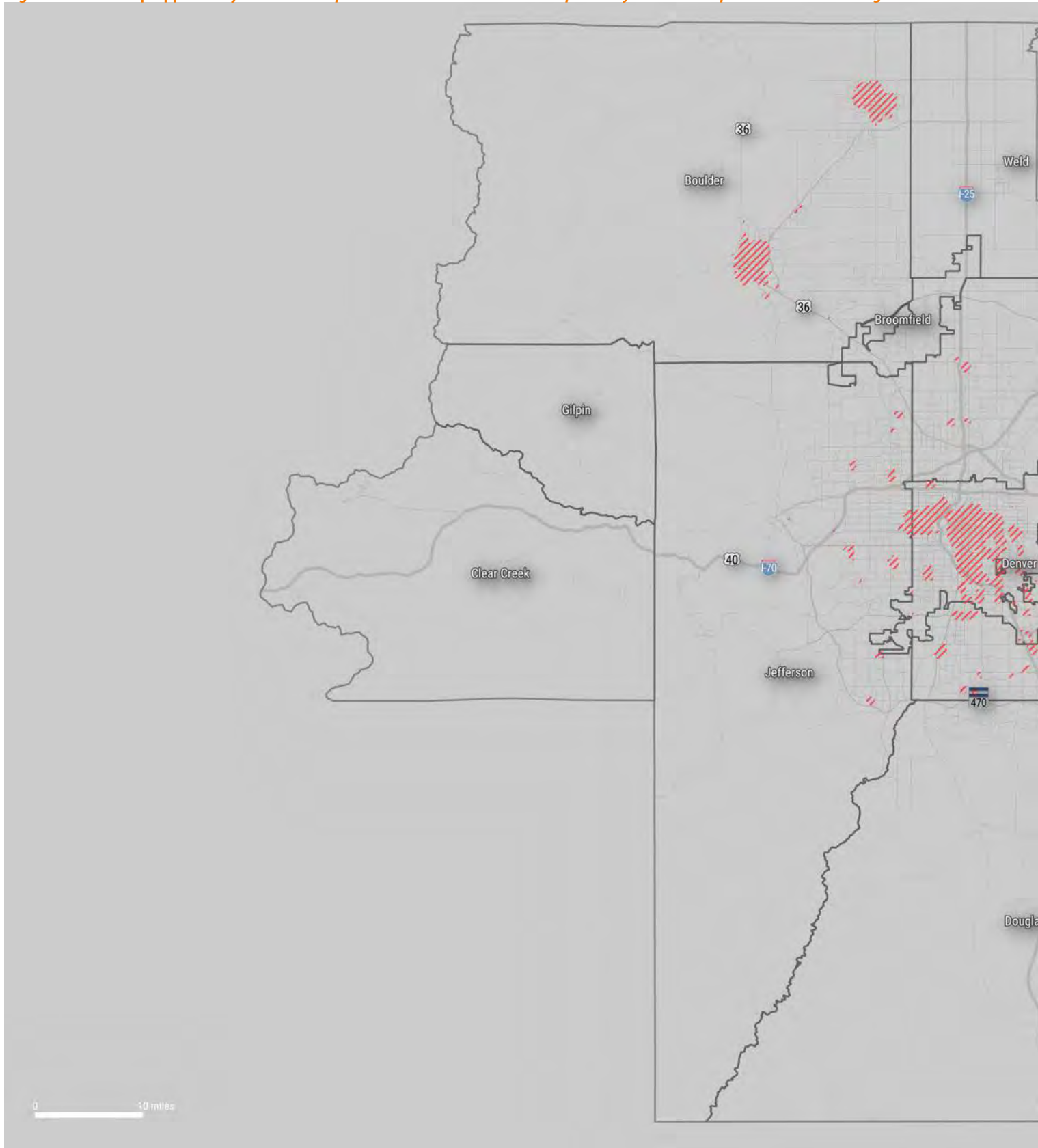


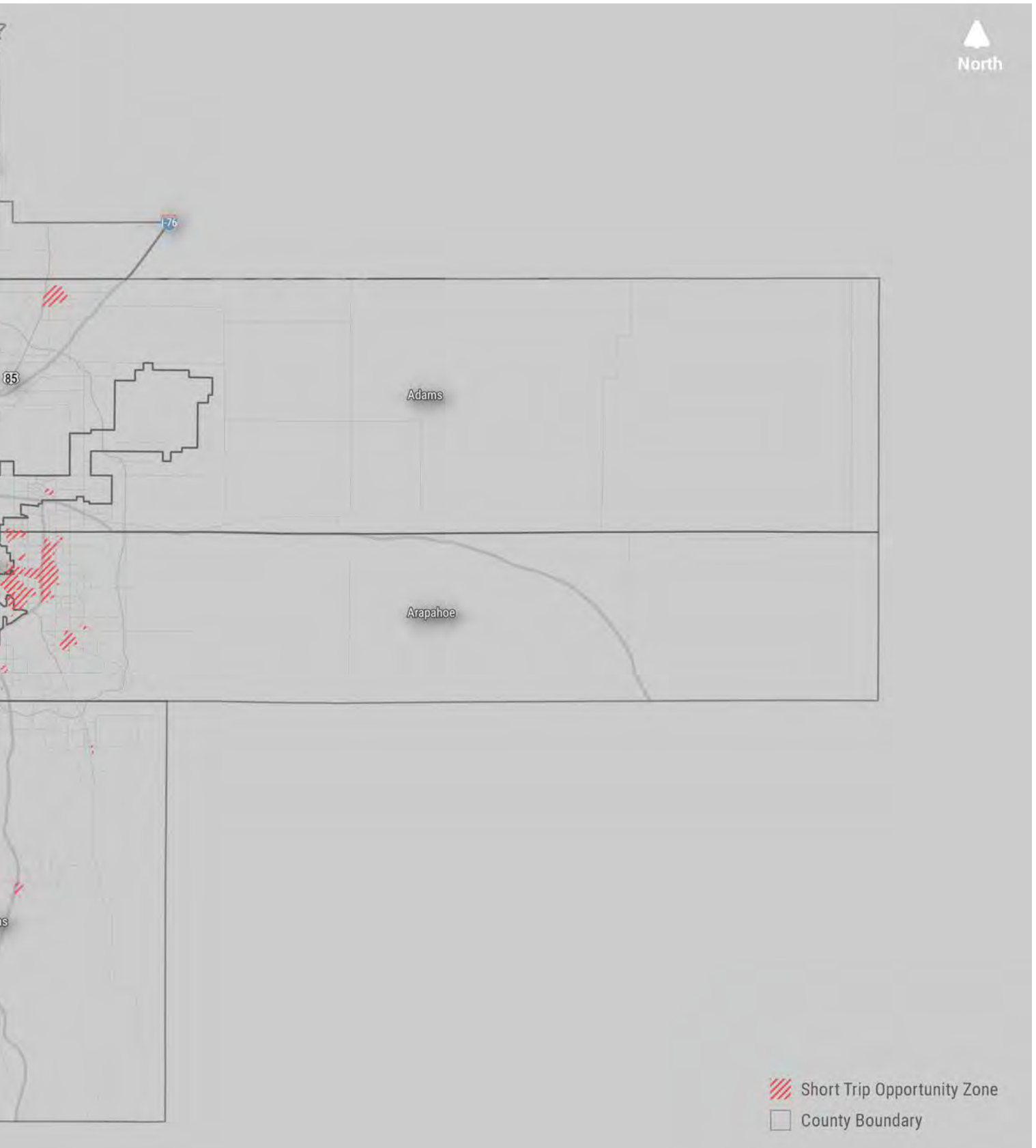
**Figure 20. Pedestrian Focus Areas - once plan is finalized this will be accompanied by an online map for interactive viewing.**





**Figure 21. Short Trip Opportunity Zones - once plan is finalized this will be accompanied by an online map for interactive viewing.**









# Chapter 3: Emerging Trends and Approaches for Local Implementation

Improving conditions for walking and bicycling in the Denver region will occur largely through local initiatives. This chapter describes emerging trends, along with policies, programs and practices for advancing active transportation in local jurisdictions. Additionally, common bicycle and pedestrian infrastructure solutions are discussed. The bicycle and pedestrian infrastructure sections give special attention to facilities and treatments that are safe and comfortable for people of all ages and abilities. This catalog is not a comprehensive manual, but it provides information and resources to generate further investigation and collaboration with other communities in the Denver region.

## EMERGING TRENDS

The transportation system has evolved rapidly over the past decade and continues to undergo significant change. This section addresses emerging trends, such as electric-assist bikes, dockless bike-sharing programs and other micromobility devices and automated vehicles. There is a great deal of uncertainty as to how these trends will affect active transportation. In general, these technologies can fill the niche of first- and last-mile challenges and decouple mobility from private vehicle ownership. However, most emerging mobility devices or technologies rely on electric propulsion and thus could reduce the amount of walking and bicycling. Moreover, these devices have the potential to increase conflicts on sidewalks or shared-use paths and contribute to overcrowding of walking and bicycling infrastructure.

## POLICIES, PROGRAMS AND PRACTICES

The development of a connected and safe active transportation system hinges on policies, programs and practices that support inclusion of active transportation considerations into routine decision-making. This section addresses many of the most common approaches, highlighting examples from the Denver region.

## INFRASTRUCTURE

In this section, common bicycle and pedestrian infrastructure treatments are presented. Bicycle facilities, intersections, sidewalks, crossings, signals and supporting elements are included. Additionally, guidance for selecting an appropriate bikeway, based on roadway conditions and context, is provided.



**Table 5. Chapter Contents**

|   | Topic                             | Page |
|---|-----------------------------------|------|
| <b>Emerging Trends</b>                  | Electric/electric-assist bicycles | 45   |
|   | Micromobility solutions           | 46   |
|   | Ride-hailing services             | 47   |
|   | Connected and automated vehicles  | 48   |
| <b>Policies, Programs and Practices</b> | Systematic safety and Vision Zero | 49   |
|   | Complete Streets                  | 50   |
|   | Street design Guidelines          | 51   |
|   | Safe Routes to School             | 52   |
|   | Traffic calming                   | 53   |
|   | Streetscaping                     | 54   |
|   | First- and last-mile connections  | 55   |
|   | Accessibility                     | 56   |
|   | Work zone accommodations          | 57   |
|   | Land use policies                 | 58   |
|   | Maintenance and repair            | 59   |
|   | Roadway resurfacing               | 60   |
|   | Tactical urbanism                 | 61   |
| <b>Infrastructure</b>                   | Bicycle infrastructure            | 62   |
|   | Bikeway selection                 | 64   |
|   | Bicycle intersection treatments   | 65   |
|   | Pedestrian infrastructure         | 66   |
|   | Supporting elements               | 71   |



## Description

E-bikes are bicycles equipped with electric motors and can increase the accessibility, comfort and range of bicycling. E-bikes will influence the future design of bicycle facilities along with the rules and regulations of where they can be ridden.

**Table 6. E-Bike Classes**

| E-bike class | Pedal Assist | Throttle | Max Speed* |
|--------------|--------------|----------|------------|
| I            | Yes          | No       | 20         |
| II           | No           | Yes      | 20         |
| III          | Yes          | Yes      | 28         |

\* Electric motor ceases to provide assistance when the bicycle reaches the listed maximum speed

## Local context

- » In August 2017, the Colorado state legislature expanded Colorado Revised Statutes Section 42-1-102 to permit e-bikes to be ridden wherever conventional bicycles can be ridden. However, local ordinances can be more restrictive.
- » Jeffco Open Space has initiated a pilot program to allow e-bikes on trails.
- » The City of Boulder permits e-bikes on most of its shared-use paths.

## Implementation considerations

- » The State of Colorado defines e-bikes as bikes with electric motors that provide power or pedal-assistance up to 20 mph.
- » Most governments are managing conflicts between e-bikes and other active transportation users by revisiting regulations on where they can operate. However, the prevalence of e-bikes may warrant the allocation of dedicated space in the future.

## Available resources

- » Colorado General Assembly, *Electric Bicycles*
- » Federal Highway Administration, *Framework for Considering Motorized Use on Nonmotorized Trails and Pedestrian Walkways under 23 U.S.C. Section 217*
- » PeopleForBikes, *Electric Bicycles*

### E-bike definition

The State of Colorado defines e-bikes as bikes with electric motors that provide power or pedal-assistance up to 20 mph.



Source: Jeffco Open Space

## Description

Micromobility solutions encompass conventional and dockless bike-sharing programs, e-scooters and other small personal mobility devices, such as e-skateboards. While many of these devices originate in a human-powered form, the availability of electric versions, and the on-demand nature of recent deployments, has increased their appeal. Micromobility devices can support access to transit and promote a car-free lifestyle. However, they also increase conflicts on sidewalks and raise safety concerns. Because the widespread use of these devices is a relatively recent phenomenon, standards for where and how they should be used have not been established. Additionally, the possible effects on pedestrians and bicyclists have not been determined. Dedicated infrastructure may be needed to accommodate micromobility devices within the right-of-way.

## Local context

- » The City of Aurora developed a bike-sharing permit program in October 2017 that outlines the protocols for implementing docked or dockless bike-sharing programs within the city.<sup>37</sup>
- » Other communities in the Denver region that have pilot programs to permit and regulate dockless bike-sharing programs/mobility operations include: Boulder, Denver, Thornton, Lone Tree and Golden.
- » The City and County of Denver’s dockless mobility vehicle pilot permit program also explicitly includes e-scooters.<sup>38</sup>
- » The City of Westminster’s station-based bike-sharing fleet includes adaptive bicycles that aim to be inclusive for people of all abilities. Their fleet includes tricycles, handcycles and side-by-side tandem bikes.<sup>39</sup>

## Implementation considerations

- » To ensure that dockless mobility and bike-sharing programs in general are equitable and inclusive, local programs should include requirements for vehicle distribution, cash payment options and accessible/adaptive vehicles.
- » Designating dockless vehicle parking areas and increasing bicycle parking may reduce occurrences of parked vehicles blocking walkways.
- » Communities should clearly communicate where e-scooters can be operated to reduce conflicts and increase safety.
- » The National Associate of City Transportation Officials (NACTO) suggests cross-jurisdictional coordination should include oversight and authority, data standards and small vehicle standards.

## Available resources

- » NACTO, *Guidelines for the Regulation and Management of Shared Active Transportation*
- » North American Bikeshare Association, *Dockless Bikeshare Regulation Preliminary Guidance*

### Denver’s Dockless Mobility Vehicle Pilot Program

Launched in June 2018, the City and County of Denver’s Dockless Mobility Vehicle Pilot Program permits up to five operators to provide a maximum of 500 bikes and 350 scooters. The program includes requirements for liability, permit fees, parking, rebalancing and data sharing.

## Description

Ride-hailing services pair drivers using their private vehicles as taxis with customers via a mobile app or website. Ride-hailing services are typically administered and operated by transportation network companies (TNCs) such as Uber and Lyft. These services affect curbside management in downtown areas where curbside areas serve a variety of functions from public space to delivery areas and bicycle parking to transit stops. Ride-hailing services also provide a first- and last-mile connection to transit. The effect of ride-hailing on active transportation is not yet established. Such services may enable people to live without a personal vehicle, but could also create increased congestion.

## Local context

- » Statewide legislation requiring liability insurance, driver background checks, vehicle inspections and permits for TNCs providing ride-hailing services has been in place since 2014 via SB 14-125.
- » Denver International Airport restricts TNC pickups and drop-offs to specific locations and charges each driver a per-trip fee.

## Implementation considerations

- » Communities can manage ride-hailing service pickups and drop-offs at popular destinations by allocating dedicated curbside zones.
- » Strategic enforcement paired with physical infrastructure (such as curb extensions, separated bike lanes, signs and markings) can discourage TNC drivers from stopping or parking too close to crosswalks, in bike lanes and in bus stops.

## Available resources

- » Schaller Consulting, *The New Automobility: Lyft, Uber and the Future of American Cities*
- » Institute of Transportation Studies, University of California – Davis, *Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States*
- » Alejandro Henao, University of Colorado, *Impacts of Ridesourcing – Lyft and Uber – on Transportation Including VMT, Mode Replacement, Parking, and Travel Behavior*
- » National Association of City Transportation Officials, *Blueprint for Autonomous Urbanism – Curbside Management*

### Ride-hailing survey

Results from ride-hailing passenger surveys included in a University of Colorado study found that over a third of passengers would have ridden a bike, walked or taken public transit to their destination if ride-hailing services weren't available.<sup>40</sup>

Source: University of Colorado



Source: Jason A. Staats/Twitter

## Description

Automated vehicles can be operated without human drivers and connected vehicles communicate with one another and with transportation infrastructure systems. This technology has the potential to reduce single-occupant vehicle trips, reduce the frequency and severity of crashes and allow street space to be reallocated to active transportation modes. These vehicles may also reduce private vehicle ownership, which in turn could promote the use of other modes for routine trips. Numerous agencies, organizations and companies are actively researching and developing connected and automated vehicles (CAVs). Implications for bicyclists and pedestrians are still being researched and considered by transportation professionals. There are likely to be positive and negative effects. It is widely expected that CAVs will reduce traffic fatalities, but they may also replace walking, bicycling and transit trips.

## Local context

- » SB 17-213 establishes regulation of automated vehicles as a statewide concern and allows their use provided they comply with all other state and federal laws.
- » DRCOG, CDOT, RTD and the Denver Metro Chamber of Commerce have partnered on the 2030 Mobility Choice Blueprint, which will develop an action plan that will define the region's mobility future through a more connected, mobile, adaptable and user-driven network.<sup>41</sup>
- » CDOT's RoadX program solicited technological solutions aimed at keeping bicycles and pedestrians safe in the International RoadX Bicycle and Pedestrian Challenge.<sup>42</sup>

## Implementation considerations

- » While proponents suggest that connected and automated vehicles could improve traffic safety, minimize the need for private vehicle ownership and reduce traffic congestion, concerns about safety and liability persist.
- » The development of connected and automated vehicles should include safety for vulnerable road users as a primary performance criterion.

## Available resources

- » National Association of City Transportation Officials, *Policy Statement on Automated Vehicles*
- » National Association of City Transportation Officials, *Blueprint for Autonomous Urbanism*
- » CDOT, *Connected & Autonomous Vehicles*



Source: EasyMile

### Automated shuttle service

RTD, CDOT and Panasonic have partnered to develop an automated shuttle service at Panasonic's Peña Station campus near Denver International Airport.

## Description

Systematic safety's central tenet is that traffic fatalities and serious injuries are preventable and unacceptable, and that street design should proactively account for user error. Vision Zero is a programmatic approach to systematic safety that aims to eliminate all collisions that result in fatalities and serious injuries. This is important to consider in active transportation planning, because bicyclists and pedestrians are involved in 24 percent of all traffic-related fatalities in the Denver region.<sup>43</sup> In recent years, communities across the nation have strengthened their commitment to transportation safety by adopting Vision Zero policies and action plans.

## Local context

- » Local Vision Zero plans include the *Denver Vision Zero Action Plan* and *Safe Streets Boulder: Vision Zero*.<sup>44,45</sup>
- » CDOT launched its Moving Towards Zero Deaths initiative and supports it as a core value of the CDOT *Strategic Highway Safety Plan*.
- » DRCOG is currently initiating a regional vision zero action plan that will provide guidance and tools to local jurisdictions to support their efforts to prioritize safety and prevent traffic-related serious injuries and fatalities.

## Implementation considerations

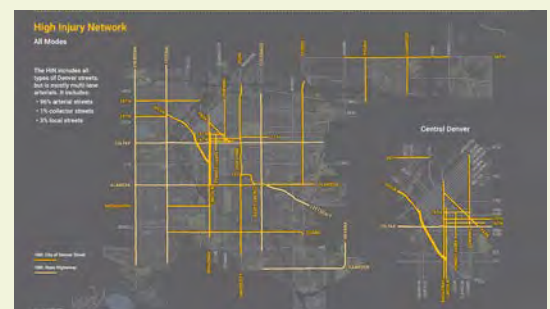
- » Effective Vision Zero programs typically include a deadline by which they aim to eliminate traffic fatalities and severe injuries and a plan to design, fund and implement crash countermeasures throughout the transportation system.
- » Education, encouragement and enforcement are important supplemental efforts, but designing streets to reduce speeds and crashes is the primary Vision Zero strategy.
- » Vision Zero programs should be funded and staffed appropriately to initiate safety-specific efforts, ensure safety-centric design in transportation projects and monitor progress.

## Available resources

- » Vision Zero Network
- » National Safety Council, Road to Zero Coalition
- » Federal Highway Administration, *Safety Culture and the Zero Deaths Vision*
- » Institute of Transportation Engineers, *Vision Zero*
- » CDOT, *Moving Towards Zero Deaths*

### Denver Vision Zero Action Plan

The Denver *Vision Zero Action Plan* sets 2030 as the goal for eliminating traffic fatalities in Denver. To accomplish this goal, the plan identified Denver's high injury network, which represents 50 percent of Denver's traffic fatalities but only 5 percent of its streets.



## Description

The Complete Streets approach requires street design to be context-sensitive and to address the needs of all travelers, including people who walk, bicycle, take transit or drive (passenger, freight, emergency vehicles). Due to the context-sensitive nature of Complete Streets, there is no one-size-fits-all solution. Local and state agencies can ensure that the planning, design, construction and maintenance of their streets consider the needs of all transportation system users by adopting Complete Streets policies, resolutions or laws.

## Local context

- » Denver region cities that currently have Complete Streets policies include Boulder, Denver and Golden.<sup>46,47,48</sup>
- » The City of Thornton is incorporating its Complete Streets policy into its city code, comprehensive plan, master and strategic plans, as well as into its standards and specifications.
- » The cities of Arvada, Aurora and Westminster participated in Smart Growth America’s second Complete Streets Consortium series to develop Complete Streets policies with an emphasis on providing first- and last-mile connections to transit.<sup>49</sup>
- » The City of Lakewood highlights Complete Streets in its comprehensive plan and will “be dedicated to designing and developing safe and attractive Complete Streets.”<sup>50</sup>
- » The Town of Parker has drafted a Complete Streets policy that envisions facilities that are “safe, comfortable and accessible for users of all ages and abilities – including pedestrians, bicyclists, transit patrons, trucks and automobiles.” The town has drafted evaluation metrics to evaluate the implementation of the Complete Streets policy as well.<sup>51</sup>

## Implementation considerations

- » Complete Streets requirements can be established through the adoption of policies, resolutions, laws, plans or design standards.
- » Complete Streets policies typically include exceptions that are sensitive to significant constraints such as limited right-of-way, environmental impacts and existing structures. Stronger policies have fewer exceptions and clearly communicate the circumstances and process by which exceptions are granted.

## Available resources

- » National Complete Streets Coalition
- » National Association of City Transportation Officials Design Guides
- » American Planning Association, *Complete Streets: Best Policy and Implementation Practices*



Source: National Complete Streets Coalition

## Description

Local transportation design guidelines and standards dictate the design of transportation infrastructure including streets, bikeways, shared-use paths, sidewalks and crossings. The design of bicycle and pedestrian facilities can affect both the actual and perceived safety of walking and bicycling. Ensuring local street design guidelines and standards incorporate bicycle and pedestrian elements is a critical part of supporting a safe and well-connected multimodal transportation system.

## Local context

- » The City of Louisville documents its street design standards in its *Design & Construction Standards Handbook*, which includes design criteria for sidewalks and curb ramps in addition to requirements for street design and pavement materials.<sup>52</sup>
- » The City of Boulder endorsed NACTO's *Urban Street Design Guide* in 2014 as part of its commitment to designing and constructing streets and public spaces.<sup>53</sup>
- » The City of Aurora included design standards for urban streets as part of its *Roadway Design and Construction Specifications*. Wider sidewalks, enhanced street crossings and more inter-connected street networks are required for urban centers and transit-oriented developments.<sup>54</sup>

## Implementation considerations

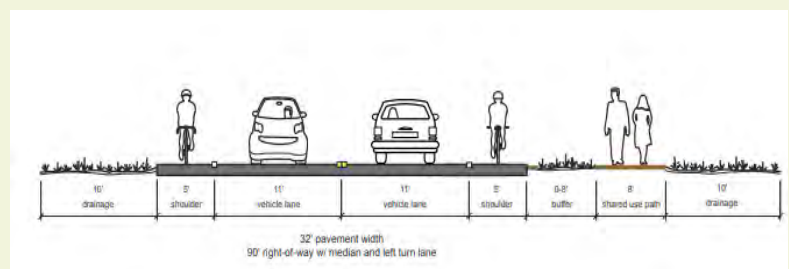
- » Local standards should be based on and supplement national and state standards, best practices and local context.
- » Design standards and guidelines can also be included in local transportation planning documents.

## Available resources

- » Federal Highway Administration, *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*
- » Manual on Uniform Traffic Control Devices, *Part 6: Temporary Traffic Control*
- » American Association of Highway Transportation Officials, *Guide for the Planning, Design, and Operation of Pedestrian Facilities*
- » American Association of Highway Transportation Officials, *Guide for the Development of Bicycle Facilities*
- » Institute of Transportation Engineers, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*
- » National Association of City Transportation Officials design guides

### Street Standard Cross Section

Boulder County's *Multimodal Transportation Standards* includes a cross section for each street type.



Source: Boulder County

## Description

Over the past several decades, the number of children walking or bicycling to school dropped significantly and childhood obesity rates have increased.<sup>55, 56</sup> Safe Routes to School (SRTS) programs allocate funding to infrastructure and noninfrastructure efforts (such as educational and encouragement programs) to increase the safety and frequency of walking and bicycling trips to and from school. Colorado Safe Routes to School, a CDOT program, collaborates with local stakeholders, fosters a safe routes to school culture statewide and implements projects and programs that encourage safe routes for school across Colorado.

## Local context

- » CDOT's SRTS program offers guidance and grants for local program development, dozens of which have been awarded to communities and schools in the Denver region.<sup>57, 58</sup>
- » Many Denver region jurisdictions have SRTS programs to advance infrastructure projects and create events and campaigns to promote bicycling and walking to school.
- » Jefferson County Public Health and the School Wellness Coalition developed the *Jeffco Safe Routes to School Community Toolkit* which supports implementing SRTS programs and projects in Jefferson County.<sup>59</sup>

## Implementation considerations

- » Successful SRTS programs facilitate coordination among government departments and divisions, school staff and faculty, parents and students and other partners.
- » SRTS programs may include Walk and Bike to School Day, walking school buses, integration of walking and bicycling into the school curriculum, or strategic speed enforcement in school zones.
- » SRTS programs and projects should always include an evaluation component.

## Available resources

- » National Center for Safe Routes to School
- » Federal Highway Administration, Transportation Alternatives Program
- » Colorado Safe Routes to School
- » Bicycle Colorado, Safe Routes to School



### Local SRTS

RTD hosts events such as a Safety Roadshow at a light rail crossing for schoolchildren.

Source: Regional Transportation District



## Description

Traffic calming uses street design features to manage motor vehicle speeds and volumes, improve safety and enhance neighborhoods. In addition to signs and markings, traffic calming is an essential element of bicycle boulevards and encouraging walkable communities. Developing criteria for candidate streets and treatment identification can help to prioritize local funding.

## Local context

- » The Town of Castle Rock has implemented a neighborhood traffic calming program.<sup>60</sup>
- » The City of Longmont outlines traffic calming techniques through its neighborhood traffic mitigation program.<sup>61</sup>
- » The City of Boulder has a neighborhood speed management program which implements engineering, education and enforcement to slow speeding traffic on residential streets.<sup>62</sup>

## Implementation considerations

- » Traffic calming policies should include planned bicycle and pedestrian facilities as prioritization criteria.
- » Establishing transparent processes by which neighborhoods can request or petition for traffic calming features can help to manage funding and implementation expectations.

## Available resources

- » Federal Highway Administration, *Traffic Calming ePrimer*
- » United States Department of Transportation, *Traffic Calming to Slow Vehicle Speeds*
- » National Association of City Transportation Officials, *Urban Bikeway Design Guide – Speed Management*
- » National Association of City Transportation Officials, *Urban Bikeway Design Guide – Volume Management*



### Traffic Circles

Neighborhood traffic circles can be an effective traffic calming tool to manage vehicular speeds while maintaining access. The City and County of Denver is currently evaluating traffic circles along West 35th Avenue in the West Highlands neighborhood.

## Description

Streetscaping improves the aesthetics, comfort and attractiveness of streets with elements including landscaping, street furniture, lighting and street design. Streetscaping can enhance the walkability, sustainability and vibrancy of a street or area. Streetscaping enhances the experience for travelers and makes walking and bicycling more enjoyable.

## Local context

- » The City of Boulder includes streetscaping standards in its *Design and Construction Standards*.<sup>63</sup>
- » The City of Golden developed a *Golden Downtown Streetscape Master Plan*.<sup>64</sup>

## Implementation considerations

- » Streetscaping can include street furniture (such as benches, tables, bicycle parking, trash receptacles), vegetation (such as trees and plants), stormwater features (such as bioswales, planter boxes, permeable pavement), various materials (such as pavers, stones) and street features (such as enhanced crossings, on-street parking, fewer or narrower travel lanes).
- » Streetscape standards can guide consistent design across a community or specific districts and neighborhoods.

## Available resources

- » Institute of Transportation Engineers, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*



### Fillmore Plaza

Completed in 2011, the Fillmore Plaza streetscape project in Denver, increased sales tax revenues and reduced ambient temperatures, water consumption, energy consumption, stormwater runoff, crime and vacancy rates.

Source: Landscape Architecture Foundation

## Description

First- and last-mile connections fill the gap between a person's transit stop and their origin or destination. To accomplish multimodal transportation targets and reduce the need for automobile parking, first- and last-mile solutions include walking, bicycling, micromobility solutions and ride-hailing services. Unsafe or uncomfortable conditions for bicycling and walking may deter transit use or prevent it altogether.

## Local context

- » All RTD buses, except for the Free MallRide and Free MetroRide, are equipped with bicycle racks. RTD also allows bikes on all light rail and commuter rail trains.
- » RTD is developing a *First and Last Mile Strategic Plan* in 2018 to address the issue of transit access.<sup>65</sup>
- » As part of the RTD FasTracks project to implement bus rapid transit service along U.S. Route 36, several first- and last-mile amenities were added including: Bike-n-Ride bike shelters were installed to provide secure, long-term bike parking; bicycle and pedestrian wayfinding signs; and bicycle and pedestrian route upgrades.<sup>66</sup>
- » The City of Lone Tree has implemented the Lone Tree Link and Link on Demand. Lone Tree Link connects people with the RTD transit system for free (such as at Lincoln Station). There are bike racks on the shuttle and all shuttles are equipped with ramps to assist those with mobility impairments.<sup>67</sup>

## Implementation considerations

- » The Federal Transit Administration states that infrastructure improvements around transit stations should be considered within a half-mile for pedestrians and within three miles for bicyclists.
- » To assist local communities in planning for first- and last-mile connectivity, DRCOG manages a Station Area Master Plan/Urban Centers set-aside of the Transportation Improvement Program.
- » Transit stations should provide secure and convenient long-term bike parking for personal bicycles and designated parking areas for dockless mobility devices such as those used by bike-sharing programs and e-scooter vehicles.
- » Transit vehicles should accommodate bicycles in a way that is safe, comfortable and convenient for riders to encourage riders to use a bicycle for their first- and last-mile connections.

## Available resources

- » Federal Transit Administration, *Manual on Pedestrian and Bicycle Connections to Transit*
- » Regional Transportation District, *First and Last Mile Strategic Plan*
- » American Public Transportation Association, *First/Last Mile Solutions*



Source: Boulder County

### Bike-n-Ride Shelters

Boulder County has opened Bike-n-Ride shelters which provide secure, long-term parking areas for passengers who bike to and from transit stations.

## Description

The Americans with Disabilities Act (ADA) prohibits discrimination against people with disabilities. This means new roadways, sidewalks and shared-use paths must be designed to accommodate the needs of people with disabilities. Existing facilities must be upgraded when a planned project is implemented. The concept of universal design suggests elements of the built environment should be accessible for people of all ages and abilities. By implementing universal design, communities are improving mobility for all, including parents with strollers, travelers with luggage and even freight deliveries.

## Local context

- » CDOT's *ADA Compliance Transition Plan* was completed and adopted by CDOT and FHWA in 2017.<sup>68</sup>
- » The City of Wheat Ridge is developing an *ADA Transition Plan* to ensure public infrastructure complies with ADA requirements.<sup>69</sup>
- » The City of Boulder's *ADA Self-Evaluation and Transition Plan for Transportation* is underway and will be developed in conjunction with the *Pedestrian Plan* update.<sup>70</sup>

## Implementation considerations

- » ADA defines specific design criteria for accessible routes to and within public facilities, sidewalks, trails, curb ramps, bus stops and rail stations. All public transportation projects and maintenance activities should and are legally required to comply with ADA.
- » All local governments are federally required to conduct ADA self-evaluations, which identify existing barriers to accessibility and to create ADA transition plans, which define time-constrained steps to mitigate barriers to accessibility.
- » Separated bike lanes should not be placed between where a transit vehicle stops and the location where passengers wait to board. Where separated bike lanes exist, communities should consider floating transit islands.

## Available resources

- » United States Department of Transportation, *Accessibility*
- » Federal Highway Administration, *Americans with Disabilities Act (ADA)/Section 504 of the Rehabilitation Act of 1973 (504)*
- » Federal Transit Administration, *Americans with Disabilities Act*
- » United States Access Board, *Proposed Guidelines for Pedestrian Facilities in the Public Right of Way*



### ADA Standards

The Americans with Disabilities Act's standards require every bus stop to provide access via an 8- by 5-foot boarding and alighting area, an accessible route (of appropriate slope and width) and a 4- by 2.5-foot space in the bus shelter (if present).

Source: United States Access Board

## Description

Construction zones often encroach on sidewalks, crosswalks and bicycle facilities. In such circumstances, bicyclists and pedestrians may have to make detours that are unsafe, difficult-to-navigate and sometimes both. All construction projects that affect the public right-of-way require permits that include traffic control plans. Local permitting processes can require and provide guidance for accommodating bicyclist and pedestrian travel through and around work zones.

## Local context

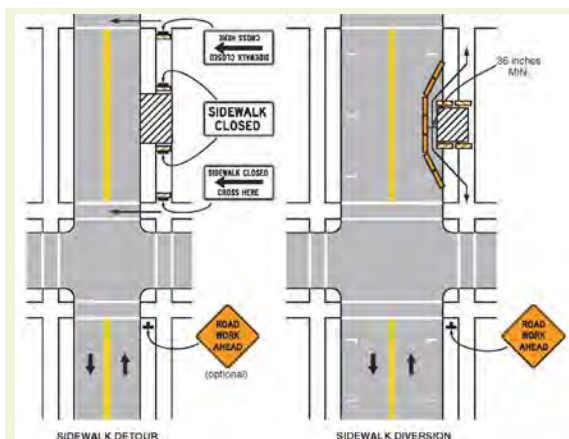
- » The City and County of Denver documents requirements for pedestrian accommodations through work zones in its *Encroachments in the Public Right of Way* document and *Pedestrian Walkway Entrance Requirements* document. It is currently investigating ways to make bicyclist and pedestrian travel through work zones safer.<sup>71</sup>

## Implementation considerations

- » Accommodations for pedestrians in work zones must comply with the American with Disabilities Act's requirements.
- » Walkways and bikeways should be kept clear of debris which could present a falling or tripping hazard.
- » There are many factors that can be considered including: advance warning and signage, adequate lighting, physical separation between construction and travelers, temporary facilities where appropriate and warnings about surface irregularities.
- » To ensure compliance, communities can make a commitment to staff permitting and on-site inspection efforts.
- » Maintain and inspect pavement markings and signs.

## Available resources

- » National Work Zone Safety Information Clearinghouse, *Accommodating Pedestrians*
- » Manual on Uniform Traffic Control Devices, *Part 6: Temporary Traffic Control*
- » Federal Highway Administration, *University Course on Bicycle and Pedestrian Transportation*



Source: Manual on Uniform Traffic Control Devices

### Traffic Control Devices

Chapter 6 of the *Manual on Uniform Traffic Control Devices* provides requirements and guidance for sidewalk detours and diversions.

## Description

Land use significantly influences how people get around. Areas with a higher concentration of destinations are more likely to have the infrastructure to support walking and bicycling trips. Municipal subdivision and zoning regulations can be designed to support or impede progress in creating comfortable walking and bicycling environments.

*Survey respondents who reported having more types of destinations easily accessible from home were more likely to have bicycled for their work commute and for other purposes.*

## Local context

- » The City of Westminster maintains design guidelines for traditional mixed-use neighborhood developments that includes provisions for detached sidewalks with street trees and accented crosswalks.<sup>72</sup>

## Implementation considerations

- » Bicycling- and walking-supportive policies promote a mix of land uses, small block sizes and a connected street grid, maximum parking requirements and short building setbacks.
- » Policies should also include provisions for connected sidewalks, bike lanes, shared-use paths, bike parking and transit amenities in new and retrofitted developments.

## Available resources

- » American Planning Association, *Policy Guide on Surface Transportation*
- » Urban Land Institute, *Active Transportation and Real Estate*



## Description

Ongoing and seasonal maintenance of pedestrian and bicycle facilities is necessary to ensure infrastructure remains useful and safe for people who walk or bicycle, especially for those who use mobility aids to navigate or access facilities such as bus stops. Damaged pavement or surface areas and accumulations of snow, ice, gravel, sand, dirt, mud, leaves and other debris can pose a significant barrier or safety risk for pedestrians and bicyclists. Maintenance programs for on-street bicycle facilities, sidewalks and shared-use paths involve sweeping, trash and debris removal and snow plowing. Snow plowing may be required more than once during inclement weather.

## Local context

- » The responsibility for sidewalk maintenance and repair varies across the region.
- » The City of Golden's *Winter Operations Maintenance Plan* sets priorities for snow clearance by street type. The city's Parks and Recreation Division establishes the process for clearing sidewalks and trails in its *Snow/Ice Control Plan*.<sup>73</sup>
- » The City of Lakewood's snow removal plan requires residents and businesses to clear snow from adjacent sidewalks, while the city removes snow from all other sidewalks and shared-use paths.<sup>74</sup>
- » Denver Public Works purchased a smaller snow plow to clear its separated bikeways while Denver Parks and Recreation maintains the city's shared-use paths.<sup>75, 76</sup>

## Implementation considerations

- » Coordination between public works, parks and recreation, public utilities and other local departments and divisions can clarify maintenance responsibilities and expectations while improving efficiency.
- » Separated bike lanes may require smaller equipment for sweeping and snow-clearing.
- » Commit to maintenance of pavement markings in good visual condition (such as crosswalks, bike lane markings, vehicle lane markings).
- » Provide methods or applications to the traveling public to notify agencies of maintenance issues, like Denver 3-1-1 and PocketGov.<sup>77</sup>

## Available resources

- » Federal Highway Administration, *Incorporating On-Road Bicycle Networks into Resurfacing Projects*



Source: City and County of Denver

## Description

Roadway resurfacing is a cost-effective opportunity to add bicycle facilities and upgrade curb ramps. In some cases, the existing pavement width may be adequate to implement bicycle lanes or add a buffer to existing bike lanes. The process for adding bikeways during resurfacing projects requires greater coordination than the conventional resurfacing process, but results in a more connected bicycle network and avoids costly and inefficient pavement marking removal and restriping. New curb ramps must be installed when streets are resurfaced, unless the work is limited to maintenance (such as joint repairs, surface sealing) or the existing curb ramps meet accessibility standards.<sup>78</sup>

## Local context

- » Most Denver region communities have five-year plans to resurface roadway pavement.
- » Local examples of bikeways added through resurfacing include: State Highway 93 climbing lane (Jefferson County) and Colorado Mills Boulevard (Lakewood).
- » The City and County of Denver considers potential bikeway improvements alongside its annual paving program.

## Implementation considerations

- » One option for improving bicycle facility maintenance is to consider the presence of on-street bicycle facilities as a factor when prioritizing which streets to resurface in a given year.
- » Methods for implementing bicycle facilities during resurfacing include lane narrowing, lane reduction, parking removal and shoulder paving.
- » Lane reduction and parking removal warrant significant public engagement with affected property and business owners.
- » The use of design minimums in combination, such as a minimal-width travel lane adjacent to a minimal-width bike lane, should be avoided if possible.

## Available resources

- » Federal Highway Administration, *Incorporating On-Road Bicycle Networks into Resurfacing Projects*
- » U.S. Department of Justice and U.S. Department of Transportation, *Joint Technical Assistance on the Title II of the Americans with Disabilities Act Requirements to Provide Curb Ramps when Streets, Roads or Highways are Altered through Resurfacing*





## Description

According to the Street Plans Collaborative, "Tactical urbanism refers to a city, organizational, and/or citizen-led approach to neighborhood building using short-term, low-cost, and scalable interventions to catalyze long-term change."<sup>79</sup> Tactical urbanism is a response to the often lengthy procedure of implementing projects through the conventional planning and design process. Local agencies can institutionalize tactical urbanism by implementing quick-build projects. These projects are intended to be installed within a year of conception and may be modified based on the response to their implementation.<sup>80</sup> Tactical urbanism projects come in a variety of forms, but can improve the bicycle and pedestrian environments when they serve as traffic calming features and/or provide separation between vehicle traffic and bicycle and pedestrian spaces.

## Local context

- » The City and County of Denver recently installed traffic circles on West 35th Avenue as part of a quick-build project aimed at improving traffic safety and promoting bicycle mobility. Denver is encouraging more tactical urbanism projects through its Vision Zero Community Program.<sup>81</sup>
- » During the summer of 2018, WalkDenver, a local advocacy group, installed a series of temporary pop-up traffic calming installations at dangerous intersections in Denver.

## Implementation considerations

- » Data collection and evaluation are essential to the tactical urbanism/quick-build process. The analysis findings can be used to modify the project as needed following implementation and to demonstrate success or identify opportunities for improvement.
- » Because quick-build projects often involve new and innovative infrastructure, it is essential to conduct outreach and clearly communicate the purpose of the project to residents, business owners and other stakeholders.
- » Partnering with community organizations, advocacy groups and others can strengthen relationships and promote a shared sense of ownership.
- » Like other infrastructure, quick-build projects require maintenance, which should be accounted for prior to implementation.

## Available resources

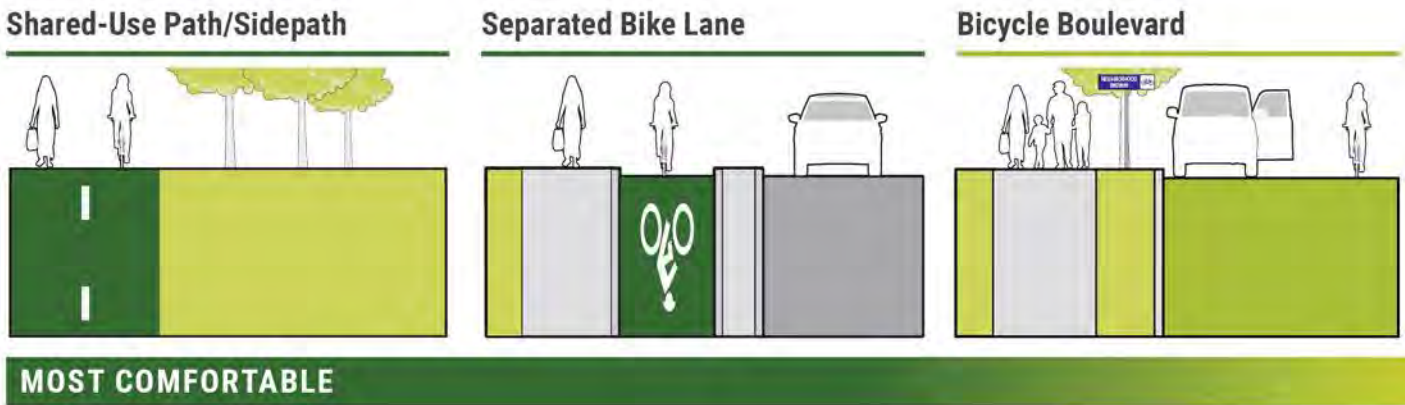
- » Street Plans Collaborative, *Tactical Urbanists' Guide to Materials and Design Version 1.0*.
- » PeopleForBikes, *Quick Builds for Better Streets: A new project delivery model for U.S. cities*



Source: David Sachs

## BICYCLE INFRASTRUCTURE

The most common types of bikeways and their comfort level under typical conditions are depicted below.



**Shared-use paths**, also known as multiuse paths, paved trails or greenways, are off-street, paved facilities for bicyclists and pedestrians that are physically separated from motor vehicle traffic. Shared-use paths are constructed in parks; along streams, utility corridors and railroad corridors; and adjacent to streets as sidepaths. Although shared-use paths are typically paved, some agencies in the Denver region install crushed gravel paths where a paved surface would be inappropriate for the context.

**Design Considerations:** Bi-directional traffic on sidepaths and frequent driveways and intersections can create unexpected conflicts for motorists and bicyclists. These conflicts can be mitigated by reducing motor vehicle turning speeds, consolidating driveways and ensuring clear sight lines between sidepath users and motorists. Conflicts between bicyclists and pedestrians may occur on shared use paths if adequate width is not provided. Unpaved shared-use paths should be firm and stable in order to be accessible to people in wheelchairs.

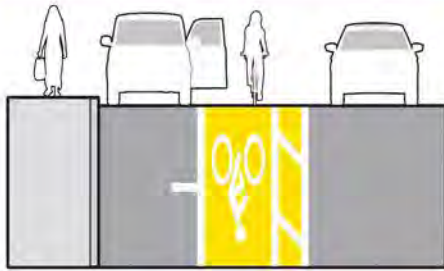
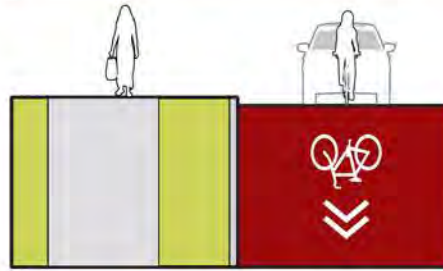
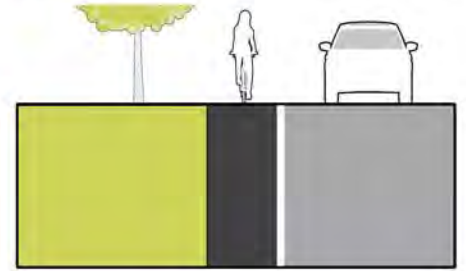
**Separated bike lanes**, also known as protected bike lanes or cycle tracks, are on-street or street-adjacent bike lanes that are physically separated from travel lanes and walkways with vertical elements. They can be one-way or bidirectional. They are intended to provide the same level of comfort as shared-use paths and are similar to sidepaths but are exclusively for bicycle travel.

**Design Considerations:** A variety of materials can be used to provide physical separation including planters, plastic posts, curb stops, concrete medians, curbs and parked motor vehicles. At intersections, separated bike lanes should be designed using signal phasing or intersection geometry to mitigate conflicts between bicyclists and motorists.

**Bicycle Boulevards**, also known as neighborhood bikeways or greenways, are shared streets optimized for bicycle travel. Signs, pavement markings and traffic calming features are used to manage motor vehicle speeds and volumes to provide a comfortable shared environment between bicyclists and motorists.

**Design Considerations:** Traffic calming features might include curb extensions, medians, speed cushions or speed tables, partial or full closures to motor vehicles and traffic circles. Strong candidates for bicycle boulevards include streets with low traffic speeds and volumes and with parallel routes that can absorb potentially diverted traffic.

*Survey respondents indicated they would walk and bike more if there were more off-street walking or multiuse paths or trails. About two-thirds agreed that they would walk more and 7 in 10 respondents agreed they would bicycle more. See Appendix B for more information.*

**Bike Lane (Buffer Preferred)****Shared Roadway****LEAST COMFORTABLE****Paved Shoulder****VARIABLE**

**Bike lanes** use signs and pavement markings to designate on-street space exclusive to bicycling. Painted buffers can be added to improve bicyclist comfort by increasing shy distance from travel lanes or on-street parking.

**Design Considerations:** Bike lanes should be signed and marked to discourage motorist use for travel or parking. Bike lane markings should extend to intersections to communicate where motorists and bicyclists are expected to travel and queue. Bike lane buffers can be narrowed or removed at constrained locations to provide space for turn lanes or intermittent on-street parking, where appropriate.

**Shared roadways** are streets without dedicated space for bicyclists. As such, shared roadways are not a bicycle facility. They may include shared lane markings, also known as sharrows, to remind motorists to look for bicyclists and to help bicyclists navigate around on-street parking. In low-speed and low-volume contexts, shared roadways can be comfortable for bicyclists.

**Design Considerations:** Shared lane markings should be positioned to guide bicyclists to ride in straight lines away from parked motor vehicles. Shared lane markings should be placed after every intersection and frequently enough to remind motorists to expect bicyclists in the street.

**Paved shoulders** can be used by bicyclists in addition to providing emergency space for motor vehicles and extending pavement longevity. The comfort of bicycling in paved shoulders varies based on shoulder width, traffic volumes and traffic speeds.

**Design Considerations:** Paved shoulders are most appropriate in rural or some suburban environments. Where space is not available for consistently wide shoulders, spot widening should be considered where sight lines are challenging. Rumble strips on paved shoulders should include occasional breaks to accommodate bicyclist access. When paved shoulders are not marked as bicycle facilities, bike route signs can remind motorists to watch for bicyclists.

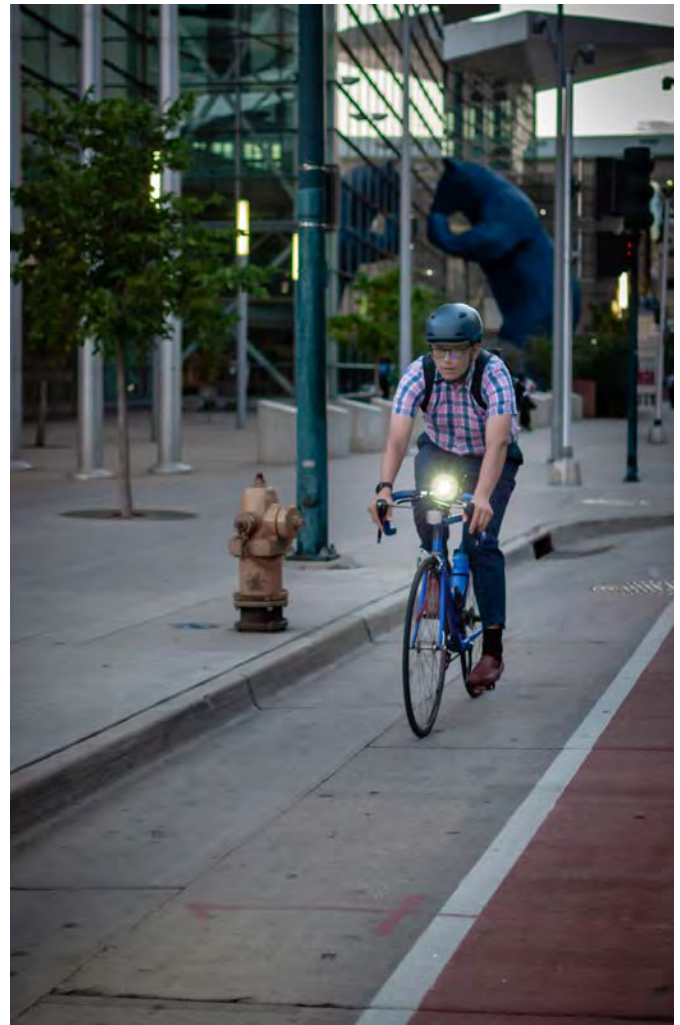
## Bicycle Infrastructure Design Guidance Resources

- » National Association of City Transportation Officials, *Urban Bikeway Design Guide*
- » American Association of Highway Transportation Officials, *Guide for the Development of Bicycle Facilities*
- » Federal Highway Administration: *Incorporating On-Road Bicycle Networks into Resurfacing Projects*; *Manual on Uniform Traffic Control Devices*; *Separated Bike Lane Planning and Design Guide*; and *Small Town and Rural Multimodal Networks*

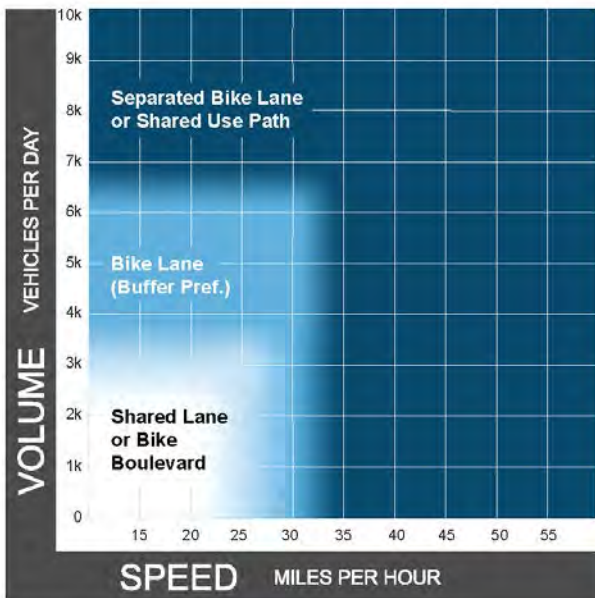
## Bikeway Selection

To develop local bicycle networks and to connect to the regional active transportation network, local agencies are responsible for identifying routes, facility types and ultimately defining projects for design and construction. The process below generally describes the process for bicycle facility selection; this process is also described in Chapter 2.

1. Identify priority routes: Connections to the ATP’s regional active transportation network and routes within short-trip opportunity zones could be given priority consideration.
2. Evaluate existing level of comfort: Priority routes can be improved by providing facilities where none exist, increasing separation for midcomfort facilities and enhancing high-comfort facilities using lighting and signage.
3. Select type of bikeway based on motor vehicle volumes and speeds for urban/suburban context (Figure 22) or rural context (Figure 23).

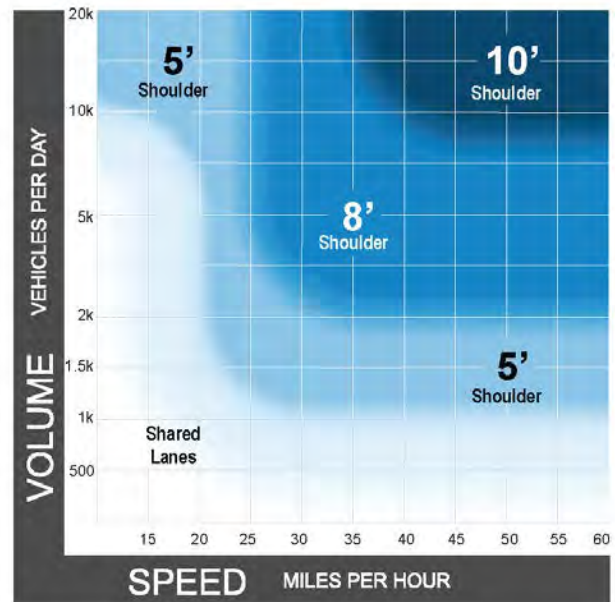


**Figure 22. Bikeway Selection Guidance by Traffic Volume and Speed, Urban or Suburban Context**



Source: Toole Design

**Figure 23. Bikeway Selection Guidance by Traffic Volume and Speed, Rural Context**



Source: Toole Design

## Bicycle Intersection Treatments

### Bike Boxes

Bike boxes delineate space at signalized intersections to allow bicyclists to position themselves in front of motorists when facing a red signal. Bike boxes are intended to facilitate bicyclist left turns and progress through intersections. Bike boxes preclude motorists from turning right on red, which can be communicated through signage.



### Bicycle Signals

Bicycle signals are traffic signals that provide designated phases for bicyclist movements. Bicycle signals can be used to reduce conflicts between motorists and bicyclists at intersections, especially where separated bike lanes are present. Like signal coordination to reduce delay for motorists traveling along a corridor, signals can be timed to reduce delay for bicyclists.



### Two-Stage Turn Boxes

Two-stage turn boxes provide greater comfort for bicyclists turning left at intersections by breaking the movement into two steps. Bicyclists travel through the intersection on a green signal, wait in the two-stage turn box and cross when presented with a green signal in the perpendicular direction. Two-stage turn boxes preclude motorists turning right on red, which can be communicated through signage. The placement of two-stage turn boxes should not conflict with pedestrians, bicyclists or motorists traveling through the intersection.



### Protected Intersections

Protected intersections separate motorist, bicyclist and pedestrian movements via signal operations, geometric separation, signs and pavement markings. Such features improve safety and comfort by reducing the frequency and severity of motorist right-turn conflicts with bicyclists and pedestrians using corner islands that reduce right-turning speeds and improve sightlines. Protected intersections also provide separate crossing space for bicyclists and pedestrians as well as queuing space for bicyclists.



## PEDESTRIAN INFRASTRUCTURE

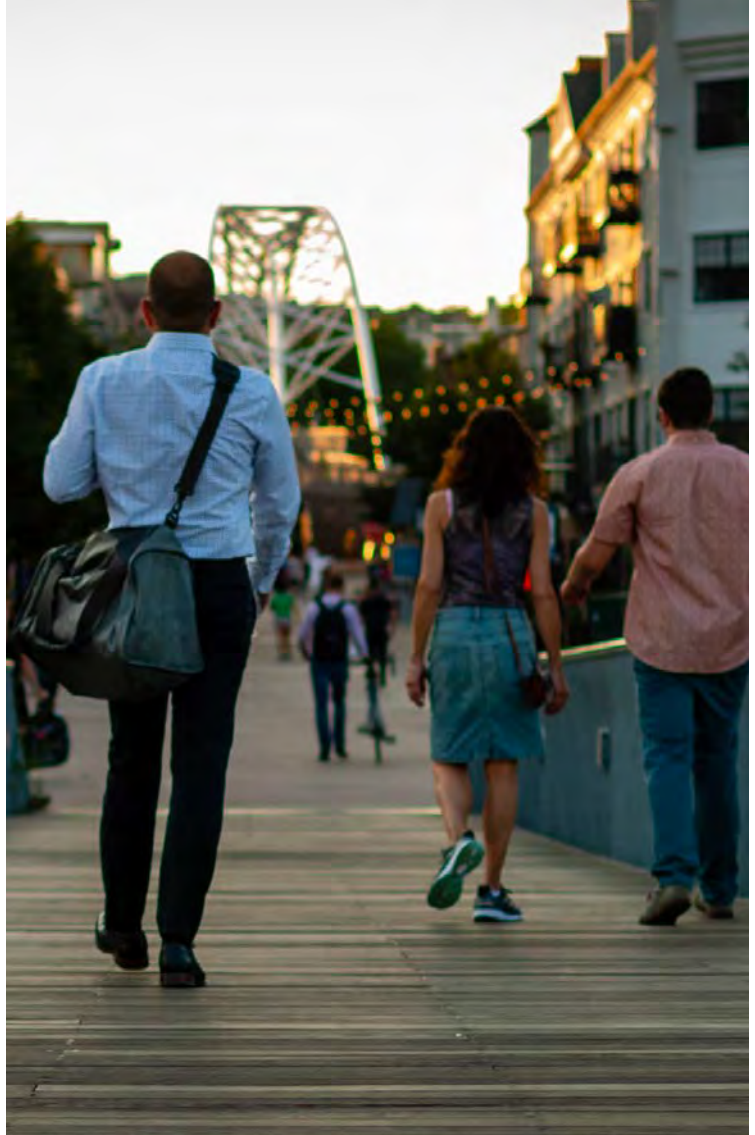
Shared-use paths and sidepaths are discussed in the Bicycle Infrastructure section above, but also accommodate people who walk. Additional detail can be found in the Bicycle Infrastructure section.



### Sidewalks

Sidewalks are paved travelways for pedestrians. Sidewalks are the foundation of any pedestrian transportation network.

**Design considerations:** In most cases, sidewalks should be installed on both sides of the street and include a buffer that provides separation from adjacent traffic and accommodates street trees, lighting and street furniture. Beyond meeting Americans with Disabilities Act requirements, sidewalks should be wide enough to accommodate comfortable side-by-side walking. The minimum clear width requirement for pedestrian routes is 4 feet to be ADA compliant and 5 to 6 feet to be comfortable for low to moderate pedestrian volumes. Higher pedestrian volumes may warrant sidewalk widths of at least 8 feet.



### Pedestrian Infrastructure Design Guidance Resources

- » American Association of Highway Transportation Officials, *Guide for the Planning, Design, and Operation of Pedestrian Facilities*
- » Federal Highway Administration, *Manual on Uniform Traffic Control Devices*
- » Federal Highway Administration, *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*
- » United States Access Board, *ADA Standards*



### Crosswalk Markings

Crosswalks, marked and unmarked, legally exist at all intersections, unless explicitly prohibited. At midblock locations, pavement markings establish a legal marked crosswalk. Marked crosswalks are delineated using transverse lines (parallel to pedestrian travel), continental markings (perpendicular to pedestrian travel) or both.

**Design considerations:** On multilane, high-volume, high-speed streets, crosswalk markings should not be installed without additional treatments (such as signs, signals, curb extensions and median refuges) that alert motorists to a pedestrian crossing. Crosswalk widths should be 6 feet or the width of the connected curb ramps, whichever is greater. Higher pedestrian volumes may warrant sidewalk widths of 8 feet or wider.

### Stop Line Markings

Stop line markings are wide, white bars that indicate where motorists should stop in advance of intersections.

**Design considerations:** At intersections, stop bars should be placed no less than 4 feet and no more than 30 feet from a crosswalk. Stop line markings are recommended by the FHWA as a proven safety countermeasure.

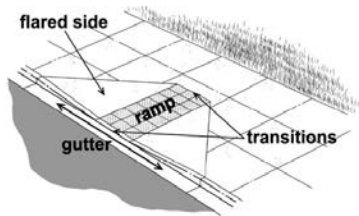
### Yield Line Markings

Also known as sharks' teeth, yield line markings are white, triangular markings that indicate where motorists should stop to yield to crosswalk users. They are especially important on multilane approaches to prevent "double threat" crashes.

**Design considerations:** At unsignalized midblock crosswalks, yield markings should be placed no less than 20 feet and no more than 50 feet from the crosswalk. Yield markings must be accompanied by "Yield Here to Pedestrians" signs.

## Pedestrian Infrastructure Design Guidance Resources (cont.)

- » United States Access Board, *Proposed Guidelines for Pedestrian Facilities in the Public Right of Way*
- » Institute of Transportation Engineers, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*
- » Colorado Department of Transportation, *Roadway Design Guide: Chapter 14 – Bicycle and Pedestrian Facilities*



### Curb Ramps

Accessible curb ramps comply with American with Disabilities Act requirements and provide a transition between sidewalks and crosswalks. Paired with other treatments, accessible curb ramps guide pedestrians with disabilities across intersections. Accessible curb ramps are required at all crosswalks on or along public streets and at transit stops.

**Design Considerations:** Accessible curb ramps have a running slope (parallel to travel direction) of less than 8.33 percent, a cross slope (perpendicular to travel direction) less than 2 percent, a width of 3 feet or greater, a detectable warning surface and smooth transitions.<sup>82</sup> Adjacent gutter pans must have slopes of 5 percent or less.

### Median Refuge Islands

Median refuge islands, also known as pedestrian refuge islands, provide space for bicyclists and pedestrians to cross one direction of motor vehicle traffic at a time. Median refuge islands are particularly important for multilane, high-volume, high-speed streets.

**Design Considerations:** Median refuge islands can be installed on streets with existing medians or they can be constructed by narrowing travel lanes or removing on-street parking. Median refuge islands must be at least 6 feet wide. Wider median islands accommodate a greater variety of bicycles and bicycle trailers used to transport children or cargo. Median refuges can connect offset crosswalks to encourage crossing pedestrians to look at oncoming traffic before crossing.

### Curb Extensions

Also known as bulb-outs, neckdowns or chokers, curb extensions narrow streets to shorten crossing distances, improve sight lines, manage on-street parking, slow traffic speeds and reduce effective turning radii.

**Design Considerations:** Curb extensions work best where on-street parking lanes currently exist. They can be built to physically enforce parking restrictions near crosswalks and improve visibility between motorists and pedestrians waiting to cross. To manage drainage, curb extensions can be built as edge islands or with integrated trench drains.

## Crossing Treatment Selection Guidance

To ensure crossing treatments are consistent locally and regionally, local agencies should consider collaborating on developing crosswalk design standards. National guidance, such as Federal Highway Administration's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* can serve as a sound starting point to consistently plan for and install safe and comfortable crossings.





### **Pedestrian Signals**

Pedestrian signals enhance crosswalks by displaying a white pedestrian symbol, an orange flashing hand and a steady orange hand to communicate walk, clear the intersection and don't walk phases. Countdown timers showing the time remaining in the clearance phase are required with the installation of any new pedestrian signal.

**Design Considerations:** Pedestrian signals can be activated by default for every traffic signal cycle or by pedestrians with crosswalk buttons, which must be accessible by pedestrians with disabilities. Lights and sound cues can be used to confirm pedestrian signal activation for pedestrians with visual and auditory disabilities. Pedestrian phases should be adjusted to ensure adequate time for all users to cross, especially near schools and hospitals.

### **Leading Pedestrian Intervals**

Leading pedestrian intervals (LPIs) initiate the pedestrian walk phase several seconds before the concurrent motor vehicle phase begins to allow pedestrians to cross first. This phasing increases the visibility of pedestrians and reduces conflicts with turning motorists, improving safety and comfort for travelers within the intersection. Leading pedestrian intervals should be considered at intersections with significant pedestrian traffic and turning vehicles.

**Design Considerations:** Leading pedestrian intervals can be timed to last three to seven seconds.<sup>83</sup> They can be implemented consistently along a corridor to manage pedestrian and motorist expectations. Prohibiting vehicular right turn on red can further increase the effectiveness of LPIs.

### **Exclusive Pedestrian Phases**

Exclusive pedestrian phases, also known as pedestrian scrambles, restrict all motor vehicle movements while allowing all pedestrian movements at signalized intersections. These phases facilitate diagonal crossings, which can reduce pedestrian delay, improve comfort and shorten crossing times.

**Design Considerations:** Exclusive pedestrian phases should be timed to allow pedestrians to cross the intersection diagonally. Diagonal crosswalk markings can further communicate to travelers the function of the exclusive pedestrian phase. Intersection curb ramps may require retrofitting to enable people with mobility devices to cross diagonally.



### **Crosswalk Signs**

Crosswalk signs draw motorists' attention to the presence of midblock crosswalks and crossing pedestrians and bicyclists.

**Design Considerations:** Crosswalk signs can be placed at midblock crossing endpoints, in the median (if present), in advance collocated with stop or yield line markings and between travel lanes in the crosswalk. Advanced crosswalk signs require the installation of stop line markings or yield line markings.

### **Rectangular Rapid Flash Beacons**

Rectangular rapid flash beacons are user-actuated flashing pedestrian crossing signs that draw motorists' attention to pedestrians waiting to cross.

**Design Considerations:** Generally, rectangular rapid flash beacons should only be installed at midblock crossings or roundabouts because the flashing beacons may not be visible to motorists turning from side streets across the crosswalk if installed at intersections. Installation on multilane streets is not recommended, unless a median is present. Advanced yield markings should be installed to maintain clear sight lines between crossing pedestrians and motorists.

### **Pedestrian Hybrid Beacons**

Pedestrian hybrid beacons, also known as high-intensity activated crosswalk beacons, also known as HAWK beacons, are user-actuated traffic signals that require motorists to stop at crosswalks. Pedestrian hybrid beacon operation includes no signal indication until activated, a flashing yellow phase after activation, a solid red phase that is long enough to accommodate crossing pedestrians and a flashing red phase that permits motorists to proceed after yielding for pedestrians and bicyclists.

**Design Considerations:** Pedestrian hybrid beacons may be installed based on guidance provided in the MUTCD. Pedestrian hybrid beacons are recommended along multilane and high-volume streets. Stop bar markings should be installed in advance of the crosswalk to maintain adequate sight lines.

## SUPPORTING ELEMENTS

### Bicycle Parking

Bicycle parking provides short- and long-term storage space for bicycles. Short-term bicycle parking includes bike racks and bike corrals. Long-term bike parking includes bike lockers, employer-provided bike rooms and public bike garages, shelters and cages. Bicycle parking siting, installation and security should follow the Association of Pedestrian and Bicycle Professionals' *Essentials of Bike Parking*.<sup>84</sup> Denver region municipalities that haven't yet established bike parking minimums for new development and redevelopment projects could consider updating their zoning codes.

*Nearly two-thirds of survey respondents indicated that having secure bike parking would increase their use of a bicycle for transportation.*



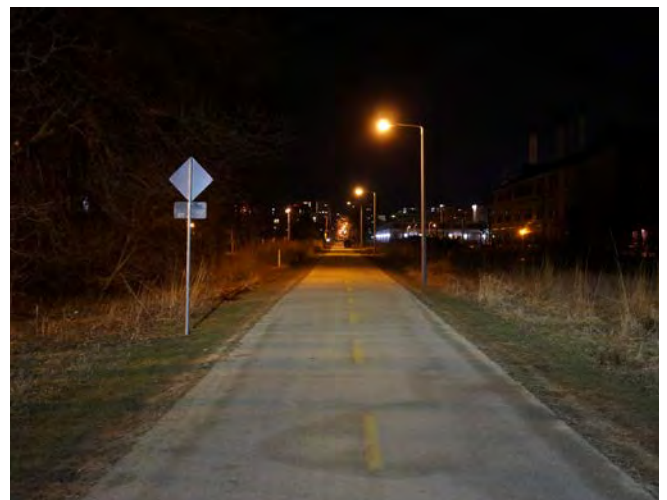
### Wayfinding

Wayfinding comprises signs, markings and maps that direct travelers to popular destinations. For bicyclists and pedestrians, wayfinding also establishes preferred routes. In addition to destination names, wayfinding signage can indicate the travel distance to each of the destinations. Destinations can include parks, neighborhoods, business districts, schools, shared-use paths and transit stations. A regional wayfinding system can strengthen the regional active transportation network by guiding bicyclists and pedestrians to local destinations while providing a consistent brand identification for the entire trip.<sup>85</sup> Similar to how numbered state highways might have different names in different jurisdictions, regional trails or shared-use paths can have multiple designations to maintain local wayfinding systems.



### Lighting

Lighting can help with nighttime visibility for pedestrians and bicyclists, both making nonmotorized travelers more visible to drivers and each other and making pavement conditions visible to help avoid potential hazards. To avoid creating a silhouetting effect, lighting at crosswalks should be placed to illuminate crossing pedestrians from the side instead of overhead. Nighttime lighting on shared-use paths and heavily traveled bicycle facilities can increase bicyclist comfort and safety, especially during winter and through underpasses. Installation of lighting along regional shared-use paths should begin and end at logical locations to avoid creating intermittently dark sections. Adequately lighted streets can also help motorists to see bicyclists in on-street facilities.



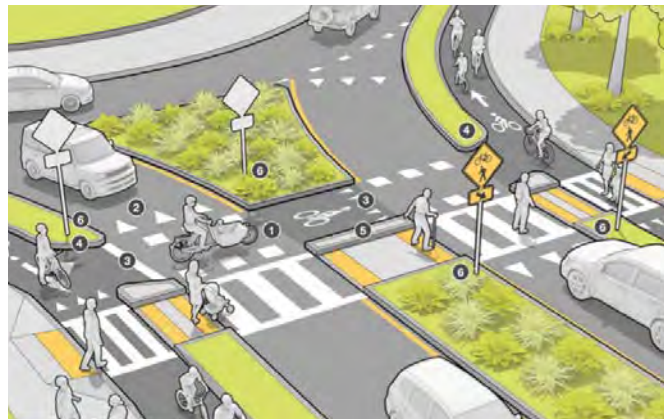
## Access to Transit

At the regional level, one of the primary functions of bicycling and walking facilities is to provide safe and comfortable access to transit stations and stops. There are a number of elements that must be implemented to provide this access, including many discussed previously in this section. Sidewalks and bikeways provide a basic level of access, but site-specific features such as curb ramps and connections from the street or path network to the station are equally important. Station area wayfinding may also be needed in many cases. Amenities such as benches, shelters, trash receptacles, bike parking and real-time bus arrival information can improve the overall experience of using transit. It is essential for local agencies and transit providers to work together to ensure transit stations and stops can be easily accessed by people who walk or bike.



## Bicycle Accommodation at Roundabouts

Accommodating bicycles through roundabouts requires careful and thoughtful design. While some bicyclists may be comfortable riding through a roundabout in mixed traffic, this approach should be reserved for low-speed situations, where bicyclists can merge with traffic with relative ease. More commonly, a separated bike lane or shared-use path, at least 10 feet in width, is needed to provide a safe and comfortable transition through the intersection. Separated bike lanes or paths can generally follow the alignment of the roundabout. Curb ramps are needed in advance of each intersection approach to transition from the street to the separated bike facility, and yield lines may also be provided where the bike facility transitions back to the street. Dependent on anticipated bicycle volumes, distinct crossing areas indicated through detectable surface materials may be needed for bicyclists and pedestrians.

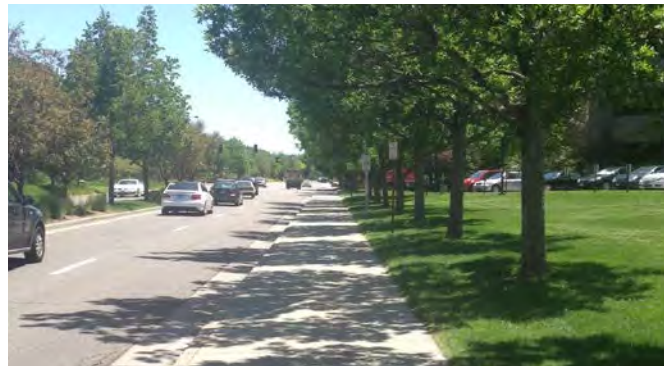


Source: MassDOT Separated Bike Lane Planning & Design Guide

**Innovative intersection designs such as continuous flow intersections and diverging diamond interchanges reduce vehicle wait times. In doing so, it may become more difficult for pedestrians and bicyclists to cross the street. Solutions can separate pedestrians and bicyclists from traffic and providing safe crossing treatments, such as pedestrian hybrid beacons, where appropriate.**

## Shade

In Colorado, skin cancer rates are nearly double the national average, combined with the high altitude, active lifestyles and sunny weather, shade canopies can play a part in creating comfortable walking environments. The presence of shade trees can encourage physical activity, improve air quality and mitigate urban heat island effect.



Source: CDPHE

This page intentionally left blank.





## Chapter 4: Taking Action

Successful plans catalyze change. Because DRCOG does not construct bicycle and pedestrian infrastructure directly, the ATP will succeed only if local agencies and other regional partners act to improve active transportation across the Denver region. DRCOG's role in the implementation of the ATP is to facilitate and encourage collaboration and coordination and to provide support for local implementation efforts, including funding local projects and programs through the TIP and associated set-asides.

This section identifies how regional organizations (such as DRCOG, TMAs and RTD) and local agencies can support bicycling and walking. These opportunities suggest concrete policies, programs and actions that, when implemented, will help the region achieve the objectives set forth in this plan and, more broadly, in *Metro Vision*. In addition to outlining regional and local opportunities to support bicycling and walking, this chapter includes case studies to demonstrate how various actions have been implemented in other regions or by local agencies within the Denver region. These case studies demonstrate a variety of approaches to supporting bicycling and walking at the regional and local levels and in a range of contexts. Finally, performance measures and benchmarks are identified to monitor progress following adoption of the ATP.

Beyond the opportunities and case studies profiled in this chapter, an inventory of local plans is included in Appendix F as a reference.

# Regional Opportunities to Support Bicycling and Walking

Regional opportunities are grouped into three categories: collaboration; education and assistance; and investments. These regional opportunities are intended to foster collaboration and prioritize information-sharing to ensure local communities have the tools they need to improve active transportation. DRCOG is the most likely agency to lead implementation of many of these opportunities, but others such as TMAs, RTD or CDOT could also play a role.

**Table 7. Regional Opportunities to Support Bicycling and Walking**

|                                 | No. | Opportunity   | Case Study Example (Page No.)                          |
|---------------------------------|-----|---|--|
| <b>Collaboration</b>            | 1   | Convene local, regional and statewide bicycle and pedestrian stakeholders to ensure cross-jurisdictional coordination on implementation of active transportation projects in the region and provide opportunities for local governments to learn from or adapt local approaches to bicycle and pedestrian planning. | New England Bike Walk Summit (78)                      |
|                                 | 2   | Coordinate with local partners and TMAs to expand the regional transportation demand management program to include greater emphasis on bicycling and walking.   |  |
|                                 | 3   | Convene local, regional and statewide bicycle and pedestrian stakeholders to coordinate policy efforts on active transportation-related issues such as e-bikes, small mobility devices, data and stop-as-yield legislation.   |  |
|                                 | 4   | Coordinate with local partners to further explore traffic safety in the Denver region and develop a Vision Zero Action Plan.  |  |
|                                 | 5   | Collaborate with transit providers, local communities, CDOT and stakeholders to enhance active transportation connections to and from transit.  |  |
| <b>Education and Assistance</b> | 6   | Collect and share information on local policies, plans and regulations as they pertain to active transportation plans.  |  |
|                                 | 7   | Conduct analyses and provide data on topics such as level of traffic stress and crashes.  | DVRPC Level of Traffic Stress Analysis (78)            |
|                                 | 8   | Continue to collect and disseminate bicycle facility inventory data, including current and proposed facilities.   | PSRC Online Data Sharing (79)                          |
|                                 | 9   | Collect bicycle and pedestrian counts and enhance count data sharing.   | DVRPC Bicycle and Pedestrian Count Program (79)        |
|                                 | 10  | Provide tools, information and education to local governments on facility design, emerging trends and related topics.   |  |
| <b>Investments</b>              | 11  | Support development of regional wayfinding for active transportation corridors.   |  |
|                                 | 12  | Consider prioritization criteria that encourage investment in high-comfort bicycling and walking facilities that are part of the regional active transportation network.  | Capital Area MPO Project Funding Basis (79)            |
|                                 | 13  | Prioritize walking and biking investments in transportation-disadvantaged areas.  | Boston Regional MPO Transportation Equity Program (78) |



# Local Opportunities to Support Bicycling and Walking

Local opportunities are also grouped into three categories: collaboration; policies, plans and regulations; and investments. These opportunities vary in terms of the amount of investment required, allowing local communities to move forward with opportunities that best align with their current capacity.

**Table 8. Local Opportunities to Support Bicycling and Walking**

|  | No. | Opportunity   | Case Study Example (Page No.)  |
|--|-----|---|--|
| <b>Collaboration</b>                   | 1   | Coordinate with neighboring jurisdictions to ensure continuity and connectivity of the active transportation networks and share best practices in bicycle and pedestrian planning.              | U.S. 36 Bikeway Wayfinding Project (80)  |
|  | 2   | Work with RTD and other transit providers on transit-supportive infrastructure, including first- and last-mile connections.   | Denver South Transportation Management Association efforts (80)  |
|  | 3   | Work with DRCOG and local TMAs to inform and promote the use of transportation demand management strategies and services.   | WalkDenver Project Shift (80)  |
| <b>Policies, Plans and Regulations</b> | 4   | Adopt policies, regulations or standards promoting Complete Streets principles and context-sensitive design for users of all ages, incomes and abilities, including mobility-limited residents. | Aurora, Arvada and Westminster Complete Streets Consortium (81)  |
|  | 5   | Adopt local active transportation, bicycle or pedestrian plans that consider land use/zoning compatibility to complement comprehensive and master planning efforts.                             | Arvada Bicycle Master Plan (81)  |
|  | 6   | Adopt a Vision Zero policy with the goal to eliminate traffic fatalities and serious injuries.  | Denver Vision Zero Action Plan (82)  |
| <b>Investments</b>                     | 7   | Design and build low-stress bicycle networks and complete sidewalk networks that facilitate on- and off-street facility connectivity.   | Denver Protected Bikeways (82), Golden's Linking Lookout Project (82), Lone Tree Pedestrian Bridge (84)                              |
|  | 8   | Improve multimodal connectivity throughout the transportation network and prioritize investment in first- and last-mile connections to transit.   | Downtown Boulder Transit Center Area Improvements (83), Aurora Metro Center Station Area Bike and Pedestrian Connector Facility (83) |
|  | 9   | Incorporate wayfinding into active transportation projects.   | Lafayette Walk and Wheel (81), City of Lakewood 40 West ArtLine (84)   |
|  | 10  | Promote educational and promotional events to encourage bicycling and walking.  | Boulder Walks (80), Brighton Full Moon Ride (84)   |
|  | 11  | Implement safety projects that improve conditions for bicyclists and pedestrians and track their effectiveness by analyzing crash data.   | Denver Vision Zero Safety Upgrades (84)  |
|  | 12  | Develop a regular maintenance schedule to ensure existing sidewalks and bicycle facilities are well-maintained.   | Boulder Sidewalk Repair Program (83)   |

## CASE STUDIES: NATIONAL

### New England Bike-Walk Summit

The East Coast Greenway Alliance held its fifth biennial New England Bike-Walk Summit in the spring of 2018. The summit brings together advocates, industry leaders and elected officials to share success stories and best practices, and to discuss strategies to advance biking and walking initiatives throughout the New England region. A steering committee with representatives from the public and private sector assists in planning the summit and selecting presenters to ensure broad representation

Themes for the 2018 summit included transportation equity, community engagement, trail planning and design, funding and advocacy.<sup>86</sup>

Regional events such as the New England Bike-Walk Summit can foster collaboration and create opportunities to discuss challenges and opportunities facing local communities as they implement bicycle and pedestrian initiatives.

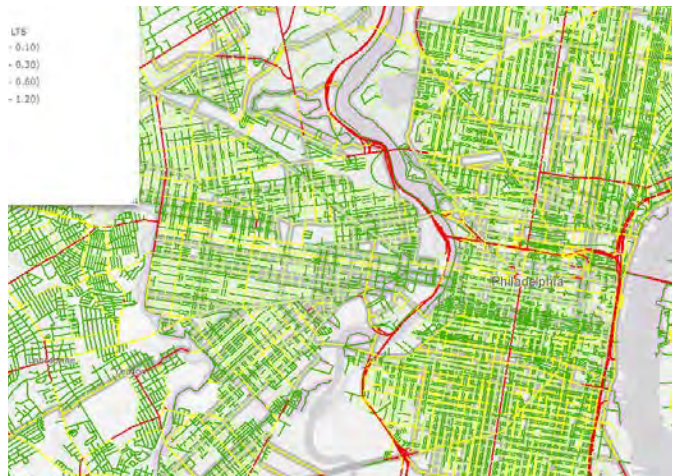


Source: East Coast Greenway Alliance

### Delaware Valley Regional Planning Commission Level of Traffic Stress Analysis

The Delaware Valley Regional Planning Commission (DVRPC) conducted a level of traffic stress (LTS) analysis to rate each street segment in the region according to its comfort for bicycling. LTS is a planning tool that has been used across the country to quantify the level of stress a person is likely to perceive while bicycling on a street.

LTS analysis is based on the understanding that a person's level of comfort on a bicycle increases as separation from vehicular traffic increases or as traffic volume and speed decrease. Each street was rated by DVRPC from one to four, with each level corresponding to bicyclist comfort thresholds. A subsequent analysis assessed the connectivity of low-stress routes in the region. These two analyses, used in combination, provided DVRPC and local agencies with a useful way to identify and prioritize needed low-stress connections.<sup>87</sup>



Source: Delaware Valley Regional Planning Commission

### Boston Region MPO Transportation Equity Program

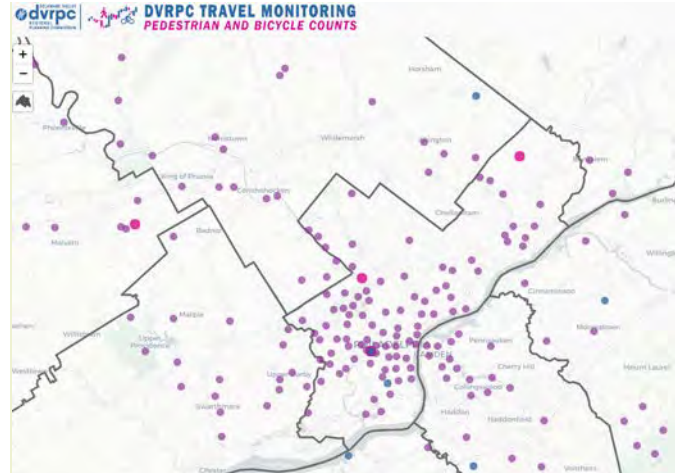
The Boston Region MPO considers equity a key component of its 2040 vision. The MPO's Transportation Equity Program ensures that the agency's resources are distributed in a way that considers the needs of traditionally underserved and underrepresented communities, including low-income and minority populations, zero-vehicle households and those with limited English proficiency.

The Transportation Equity Program supports many of the MPO's core planning activities. It evaluates demographic equity prior to project selection and funding, analyzes the effects of past MPO-funded projects on underserved communities, and ensures underserved communities have an active role in planning and decision-making processes and that they receive a fair share of investments.<sup>88</sup>

### Delaware Valley Regional Planning Commission Bicycle and Pedestrian Count Program

In addition to its LTS analysis, DVRPC manages a robust bicycle and pedestrian count program that enables the agency to monitor regional bicycle and pedestrian traffic trends.<sup>89</sup> The program is housed within its travel monitoring program and includes a combination of short-duration counts and permanent count locations.

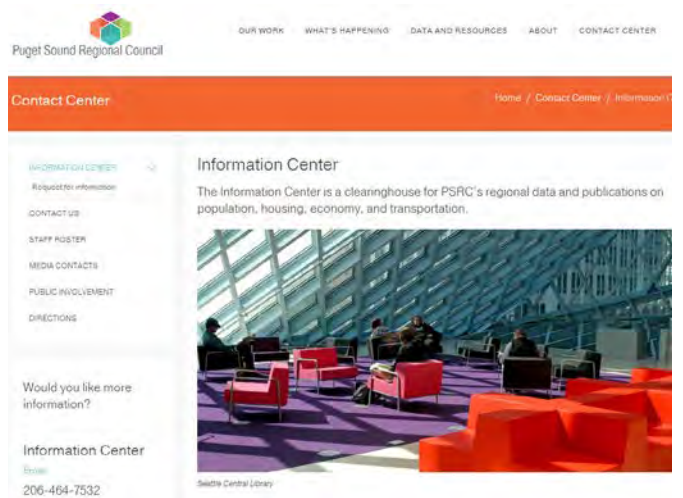
DVRPC employs a cyclical approach for short-duration bicycle counts, counting each location for a three-year period on a rotating basis. DVRPC is in the process of developing a similar schedule for pedestrian counts. Permanent count locations use technologies such as microwave, infrared, video or pressure plates, while the short-duration counts are either conducted manually or using pneumatic tube counters. In addition to its own counts, the DVRPC also collects data from other entities and includes it in its public-facing database. DVRPC’s experience highlights the significant staff requirement associated with maintaining a comprehensive count program, as well as the need to budget for data upload fees.



Source: Delaware Valley Regional Planning Commission

### Puget Sound Regional Council Online Data Sharing

The Puget Sound Regional Council (PSRC) develops a variety of regional bicycle and pedestrian planning resources for local jurisdictions.<sup>90</sup> PSRC maintains the data online to ensure it is easily accessible both for member governments as well as the public. The Data and Resources section of PSRC’s website provides a portal to PSRC’s wide range of tools and data products, including everything from bike facility information and count data to information about the models and projections used to plan for the region. PSRC also maintains two blogs to communicate the council’s activities—one for general-interest regional issues and one specifically related to data.



Source: Puget Sound Regional Council

### Capital Area Metropolitan Planning Organization Project Funding Basis

MPO policies governing how TIP funds are distributed are among the most significant ways MPOs can support active transportation in their regions. The Capital Area MPO (CAMPO) approach to allocating project funding is based on project criteria, planning factors, cost-benefit analysis and a project score. For active transportation projects, CAMPO weights planning factors much heavier than cost-benefit analysis. Of all criteria considered to determine the project score, connectivity, safety and social and environmental effects are weighted the highest. The cost-benefit analysis is conducted using data from the 2000 Census Transportation Planning Products, CAMPO 2040 Regional Travel Demand model demographic structure and a geographic information system buffer analysis to select traffic analysis zones that would be affected by the project. Once these factors have been assessed for each project, a review committee recommends the highest-ranking projects based on eligibility and funding availability. The recommended projects are then subject to the public involvement process and reviewed by CAMPO’s Technical Advisory Committee before going to its Transportation Policy Board for final approval.<sup>91</sup>

## CASE STUDIES: DENVER REGION

### U.S. 36 Bikeway Wayfinding Project

The U.S. Route 36 corridor includes a bus rapid transit line as well as a bikeway, making it a critical multimodal link in northwest Denver. To improve access to transit along the U.S. Route 36 corridor, Commuting Solutions and its local agency partners are installing a branded pedestrian and bicyclist wayfinding system within the Flatiron Flyer station areas and along the U.S. 36 Bikeway.

A robust wayfinding program can raise awareness of bicycling and walking while increasing the accessibility and usefulness of bikeways and pedestrian paths. To implement the wayfinding project, Commuting Solutions, in partnership with several communities along the corridor, received a Station Area Master Planning (STAMP) grant from DRCOG in 2016. This wayfinding signage project is currently being installed throughout the corridor and is slated for completion in December 2018.<sup>92</sup>



### Denver South Transportation Management Association Efforts

The Denver South Transportation Management Association (Denver South TMA) is a nonprofit coalition of public and private entities along Denver's southeast I-25 corridor that work together to improve access and mobility throughout the region. In addition to contributing funding to bring the Southeast Rail Line Extension project to fruition, the Denver South TMA, in partnership with public and private partners, has expanded first- and last-mile solutions to get people from light rail stations to their places of employment. One of these solutions is the Lone Tree Link, a free shuttle service connecting Lincoln Station with major employment centers. Another solution is the Go Centennial pilot project, which offered light rail riders a free Lyft ride from Dry Creek Station to their workplace.<sup>93</sup>

### WalkDenver Project Shift

Project Shift is a seven-month leadership program that supports neighborhood advocates as they champion car-light lifestyles in neighborhoods near Federal Boulevard. Each Project Shift cohort focuses on a different area of Denver, with teams representing neighborhoods within that area. Each team identifies goals related to promoting car-light lifestyles within its selected communities. Each team develops a project to help it accomplish its goals. Past projects include neighborhood walking tours, a neighborhood bike fest, installation of wayfinding signage during a bike event, and an enhanced bus-stop seating pop-up, among other community outreach efforts. The project was funded by a grant from DRCOG's TIP Transportation Demand Management Set-Aside as well as funding from the Colorado Health Foundation.<sup>94</sup>

### Boulder Walks

The City of Boulder launched the Boulder Walks Program as part of its *Transportation Master Plan Update* to introduce community members to walking for enjoyment, highlight the benefits of walking in Boulder and facilitate engagement with the city's pedestrian planning activities. Boulder Walks has not only conducted walkabouts and walk audits, but also produces walking route maps to highlight local resources and encourage residents and visitors to explore on-foot. In 2014, the City of Boulder hosted a Walk Bike Summit that brought together community members to create a vision for a walk- and bike-friendly future and to develop strategies to achieve this vision.<sup>95</sup>



Source: City of Boulder

### Lafayette Walk and Wheel

In 2014, the City of Lafayette was awarded a Walk and Wheel grant from Kaiser Permanente, which provided funds to promote bicycle and pedestrian access in the city. To engage the public in this effort, the city conducted bike and walk audits and hosted public input sessions. The key project released as part of the grant was an active transportation map which highlighted the existing Walk and Wheel routes, guiding users to destinations along low-stress bicycle and pedestrian routes. The grant also led to the installation of wayfinding signage, bike lanes, sidewalk connections and multimodal trail connections.<sup>96</sup>



Source: City of Lafayette

### Aurora, Arvada and Westminster Complete Streets Consortium

In December 2017, Aurora, Arvada and Westminster were awarded Smart Growth America’s Complete Streets Consortium technical assistance award. The three cities applied for the award collaboratively and received free technical assistance to host three workshops in 2018. The workshops provided participants with strategies to implement Complete Streets, equipping each city with the tools to build transportation networks that serve all street users. A recent workshop in Westminster offered a team of engineers, planners, elected officials and health professionals an in-depth site visit of 72nd Avenue—a corridor slated to be transformed into a complete street. After visiting the corridor, the team brainstormed policy solutions that could make 72nd Avenue and similar streets safer and more comfortable.<sup>97</sup> The award exemplifies the synergies possible when communities collaborate to work towards achieving active transportation goals.










Source: Smart Growth America

### Arvada Bicycle Master Plan

Arvada’s *Bicycle Master Plan* sets forth a comprehensive set of recommendations with the goal of creating a city that is connected, comfortable, safe and convenient for bicycling. Arvada is already a silver-level Bicycle Friendly Community, but this plan sets the stage for Arvada to become an even better city for bicycling. To ensure steady progress toward the recommendations, the plan includes key targets to be met by 2022.<sup>98</sup> Central to the plan is a low-stress network planning approach, which used a level of traffic stress analysis to identify a proposed bicycle network appropriate for less confident riders, including families and older adults, while also serving more confident riders. The plan provides a robust framework to guide Arvada’s progress toward becoming a community that offers bicycling as a safe and viable transportation option. It also serves as an example of how medium-sized municipalities can effectively plan for bicycles.

## Arvada Bicycle Master Plan

SEPTEMBER 2017  ARVADA

### Denver Vision Zero Action Plan

In 2017, the City and County of Denver released its *Denver Vision Zero Action Plan*, which charts progress over the next five years toward Denver's commitment to eliminate traffic deaths and serious injuries by 2030. Foundational to the action plan is the priority of human life and the recognition that speed is a fundamental factor in crash severity. The action plan hones in on Denver's most dangerous streets and most vulnerable users by identifying a high injury network and communities of concern which, in combination, provide focus for Vision Zero efforts. The action plan includes five action-oriented themes to guide the work towards creating safer streets:

- » enhance city processes and collaboration
- » build safe streets for everyone
- » create safe speeds
- » promote a culture of safety
- » improve data and be transparent

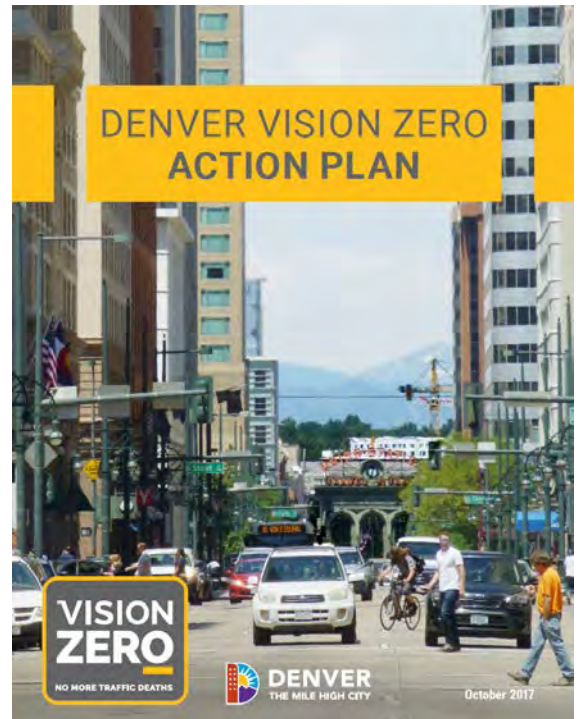
Within each theme, concrete short- and medium-term actions provide a roadmap for partner agencies and stakeholders.<sup>99</sup>

### Denver Protected Bikeways

Separated bikeways offer physical protection from vehicles, enhancing safety and comfort for cyclists. Denver's 14th Street separated bikeway is protected from motor vehicle traffic by parking and concrete curbs and separation is maintained at intersections. This type of low-stress bikeway is a key component of Denver's continued efforts to build an enhanced bikeway network.

### Linking Lookout, Golden

Golden's Linking Lookout project, completed in 2017, built a grade-separated unsignalized interchange at U.S. Route 6 and 19th Street, creating a high-comfort facility for bicyclists and pedestrians accessing Lookout Mountain. The project lowered U.S. Route 6 by 24 feet and transformed 19th Street into a bridge. The bridge incorporates a distinct landscaped lid that functions as a park. The lid not only allows for the comfortable separation of pedestrians and bicyclist from vehicle traffic, but creates an enjoyable connection between downtown Golden, Lookout Mountain trails and the communities at the base of Lookout Mountain. In this way, the project creates a low-stress pedestrian and bicycle network connection that links a key recreational destination. The project was made possible by a partnership between the City of Golden, the Colorado School of Mines and CDOT.<sup>100</sup>



Source: Muller Engineering Company

### ***Downtown Boulder Transit Center Area Improvements***

As part of the City of Boulder’s voter-approved Capital Improvement Bond, changes were made to the downtown Boulder transit station to better accommodate transit while improving access for bicyclists and pedestrians. The project added new bus bays to improve bus operations and increase passenger access, bulb-outs at crosswalks to shorten the pedestrian crossing distance and the permanent closure of a one-block segment to vehicle through-traffic in order to minimize conflicts between vehicles and pedestrians.<sup>101</sup> By improving safety for bicyclists and pedestrians accessing the station, this project strengthens a key multimodal connection for Boulder.

### ***Aurora Metro Center Station Area Bike and Pedestrian Connector Facility***

In 2015, DRCOG awarded a TIP project to Aurora to build the Metro Center Station Area Bike and Pedestrian Connector Facility. The project was completed in 2017 and includes a 10-foot-wide multiuse path with lighting, wayfinding signage and bicycle parking. The connector improves access for bicyclists and pedestrians to several key destinations in the area, including the Aurora Municipal Center, the High Line Canal Trail and the Aurora Metro Center Station.<sup>102</sup> The facility will enhance first- and last-mile connections between a major transit center and a major employer. The connector uses City Center Park and the Alameda underpass to provide a safe, separated and pleasant experience.

### ***Boulder Sidewalk Repair Programs***

Boulder has two sidewalk repair programs to ensure that necessary sidewalk repairs are completed to keep the city walkable. Although private property owners are responsible for maintenance of sidewalks adjacent to their property, both programs include cost-sharing policies to alleviate the burden on private property owners. The Annual Sidewalk Repair Program ensures that repairs are prioritized and completed in a systematic fashion by identifying a specific area in Boulder each year for repair efforts. The cost-sharing policy associated with the Annual Sidewalk Repair Program limits the amount that property owners will be assessed for sidewalk repairs. The Miscellaneous Sidewalk Repair Program allows for cost-sharing for any areas of the city, even if they are not targeted that year. The cost-sharing incentives vary slightly from the Annual Sidewalk Repair Program.<sup>103</sup> The two programs ensure that sidewalk repairs are prioritized and incentivized.

### ***Brighton Full Moon Bike Ride***

Brighton’s Full Moon Bike Ride is a free monthly event that takes place every full moon from April through October. The bike rides are open to everyone, including families, and each month’s ride is inspired by that month’s full moon or another unique aspect of bicycling in Brighton. The bike rides are facilitated by the City of Brighton’s Bike Brighton subcommittee, which advises the Parks and Recreation Advisory Board on becoming a bike-friendly community.<sup>104</sup> The ride is a low-cost community engagement tool that is fun and educational for residents.



Source: City of Brighton

### City of Lakewood 40 West ArtLine

The 40 West ArtLine is an innovative 4-mile art trail that guides visitors through Lakewood’s 40 West Arts District. The interactive trail, marked with a painted green line, leads bicyclists and pedestrians along over 70 ground murals, story totems, sculptures and other art pieces. The trail connects three parks and two historic neighborhoods as well as the Lamar Station on the W Line.<sup>105</sup> The 40 West ArtLine is distinct in its ability to enhance the neighborhood’s identity while providing wayfinding to transit and cultural amenities. The 40 West ArtLine was supported by the Our Town grant from the National Endowment for the Arts.



Source: Katy Casper

### Denver Vision Zero Safety Upgrades

In 2017, as part of Denver’s Vision Zero program, Denver Public Works installed a Rectangular Rapid Flash Beacon (RRFB) at a dangerous crossing for pedestrians walking to the 30th Avenue and Downing Street light rail station. RRFBs are push-button flashing warning devices that encourage motorists to yield to crossing pedestrians and bicyclists. Studies have shown that the installation of RRFBs can increase motorist yield from 34 percent to over 90 percent. Denver’s *Vision Zero Action Plan*, released in October 2017, includes actions aimed to create safe speeds and build safe streets for everyone. The *Vision Zero Action Plan* prioritizes safety investments along the high injury network as well as those that improve traffic safety for the most vulnerable Denverites.



Source: City and County of Denver

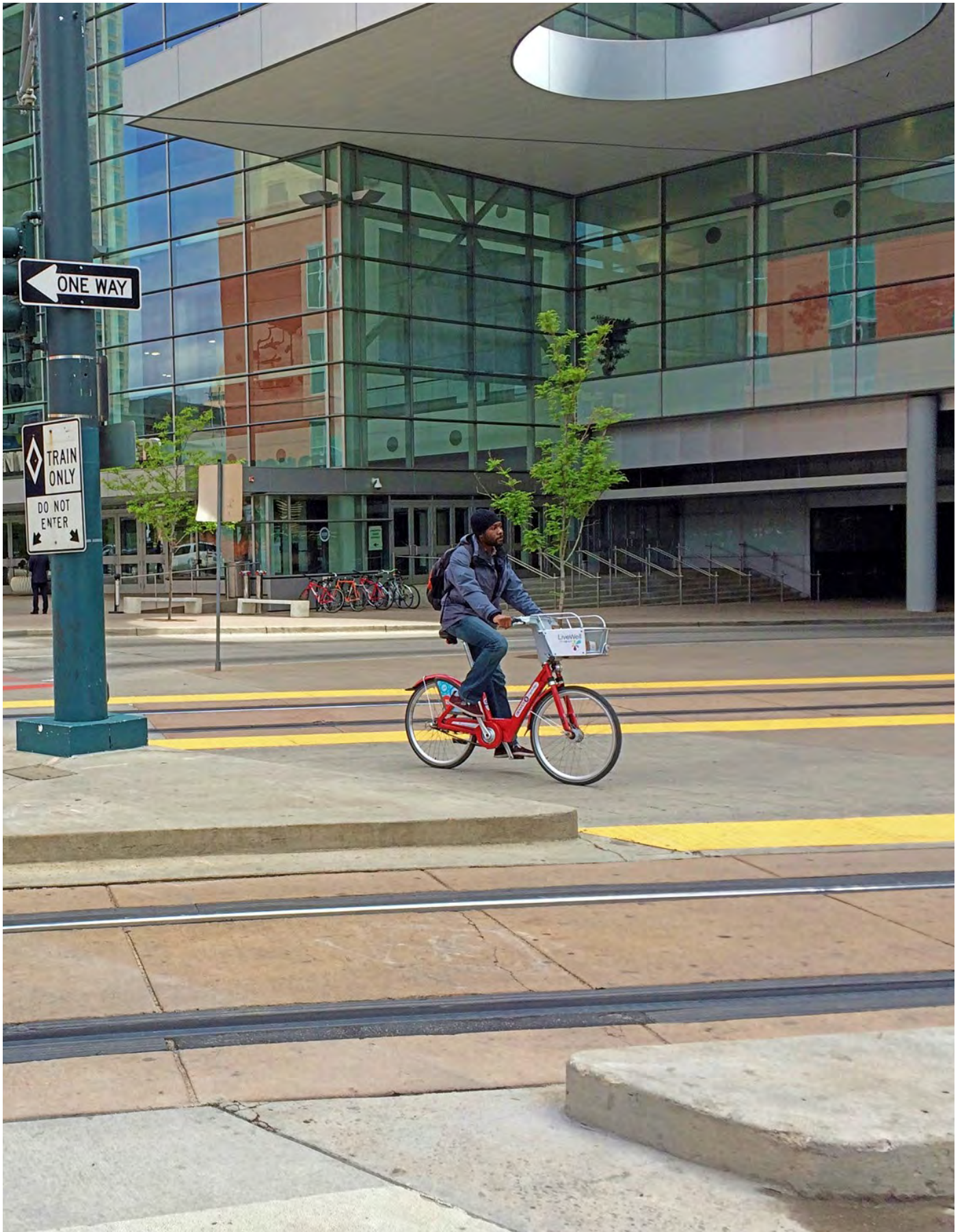
### Lone Tree Pedestrian Bridge

Lone Tree’s Lincoln Avenue Pedestrian Bridge, completed in 2018, provides a separated crossing for bicyclists and pedestrians over Lincoln Avenue, a high-volume corridor that bisects the city and previously represented a barrier for bicyclists and pedestrians. The bridge connects two existing trails on the north and south sides of Lincoln Avenue. In addition to creating a key link in the bicycle and pedestrian network, the bridge features an iconic leaf-shaped mast that rises 78 feet above the bridge.<sup>106</sup> The walkway is lighted at night, and the translucent roof allows sunlight to light the path during the day. Iconic bicycle and pedestrian projects such as this one can create a sense of pride for residents while enhancing city identity.



Source: Michael Tamburello





## Monitoring Progress

The ATP establishes a vision for improving conditions for bicycling and walking in the region. It also identifies tools, policies and programs for regional and local agencies to pursue to achieve the vision. Through the efforts of DRCOG, regional partners and local agencies, the actions outlined in the ATP will help the region achieve the targets outlined in *Metro Vision*.

Monitoring progress at the regional level is critical to understanding if the plan is being faithfully implemented and whether the needs of bicyclists and pedestrians are being adequately met. DRCOG will monitor progress toward regional active transportation targets through the 17 performance measures listed in Table 9. Each performance measure relates to a regional active transportation objective established in the planning process. In turn, these objectives support *Metro Vision* themes and key principles. A few of the identified performance measures are already reported through other DRCOG mechanisms, though most are new.

Baseline data for each performance measure are provided to serve as a reference for future comparison. At a later point, the plan may be amended to include targets for each performance measure.

**Table 9. Active Transportation Plan Objectives and Performance Measures**

|   | Objective   |    | Performance Measures   | Baseline |            |
|---|---|----|--|----------|------------|
|   |   |    |  | Total    | Year       |
| 1 | Reduce the number and severity of crashes involving pedestrians and bicyclists.                   | 1  | number of pedestrian and bicyclist fatalities and serious injuries   | 374      | 2015       |
|   |   | 2  | number of pedestrian fatalities and serious injuries per 100,000 residents   | 8.3      | 2015       |
|   |   | 3  | number of bicyclist fatalities and serious injuries per 100,000 residents  | 4.1      | 2015       |
| 2 | Increase bicycling and pedestrian activity.   | 4  | percent of population using non-SOV mode to work   | 25%      | 2016       |
|   |   | 5  | daily vehicle miles traveled per capita  | 27.5     | 2015       |
|   |   | 6  | number of schools participating in bike/walk to school day   | 24       | 2018       |
| 3 | Expand and connect the regional and local bicycle networks.                                       | 7  | miles of existing regional active transportation corridors   | 684      | 2018       |
|   |   | 8  | miles of bicycle facilities in DRCOG's Bicycle Facility Inventory  | 2,170    | 2018       |
| 4 | Expand and connect comfortable transportation facilities for people who bike and people who walk. | 9  | miles of sidewalk along arterials and collector streets  | 3,032    | 2016, 2018 |
|   |   | 10 | miles of sidewalk in pedestrian focus areas  | 2,678    | 2016, 2018 |
|   |   | 11 | miles of high-comfort bicycle facilities (shared-use paths, sidepaths, separated bicycle lanes, bicycle boulevards)                | 1,288    | 2018       |
| 5 | Improve bicycle and pedestrian access to and from transit.  | 12 | percentage of arterial and collector streets with bicycle facilities within one mile of transit stations                           | 18%      | 2018       |
|   |   | 13 | percentage of arterial and collector streets with sidewalks within 1/4-mile of transit stations                                    | 77%      | 2018       |
| 6 | Improve the region's multimodal transportation system.  | 14 | number of member governments with Complete Streets policies/regulations/codes  | 4        | 2018       |
|   |   | 15 | number of member governments with bike-sharing/dockless mobility policies  | 8        | 2018       |
| 7 | Improve and expand equitable access to regional active transportation corridors.                  | 16 | Percent of the population within 1/2-mile distance of an existing regional active transportation corridor                          | 38%      | 2015       |
|   |   | 17 | Percent of transportation-disadvantaged population within 1/2-mile distance of an existing regional active transportation corridor | 33%      | 2016       |

# Endnotes

1. Denver Regional Council of Governments. 2017. [Metro Vision](#).
2. Colorado Department of Local Affairs. [State Demography Office - Net Migration by Age Comparison](#).
3. John Hanc. 2016. "Denver's Appeal to Millenials? Jobs, Mountains and, Yes, Weed". [The New York Times](#).
4. Denver Regional Council of Governments. 2017. [Metro Vision](#).
5. Denver Regional Council of Governments. 2017. [Metro Vision](#).
6. Colorado Department of Local Affairs. 1990-2050 Population Data.
7. Denver Regional Council of Governments. [2040 Metro Vision Regional Transportation Plan, Appendix 7: Active Transportation Component](#).
8. Denver Regional Council of Governments. 2006. [Pedestrian and Bicycle Element of the 2035 Metro Vision Regional Transportation Plan](#).
9. US Census. ACS, 2012-2016 Estimates.
10. Denver Regional Council of Governments. 2017. [Metro Vision](#).
11. Denver Regional Council of Governments. 2015. Travel Model.
12. Denver Regional Council of Governments. Front Range Travel Survey.
13. Denver Regional Council of Governments. 2015. Travel Model..
14. City and County of Denver. 2017. [Denver Moves: Transit Plan, State of the System](#).
15. Regional Transportation District. [Facts and Figures](#).
16. Denver Regional Council of Governments. 2018. Pedestrian and Bicycle Crash Report.
17. NHTSA. [2016 Fatal Motor Vehicle Crashes](#).
18. Colorado Department of Transportation. Crash Problem Identification Reports, 2014-2017.
19. Denver Regional Council of Governments. Crash Data Analysis; ACS 2012-2016.
20. Denver Regional Council of Governments. [Regional Transportation Plan](#).
21. Denver Regional Council of Governments. [Unified Planning Work Program](#).
22. Keystone Policy Center. 2016. [Initial Strategic Action Plan on Aging for Colorado](#).
23. U.S. Department of Health and Human Services. 2014. [Active Living](#).
24. Community Preventive Services Task Force. 2016. [Physical Activity: Built Environment Approaches Combining Transportation System Interventions with Land Use and Environmental Design](#).
25. Colorado Department of Public Health & Environment. 2017. [Overweight and Obesity in Colorado: Colorado adults, teens, and children](#).
26. United States Census Bureau. 2016 American Community Survey 5-Year Estimates.
27. Wesley Marshall and Norman Garrick. Evidence on Why Bicycle-Friendly Cities Are Safer for All Road Users, Environmental Practice 13, no. 1, 2011, p. 16–27.
28. Federal Highway Administration. Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE).
29. Federal Highway Administration. Bicycle Safety Guide and Countermeasure Selection System (BIKESAFE).
30. Rebecca Sanders. Roadway Design Preferences Among Drivers and Bicyclists in the Bay Area. 93rd Annual Meeting of the Transportation Research Board, Washington, D.C, 2014.
31. BBC Research and Consulting. Economic and Health Benefits of Bicycling and Walking. Prepared for the Colorado Office of Economic Development and International Trade. 2016.
32. Denver Regional Council of Governments. 2018. [Policy on Transportation Improvement Program \(TIP\) Preparation](#).
33. Denver Regional Council of Governments. 2017. [TIP Eligible Bicycle Corridors](#).
34. Denver Regional Council of Governments. [Regional Data Catalog: Bicycle Facility Inventory](#).
35. Denver Regional Council of Governments. [Denver Regional Bicycle Map](#).
36. Denver Regional Council of Governments. [Bike to Work Day 2017 Survey of Participants](#).
37. City of Aurora. [Bike Share](#).
38. City and County of Denver. 2018. [Dockless Mobility Vehicle Pilot Permit Program Overview](#).
39. Zagster. 2016. [Westminster and Zagster Introduce Inclusive Bike Share Program](#).
40. Heno, A. & Marshall, W.E. The impact of ride-hailing on vehicle miles traveled. Transportation (2018).
39. [Mobility Choice Blueprint](#).
42. Colorado Department of Transportation. 2017. [Colorado Department of Transportation Reveals Winners of International RoadX Bicycle and Pedestrian Challenge](#).
43. Denver Regional Council of Governments and Colorado Department of Transportation. 2010-2015 Crash Database.
44. City and County of Denver. [Vision Zero](#).
45. City of Boulder. [Safe Streets Boulder: Vision Zero](#).
46. City of Golden. [Complete Streets Policy](#).
47. City and County of Denver. 2011. [Complete Streets Policy](#).
48. City of Boulder. [Complete Streets](#).
49. Smart Growth America. [National Complete Streets Coalition](#).
50. City of Lakewood. [Lakewood 2025: Moving Forward Together](#).
51. Town of Parker. [Help Develop a Complete Streets Policy](#).
52. City of Louisville, Department of Public Works Engineering Division. 2015. [Design and Construction Standards](#).
53. Letter from Tracy Winfree, Director of Public Works for Transportation, City of Boulder. 2014.
54. City of Aurora. 2016. [Roadway Design & Construction Specifications](#).
55. The National Center for Safe Routes to School, 2011.
56. Ogden et al. 2010. "Prevalence of high body mass index in US children and adolescents, 2007-2008." JAMA; 303(3): 242-9.
57. Colorado Department of Transportation. [Safe Routes to School](#).
58. Colorado Department of Transportation. [Safe Routes to School Map](#).
59. Jefferson County Public Health. [SRTS Community Toolkit](#).
60. Town of Castle Rock. [Neighborhood Traffic Calming Program](#).
61. City of Longmont. 2006. [Neighborhood Traffic Mitigation Program Manual](#).
62. City of Boulder. [Design and Construction Standards](#).

63. <https://bouldercolorado.gov/plan-develop/design-construction-standards>
64. City of Golden. [Downtown Streetscape Master Plan](#).
65. Regional Transportation District. [First and Last Mile Strategic Plan](#).
66. Commuting Solutions. [Bike-n-Ride](#).
67. [Lone Tree Link](#).
68. Colorado Department of Transportation. 2017. [ADA Compliance Transition Plan](#).
69. City of Wheat Ridge. 2017. [ADA Transition Plan](#).
70. City of Boulder. ADA [Self Evaluation and Transportation Plan for Transportation](#).
71. City and County of Denver. 2014. [Encroachments in the Public Right of Way](#).
72. City of Westminster. 2006. [Design Guidelines for Traditional Mixed Use Neighborhood Developments](#).
73. City of Golden. 2018. [Winter Operations Maintenance Plan](#).
74. City of Lakewood. [Snow and Ice Control](#).
75. City and County of Denver. [Snow Removal](#).
76. City and County of Denver. [Urban Trails](#).
77. City and County of Denver. [Pocketgov](#).
78. U.S. Department of Justice and U.S. Department of Transportation. 2016. [ADA Requirements when Roads are Resurfaced](#).
79. Streets Plans Collaborative. 2016. Tactical Urbanists' Guide to Materials and Design. Version 1.0.
80. PeopleForBikes. 2016. [Quick Builds for Better Streets: A new project delivery model for U.S. cities](#).
81. City and County of Denver. [Vision Zero Community Program](#).
82. U.S. Access Board. 2010. [ADA Standards](#).
83. Fayish, A. and F. Gross, "Safety Effectiveness of Leading Pedestrian Intervals Evaluated by a Before-After Study with Comparison Groups," Transportation Research Record: Journal of the Transportation Research Board, 2010.
84. Association of Pedestrian and Bicycle Professionals. 2015. [Essentials of Bike Parking](#).
85. National Association of City Transportation Officials. [Transit Street Design Guide](#).
86. East Coast Greenway. [New England Bike-Walk Summit](#).
87. Delaware Valley Regional Planning Commission. 2017. [DVRPC Bicycle LTS and Connectivity Analysis](#).
88. Boston Region MPO. [Transportation Equity Program](#).
89. Delaware Valley Regional Planning Commission. [Pedestrian and Bicycle Counts](#).
90. Puget Sound Regional Council. [Information Center](#).
91. Capital Area Metropolitan Planning Organization. 2017. [2019-2022 Project Call: Project Selection Criteria](#).
92. Commuting Solutions. [Wayfinding](#).
93. [Denver South Transportation Management Association](#).
94. [Project Shift](#).
95. City of Boulder. [Boulder Walks Program](#).
96. City of Lafayette. [Walk and Wheel Program](#).
97. Smart Growth America. 2018. [Complete Streets Consortium Series: Colorado kick-off in Westminster](#).
98. City of Arvada. 2017. [Bike Master Plan](#).
99. City and County of Denver. 2017. [Vision Zero Action Plan](#).
100. City of Golden. [Linking Lookout Project](#).
101. City of Boulder. [Transit System Enhancements: Downtown Boulder Station Area Improvements](#).
102. City of Aurora. [Aurora Metro Center Station](#).
103. City of Boulder. [Sidewalk Repair and Maintenance](#).
104. City of Brighton. [Bike Brighton 2018 Bike Rides](#).
105. [40 West ArtLine](#).
106. City of Lone Tree. 2017. [Construction Continues on Pedestrian Bridge](#).

***Preparation of this report has been financed in part through federal grants from the U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration.***





# Appendix A: County Profiles

The Denver region is geographically and culturally diverse, ranging from small mountain communities to urbanized cities and suburban communities to agricultural expanses. As a result, the active transportation context and needs vary across the region. In recognition of this fact, county profiles are presented in this section to describe the key planning considerations and highlight the relationship of the Regional Active Transportation Network to each county.

The following data sources are used for each county, unless noted otherwise:

- population, employment, demographic and employment information: American Community Survey, 2012-2016
- worker flows: Longitudinal Employer-Household Dynamics, 2012-2015
- housing costs: 2017 Housing + Transportation Index
- crashes: DRCOG crash report (2010-2015)<sup>1</sup>, CDOT Colorado Problem Identification Reports (2014-2017)<sup>2</sup>
- bicycle facility inventory: DRCOG<sup>3</sup>
- health indicators: Colorado Behavioral Risk Factor Surveillance System

<sup>1</sup> The crash data source for this report is the DRCOG/CDOT traffic crash database. The database only includes records for crashes reported to, or by, law enforcement agencies. The crash statistics reported for each county are limited to motor vehicle crashes involving pedestrians and bicyclists from calendar years 2010 through 2015. Pedestrian crashes refer to crash types that were classified as “pedestrian” or if a pedestrian was involved in a harmful event that took place during the crash. Bicycle crashes refer to crash types that were classified as “bicycle” or if a bicycle was involved in a harmful event that took place during the crash. Given data limitations, it is not possible to determine which individual or person type (for example, the driver, passenger, pedestrian or bicyclist) was injured in a specific crash. It was assumed that the most vulnerable person was the most likely to suffer the most severe injury. Readers are encouraged to consider these data constraints while reading the information.

<sup>2</sup> CDOT reports were used for total fatalities by county; all other crash data based on DRCOG crash analysis

<sup>3</sup> The DRCOG Bicycle Facility Inventory is updated annually, but may not include recently installed facilities or facilities that do not meet the facility type definitions in the inventory (for example recreational single-track trails are not included). Data was downloaded on March 28, 2018. On-street facility mileage is calculated based on centerline mileage. Paved trail includes shared-use paths, sidepaths, and neighborhood paths. Bike lane mileage is calculated based on roadway centerlines. Denver bicycle facility mileage is based on City and County of Denver data.

# Adams County

## PLANNING CONTEXT

Adams County is situated in the northeast portion of the Denver region, extending east from its shared boundaries with Boulder County, the City and County of Broomfield, the City and County of Denver and into the plains. Historically, agriculture has been the predominant land use in Adams County, and a large portion of the county remains dedicated to agricultural activities.

From 2010 to 2017, Adams County welcomed around 60,000 new residents, growing to just over half a million people. Most of the growth has occurred in cities in the western part of the county, such as Arvada, Aurora, Brighton, Commerce City, Federal Heights, Northglenn, Thornton and Westminster. Adams County also includes smaller towns such as Bennett and Lochbuie. New residents may be attracted to Adams County due to its relatively low combined housing and transportation costs (second to Denver in the region).

Among counties in the Denver region, Adams County has the lowest median age (33), the highest percent of Hispanic or Latino residents (39 percent) and the second highest family poverty rate (10 percent). Adams County also has the second highest rate of adult obesity (64 percent) among counties in the region.

### Engaging Adams County Residents

Planning and programming strategies to encourage walking and bicycling in Adams County should be customized to best engage residents. The following ideas are offered for consideration:

- » Target walking and bicycling events and programming toward youth and family-friendly activities.
- » Ensure wayfinding, maps and other walking and bicycling encouragement materials are provided in both English and Spanish.
- » Tailor public engagement strategies to increase participation among underrepresented communities by providing childcare, leveraging community connections and meeting at convenient locations and times for residents.

### Plans and Policies

Several plans that identify needed bicycling and walking improvements have been completed in Adams County. Many of these plans also highlight the importance of collaboration across agencies and jurisdictional boundaries. Highlights from plans in Adams County are shown in Table 10.

**Table 1. Sample of Local and County Plans that Influence Bicycling and Walking in Adams County**

| Title  | Big Idea   |
|--|--|
| Adams County Open Space, Parks and Trails Master Plan (2012) | This plan highlights the importance of collaboration between and across jurisdictional boundaries to connect on- and off-street active transportation networks.  |
| Adams County Transportation Plan (2012)                      | The plan recommends that the county establish Complete Streets design standards to address the needs of all user groups and that design standards be coordinated with cities in the county.  |
| Walk. Bike. Fit (Commerce City) (2012)                       | A two-tier network approach was developed: 1) an active travel grid, consisting of comfortable and safe streets and 2) a regional network of greenways, trails and active travel corridors.  |
| Connect Northglenn (2018)                                    | The plan includes performance measures that address goals such as reducing school-related vehicle trips, increasing bicycle mode share and reducing bicyclist fatalities and injuries. These metrics will help the city track its progress in meeting the plan goals.    |
| Westminster Mobility Action Plan (2017)                      | As part of the planning process, 13 low-cost demonstration projects were identified for potential near-term implementation. The public was then invited to vote on these projects through an online survey and the top five were ultimately selected for implementation. |
| Town of Bennett Regional Trail Plan (2011)                   | Alignments were identified for nine trails. For each trail, specific opportunities and constraints were identified, along with ideas for connections to other trails.  |
| 2030 Westminster Bicycle Plan                                | This was Westminster's first comprehensive bicycle planning effort.  |

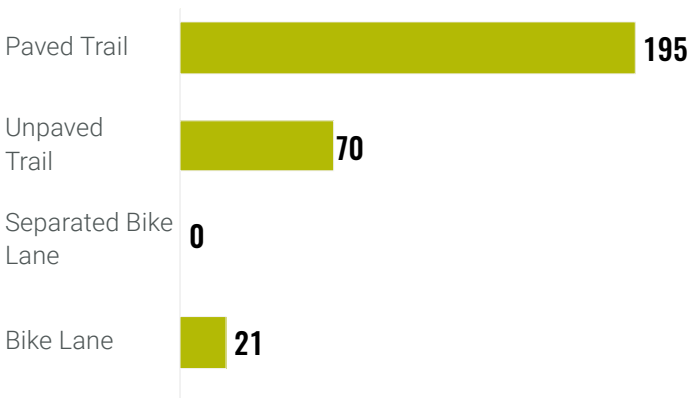


## WALKING AND BICYCLING IN ADAMS COUNTY

### Existing Facilities

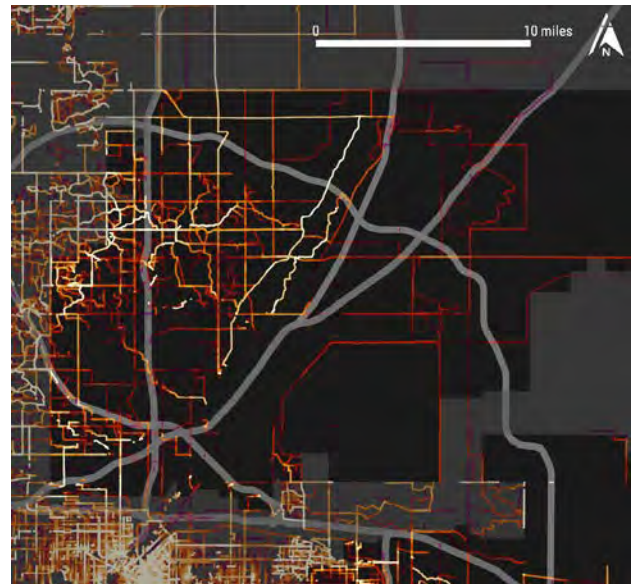
Adams County has a solid foundation for biking and walking including the South Platte River Trail, Sand Creek Greenway, Clear Creek Trail and Farmers' High Line Canal Trail each pass through the county, linking residents to destinations inside the county and to bike networks in adjacent counties. Along with these regional trails, local off-street and on-street bike facility networks have been developed to varying degrees throughout the county. In addition, Adams County has 3,052 miles of sidewalks.

**Figure 1. Adams County Bicycle Facility Mileage**



### Activity Level

Like much of the Denver region, Adams County is mostly characterized by suburban and rural development patterns, where housing is separate from commercial and retail destinations. Improvements to the transportation network in these land use contexts would improve walking and bicycling for transportation. Walking and bicycling currently account for less than 2 percent of work trips (1.3 percent and 0.3 percent, respectively). Additionally, over two-thirds of workers who live in Adams County are employed in another county (71 percent), limiting the potential for walking and bicycling as a commute option for many workers. Recreation and leisure trips may offer the best opportunity to increase walking and bicycling in Adams County.

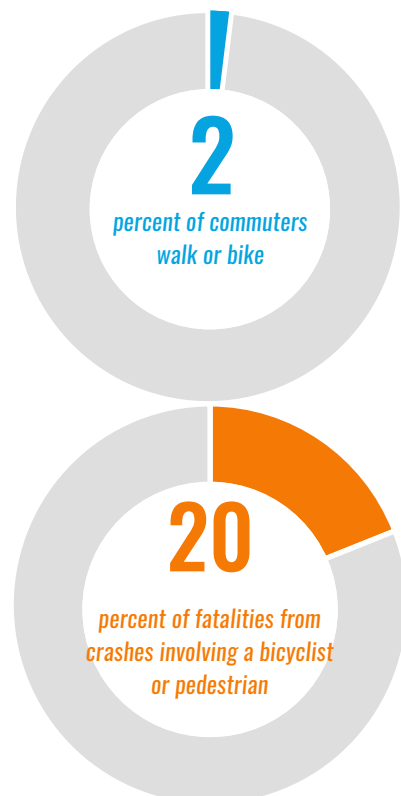


Adams County Strava data

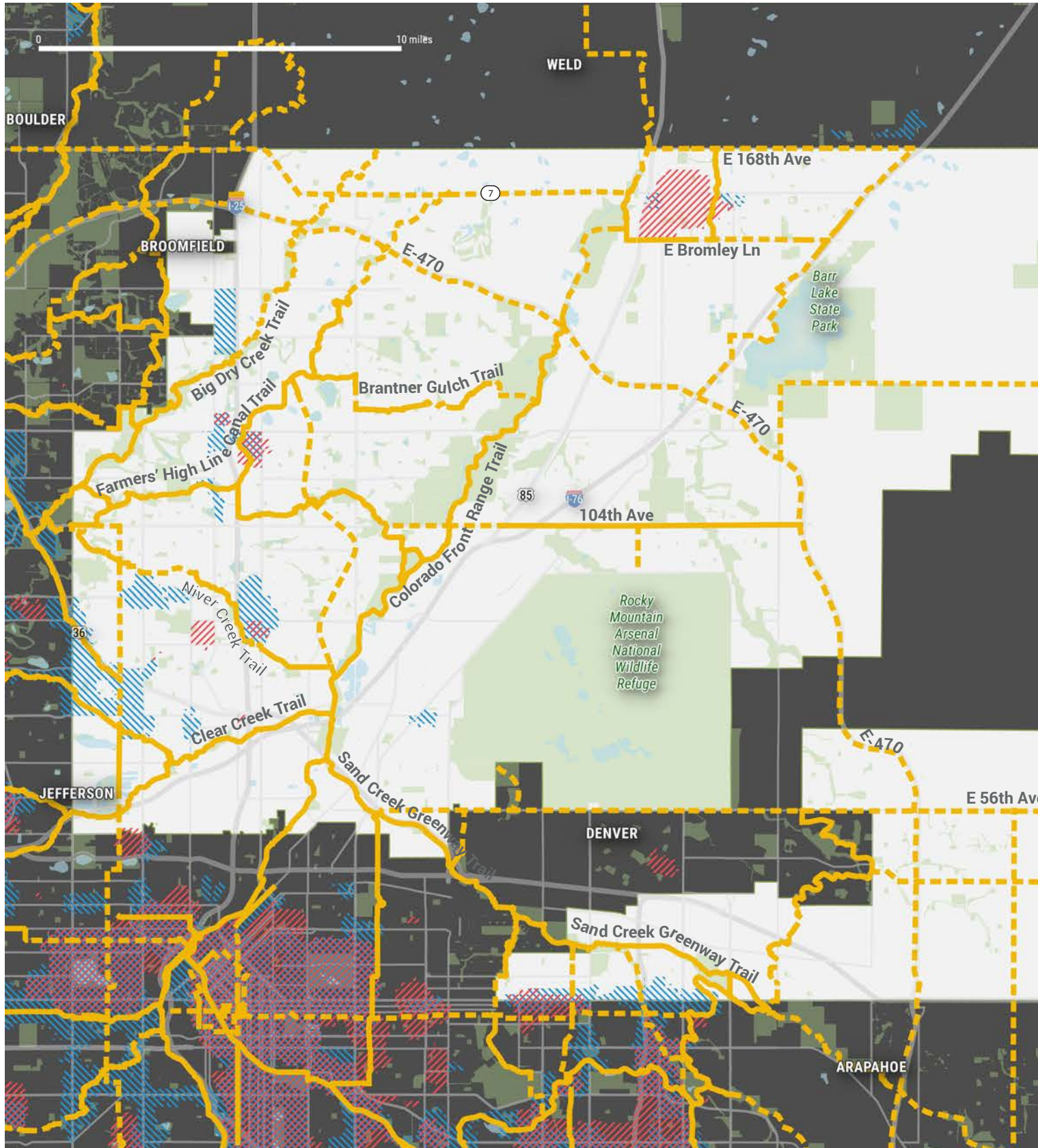
### Crashes

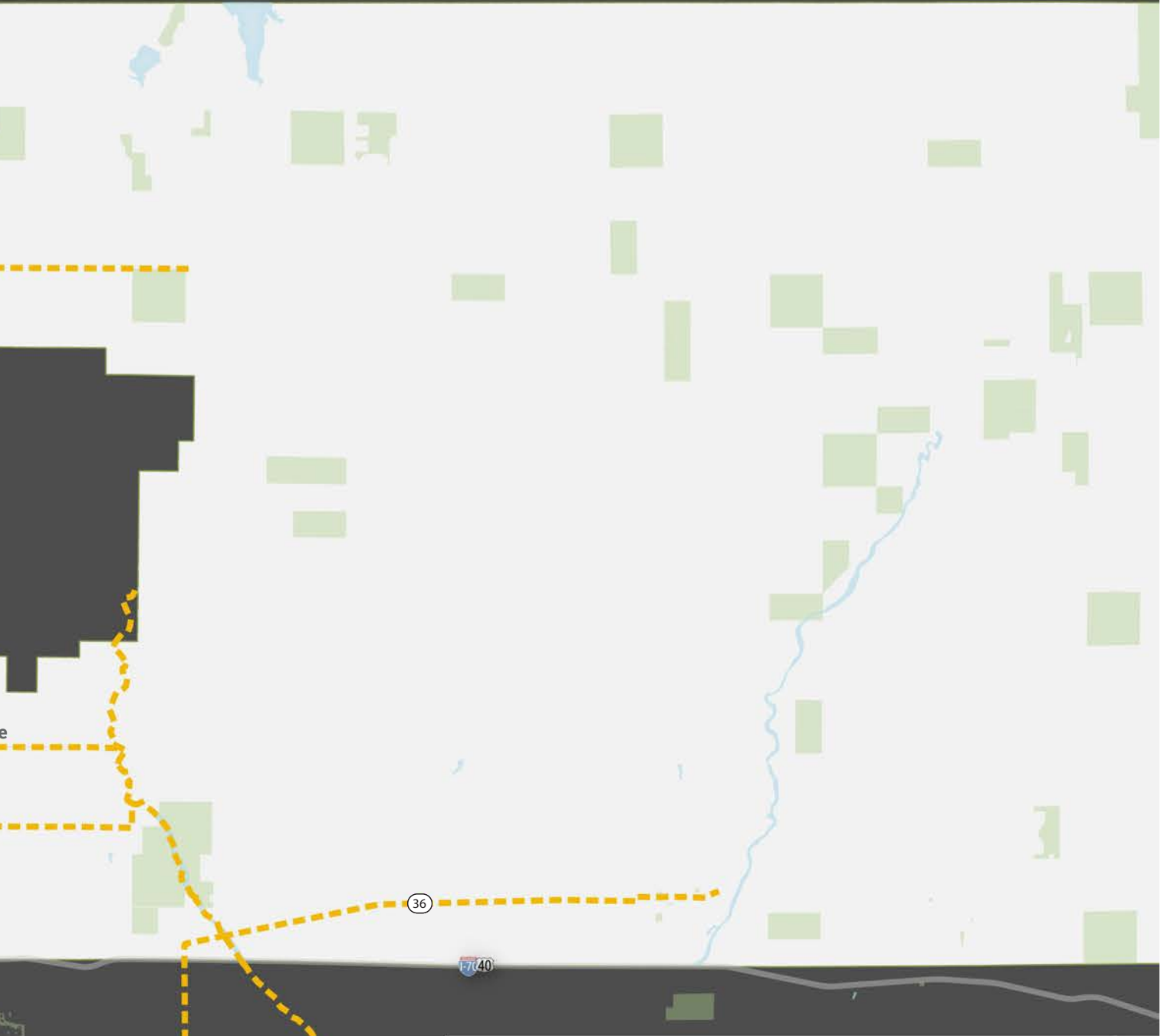
There were 1,190 reported pedestrian and bicycle crashes from 2010 to 2015, including 32 people killed in crashes involving a pedestrian, and three killed in crashes involving a bicycle. In the same period, there were 132 pedestrian-related serious injuries and 38 bicyclist-related serious injuries.

**Figure 2. Commute Mode Share Compared to Traffic Fatalities**



**Figure 3. Regional Active Transportation Network, Adams County**





- Existing Regional Active Transportation Corridor
- Future Regional Active Transportation Corridor
- Short Trip Opportunity Zones
- Pedestrian Focus Area

# Arapahoe County

## PLANNING CONTEXT

Arapahoe County is situated in the central and eastern portions of the Denver region, bordered by the City and County of Denver, Adams County and Douglas County. The county has two distinctly different land use contexts: urban/suburban in the western portion and rural in the eastern portion. The urbanized area of the County includes Aurora, Bow Mar, Centennial, Cherry Hills Village, Columbine Valley, Foxfield, Glendale, Greenwood Village, Englewood, Littleton and Sheridan. The rural portion is home to Bennett, Byers, Deer Trail, Strasburg and Watkins.

With about 640,000 residents, Arapahoe County is the second most populated county in the Denver region, and is home to over 19 percent of the region's total population. Most of the recent growth has occurred in cities in the western part of the county such as Aurora and Centennial. Arapahoe County is home to multiple major employment centers such as the Denver Tech Center and Buckley Air Force Base. It is anticipated that the county will continue to grow rapidly in population and employment over the next few decades.

Arapahoe County has the highest percentage of non-white residents in the Denver region, with nearly one out of four identifying as non-white. Arapahoe County is also home to over 18 percent of the region's zero-vehicle households. Arapahoe County's adult obesity rate (58 percent) is third highest in the region.

## Plans and Policies

Several plans identifying bicycling and walking improvements have recently been completed in Arapahoe County. Many of these highlight the importance of a regional, interconnected system that extends beyond local agency and county boundaries. Highlights from plans in Arapahoe County are shown in Table 11.

### The Importance of Stakeholders

The existing and planned active transportation system in Arapahoe County is a result of significant and longtime coordination among various stakeholders. The following list is a sample of stakeholders who have advocated for expanding the multimodal system through various plans and projects:

- » local businesses, school districts and neighborhood homeowner associations
- » Denver South Transportation Management Association
- » High Line Canal Conservancy, Cherry Creek and South Platte Trail working groups
- » South Suburban Recreation District

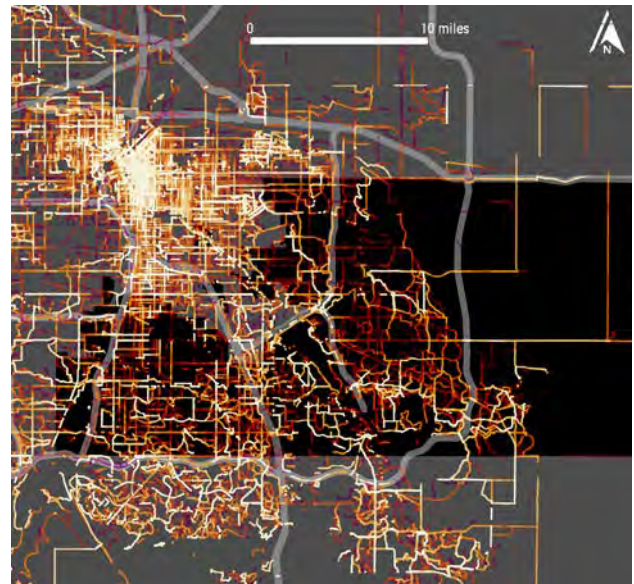
**Table 2. Sample of Local and County Plans that Influence Bicycling and Walking in Arapahoe County**

| Title   | Big Idea  |
|---|---|
| Arapahoe County Bicycle and Pedestrian Master Plan (2017)           | The proposed On-Street Bike and Trail Network was developed to accommodate “interested but concerned” bicyclists by providing a connected system of low-stress bike routes. The network builds from existing facilities and those planned by Arapahoe County communities. It connects on-street bike routes and off-street trails and will connect users to key destinations. |
| City of Littleton Bicycle and Pedestrian Master Plan (2011)         | The plan provides an inventory of existing pedestrian and bicycle facilities, determines potential improvements to the pedestrian and bicycle system and emphasizes collaborating with schools and other programs to promote walking and bicycling, an update will occur in 2019.   |
| Denver South TMA North-South Regional Bicycle Corridor Study (2018) | The overall goals of the plan are to create two low-stress regional north-south bicycle corridors that parallel Interstate 25, encourage bicycle travel and enhance the overall economic vitality and community prosperity of the Denver South area.  |
| City of Aurora Bicycle and Pedestrian Master Plan (2012)            | This plan provides a coordinated vision for accommodating and encouraging bicycling for transportation while also benefitting pedestrians. This plan seeks to extend the reach of the city's extensive trail network.   |
| Town of Foxfield Trails Plan (2014)                                 | This plan includes a network of planned and proposed trails. A plan goal was to coordinate with adjacent regional trail systems as well as other governmental jurisdictions, communities, public agencies and private organizations.  |
| City of Englewood Walk and Wheel Master Plan (2015)                 | This plan identifies the top priority projects to the bicycle and pedestrian network, outlines quick-wins and proposes education and encouragement programming.   |

# WALKING AND BICYCLING IN ARAPAHOE COUNTY

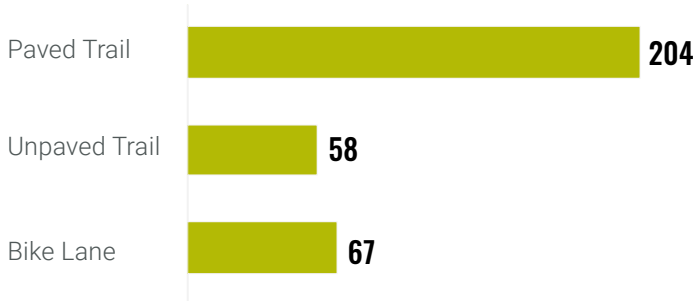
## Existing Facilities

The western portion of Arapahoe County has a foundational network for biking and walking. Portions of the South Platte River Trail, the High Line Canal Trail, the Cherry Creek Trail and Piney Creek Trail all pass through the county, providing links for residents to destinations inside the county and in adjacent counties. In addition to these regional trails, local off-street and on-street bike facility networks have been developed to varying degrees throughout the county. Arapahoe County has 3,988 miles of sidewalks.



Arapahoe County Strava data

Figure 4. Arapahoe County Bicycle Facility Mileage



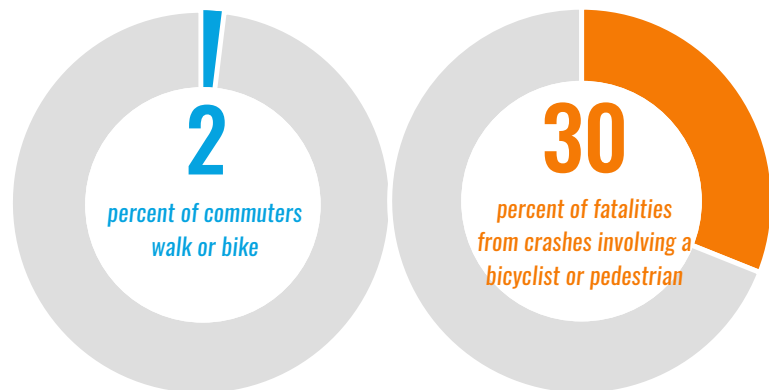
## Activity Level

Arapahoe County is mostly characterized by suburban and rural land use patterns, where lower density housing is separate from commercial and retail destinations. While significant investment is needed to encourage walking and bicycling and increase Arapahoe County’s walking and bicycling commute rates (1.6 percent and 0.3 percent, respectively), Arapahoe County can build off of its existing foundational network of trails and bike lanes to encourage bicycling and walking. Close to two-thirds of workers who live in Arapahoe County are employed in another county (64 percent), potentially requiring heightened coordination among local agencies to enhance the walking and bicycling facilities across jurisdictional boundaries and improve first- and last-mile connections to transit.

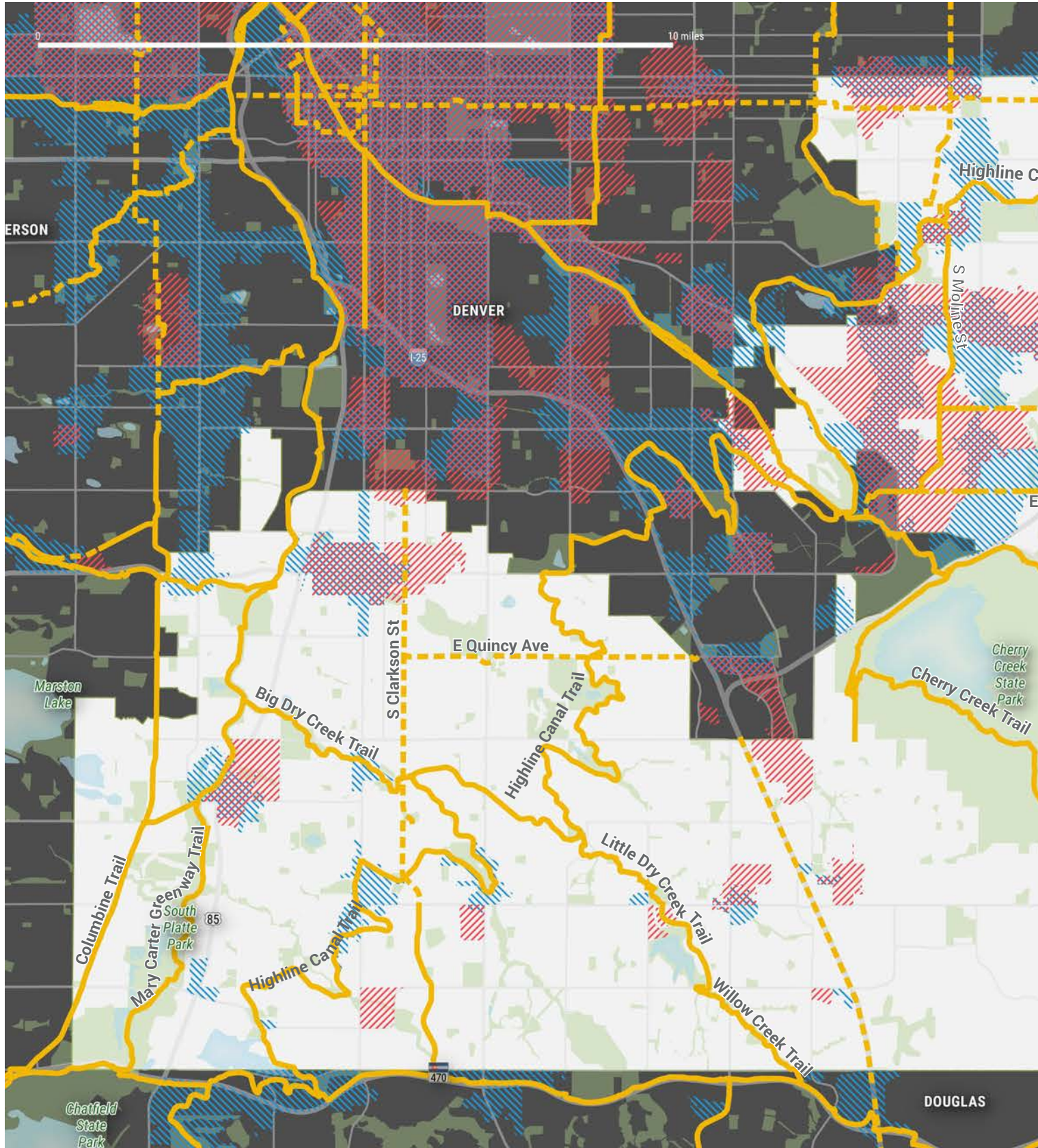
## Crashes

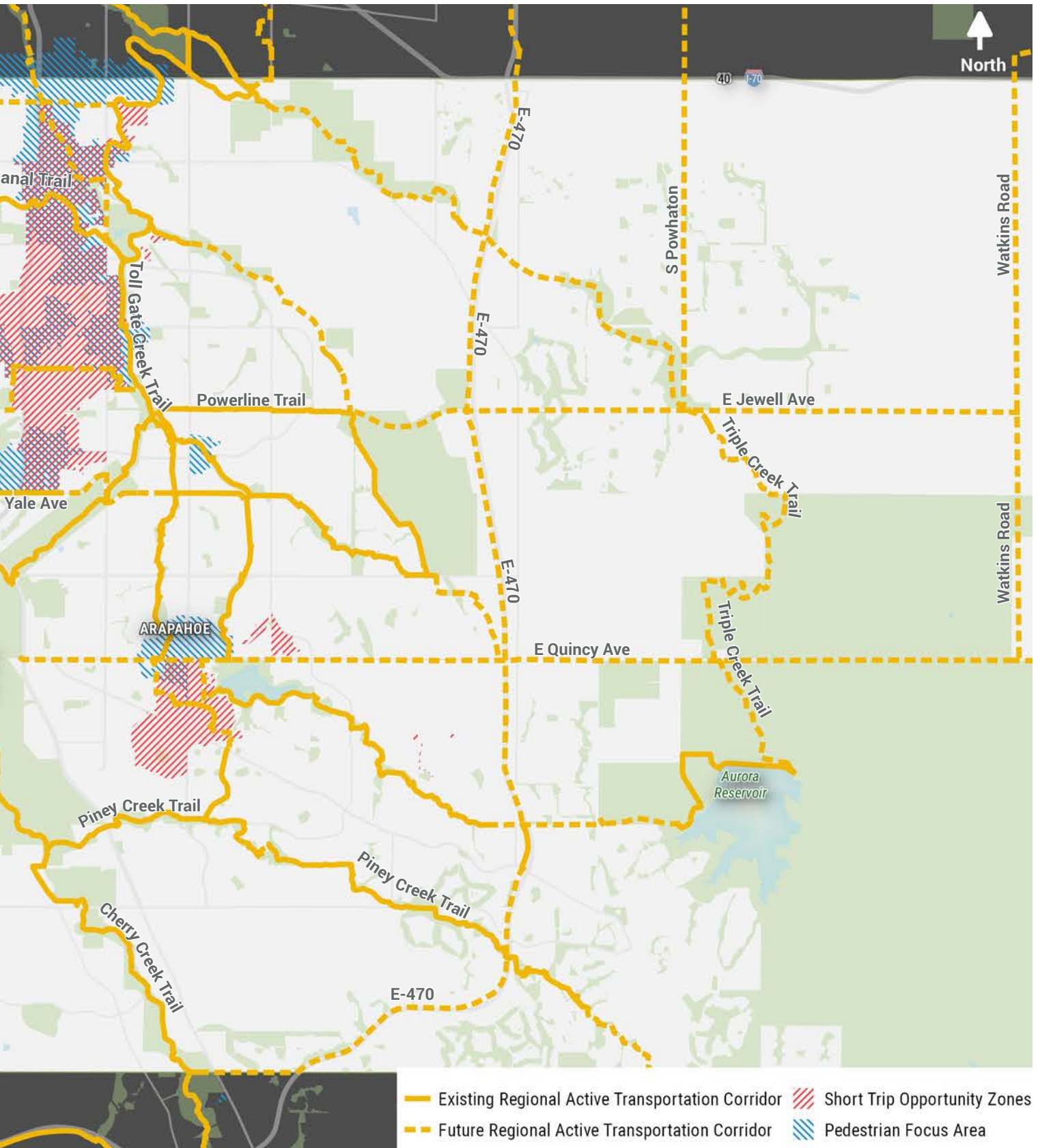
There were 2,177 reported pedestrian and bicycle crashes in Arapahoe County from 2010 to 2015, including 44 people killed in crashes involving a pedestrian, and five people killed in crashes involving a bicycle. There were 241 pedestrian-related serious injuries and 88 bicyclist-related serious injuries in the county in the same period. Arapahoe County experiences the second highest rate of pedestrian crashes in the region, behind the City and County of Denver, and the third highest rate of bicycle crashes in the region, behind Boulder County and the City and County of Denver.

Figure 5. Commute Mode Share Compared to Traffic Fatalities



**Figure 6. Regional Active Transportation Network, Arapahoe County**





# Boulder County

## PLANNING CONTEXT

Boulder County is situated in the northwestern portion of the Denver region, extending from its boundaries with Jefferson County, the City and County of Broomfield and Weld County into the Rocky Mountains. Boulder County is home to 10 incorporated towns and cities including the City of Boulder, Town of Erie, Town of Jamestown, City of Lafayette, City of Longmont, City of Louisville, Town of Lyons, Town of Nederland, Town of Superior and Town of Ward. Boulder County’s unincorporated areas encompass Allenspark, Coal Creek Canyon, Eldora, Eldorado Springs, Gold Hill, Gunbarrel, Hygiene and Niwot.

Boulder County is home to approximately 9 percent of the region’s population, with just over 320,000 residents. It welcomed nearly 27,000 new residents from 2010 to 2017, despite that its population growth of 9 percent is lower than the Denver regional average. Most of the growth in Boulder County has occurred in the eastern communities such as Louisville, Lafayette and Longmont.

Approximately 10 percent of Boulder County residents walk or bike to work, which is the highest county percentage in the region. The mean travel time to work in Boulder is just over 22 minutes, which is the lowest in the region. Boulder County also has the second lowest obesity rate (44 percent) and the second highest rate of adults who participate in substantial aerobic physical activity each week (71 percent) among counties in the region.

### Integration with Transit

The active transportation system in Boulder County is increasingly connected to the regional transit system.

Ideas for further integrating the active transportation system with the transit system include:

- » Install wayfinding signage and pavement markings on RTD property and adjacent facilities.
- » Increase bike-to-transit workshops and earn-a-bike programs to provide education and transportation options.
- » Expand and supplement EcoPass programs
- » Increase secure bike parking shelters and bicycle sharing stations and areas at RTD facilities.
- » Publish and distribute maps and other information to educate all groups about the availability of transportation options.

**Table 3. Sample of Local and County Plans that Influence Bicycling and Walking in Boulder County**

| Title  | Big Idea   |
|--|--|
| Boulder County Transportation Master Plan (2012)             | This plan includes emphasis on efficiency, equity and safety, as well as network recommendations for major corridors. Programmatic and policy recommendations emphasize the importance of outreach, education and integrating the modes of transportation. |
| City of Boulder Transportation Master Plan (2014)            | This plan includes emphasis on vehicle miles traveled reduction and mode share targets for 2035. The targets are 25 percent for pedestrians and 30 percent for bikers.   |
| City of Louisville McCaslin Boulevard Small Area Plan (2017) | This is one of multiple small area plans in Louisville with an emphasis on enhancing bicycle and pedestrian connections, including orienting development to be more inviting to those traveling on foot or by bike.  |
| Town of Superior Transportation Plan (2014)                  | This plan emphasizes consideration of environmental and community impacts. The plan outlines policies and strategies that focus on future connections and TOD principles in specific areas and along specific corridors.                                   |
| Envision Longmont Multimodal and Comprehensive Plan (2016)   | This plan includes specific multimodal transportation indicators such as mode split, greenways, trails and bikeways, connectivity and active transportation.   |



## Plans and Policies

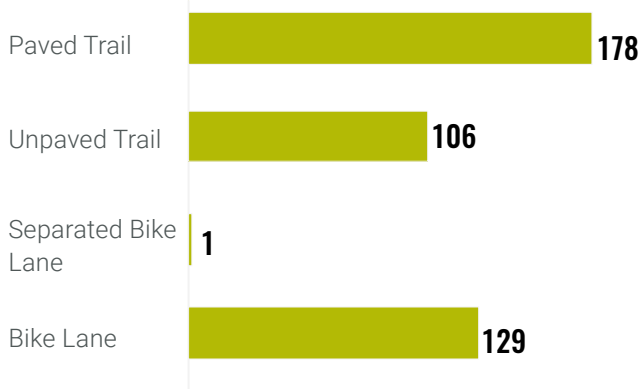
Several plans identifying bicycling and walking improvements have recently been completed in Boulder County. Highlights from plans in Boulder County are shown in Table 12.

## WALKING AND BICYCLING IN BOULDER COUNTY

### Existing Facilities

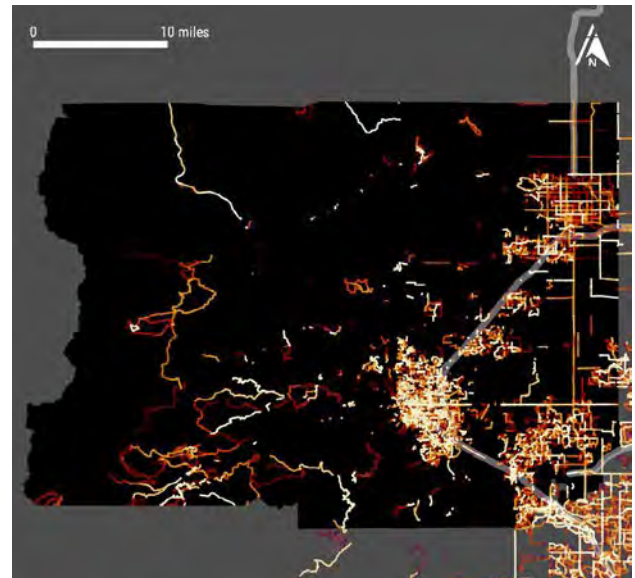
Boulder County is home to the most bicycle facilities (by miles) in the region. The eastern portion of Boulder County has a very strong foundational network for biking and walking. U.S. Route 36 and many other major roadways in Boulder County such as North 75th Street, McCaslin Boulevard, State Highway 93, State Highway 170 and Airport Road in Longmont, all have wider shoulders or dedicated facilities for bicycling, allowing for connections among communities. In addition to these facilities, robust local off-street and on-street bike facility networks have been developed in communities throughout the county. Boulder County also has 2,105 miles of sidewalks.

**Figure 7. Boulder County Bicycle Facility Mileage**



### Activity Level

Boulder County is characterized by smaller cities and towns, connected by county roads and state highways. Many local communities have extensive off-street and on-street bicycle and walking facilities. Over 10 percent of Boulder County residents walk or bike to work, the highest percentage in the region. Boulder County’s mean travel time to work is just over 22 minutes, which is the lowest in the region, potentially lending itself to walking and bicycling as a commute option for many workers.

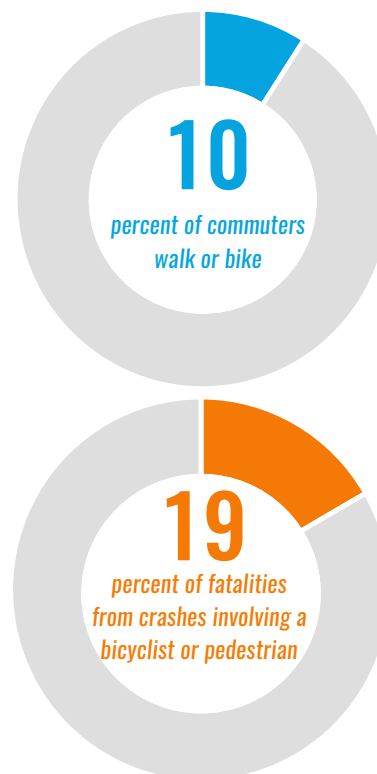


*Boulder County Strava data*

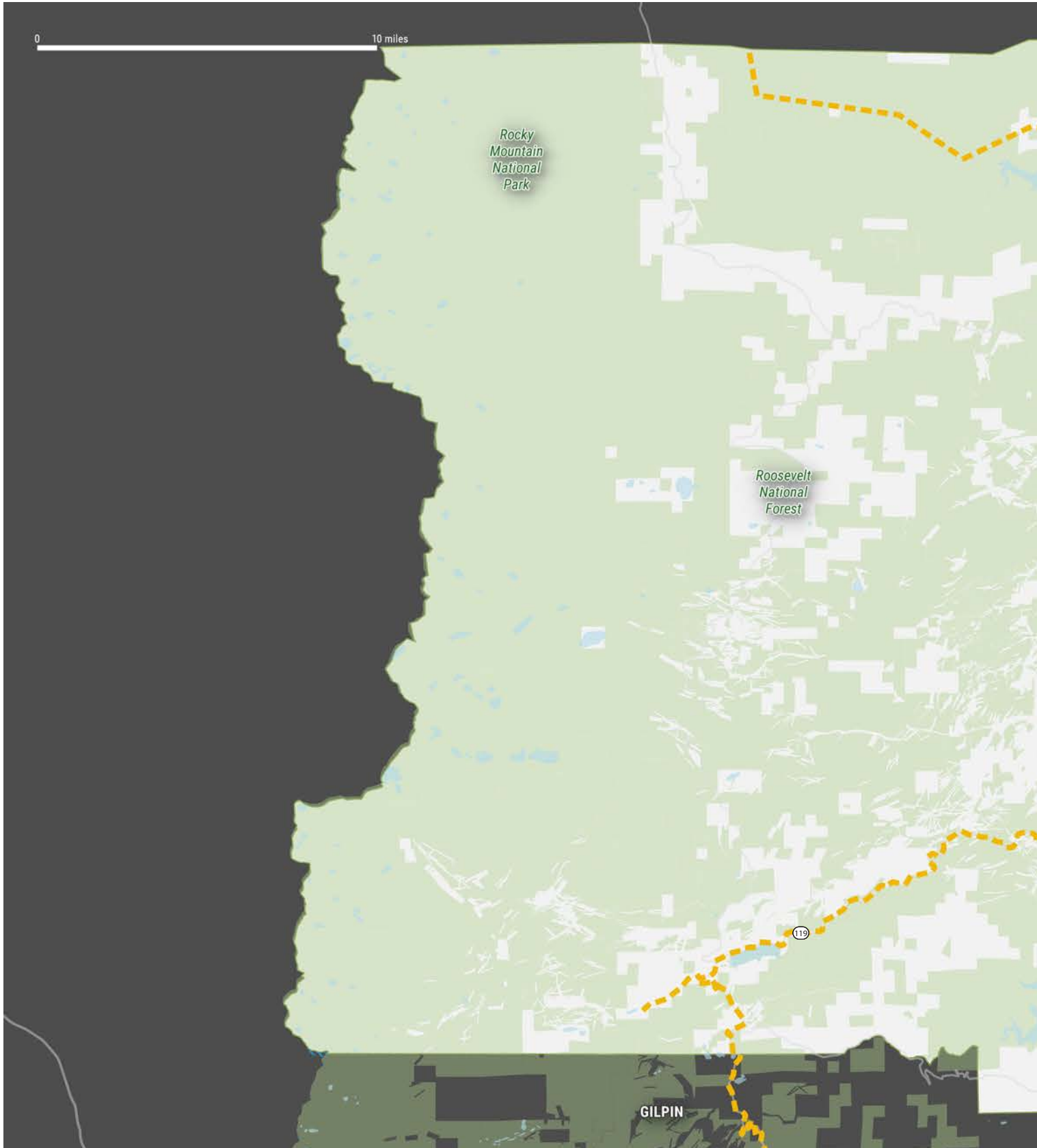
### Crashes

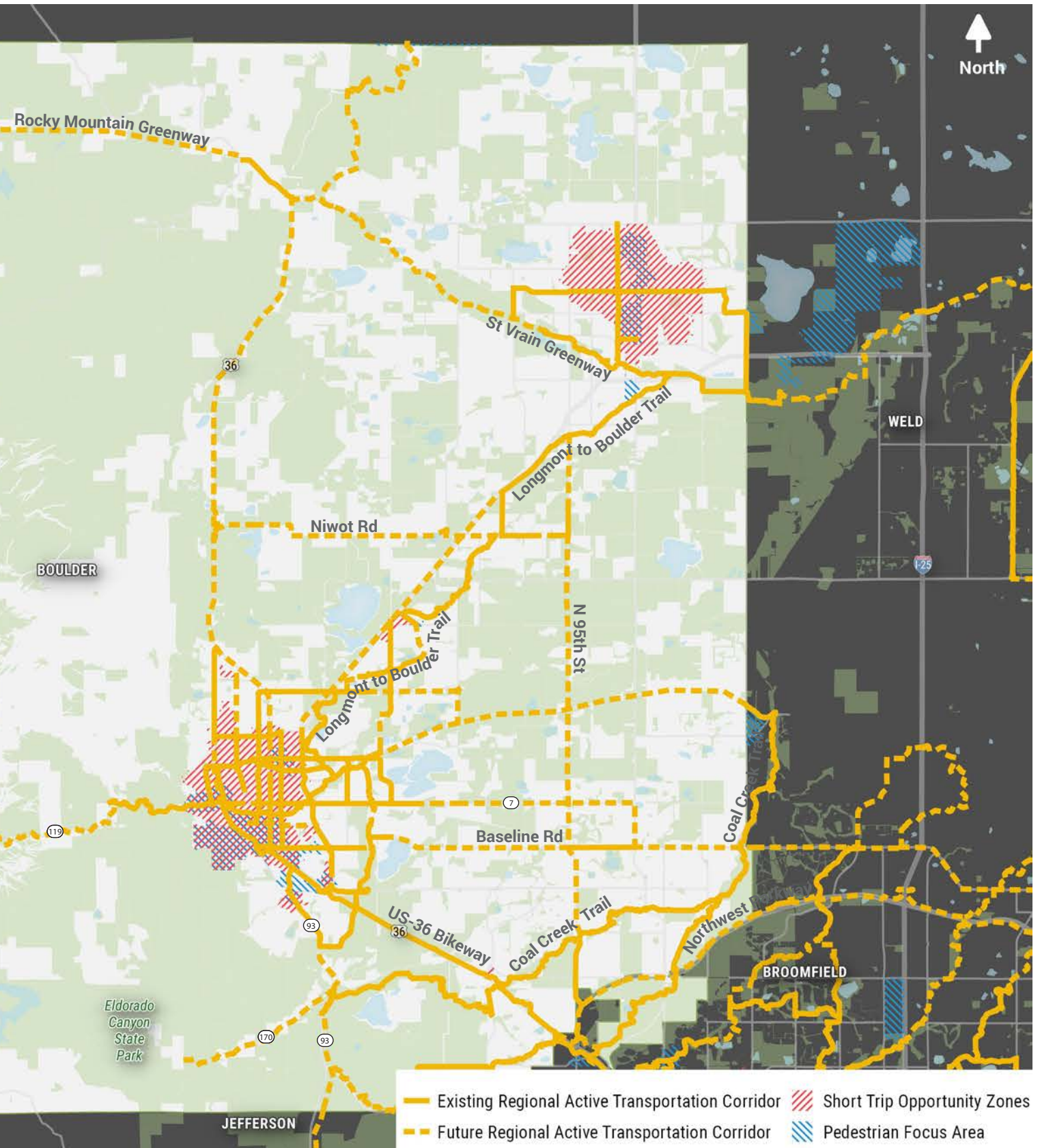
There were 1,469 reported pedestrian and bicycle crashes in Boulder County from 2010 to 2015, including 16 people killed in crashes involving a pedestrian, and five killed in crashes involving a bicycle. There were 98 pedestrian-related serious injuries and 163 bicyclist-related serious injuries in the county in the same period. Despite higher levels of bicycling and walking, pedestrians and bicyclists account for a smaller share of fatalities than in most other counties in the region.

**Figure 8. Commute Mode Share Compared to Traffic Fatalities**



**Figure 9. Regional Active Transportation Network, Boulder County**





# City and County of Broomfield

## PLANNING CONTEXT

The City and County of Broomfield is situated in the northern portion of the Denver region and is the smallest county in the region. The City and County of Broomfield is nestled east of Boulder County, north of Jefferson County and west of Adams County. Broomfield is a consolidated city and county and predominantly includes suburban residential and commercial land uses with multiple open spaces and parks.

The City and County of Broomfield has experienced the highest rate of growth (22 percent) in the region since 2010, increasing from approximately 56,000 residents to over 68,000. It is anticipated that Broomfield will continue to grow rapidly in population and employment, particularly in the northeastern area along Northwest Parkway and Interstate 25 over the next few decades. Between the statistical periods of 2007-2011, and 2012-2016, the City and County of Broomfield experienced a decrease in the percentage of families in poverty (from 4.2 percent to 3.7 percent), reducing the percentage of families in poverty to the second lowest in the region, behind Douglas County.

More than any other county, the City and County of Broomfield experiences significant worker flows in and out of the county. Over 87 percent of residents' commute to other counties for employment, and over 87 percent of those employed in the City and County of Broomfield commute in from locations outside Broomfield. The City and County of Broomfield has the lowest asthma rate in the region (7 percent).

## Plans and Policies

Multiple plans identifying bicycling and walking improvements have recently been completed in the City and County of Broomfield. Highlights are shown in Table 13.

### Combining Trails and On-Street, Low-Stress Networks

The trail system in the City and County of Broomfield is extensive, well-used and highly valued by the community. The trail system includes many grade-separated crossings of major roads, enabling safe and efficient crossings for bicyclists and pedestrians.

The City and County of Broomfield's Bicycle and Pedestrian Assessment (2018) recommends an on-street, low-stress network to further support and connect the robust, low-stress trail system already established. Broomfield looks for opportunities to expand the on-street network during construction of new roads and when repaving existing roads to create new and improved lanes. Broomfield's current street standards include bike lanes for minor and major arterial streets, and connector streets through multifamily residential and commercial areas.

**Table 4. Sample of Local and County Plans that Influence Bicycling and Walking in the City and County of Broomfield**

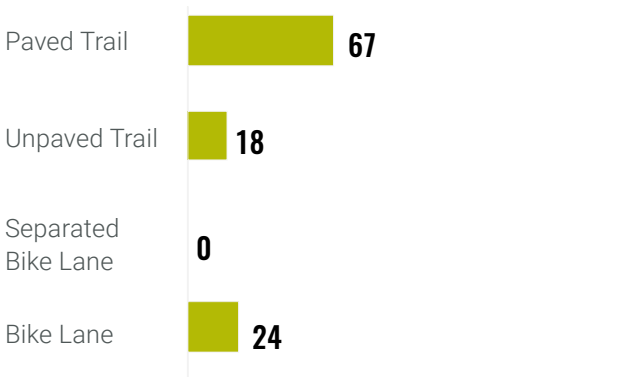
| Title   | Big Idea  |
|---|---|
| Transportation Plan (2016)                      | This plan sets a vision and includes multiple goals focused on active transportation, it recommends a low-stress network that serves all ages and abilities and includes detailed performance measures such as miles of bike lanes, number of collisions involving a pedestrian or cyclist and percent of all fatal collisions that involved a pedestrian or cyclist. |
| Bicycle and Pedestrian Assessment (2018, Draft) | Building on relevant goals from the Transportation Plan, the plan provides a detailed inventory of the existing active transportation plan facilities, identifies deficiencies and missing links, then identifies and prioritizes capital projects and sets a path to implement the goals.  |

# WALKING AND BICYCLING IN THE CITY AND COUNTY OF BROOMFIELD

## Existing Facilities

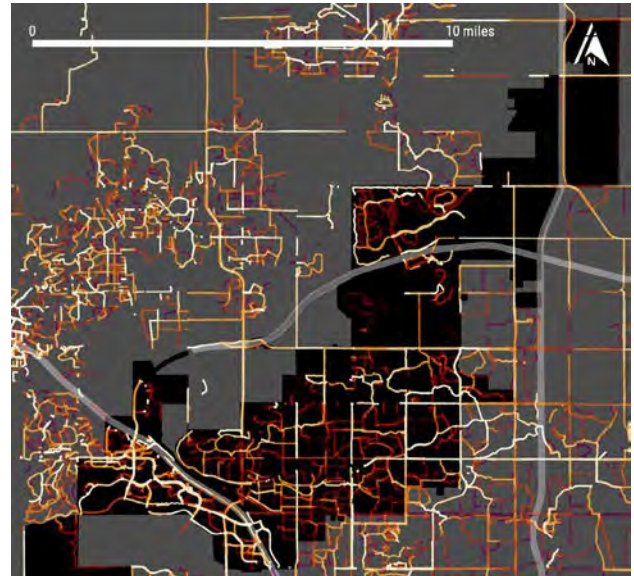
The City and County of Broomfield has a strong foundational network for biking and walking. Portions of the U.S. 36 Bikeway, facilities in the Interlocken area, and many other major roadways in Broomfield such as Midway Boulevard, 136th Avenue, Sheridan Parkway and Lowell Boulevard, all have wider shoulders or dedicated facilities for bicycling. Over 70 percent of Broomfield’s arterial street system includes bike lanes. Local off-street and on-street walking and bike facilities have been developed to varying degrees in neighborhoods throughout the county. In addition, Broomfield has 580 miles of sidewalks.

**Figure 10. City and County of Broomfield Bicycle Facility Mileage**



## Activity Level

The City and County of Broomfield is mostly characterized by suburban land use patterns, where lower density housing is separated from commercial and retail destinations. Broomfield has relatively low rates of walking and bicycling commuting (1 percent and 0.4 percent, respectively), the second lowest in the Denver region, behind Douglas County. With nearly 90 percent of workers who live in the City and County of Broomfield employed in another county, linking active transportation with transit may be the most feasible way to increase walking and bicycling for commute trips. Greater opportunities likely exist for noncommute trips.

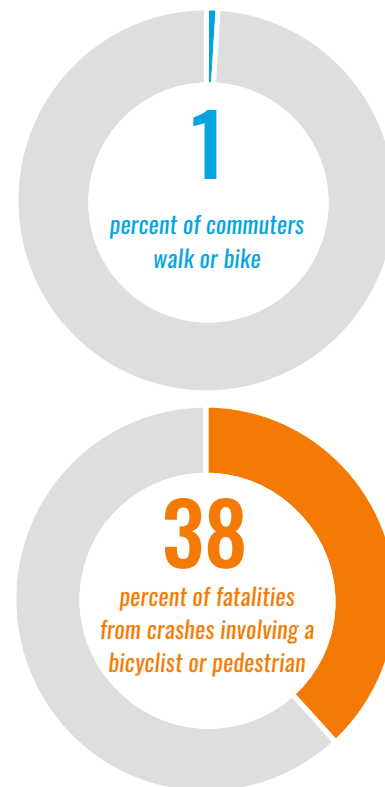


City and County of Broomfield Strava data

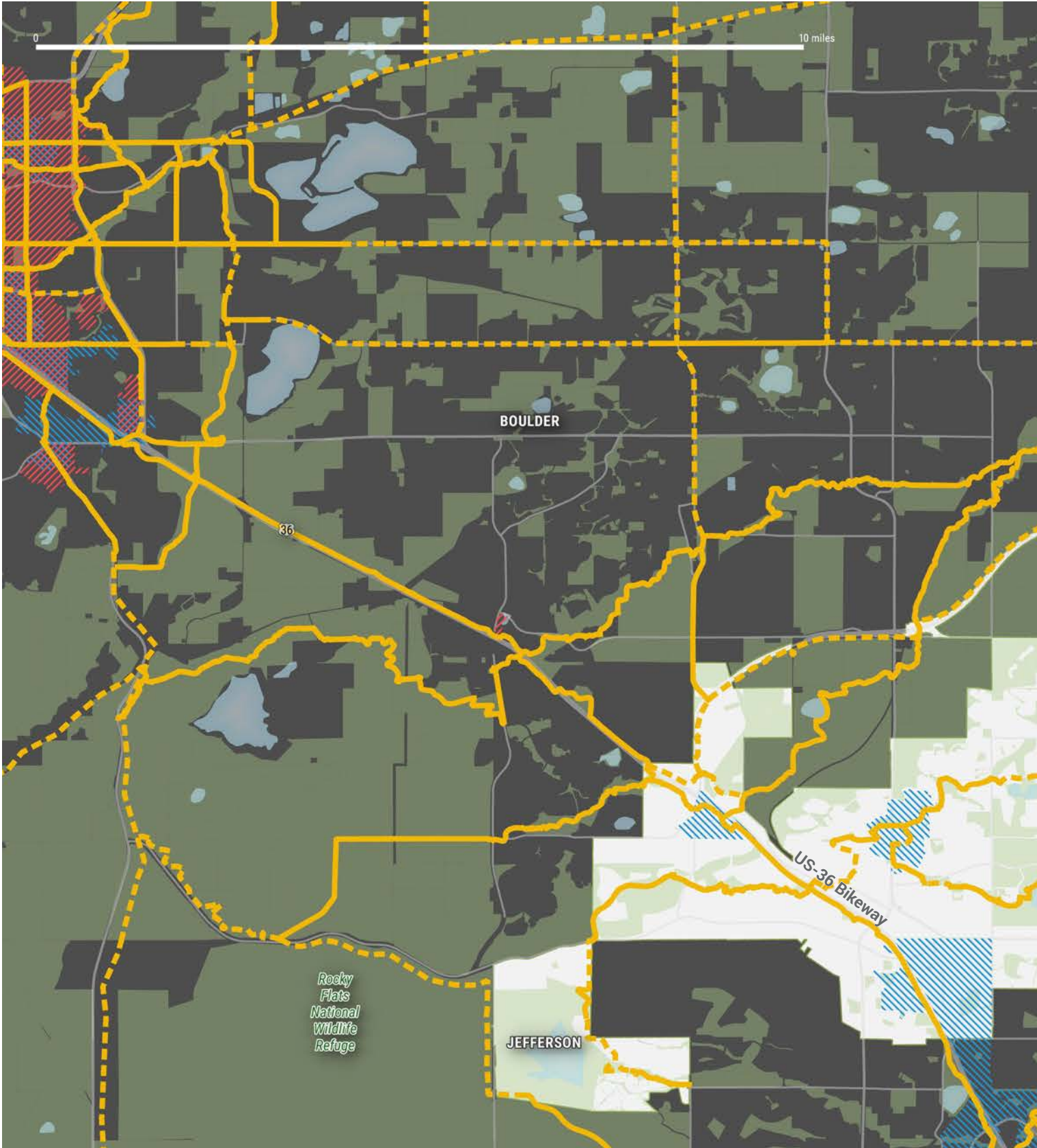
## Crashes

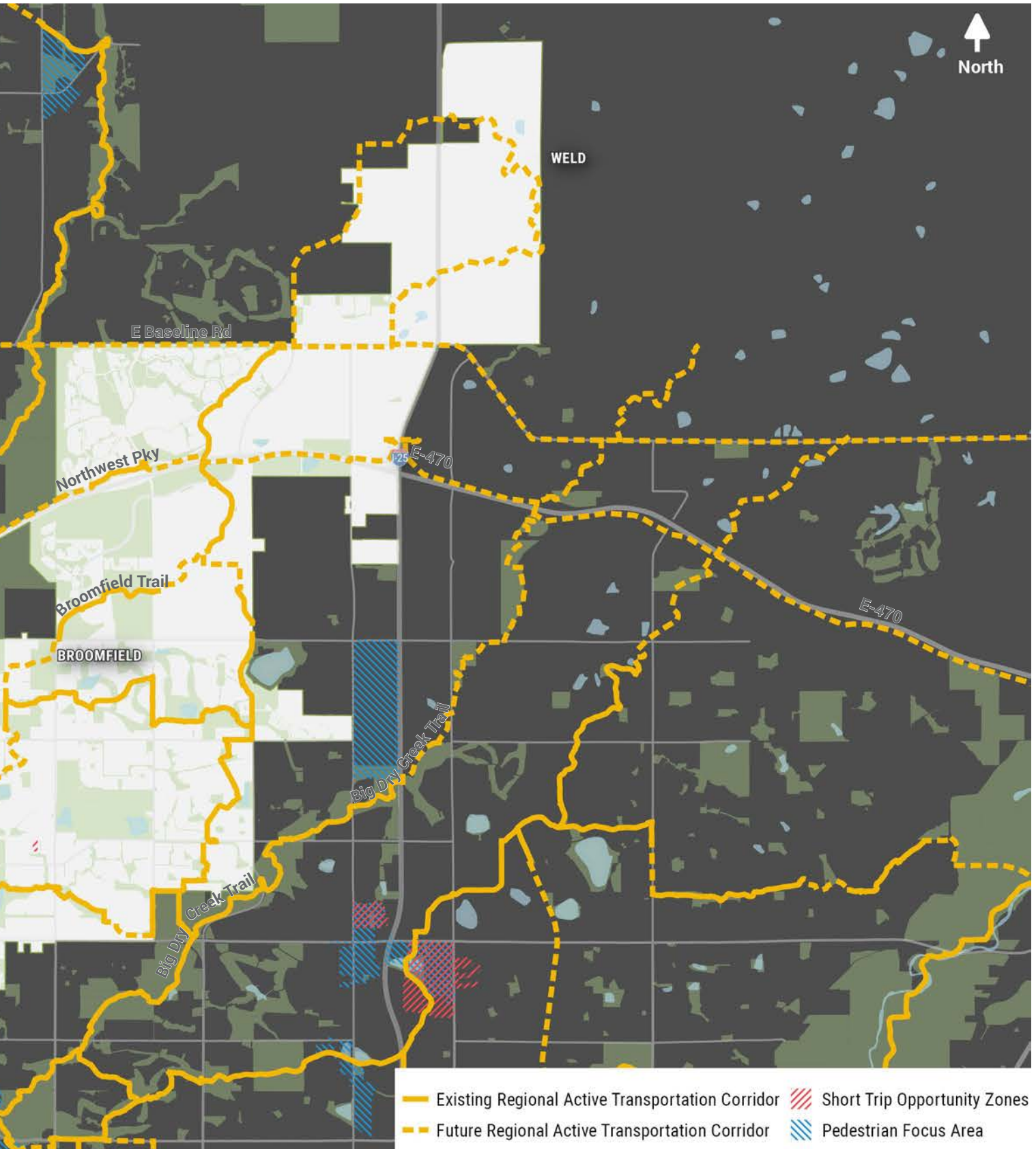
There were 124 reported pedestrian and bicycle crashes in the City and County of Broomfield from 2010 to 2015, including five people killed in crashes involving a pedestrian. No bicyclist fatalities were reported. There were 17 pedestrian-related serious injuries and eight bicyclist-related serious injuries in Broomfield in the same period. From 2010 to 2015, the City and County of Broomfield experienced the highest share of pedestrian and bicyclist fatalities relative to all traffic fatalities.

**Figure 11. Commute Mode Share Compared to Traffic Fatalities**



**Figure 12. Regional Active Transportation Network, City and County of Broomfield**





# Clear Creek County

## PLANNING CONTEXT

Clear Creek County is the westernmost county in the Denver region, extending from its boundary with Jefferson County and south from its border with Gilpin County into the Rocky Mountains. Clear Creek County is home to multiple municipalities including Empire, Georgetown, Idaho Springs, Silver Plume and a significant amount of national forest land.

With just over 9,500 residents, Clear Creek County is the second least populated county in the Denver region, behind Gilpin County, and is home to less than 1 percent of the region's total population (approximately 0.3 percent). Clear Creek County experienced the lowest growth rate in the region, averaging only 5 percent from 2010 to 2017, and even experienced a decrease in population from 2011 to 2013.

Clear Creek County has the oldest average population in the region. Between statistical periods of 2007-2011, and 2012-2016, Clear Creek County experienced an increase in the percentage of families in poverty (from 3.1 percent to 4.3), in contrast to most counties in the region. The mean travel time to work for Clear Creek County workers is 30 minutes, the second highest average commute time behind Gilpin County.

While Clear Creek County has the second lowest obesity rate among counties in the Denver region (44 percent), the county has the highest asthma rate in the region (14 percent).

## Plans and Policies

Multiple plans identifying bicycling and walking improvements have recently been completed in Clear Creek County. Highlights from plans are shown in Table 14.

### Vision to Reality for the Clear Creek Greenway

The development of a greenway for Clear Creek County has been long envisioned and has become a priority for local communities. The vision is for a 36-mile multiuse trail between the Jefferson County western border and the Continental Divide. The trail will serve as the main bicycle route in Clear Creek County, running alongside Clear Creek and connecting communities with parks, recreational facilities, open space and commercial recreational opportunities. The greenway is intended to serve all users including bikers, hikers, climbers, as well as boaters, anglers and scientists.

The greenway embraces the County's distinct cultural heritage and natural environment and provides an outdoor resource for families, visitors and recreational enthusiasts to enjoy.

**Table 5. Sample of Local and County Plans that Influence Bicycling and Walking in Clear Creek County**

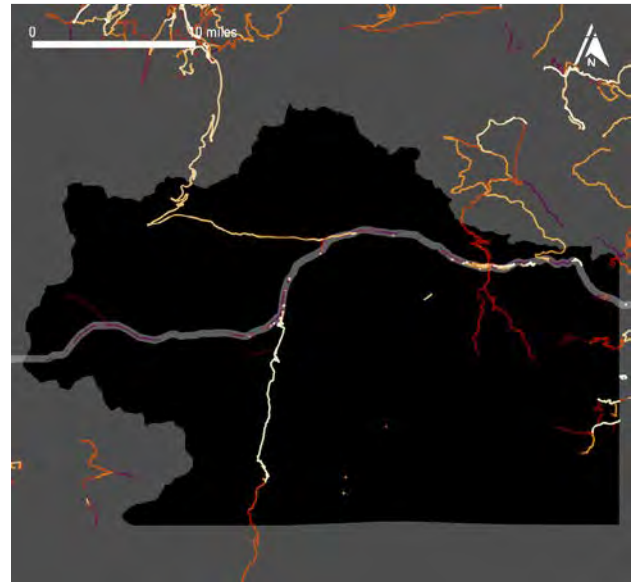
| Title  | Big Idea  |
|--|---|
| Envision Idaho Springs Comprehensive Plan (2017) | This plan emphasizes sustainable recreational opportunities for all ages and abilities while considering effects and highlights the importance of the eventual regional connection of the Clear Creek Greenway as a part of the Peaks to Plains trail.  |
| Clear Creek County Community Master Plan (2017)  | This plan is a high-level, visionary plan for Clear Creek County with specific transportation goals such as reducing motor vehicle dependence and creating more multimodal options such as creating carpool and transit options, it highlights tourism and the ability for multimodal facilities to enhance the visitor experience. |
| Clear Creek Greenway Plan (2005)                 | This plan includes the recommended alignment of the Clear Creek Greenway and was completed in coordination with major stakeholders including CDOT, U.S. Forest Service, local officials, property owners and stakeholders.  |
| Town of Georgetown Comprehensive Plan (2016)     | The plan's transportation theme is to promote a road network that serves the needs of residents and visitors, minimizes the disruption to residential areas, maintains the highest possible safety standards and protects the historic integrity of Georgetown.   |



# WALKING AND BICYCLING IN CLEAR CREEK COUNTY

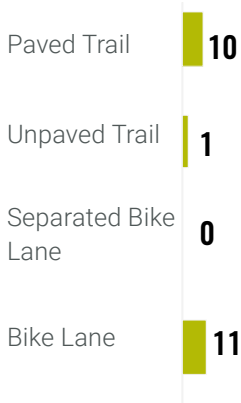
## Existing Facilities

The smaller communities in Clear Creek County have a network of sidewalks and some bicycling facilities but the mountainous terrain limits the routes available for connecting smaller towns to one another. A primary connection currently meanders along Silver Valley Road, Alvarado Road and Stanley Road which all parallel Interstate 70 and Clear Creek, and connects Loveland Ski Area to Silver Plume, Georgetown, Lawson, Downieville and Idaho Springs. Eventually the connection will become the Clear Creek Greenway, a 36-mile trail from the Jefferson County line to the Eisenhower Tunnels. Clear Creek County has about 15 miles of sidewalks.



City and County of Broomfield Strava data

**Figure 13. Clear Creek County Bicycle Facility Mileage**



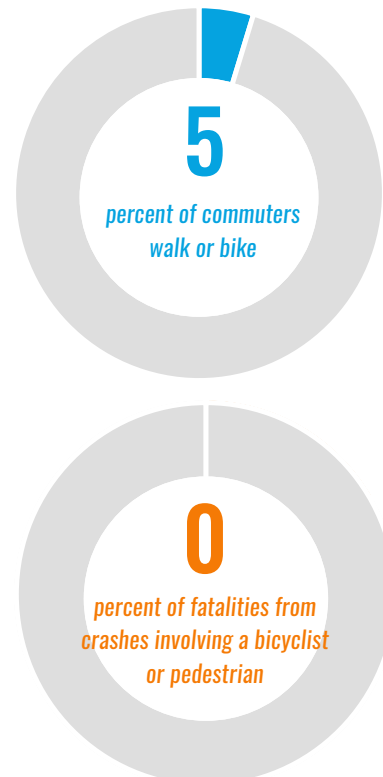
## Activity Level

Approximately 5.4 percent of Clear Creek County workers walk or bike to work (4.6 percent and 0.8 percent, respectively). It is likely that these employees live and work in the same town because Clear Creek County is characterized by small towns nestled in mountainous terrain, outside of town limits, and such environments can be more challenging areas in which to walk or bike for transportation. Efforts to improve walking and bicycling commute trips may be best served by focusing on employees that live and work in the same town. Nearly 80 percent of workers who live in Clear Creek County are employed in another county, potentially limiting walking and bicycling as a commute option for many workers.

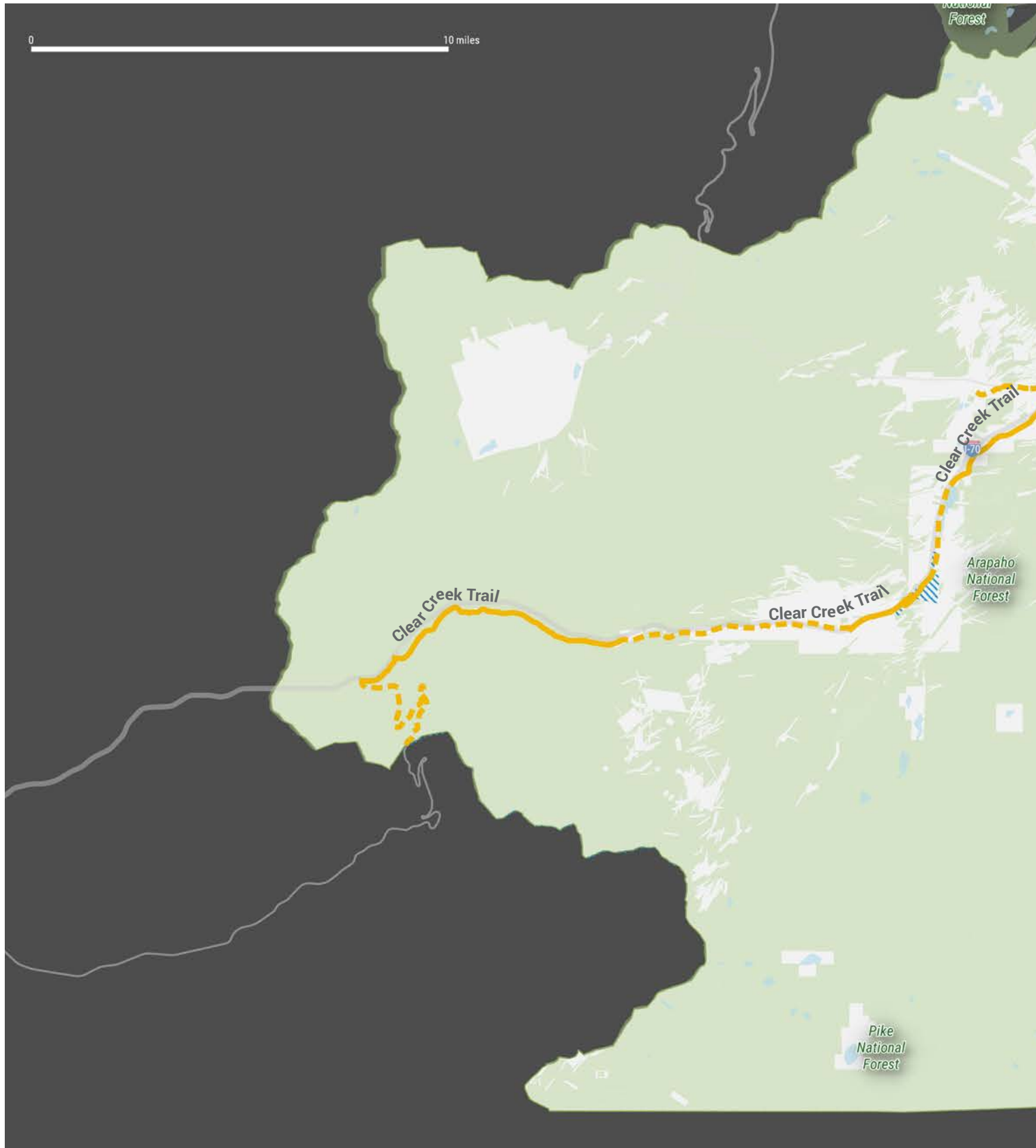
## Crashes

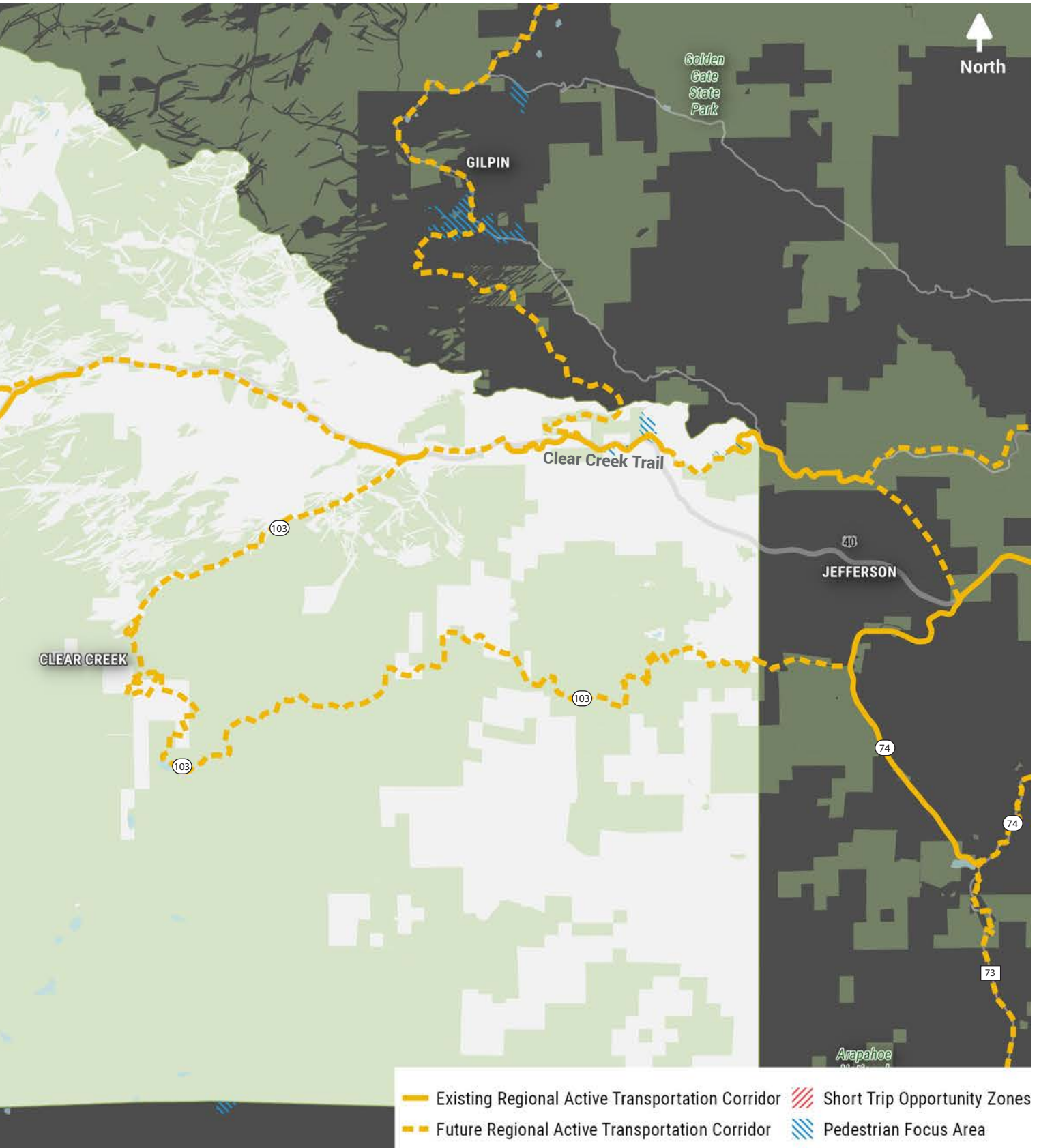
There were 17 reported pedestrian and bicycle crashes in Clear Creek County from 2010 to 2015. No fatalities were reported. There were five pedestrian-related serious injuries and four bicyclist-related serious injuries in the county in the same period.

**Figure 14. Commute Mode Share Compared to Traffic Fatalities**



**Figure 15. Regional Active Transportation Network, Clear Creek County**





# City and County of Denver

## PLANNING CONTEXT

The City and County of Denver is central to the Denver region, sharing borders with Adams, Arapahoe and Jefferson counties. The City and County of Denver is a consolidated city and county. Denver is home to the region’s Central Business District with predominantly urban neighborhoods and some suburban neighborhoods on the outskirts of the county.

Denver is the most populated county in the region, home to over 700,000 residents, which amounts to more than 20 percent of the region’s total population. Denver has added over 100,000 new residents from 2010 to 2017. Denver’s growth rate of 16.8 percent was higher than the regional average of 13.3 percent but lower than Broomfield and Douglas counties. Denver is home to the highest percentages of families in poverty. Approximately 12.2 percent of families in Denver lived in poverty from 2012 to 2016, down from 14.2 percent in 2007 to 2011. The City and County of Denver’s Hispanic population is just over 31 percent second in the region to Adams County.

Approximately 7 percent of Denver residents walk or bike to work, and another nearly 7 percent take public transportation, the highest percentage of residents in the region. Approximately 4.1 percent of Denver households have no vehicle available, the highest percentage in the Denver region. Among counties in the Denver region, Denver has the fourth highest adult obesity rate (57 percent).

## Plans and Policies

Several plans identifying bicycling and walking improvements have recently been completed in Denver. Highlights from plans are shown in Table 15.

### Funding Multimodal Improvements Through the General Obligation (GO) Bond

Denver’s GO bond authorization was presented to, and approved by, voters in November 2017, giving the city and county \$937 million to expedite improvements. The initial list of projects totals over \$193 million and delivers on high priority investments that are ready. The initial list includes over \$41 for transportation projects, almost all of which will improve facilities for walking and biking within the city and county.

The City and County of Denver extensively involved the public prior to the ballot authorization and received over 4,000 comments. The public was invited to participate at six community meetings held around the city, via the GO bond website, at a public library or recreation center and through their councilmember’s office.

**Table 6. Sample of Local and County Plans that Influence Bicycling and Walking in the City and County of Denver**

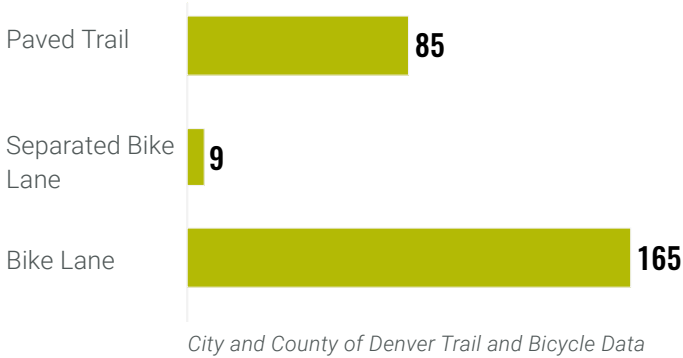
| Title  | Big Idea   |
|--|--|
| Denver Moves: Pedestrians and Trails (2017)  | This plan is guided by six main goals including accessibility, connectivity, destination access, equity, health and safety. Network recommendations for the pedestrian realm are divided into missing sidewalks and sidewalks that are too narrow, and then divided into six tiers of improvements. Performance measures in the plan focus on facilities and their ability to equitably be provided around the city and county.                              |
| Denver Moves: Enhanced Bikeways Study (2016) | This plan is guided by four main goals including: understand safety along the separated bikeways, understand how separated bikeways are being used, understand community opinions about separated bikeways and understand the economics of separated bikeways. Performance measures in this plan focus on compliance, use and input from the community and facility users.   |
| Denver Moves: Bicycles (2011)                | This plan is an action-oriented plan building presenting toolbox of bicycle and multi-use facility types and their consideration for use in Denver’s nonmotorized network. It examines the feasibility of these facility types, incorporates them into a comprehensive multiuse and bicycle network, and develops an implementation strategy for the future. Performance measures in this plan focus on the linear miles of facilities added to the network. |

# WALKING AND BICYCLING IN THE CITY AND COUNTY OF DENVER

## Existing Facilities

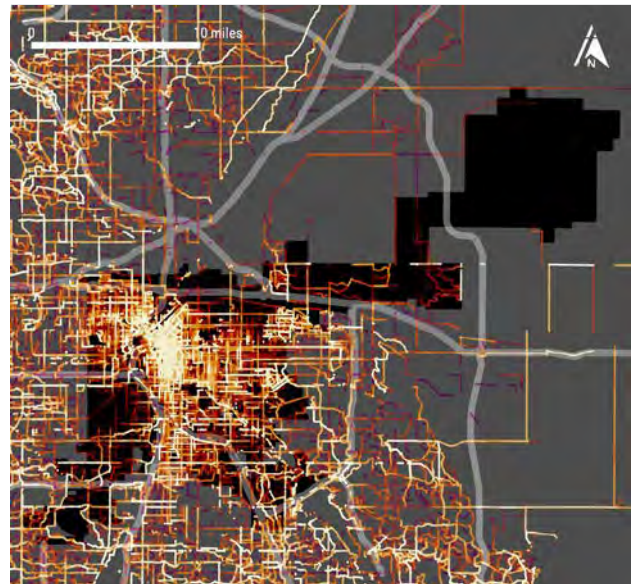
Denver includes several major bicycle facilities. Portions of the South Platte River Trail and the Cherry Creek Trail pass through Denver, providing links to destinations inside Denver and in adjacent counties. In addition to these regional trails, major roadways such as Montview Boulevard, West 29th Avenue, West 46th Avenue, Martin Luther King Jr. Boulevard and many streets in the Central Business District/downtown have dedicated facilities for bicycling, allowing for connections between urban neighborhoods. Denver has 3,934 miles of sidewalks.

**Figure 16. City and County of Denver Bicycle Facility Mileage**



## Activity Level

Denver is characterized by urban environments, connected by local, collector and major arterial streets. Nearly 7 percent of City and County of Denver residents walk or bike to work, the second-highest percentage in the region to Boulder County. The City and County of Denver residents' mean travel time to work is just over 25 minutes, which is the second-lowest in the region (behind Boulder County), potentially lending itself to walking and bicycling as a commute option for many workers.

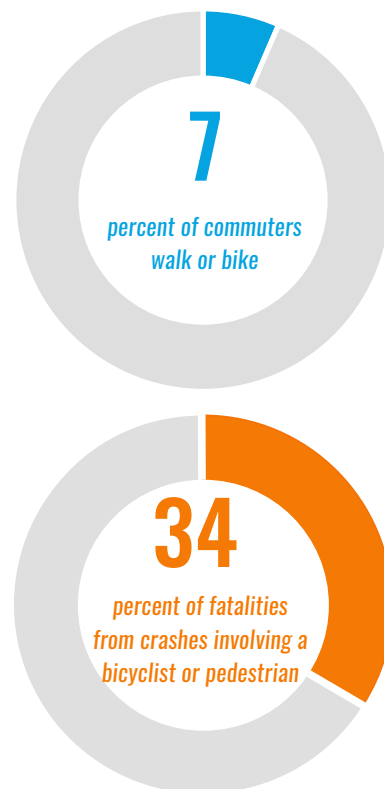


*City and County of Denver Strava data*

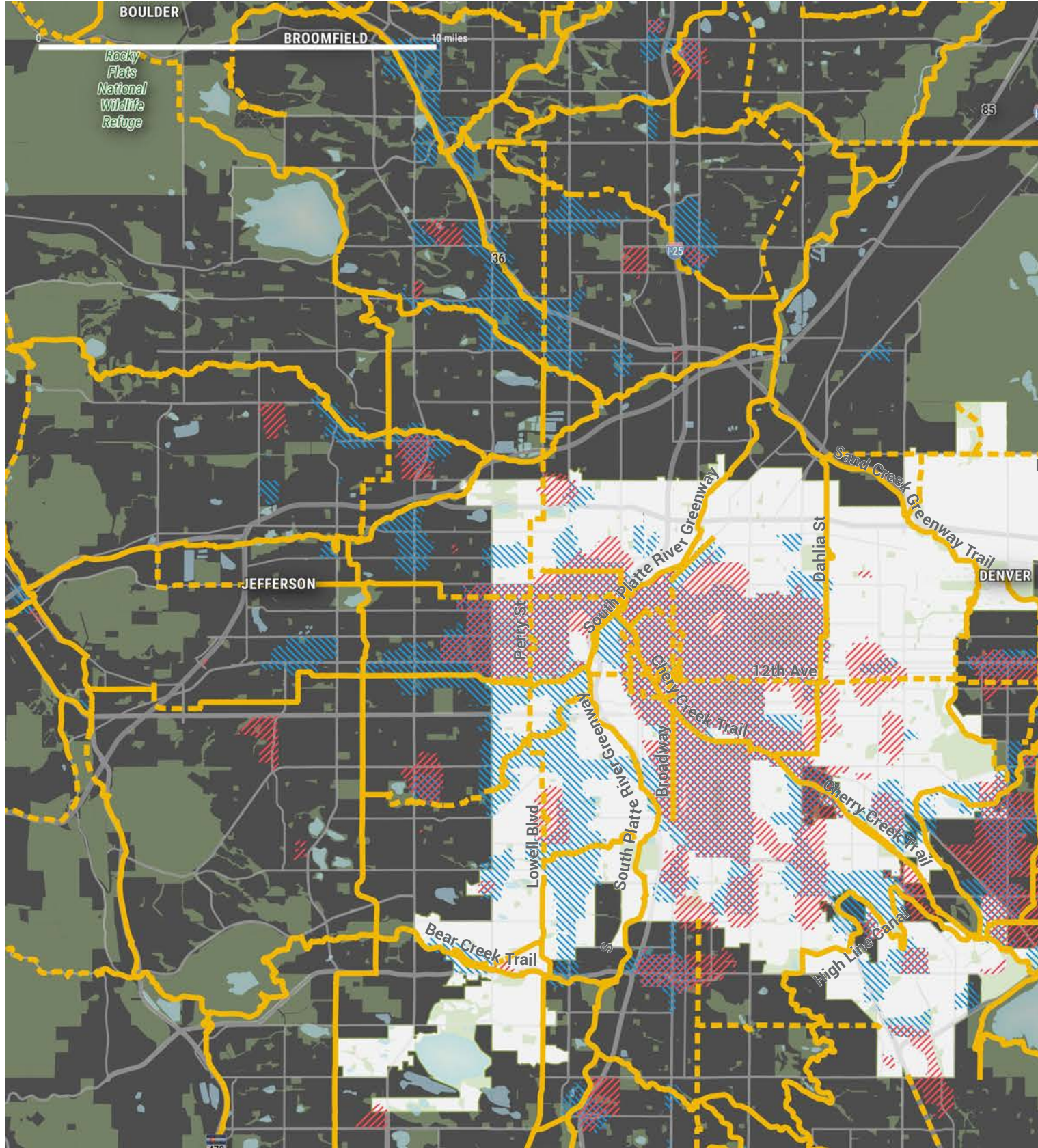
## Crashes

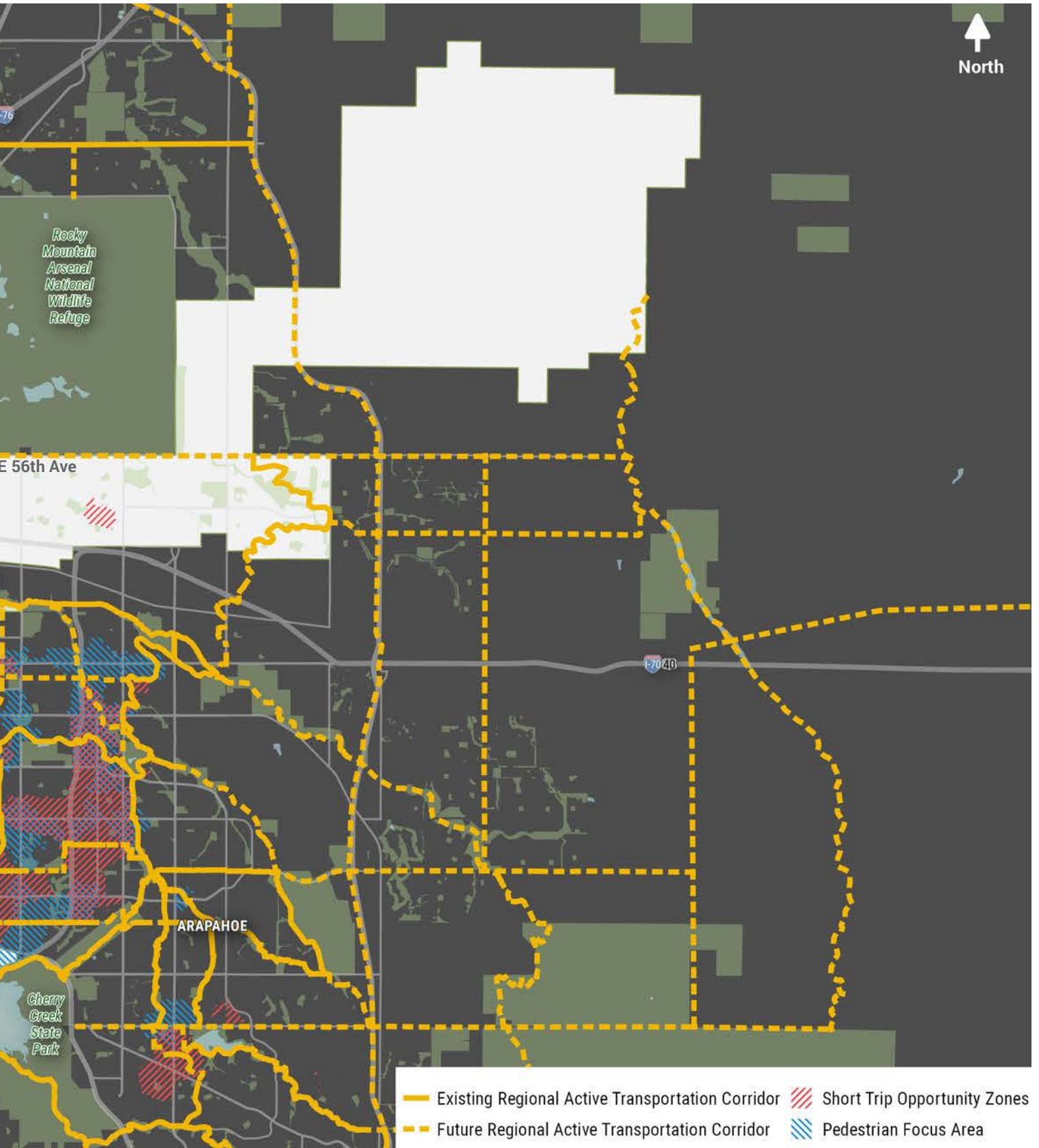
There were 2,217 reported pedestrian and bicycle crashes in Denver from 2010 to 2015, including 73 people killed in crashes involving a pedestrian, and 10 killed in crashes involving a bicycle. There were 498 pedestrian-related serious injuries and 217 bicyclist-related serious injuries in Denver in the same period. Denver experiences over 35 percent of the region's reported pedestrian and bicycle crashes.

**Figure 17. Commute Mode Share Compared to Traffic Fatalities**



**Figure 18. Regional Active Transportation Network, City and County of Denver**





# Douglas County

## PLANNING CONTEXT

Douglas County is situated in the southern portion of the Denver region, extending south from its boundary with Arapahoe County and east from its border with Jefferson County. Douglas County is home to numerous communities including Castle Rock, Larkspur, the Pinery, Westcreek, Parker, Franktown, Roxborough Park, Stonegate, Highlands Ranch, Sedalia, Louviers, Heritage Hills, Lone Tree, Castle Pines and Perry Park. The communities in the northern part of the County have been rapidly growing while lower-density residential and agriculture have been, and still are, the predominant land use in the southern part of the county. Approximately one-third of Douglas County is national forest land.

Douglas County's growth rate of nearly 17% from 2010 to 2017 is higher than the region's average, and second only to the City and County of Broomfield. It is anticipated that the County will continue to grow rapidly in population and employment over the next few decades. In 2017, the population in Douglas County was about 335,000. Douglas County is one of two counties in the region that experienced an increase in the percentage of families in poverty (from 2.1 percent to 2.8 percent) from 2007-2011 to 2012-2016. Further, Douglas County has the highest combined housing and transportation costs in the region of nearly \$39,000/year. Only 1 percent of households in Douglas County do not have a vehicle, and over 78 percent of Douglas County workers drove alone for their commute, the highest percentage in the region. Key health indicators in Douglas County are generally consistent with averages for the region. Douglas County has the third highest adult asthma rate in the region (9.5 percent).

### Master Planning and Active Transportation

Highlands Ranch's most popular community amenity is the outdoor recreation system, including a robust network of trails, sidewalks and bicycle lanes. The system in Highlands Ranch features concrete, crusher fine (gravel) and single-track facilities for a variety of users, connecting the community's recreation centers, commercial areas and parks. The southern portion of Highlands Ranch (Backcountry Wilderness Area) is dedicated to open space and trails. This system is a result of years of master planning prior to the build out of the community. The master planning process allowed Highlands Ranch to prioritize and include active transportation facilities for commuting and recreation.

## Plans and Policies

Several plans identifying bicycling and walking improvements have recently been completed in Douglas County. Highlights from the plans are shown in Table 16.

**Table 7. Sample of Local and County Plans that Influence Bicycling and Walking in Douglas County**

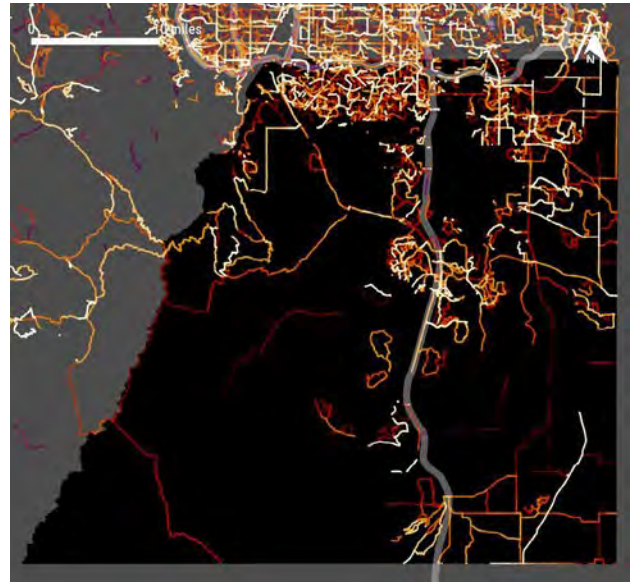
| Title  | Big Idea  |
|--|---|
| Lone Tree Walk and Wheel Report (2015)                       | This report includes six goals focusing on maintaining and expanding a well-connected trail, bikeway and walkway system. Two goals focus to ensure that implementation uses a variety of funding sources and that the consideration for walking and biking is more integrated into capital improvement projects and various agencies within the city. |
| Castle Rock Transportation Master Plan (2017)                | This plan focuses on developing a connected, vital, coordinated and safe system. The recommended bicycle network identifies facility types (on- and off-street) and includes regional off-street facilities. The plan also includes a goal for environmental stewardship.   |
| Town of Parker Transportation Master Plan (2014)             | This plan is founded on six main principles and envisions an integrated and interconnected multimodal system that promotes the health and well-being of residents. Data include areas within biking and walking distance of school, as well as areas within biking and walking distance of retail.  |
| Douglas County 2030 Parks, Trails and Open Space Master Plan | This plan is guided by seven goals and emphasizes the stewardship of the natural environment, a focus on public programs for recreation and public awareness of the use of the natural and built environments.  |



## WALKING AND BICYCLING IN DOUGLAS COUNTY

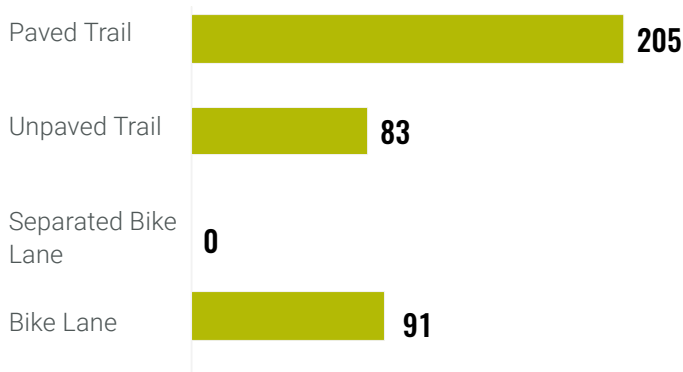
### Existing Facilities

The northern portion of Douglas County has a foundational network for biking and walking. Portions of the South Platte River Trail, the C-470/E-470 Trail, Cherry Creek Trail and Colorado Front Range Trail all pass through the county, providing links for residents to destinations inside the county and in adjacent counties. In addition to these regional trails, local off-street and on-street bike facility networks have been developed to varying degrees throughout the county. Douglas County has 2,307 miles of sidewalks.



Douglas County Strava data

Figure 19. Douglas County Bicycle Facility Mileage



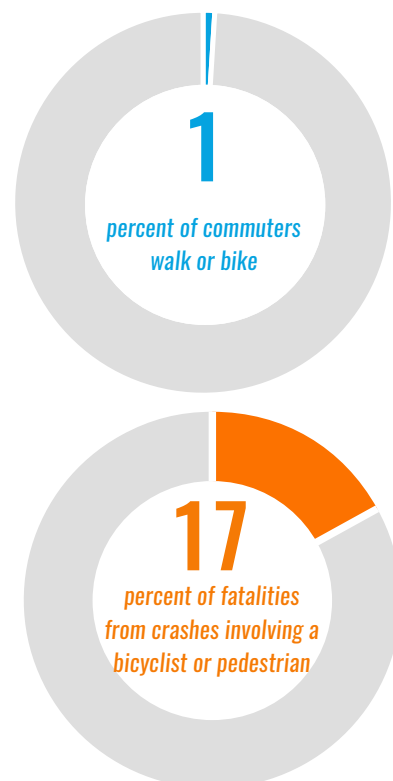
### Activity Level

Douglas County is mostly characterized by suburban and rural land use patterns, where lower density housing is separate from commercial and retail destinations. Because walking and bicycling commute rates to work are low (0.9 percent and 0.2 percent, respectively), linking active transportation with transit may be the most feasible way to increase walking and bicycling for commute trips. Recreation and leisure trips may offer the best opportunity to increase walking and bicycling in Douglas County.

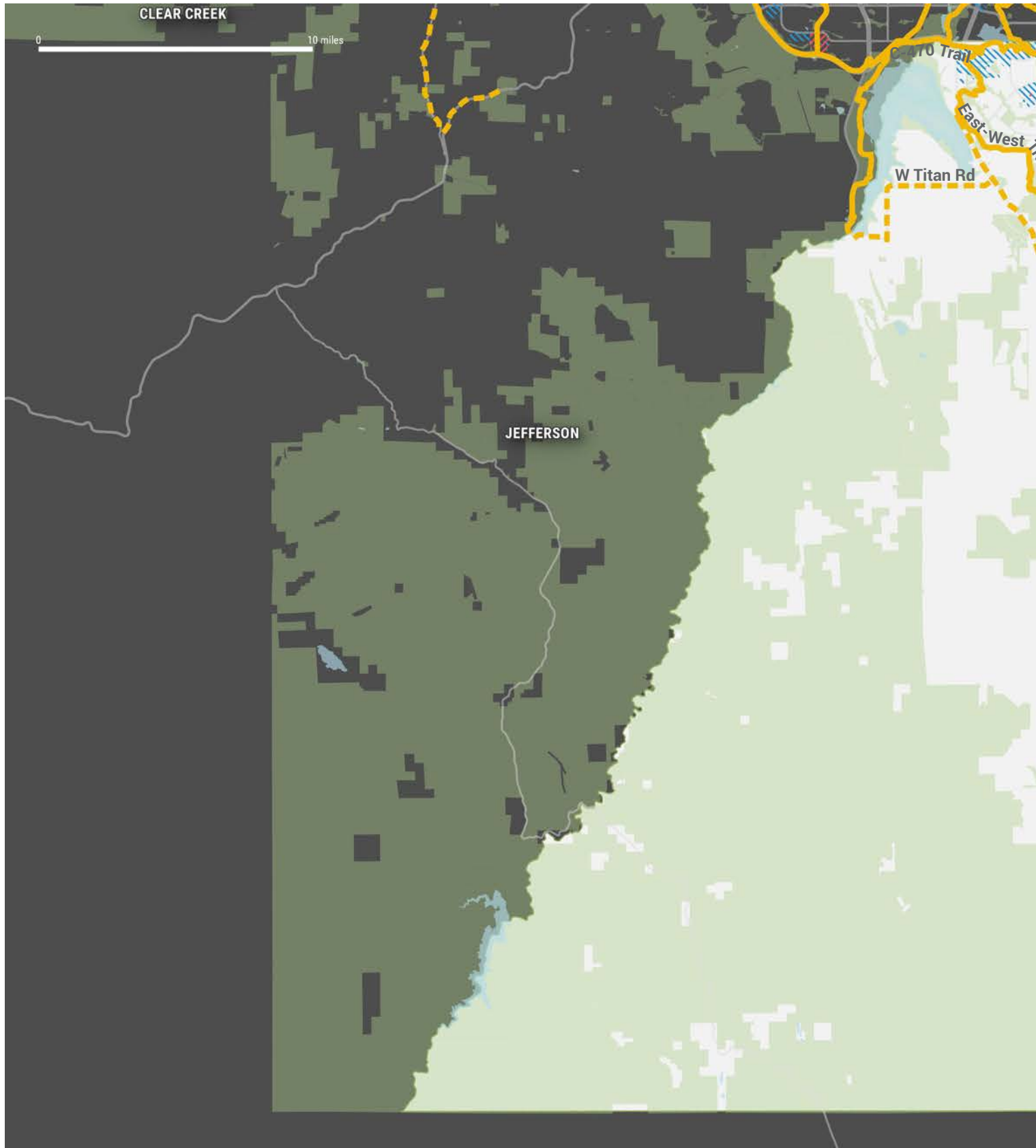
### Crashes

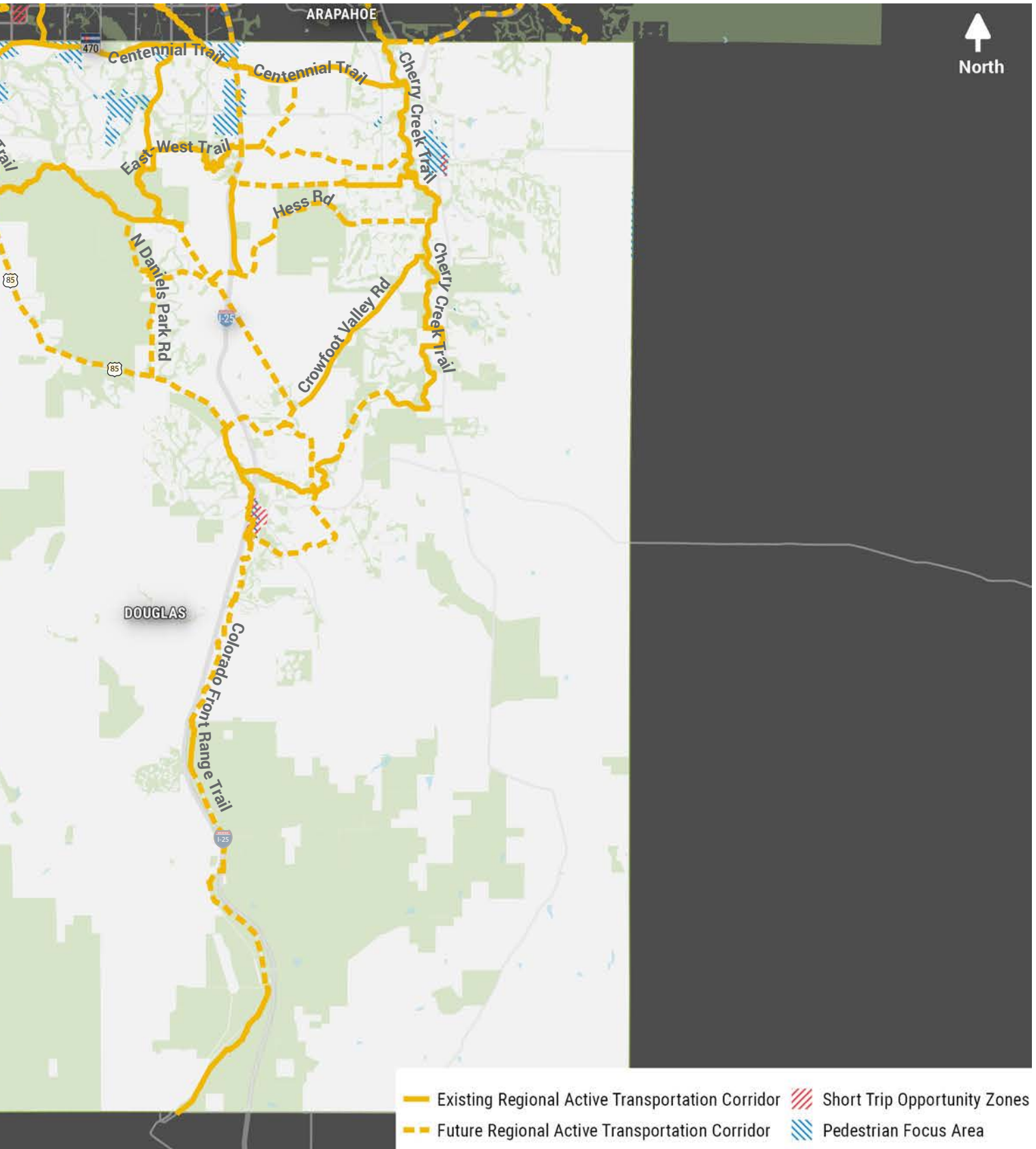
From 2010 to 2015, There were 358 reported pedestrian and bicycle crashes in Douglas County, including 12 people killed in crashes involving a pedestrian, and 2 killed in crashes involving a bicycle. There were 27 pedestrian-related serious injuries and 21 bicyclist-related serious injuries in the county in the same period. Douglas County experiences approximately 3 percent of the region's pedestrian and bicycle crashes.

Figure 20. Commute Mode Share Compared to Traffic Fatalities



**Figure 21. Regional Active Transportation Network, Douglas County**





# Gilpin County

## PLANNING CONTEXT

Gilpin County is in the western portion of the Denver region, extending west from its borders with Jefferson County and Boulder County and north from its border with Clear Creek County. Gilpin County is home to two small towns (Black Hawk and Central City), several small communities and a significant amount of national forest land. The primary travel corridor through Gilpin County is State Highway 119 from U.S. Route 6/Interstate 70 to State Highway 72 and Nederland.

With a population of about 6,000, Gilpin County is the least populated county in the Denver region and is home to less than 1 percent of region's total population (approximately 0.2 percent). Gilpin County experienced a relatively low growth rate compared with other counties in the region, averaging 9 percent from 2010 to 2017, and even experienced a decrease in population from 2010 to 2011. Gilpin County has the second-oldest average population in the region, behind Clear Creek County. Between the statistical periods 2007-2011, and 2012-2016, Gilpin County experienced a decrease in the percentage of families in poverty (from 6.4 percent to 4.5), like many counties in the region.

The mean travel time to work for Gilpin County workers is 34.7 minutes, the highest average commute time in the region. Nearly 25 percent of workers residing in Gilpin County commute over an hour each way. Gilpin County also has the highest average annual rate of vehicle miles traveled per household (over 26,000 miles a year). Gilpin County has the lowest obesity rate and the highest rate of adults who participate in substantial aerobic physical activity each week (74 percent). However, Gilpin County has the second-highest asthma rate (11 percent) in the region.

## Plans and Policies

A handful of plans identifying bicycling and walking improvements have recently been completed in Gilpin County. The City of Black Hawk and the City of Central City comprehensive plans both acknowledge the challenges to walking and biking that the steep mountainous terrain presents, but the plans also highlight the opportunity to use historic resources, such as tramways and railroad tracks, as trail linkages. Highlights from the plans are shown in Table 17.

### Biking and State Highway 119

Black Hawk is home to local bicycle routes on Gregory Street and Bobtail Road that connect to touring bicycle routes. State Highway 119 and County Route 279, which go through Black Hawk, are part of the Peak to Peak Scenic Byway (a state and nationally designated byway which extends from Estes Park to Black Hawk) and the Great Parks Bicycle Route (a 2,455-mile bicycle route that extends from Jasper, Alberta, to Durango, Colorado).

**Table 8. Sample of Local and County Plans that Influence Bicycling and Walking in Gilpin County**

| Title  | Big Idea   |
|--|--|
| City of Black Hawk Comprehensive Plan (2004)   | Related to transportation, the plan highlights the recreational opportunities and opportunities for bikeways. The plan acknowledges the challenges to walking and biking due to the mountain terrain and the hazardous abandoned mines. The plan recommended formal trail definition on existing and proposed routes as well as links to Golden Gate Canyon State Park.  |
| City of Central City Comprehensive Plan (2017) | This plan is guided by five primary goals. A secondary goal to enhance pedestrian and bike mobility in the city is identified and the plan acknowledges the challenges to walking and biking due to steep terrain. The plan recommends using historic tramway, railways and other regional corridors to develop a paved and unpaved regional trail network.  |
| Gilpin County Master Plan (2017)               | This plan is guided by three overall principles and eleven goals. The recreation goal recommends that the county concentrate its efforts away from land-intensive passive recreation (such as hiking trails) and more toward facility-orientated active recreation (such as baseball and soccer). The roads goal recommends the county should encourage a road system which is compatible with the natural environment and the rural heritage of the area. |

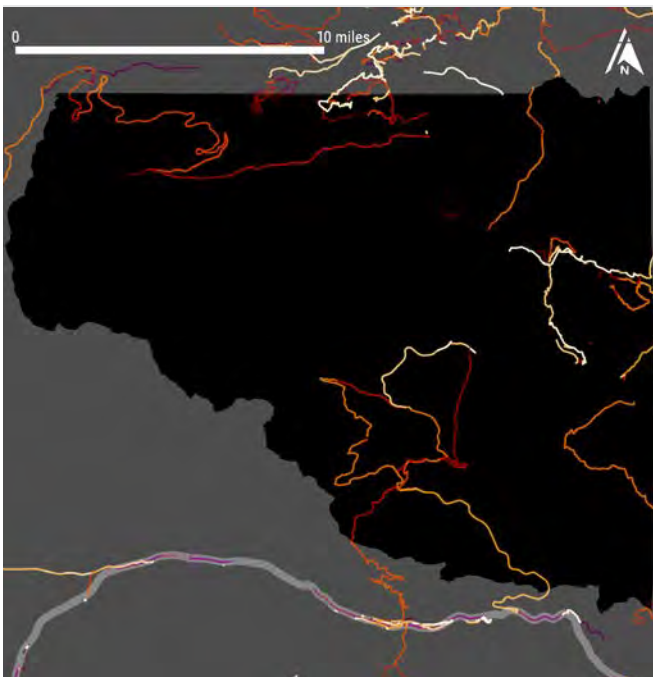
## WALKING AND BICYCLING IN GILPIN COUNTY

### Existing Facilities

The communities of Black Hawk and Central City have a limited network of sidewalks and Rollinsville does not currently have any sidewalks. The mountainous terrain of Gilpin County limits the routes available for connecting the smaller towns to each other. Portions of State Highway 119 have 4-foot and 6-foot shoulders, but they are not continuous. Some recreational trails exist in the national forest lands and in state parks such as Golden Gate Canyon State Park. Gilpin County has about seven miles of sidewalks.

### Activity Level

Approximately 2 percent of Gilpin County workers walk or bike to work (2.0 percent and 0.1 percent, respectively). It is likely that these employees live and work in the same town since Gilpin County is characterized by small towns nestled in mountainous terrain, and efforts to increase walking and biking trips may be best served by focusing on these areas. Nearly 70 percent of workers who live in Gilpin County are employed in another county, potentially limiting walking and bicycling as a commute option for many workers.

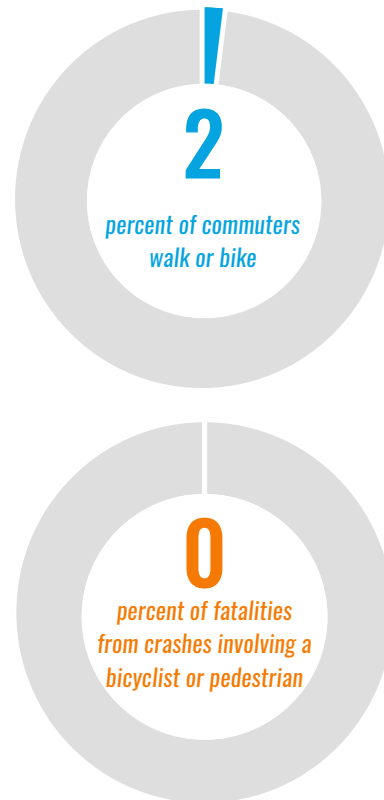


Gilpin County Strava data

### Crashes

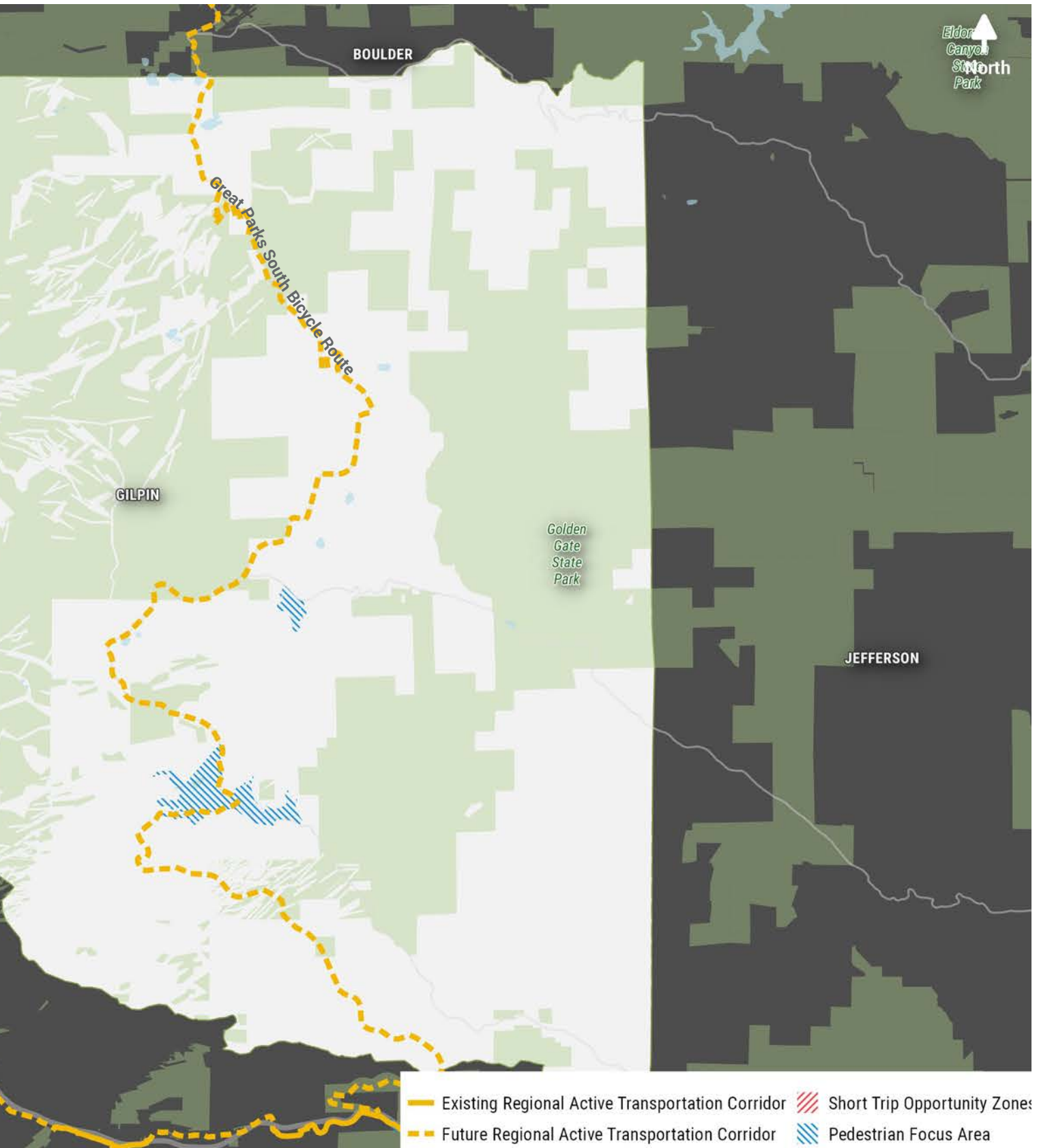
There were six reported pedestrian and bicycle crashes in Gilpin County from 2010 to 2015. No fatalities were reported. There were no pedestrian serious injuries and no bicyclist serious injuries in the county in the same period.

Figure 22. Commute Mode Share Compared to Traffic Fatalities



**Figure 23. Regional Active Transportation Network, Gilpin County**





# Jefferson County

## PLANNING CONTEXT

Jefferson County is situated in the western and south portions of the Denver region. Jefferson County is home to many communities including Lakewood, Morrison, Kittredge, West Pleasant View, East Pleasant View, Golden, Ken Caryl, Indian Hills, Edgewater, Evergreen, Lakeside, Mountain View, Conifer, Wheat Ridge, Aspen Park, Idledale and Genesee. Jefferson County is the third-largest county in the region by size, behind Adams and Arapahoe Counties. Approximately one-quarter of Jefferson County is national forest land.

With a population of just over 574,000, Jefferson County is home to approximately 17 percent of the region’s total population. Jefferson County’s growth percentage of 7.3 percent from 2010 to 2017 is lower than the region’s average, and second-lowest in the region only to Clear Creek County.

Jefferson County experienced a slight decrease in the percentage of families in poverty from 2007-2011 to 2012-2016 (from 5.8 percent to 5.1 percent). Approximately 12 percent of households in Jefferson County do not have a vehicle, and over 78 percent of Jefferson County workers drove alone for their commute, the highest percentage in the region, shared with Douglas County. Key health indicators in Jefferson County are consistent with averages for counties in the region, with an obesity rate of 56 percent and an asthma rate of 9.3 percent.

## Plans and Policies

Several plans identifying bicycling and walking improvements have recently been completed in Jefferson County. Highlights from the plans are shown in Table 18.

### Mountain Biking in Jefferson County

Jefferson County’s mountain biking network is one of the most extensive systems in the country and includes over 258 miles. The system offers a network of trails ranging from paved regional trails to single-track mountain biking trails in open space properties like Apex Park and Reynolds Park. Jefferson County’s trail system attracts residents as well as visitors from the Front Range and beyond.

Taking care of existing trails is a top priority for the county. To do so effectively and efficiently, an annual trails assessment was implemented. The assessment helps to develop work plans and priorities for trail maintenance, identify opportunities for volunteer stewardship projects by groups or as a special event and communicate to visitors where maintenance will be occurring.

**Table 9. Sample of Local and County Plans that Influence Bicycling and Walking in Jefferson County**

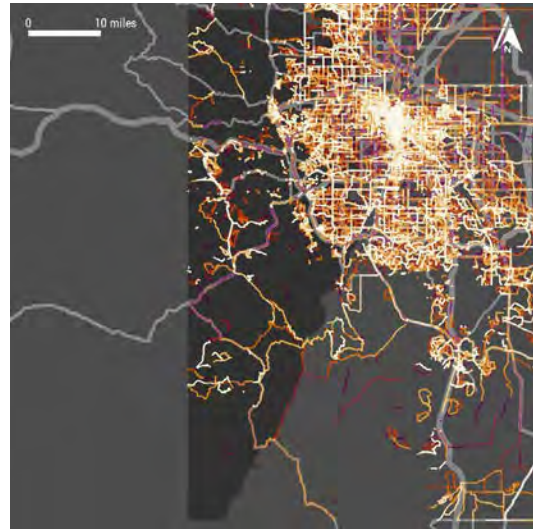
| Title  | Big Idea  |
|--|---|
| Jeffco Regional Bikeways Wayfinding Guide (2016)       | The goal of the guide is to develop a regional wayfinding network of well-used, more intuitively navigable and memorable bicycle routes. The guide provides universal graphic standards, so each jurisdiction can implement signage within its jurisdiction.  |
| Arvada Bicycle Master Plan (2017)                      | The goal of the plan is to build a connected and comfortable bicycle network, create a safe place for all types of bicyclists to ride and turn bicycling into a convenient form of travel for all trips. Specific targets are identified such as the percent of trips made by bicycle and percent of residents who find it very easy to travel by bike.   |
| City of Edgewater Comprehensive Plan (2013)            | The plan’s policies and strategies focus on creating a sense of place. Strategies include creating an attractive pedestrian and bicycle friendly environment to promote livability, quality of life, a stronger sense of place, sustainability and healthy lifestyles.  |
| City of Lakewood Bicycle Master Plan                   | The Lakewood Bicycle Master Plan serves as an update to the city’s first bicycle plan, adopted in 2005, and includes goals such as creating educational programs to promote bicycling and improve safety for bicyclists, and further developing a connected bicycle network.  |
| City of Wheat Ridge Bicycle and Pedestrian Master Plan | The Wheat Ridge Bicycle and Pedestrian Master Plan identifies a low-stress bicycle network and pedestrian priority routes. The bicycle network includes recommendations for several low-cost neighborhood bikeways, emphasizing connectivity and comfort. For pedestrians, the focus is on prioritizing sidewalk gaps along busy roads and connecting residents (especially seniors) to important community destinations. |



# WALKING AND BICYCLING IN JEFFERSON COUNTY

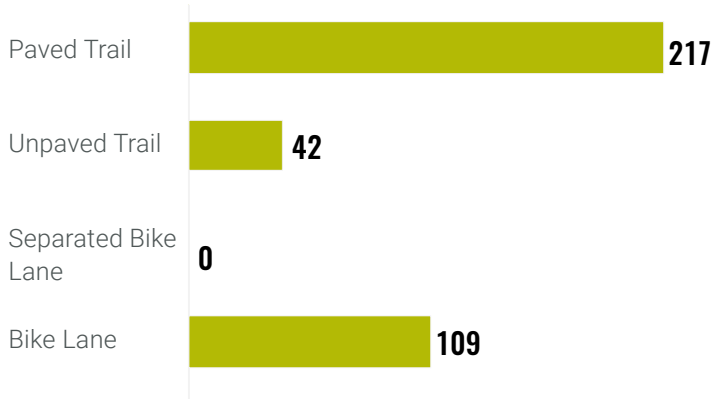
## Existing Facilities

The northern half of Jefferson County has a foundational network for biking and walking. Portions of the C-470 Trail, Clear Creek Trail and Colorado Front Range Trail all pass through the county, providing links for residents to destinations inside the County and in adjacent counties. In addition to these regional trails, local off-street and on-street bike facility networks have been developed to varying degrees throughout local communities in the county. Jefferson County has 3,762 miles of sidewalks.



Jefferson County Strava data

**Figure 24. Jefferson County Bicycle Facility Mileage**



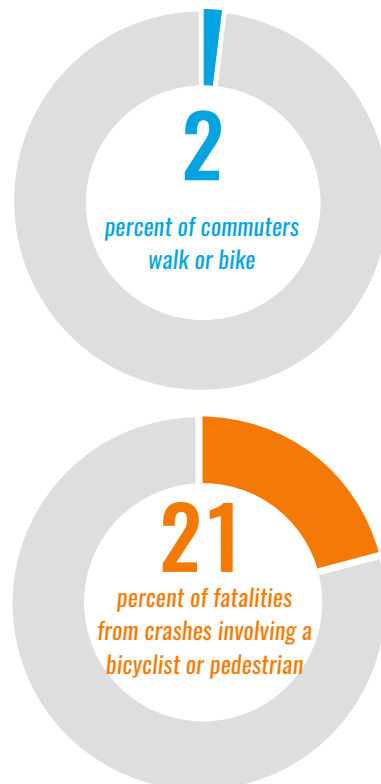
## Activity Level

Jefferson County is mostly characterized by suburban and rural land use patterns, where lower density housing is separate from commercial and retail destinations. Additionally, approximately two-thirds of Jefferson County residents leave the county for work. These challenges are reflected in the county's lower walking and bicycling commute rates (1.6 percent and 0.6 percent, respectively). Linking active transportation with transit may be the most feasible way to increase walking and bicycling for commute trips. However, beyond work trips, Jefferson County is known for high levels of recreational bicycling and can build on this characteristic moving forward.

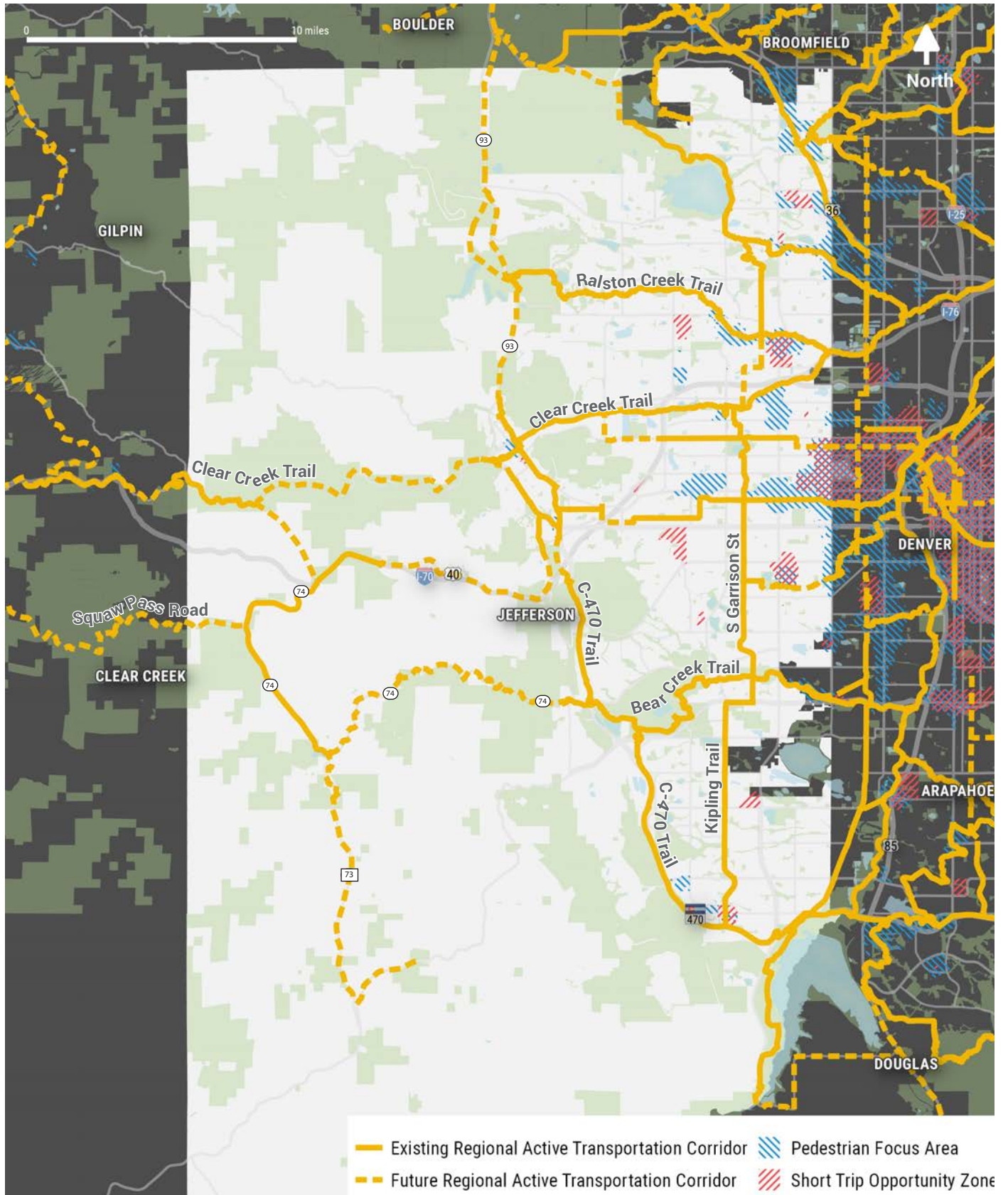
## Crashes

From 2010 to 2015, There were 1,706 reported pedestrian and bicycle crashes in Jefferson County, including 40 people killed in crashes involving a pedestrian, and 11 killed in crashes involving a bicycle. There were 173 pedestrian-related serious injuries and 77 bicyclist-related serious injuries in the county in the same period.

**Figure 25. Commute Mode Share Compared to Traffic Fatalities**



**Figure 26. Regional Active Transportation Network, Jefferson County**



This page intentionally left blank.

# Southwest Weld County

## PLANNING CONTEXT

Southwest Weld County is situated in the northern and eastern portion of the Denver region, extending north from its boundaries with the City and County of Broomfield and Adams County, and east from its border with Boulder County. The southwest portion of Weld County is home to many communities including Dacono, Frederick, Firestone, Longmont and Mead. The main corridors in Southwest Weld County include State Highway 52, State Highway 119, State Highway 66 and Interstate 25.

Weld County (overall) experienced a significant growth in population, adding nearly 20 percent of its population from 2010 to 2017. In 2017, the population of the entire county was just over 304,000. The communities located along I-25 and within the Denver region, specifically Dacono, Frederick, Firestone and Mead, experienced significant population growth along with employment growth. Many residents of these bedroom communities commute north to Loveland and Fort Collins, east to Longmont and Boulder and south to Denver for employment. Weld County (overall) has the highest obesity rate (66 percent) and the lowest rate of adults who participate in substantial aerobic physical activity each week (53 percent) among counties in the Denver region.

### Regional Trails in Southwest Weld County

Southwest Weld County is home to many rapidly developing communities, including Mead. As a part of their comprehensive planning process, these communities have identified local and regional trail connections to support their envisioned on-street bicycle and walking facilities.

Interconnected trail systems are planned to connect local lakes and reservoirs to streams and rivers. Mead has a vision for a looping trail system to link to other regional trails. For example, the St. Vrain Loop trail is envisioned to circle the entirety of Mead and eventually connect to the South Platte River Trail, which would connect users to communities like Evans and Greeley, and beyond into northeastern Colorado.

## Plans and Policies

Several plans identifying bicycling and walking improvements have recently been completed in Southwest Weld County. Highlights are shown in Table 19.

**Table 10. Sample of Local and County Plans that Influence Bicycling and Walking in Southwest Weld County**

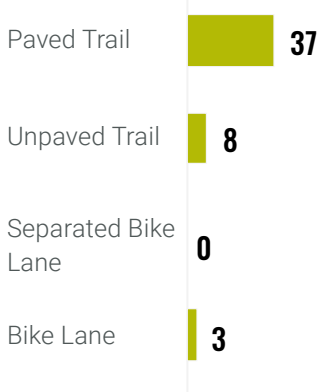
| Title                                       | Big Idea   |
|---|--|
| Town of Firestone Master Plan (2013)        | The plan emphasizes the off-street walking and biking infrastructure with the goal of becoming a pedestrian and nonmotorized connected community, where one can walk to work, home or service centers on a comfortable and convenient trail system.  |
| Weld County 2035 Transportation Plan (2011) | The plan emphasizes coordination among agencies and encourages partnerships with the CDOT, North Front Range Metropolitan Planning Organization, DRCOG, Upper Front Range Transportation Planning Region, municipalities, special districts and private entities to coordinate transportation improvements, land use strategies and enhance interagency communication. Weld County does not have a formal bikeway system; municipalities designate bike routes, on-street striped bike lanes and off-road multipurpose trails. |
| Town of Frederick Comprehensive Plan (2015) | The plan includes a goal to provide infrastructure and services to maintain and support a high quality of life for residents and businesses through collaborative efforts and partnerships. The plan recommendations for existing and proposed trails, as well as sidewalks and bike lanes.  |

# WALKING AND BICYCLING IN SOUTHWEST WELD COUNTY

## Existing Facilities

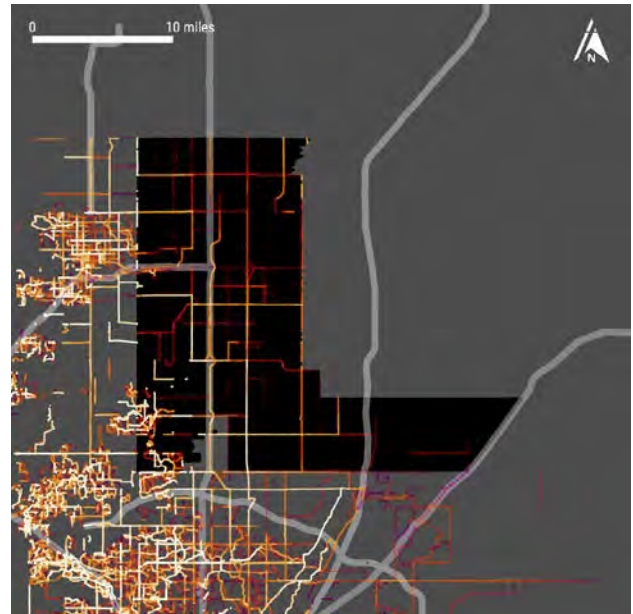
Southwest Weld County has limited facilities for walking and biking. Colorado Boulevard, from County Road 12 to approximately County Road 26, is the longest regional trail and connects Dacono, Frederick and Firestone. St. Vrain State Park also includes localized trails for recreating within the state park. Local off-street and on-street bike facility networks have been developed to varying degrees throughout local communities in southwest Weld County. Overall, Weld County has 762 miles of sidewalks in the DRCOG inventory.

**Figure 27. Southwest Weld County Bicycle Facility Mileage**



## Activity Level

Southwest Weld County is mostly characterized by rural land use patterns, where lower density housing is separate from smaller nodes of commercial and retail. The percentages of workers who commute to work by walking or bicycling are 2.3 percent and 0.4 percent, respectively.

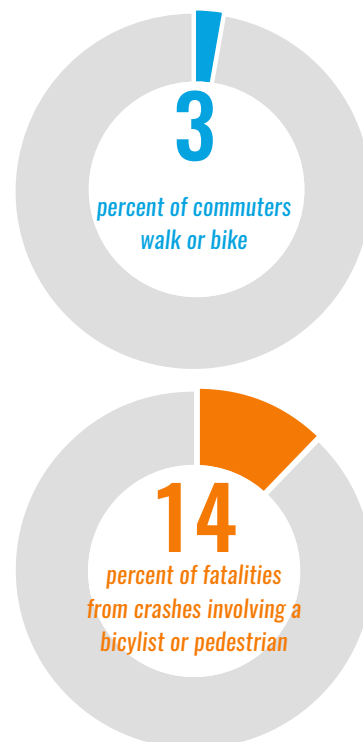


Southwest Weld County Strava data

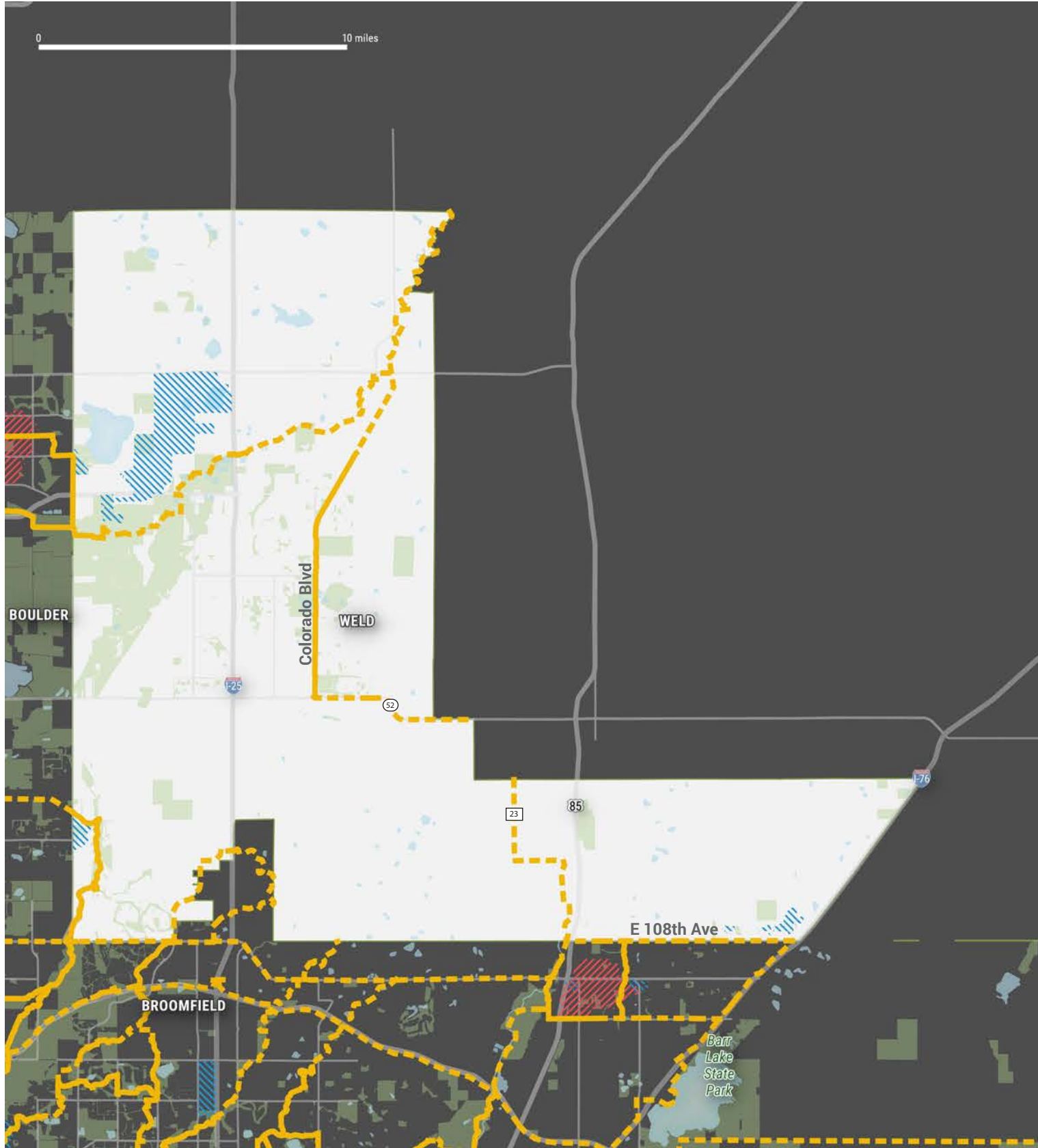
## Crashes

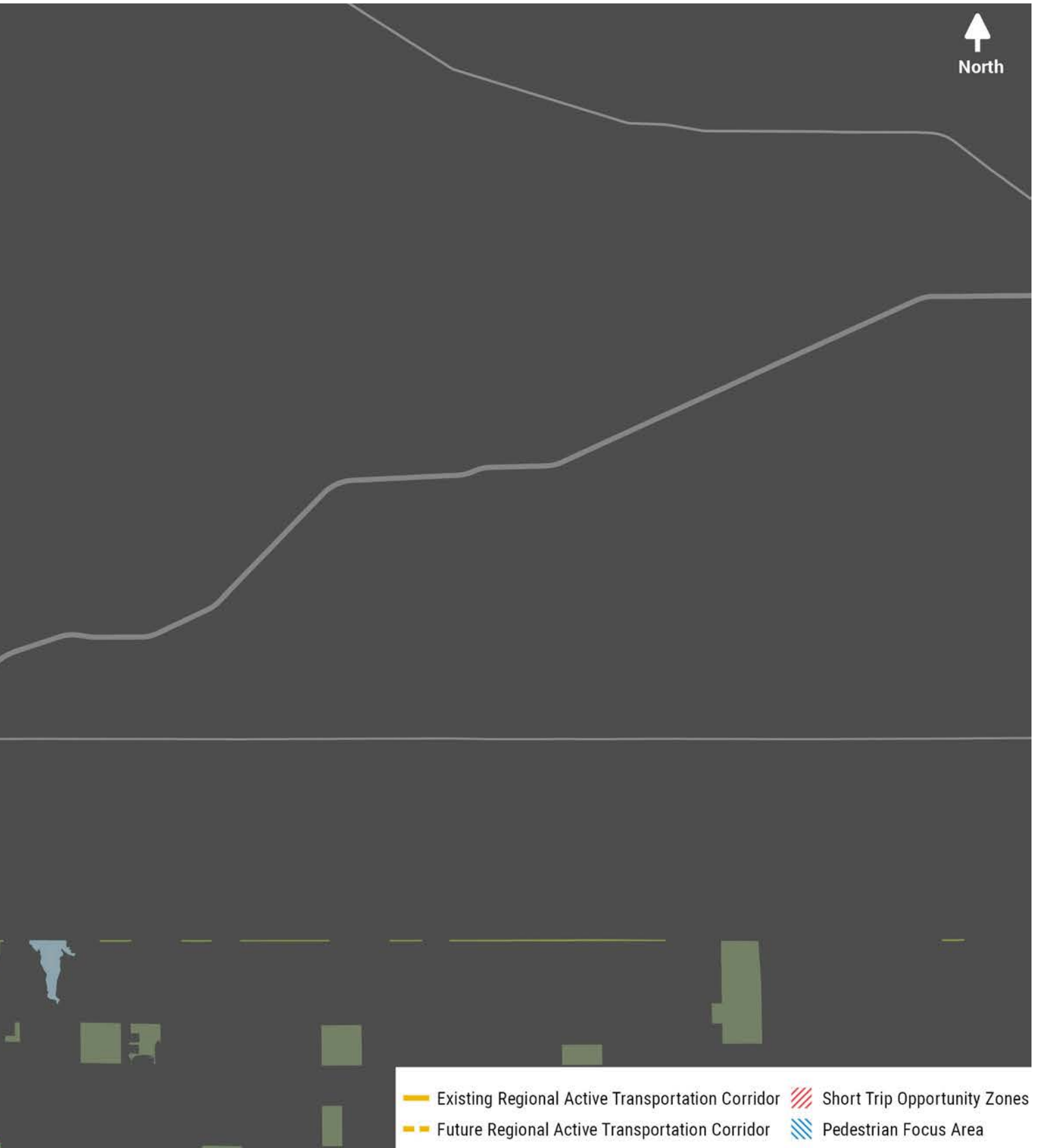
From 2010 to 2015, there were 39 reported pedestrian and bicycle crashes in southwest Weld County, including four people killed in crashes involving a pedestrian and one killed in a crash involving a bicycle. There were six pedestrian-related serious injuries and five bicyclist-related serious injuries in the county in the same period.

**Figure 28. Commute Mode Share Compared to Traffic Fatalities**



**Figure 29. Regional Active Transportation Network, Southwest Weld County**











APPENDIX B:

**Denver Regional Council of Governments**  
**Survey of Residents about Active Transportation**

---

**Report of Results**

**August 2018**

Prepared by:



**NRC**  
National Research Center Inc



## Table of Contents

|   |            |
|---|------------|
| <b>Key Findings</b> .....   | <b>1</b>   |
| <b>Survey Background</b> .....  | <b>3</b>   |
| <b>Modal Share of the Work Commute</b> .....  | <b>4</b>   |
| <b>Active Transportation (Walking and Bicycling)</b> .....  | <b>7</b>   |
| <b>Feelings of Safety and Comfort Bicycling</b> .....   | <b>10</b>  |
| <b>Perception of Neighborhood as Bicyclist and Pedestrian Friendly</b> .....  | <b>15</b>  |
| <b>Transportation of School-Aged Children</b> .....   | <b>20</b>  |
| <b>Factors Influencing Mode Choices</b> .....   | <b>22</b>  |
| <b>References</b> .....   | <b>33</b>  |
| <b>Appendix A: Mailed-Invitation Results (“Scientific”)</b> .....   | <b>34</b>  |
| <b>Appendix B: Opt-In Results</b> .....   | <b>52</b>  |
| <b>Appendix C: Comparison of Scientific and Opt-In Survey Results</b> .....   | <b>70</b>  |
| <b>Appendix D: Selected Survey Responses by Selected Respondent Characteristics</b> .....                                 | <b>81</b>  |
| Selected Survey Responses by Age of Respondent.....   | 82         |
| Selected Survey Responses by Gender of Respondent.....  | 91         |
| Selected Survey Responses by Housing Tenure (Rent or Own).....  | 98         |
| Selected Survey Responses by Race/Ethnicity of Respondent.....  | 107        |
| Selected Survey Responses by Whether Respondent Typically Bicycled for Any Purpose<br>in Previous Year.....               | 115        |
| Selected Survey Responses by Whether Respondent Typically Walked, Jogged or Ran<br>for Any Purpose in Previous Year ..... | 125        |
| Selected Survey Responses by Whether Household Has One or More Bicycles .....   | 135        |
| Selected Survey Responses by Whether Household Has One or More Passenger<br>Vehicles.....                                 | 144        |
| Selected Survey Responses by Presence of Children in Household.....   | 152        |
| Selected Survey Responses by Type of Bicyclists .....   | 159        |
| Crosstabulations of Comfort and Actual Riding of Bicycle in Various Scenarios<br>(Question #9 and #10).....               | 168        |
| <b>Appendix E Survey Methodology</b> .....  | <b>172</b> |
| <b>Appendix F: Survey Materials</b> .....   | <b>178</b> |

## Key Findings

National Research Center, Inc. through a subcontract with Toole Design Group, LLC (TDG) worked with staff from TDG and Denver Regional Council of Governments (DRCOG) to develop a short survey about interest in, and barriers to, using active transportation modes in the region. An invitation to complete the survey was mailed out to a random sample of 5,000 postal addresses in the 10-county DRCOG planning area. Out of the 4,789 invitations that are presumed to have reached an occupied household, 369 resulted in a completed survey for a response rate of 7.7%. With 369 responses, the 95% confidence interval or “margin of error” is plus or minus  $\pm 5.1\%$  around any given percentage point.

In addition to the “scientific” survey, DRCOG and TDG staff promoted the survey by sharing a unique URL with partners and interested parties with the intention of gathering responses from as wide a sample of community members as possible. This “opt-in” effort resulted in the completion of 412 surveys that are identified by the unique URL. The key findings presented here are only from the mailed scientific survey.

- **Among employed respondents, about 8 in 10 drove alone as all or part of their work commute on one or more days of the week previous to which they completed the survey.**

About three-quarters (74%) of respondents were employed full- or part-time when they completed the survey. Employed respondents indicated the modes they had used to go to and from work each day of the previous week. Overall, 61% of all work commute trip segments were made by driving alone.

The most common reason given for driving as their primary transportation to get to work was that it was the quickest or most convenient way to get to work. Other options frequently chosen by respondents included having an irregular work schedule, feeling that it takes too long to use public transportation and the need or desire to make stops or run errands on the way to or from work.

- **Two in 10 employed respondents walked for one or more of their work commute trip segments in the previous week, while 13% had bicycled.**

Walking accounted for 8% of all work commute trip segments while bicycling accounted for 5% of work commute trip segments.

- **In a typical month with good weather, about 8 in 10 respondents said they had walked, jogged or ran for any purpose in the past year, and 5 in 10 had bicycled.**

Most of those who had engaged in active transportation in a typical month had done so for fun or exercise.

- **About half of all respondents had walked for transportation to get to a destination other than work in a typical month with good weather, while about 3 in 10 had bicycled for this purpose.**

- **Less than 2 in 10 of all respondents had walked, jogged or ran to work in a typical month (15%) or had bicycled to work in a typical month (17%).**

- **About 4 in 10 respondents said they did not want to walk as a means of transportation, and a similar proportion said they did not want to bicycle as a means of transportation.**

- **About 5% of all respondents said they would feel very comfortable and 7% would feel somewhat comfortable riding a bicycle on a four-lane roadway with no bicycle lane.**

Those completing the Active Transportation Survey assessed how comfortable or uncomfortable they would feel riding a bicycle in a variety of different situations. The scenarios ranged from biking on a path or trail separate from a street to riding on a major street with two or three traffic lanes in each direction with no bike lanes. Respondents were instructed to answer these questions regardless of whether they ever actually did bicycle at all or in these situations.

- **Roughly 2 in 10 respondents would feel very comfortable on a two- or four-lane roadway with a bicycle lane, and an additional 4 in 10 would feel somewhat comfortable.**

- **In general, comfort levels riding in each specific situation were correlated with higher levels of having actually ridden a bicycle in that situation.**

- **A majority of respondents rated most aspects of their neighborhoods as somewhat bicyclist and pedestrian friendly.**

All of those surveyed, whether or not they were current bicyclists or pedestrians, were asked whether they agreed or disagreed with twelve statements about their neighborhood. An index score was calculated from these statements to provide a single measure of the extent to which a neighborhood was friendly to bicyclists and pedestrians.

- **Those with more bicyclist and pedestrian friendly neighborhoods were more likely to have bicycled and mildly more likely to have walked.**

- **Respondent who reported having more types of destinations easily accessible from home were more likely to have bicycled for their work commute and to have bicycled for other purposes.**

## Survey Background

National Research Center, Inc. through a subcontract with Toole Design Group, LLC (TDG) worked with staff from TDG and the Denver Regional Council of Governments (DRCOG) to develop a short survey about interest in, and barriers to, using active transportation modes in the region.

An invitation to complete the survey was mailed out to a random sample of 5,000 postal addresses in the 10-county DRCOG region. Each household was mailed a postcard, a letter and a reminder postcard that included instructions on how to access a URL to complete the survey online. Of the 5,000 addresses, about 211 of the invitations were returned as undeliverable. Out of the 4,789 invitations that are presumed to have reached an occupied household, 369 resulted in a completed survey for a response rate of 7.7%. With 369 responses, the 95% confidence interval or “margin of error” is plus or minus  $\pm 5.1\%$  around any given percentage point. More information about the survey methodology can be found in *Appendix E Survey Methodology*, while the questionnaire itself along with the mailing materials can be found in *Appendix F: Survey Materials*.

Additionally, DRCOG and TDG staff promoted the survey by sharing a unique URL with partners and interested parties with the intention of gathering responses from as wide a sample of community members as possible. This “opt-in” effort resulted in the completion of 412 surveys that are identified by the unique URL.

Survey results from the randomly selected mail sample and the opt-in sample were compared and, even after weighting to population norms, were found to be significantly different in question response. Those who participated in the opt-in survey had higher rates of use for active transportation mode than those in the random mail sample; perhaps because those who do use active transportation are more likely to be connected to community agencies promoting the survey. Because of this bias, their results are reported separately from the mailed survey, which being a random sample, better represents the general population. Tables of results for the two survey efforts can be found in *Appendix A: Mailed-Invitation Results (“Scientific”)* and *Appendix B: Opt-In Results*. Also provided is a comparison of select survey results for the scientific and opt-in surveys (see *Appendix C: Comparison of Scientific and Opt-In Survey Results*). Crosstabulations of selected scientific survey results by selected respondent characteristics are also provided (see *Appendix D: Selected Survey Responses by Selected Respondent Characteristics*).

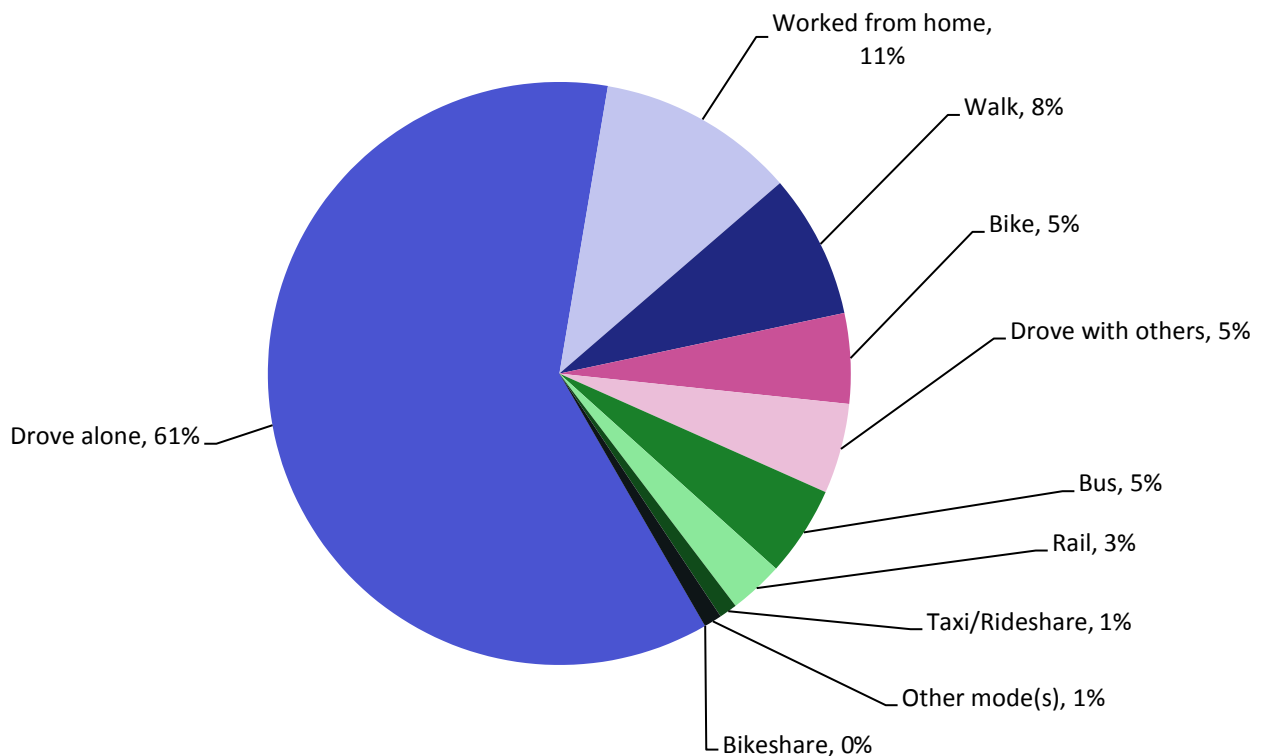
## Modal Share of the Work Commute

The modal share of the work commute was assessed through the survey, mainly for the purpose of identifying, characterizing, and comparing mode users. About three-quarters (74%) of respondents were employed full- or part-time when they completed the survey (see Table 1 in *Appendix A: Mailed-Invitation Results (“Scientific”)*). Employed respondents indicated the modes they had used to go to and from work each day of the last week.

About 6 in 10 (61%) of all work commute trip segments were made by driving alone. The next most common modes used for the work commute trip segments were walking (8%), biking (5%) and carpooling (5%). About 1 in 10 work commute trips were replaced by employees working from home, or were employees who worked from home in addition to having commuted to their workplace.

**Figure 1: Modal Share of Work Commute Trip Segments**

In the last week that you worked, please indicate all of the ways you traveled to or from work each day (please select all that apply). Graph shows average percent of all trips made by each mode for the work commute (including if more than one mode was used on the same day).



Many respondents indicated that they used more than one mode for their work commute in the previous week. For some respondents, they may have used multiple modes for a single one-way commute; for example, by walking to a bus stop or rail station and riding transit. Other respondents may have used different modes on different days; for example, driving alone to and from work on a Monday, but riding their bicycle on Tuesday. Some used multiple modes per day and used different modes on different days.

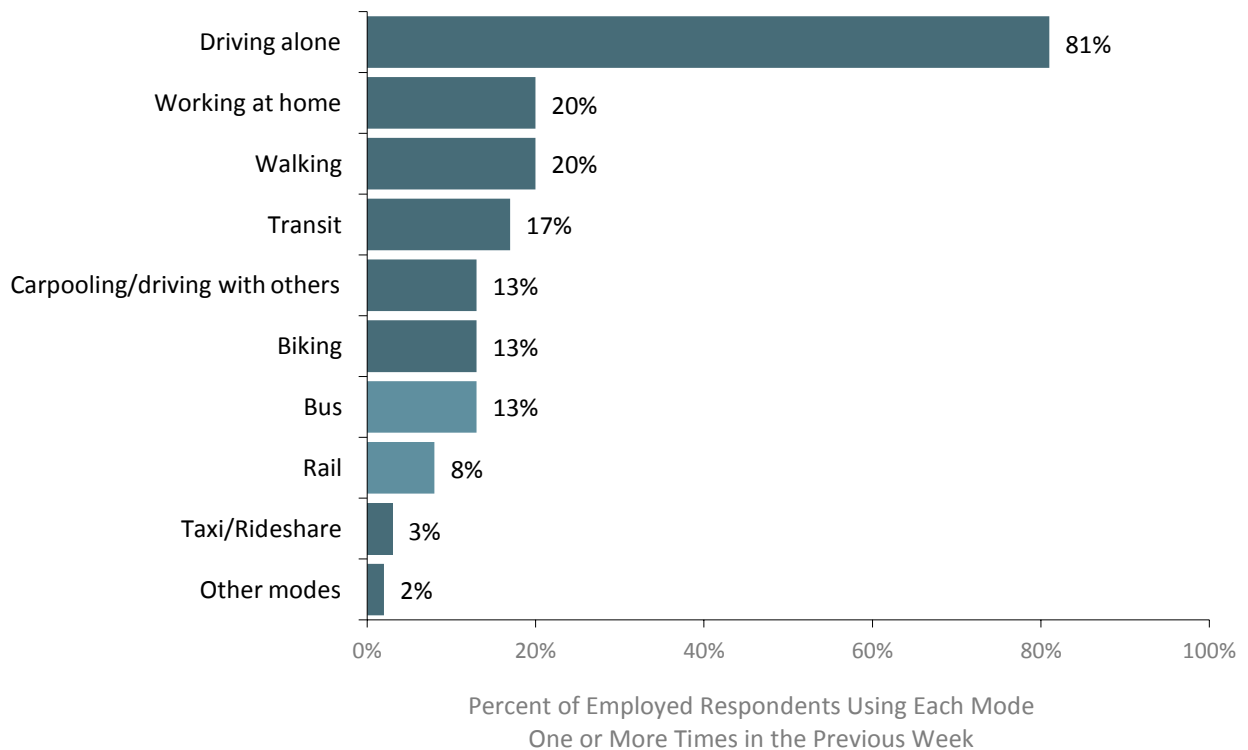
Figure 1 on the previous page showed the proportion of all the work commute trips and segments that were made via the various modes. Figure 2 below displays the proportion of respondents who indicated they had used each mode at least once for the work commute during the previous week. The rank order of the popularity of the different mode choices remained similar with both analyses, but the figure below can show what proportion of employees are able to make their commute in a typical week without dependence on a private vehicle. As shown, 8 in 10 employed respondents had driven a single-occupancy vehicle for one or more segments of their work commute, indicating that about 2 in 10 employees have chosen to usually use alternate modes for their work commute.

About 2 in 10 employed respondents had walked, while 13% had biked. Bus had been used for the work commute at least once in the week previous to completing the survey by 13% of respondents, while 8% had used rail. Some respondents had used both bus and rail; overall 17% had used some form of transit.

Two in 10 employed respondents said they had worked at home one or more days of the previous week. However, given that only 11% of all work commute segments were classified as working from home, it's likely that many of these employees may have gone to their workplace for at least part of the day on the days they also completed some work from home.

**Figure 2: Proportion of Respondents Using Each Mode At Least Once for the Work Commute in a Typical Week**

In the last week that you worked, please indicate all of the ways you traveled to or from work each day (please select all that apply). Graph shows percent of employed respondents using each mode at least once.

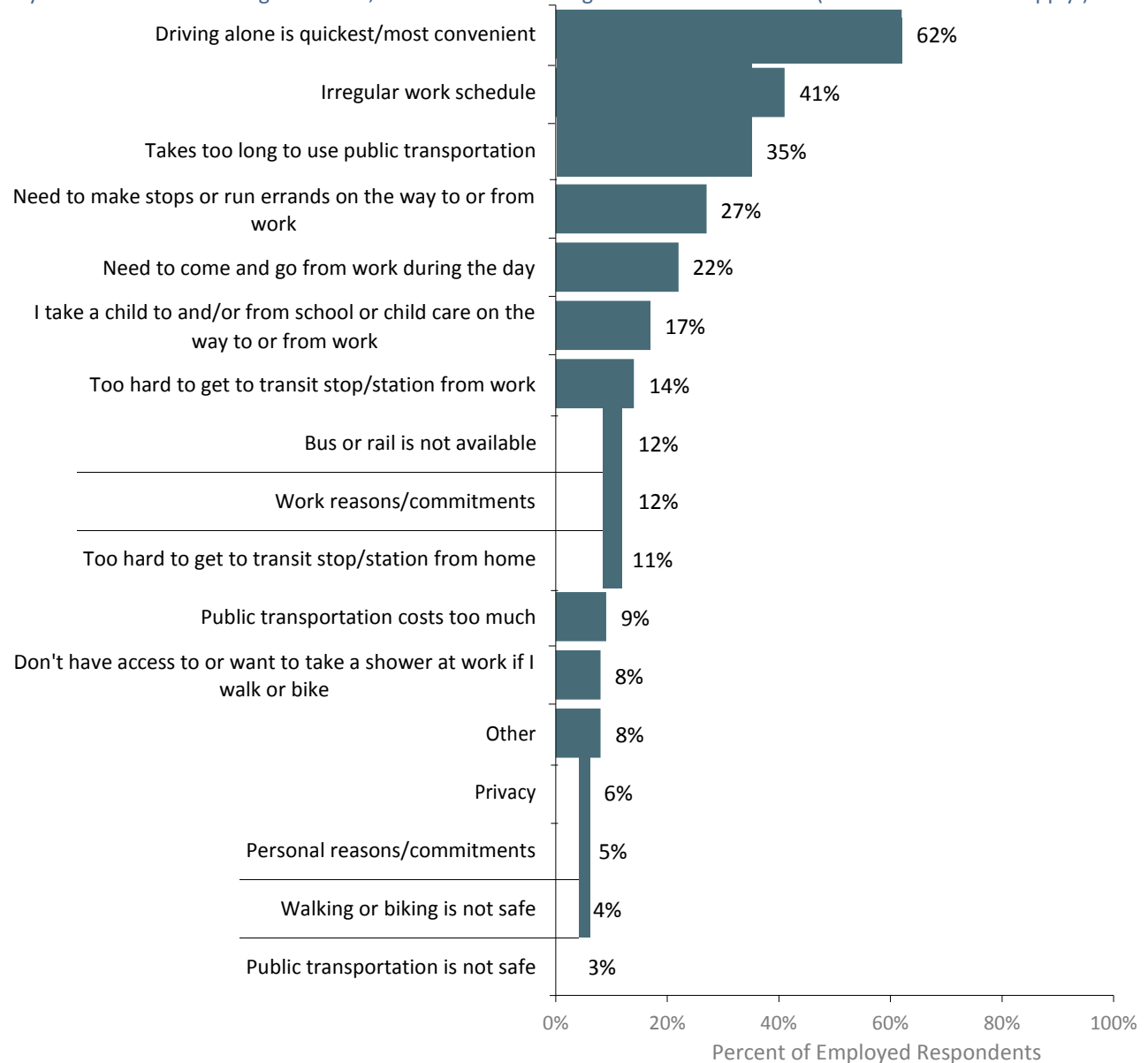




As a follow-up to reporting about their mode choices for the work commute, survey participants were asked what the main reasons were they most often drove to get to work. The most common response was that it was the quickest or most convenient way to get to work (indicated by 62% of those who answered the question). Other options frequently chosen by respondents included having an irregular work schedule, feeling that it takes too long to use public transportation and the need or desire to make stops or run errands on the way to or from work. Respondents had the opportunity to write in a response in their own words if their reason was not included on the list. Those responses can be found in *Appendix A: Mailed-Invitation Results (“Scientific”)*.

**Figure 3: Reasons for Most Often Driving to Work**

If you most often drive to get to work, which of the following are the main reasons? (Please select all that apply.)



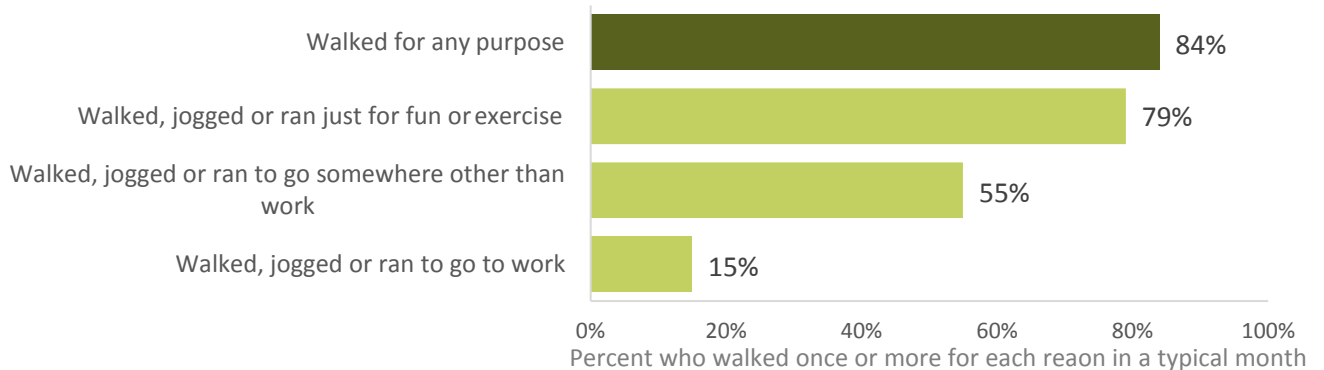
## Active Transportation (Walking and Bicycling)

Several questions were included on the survey to assess respondents’ participation in active transportation. All those completing the survey were asked whether they had a health issue or physical limitation that prevented them from being able to walk or bike for fun, exercise or transportation; 10% of respondents reported having a health or mobility issue that prevented them from walking (see Table 6 in *Appendix A: Mailed-Invitation Results (“Scientific”)*), while 15% had an issue that prevented them from bicycling (Table 7). Those who did not have a physical limitation that prohibits walking were asked how often in a typical month they had walked for various purposes. In Figure 4 and Figure 5 below, those with a limitation that proscribed walking or biking are assumed to have not walked or biked in a typical month.

About 8 in 10 respondents (84%) had walked for any purpose in the last year, while about 5 in 10 had ridden a bicycle. Respondents were more likely to have walked or bicycled for fun or exercise than for transportation, but about half (55%) had walked to a destination at least once in a typical month, and 30% had bicycled to a destination. Fewer than 2 in 10 had walked to work (15%) or bicycled to work (17%).

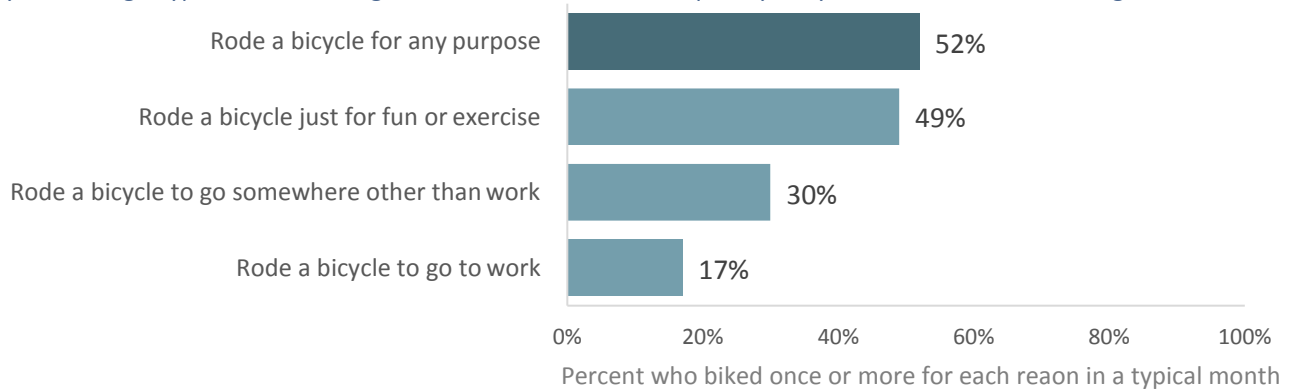
**Figure 4: Proportion of Respondents Walking for Fun/Exercise or Transportation**

Last year, during a typical month with good weather, about how frequently did you do each of the following?



**Figure 5: Proportion of Respondents Bicycling for Fun/Exercise or Transportation**

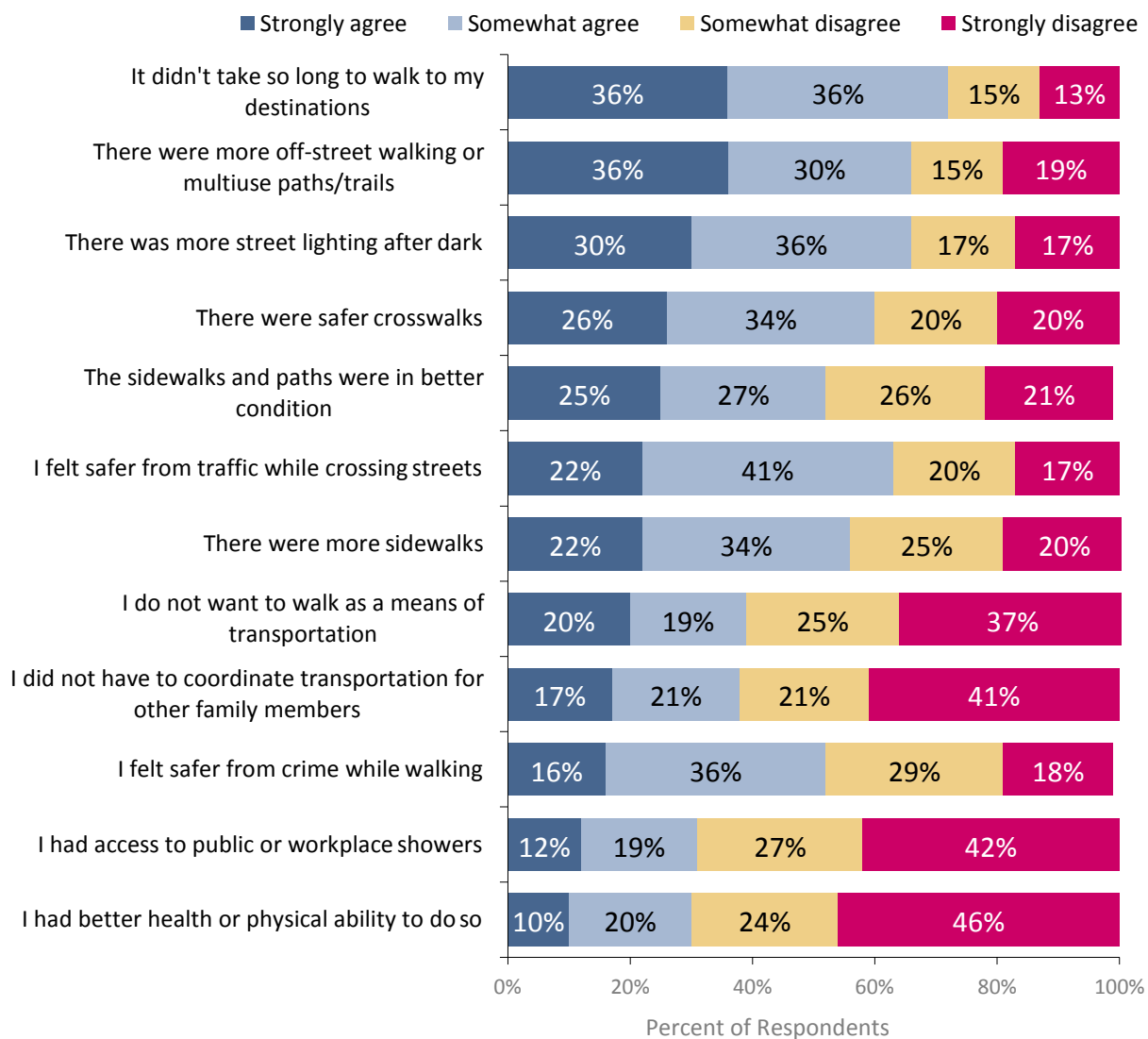
Last year, during a typical month with good weather, about how frequently did you do each of the following?



Those completing the survey were asked whether certain factors might help increase their use of walking or biking as a means of transportation. Only about 4 in 10 respondents reported they did not want to walk as a means of transportation; therefore, 6 in 10 disagreed with that statement, indicating that many would at least consider walking more. One of the biggest barriers is the amount of time it takes to walk, with nearly three-quarters saying they would walk more if didn't take so long to get to their destination. About two-thirds agreed that they would walk more if there were more off-street walking or multi-use paths or trails, or if there were more street lighting after dark. Access to public or workplace showers was not a strong facilitator for many of those participating in the survey; about 7 in 10 disagreed that having such access would increase their use of walking as a means of transportation; however, for 3 in 10, it might increase their chances of walking for the work commute.

**Figure 6: What Might Increase Walking for Transportation**

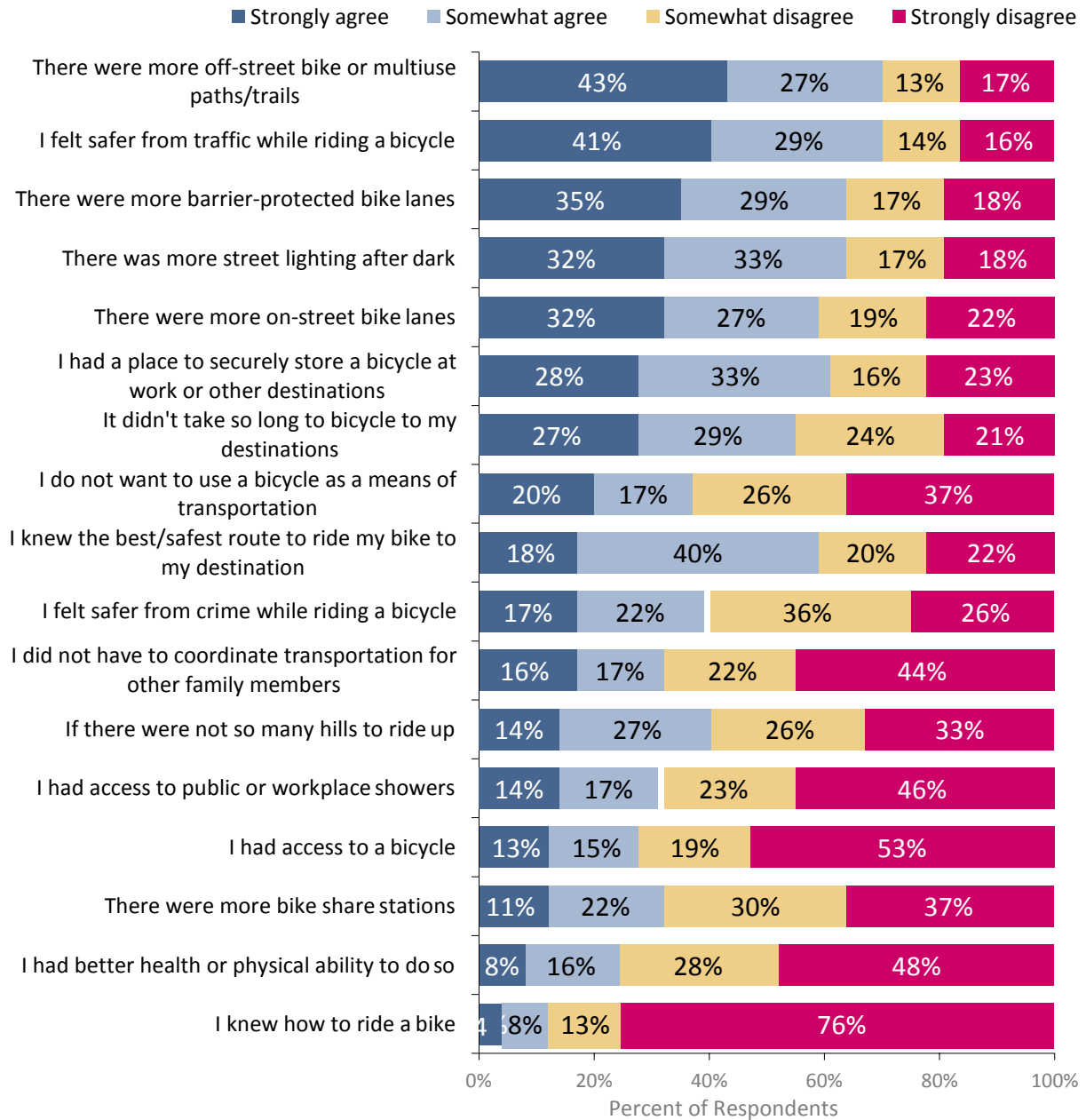
How strongly do you agree or disagree with the following statements? I would walk more to get places if...



As with walking, the availability of off-street paths and trails was also a strong potential facilitator for increasing bicycle use as a means of transportation, with about 7 in 10 respondents agreeing they would bicycle more if there were more such paths and trails. Safety from traffic, street lighting after dark, barrier-protected bike lanes, places to securely park a bike and more on-street bike lanes were also concerns that could be addressed to help facilitate increased bicycling by at least 5 in 10 survey participants.

**Figure 7: What Might Increase Bicycling for Transportation**

To what extent do you agree or disagree that each of the following would increase your use of a bicycle as a means of transportation:



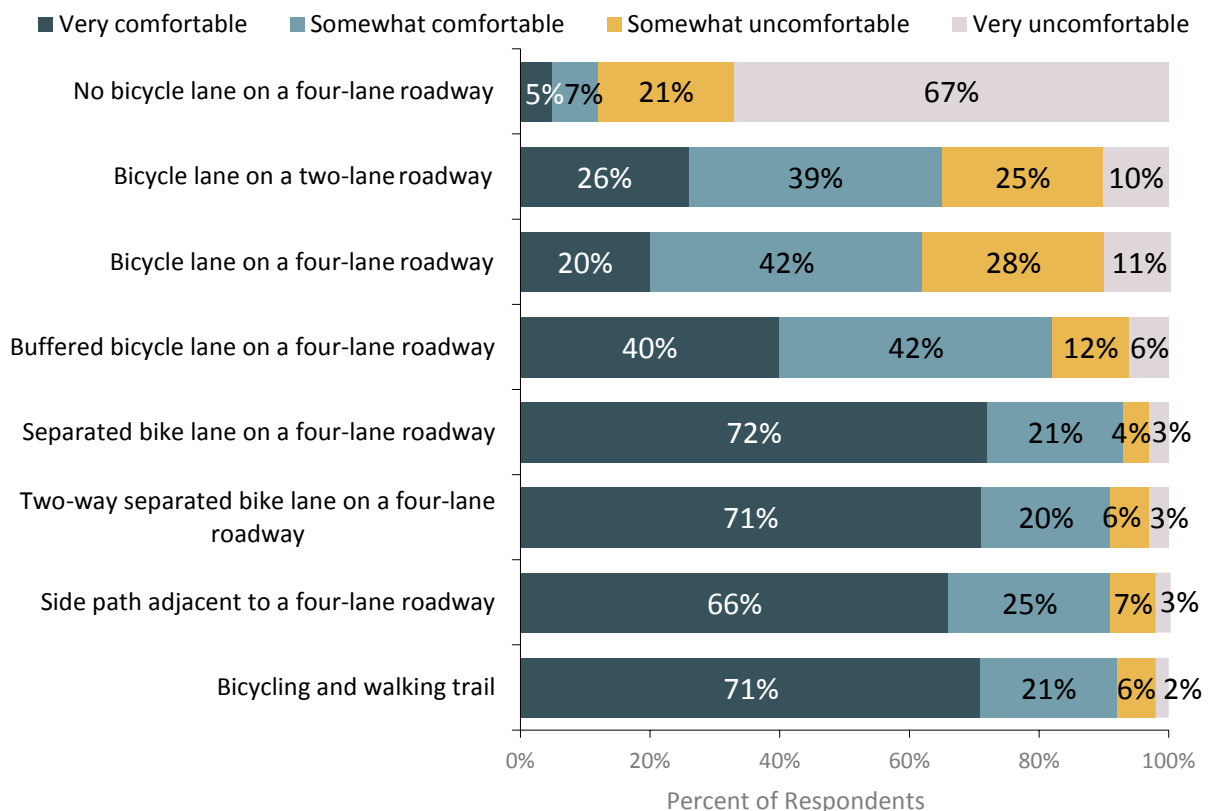
## Feelings of Safety and Comfort Bicycling

Those completing the Active Transportation Survey assessed how comfortable or uncomfortable they would feel riding a bicycle in a variety of different situations. The scenarios ranged from biking on a path or trail separate from a street to riding on a major street with two or three traffic lanes in each direction with no bike lanes. Photos were shown with the brief description and can be seen in *Appendix F: Survey Materials*.

As might be expected, one of the situations with the highest comfort rating was riding on a bicycling and walking trail (shared use path) that is separate from the street (92% feeling very or somewhat comfortable). However, high comfort levels were also reported for being on a sidepath adjacent to a four-lane roadway, on a two-way separated bike lane on a four-lane roadway, and on a separated bike lane on a four-lane roadway, with over 65% of respondents reporting they would be very comfortable riding a bike lane in those situations, and an additional 20% feeling somewhat comfortable. About 8 in 10 survey participants would be at least somewhat comfortable on a buffered bicycle lane on a four-lane roadway, but only 4 in 10 would be very comfortable. Thinking about riding on a bicycle lane on a roadway (two-lane or four-lane), about two-thirds would be at least somewhat comfortable, but only about 2 in 10 would very comfortable. Only 5% of individuals would be very comfortable riding a bicycle on a four-lane roadway with no bicycle lane, and only an additional 7% would be somewhat comfortable.

**Figure 8: Comfort Riding Bicycle in Various Scenarios**

Below is a list of places on which you could ride a bike (regardless of whether you actually ever do so). Please tell us how uncomfortable or comfortable you would feel biking on a...

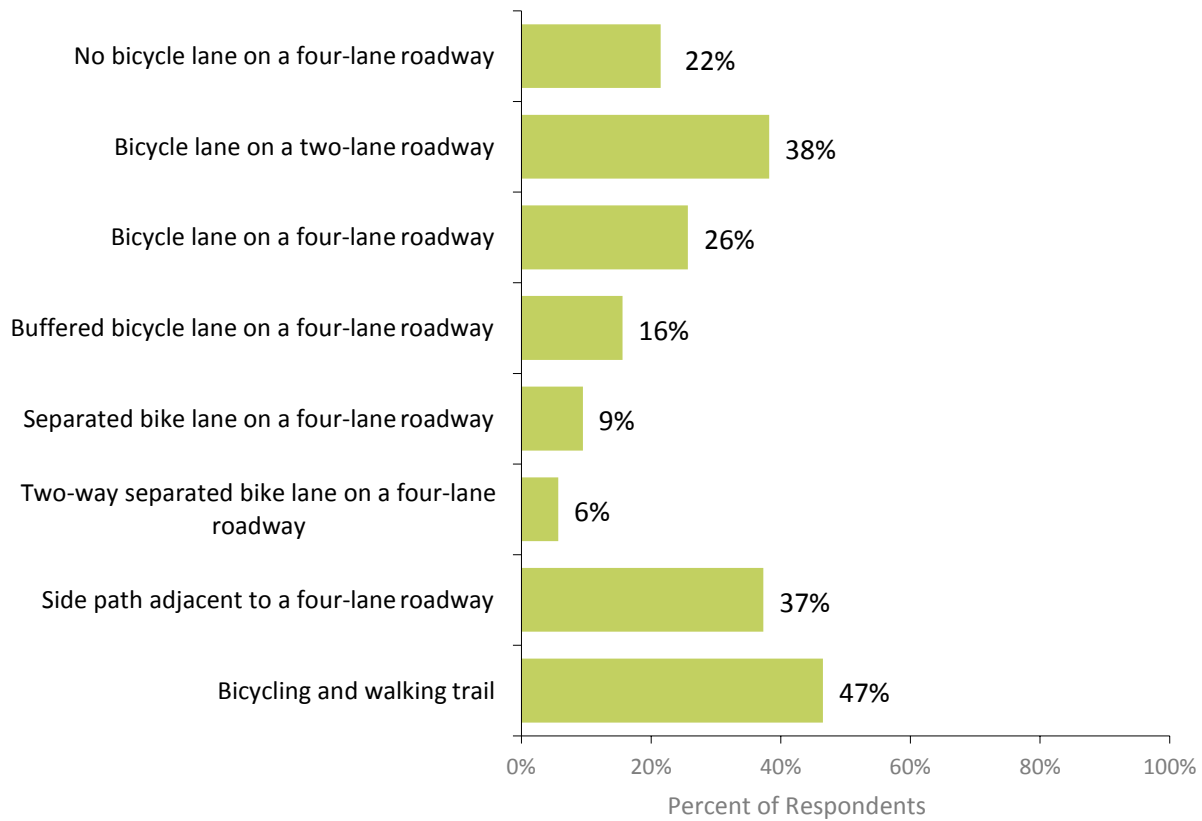


Those who reported they had bicycled in the last month were asked if they had ridden a bicycle in any of the situations that had been previously described. The proportion of all respondents who had ridden in these scenarios is shown in Figure 9 below – those who had not ridden were assumed to not have ridden in these scenarios.

In spite of only 12% of respondents feeling somewhat and very comfortable riding on a roadway with no bicycle lane, about 2 in 10 respondents had done so. More typically, respondents had ridden on a shared use path, a side path adjacent to a roadway, or on a bicycle lane.

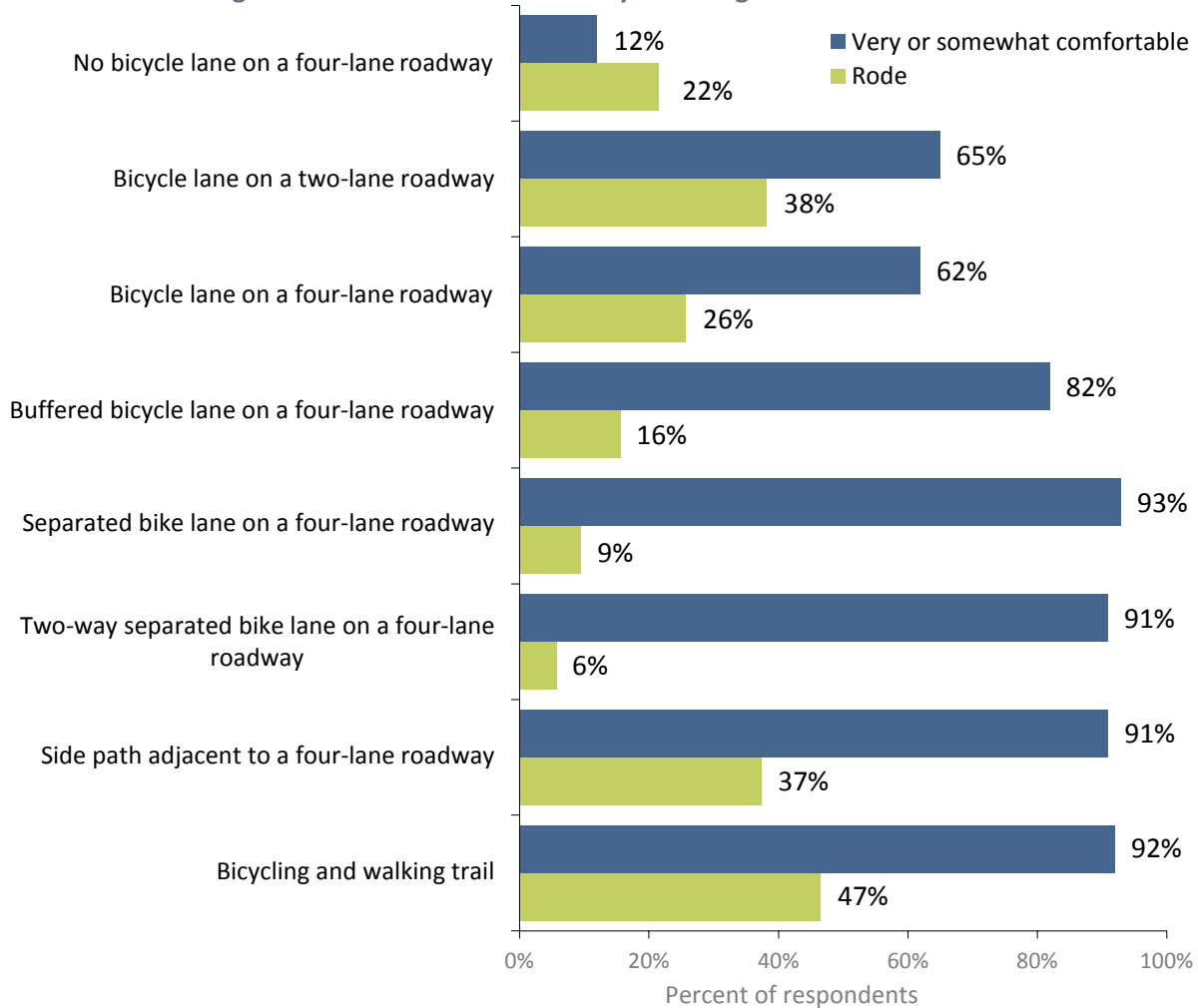
**Figure 9: Rode Bicycle in Various Scenarios**

Last year, during a typical month with good weather, did you ride a bicycle on any of the following?



The proportion of respondents reporting they would feel comfortable riding a bicycle in various situations and the proportion who had actually done so is compared in the figure below. In general, those situations in which a greater percentage of people said they would hypothetically be comfortable riding had a greater proportion of respondents who had ridden in them. However, while over 90% of respondents had said they would feel at least somewhat comfortable riding on a separated bike lane or two-way separated bike lane on a four-lane roadway, very few (less than 10%) had actually done so. This may be due to the relative availability of these types of facilities in the DRCOG region compared to the others.

**Figure 10: Comfort and Actual Bicycle Riding in Various Scenarios**



Crosstabulations looking at the proportion of people at each comfort level for a scenario who had actually ridden a bicycle in that situation and also looking at the comfort levels by whether a person had ridden in that situation can be found in *Appendix D: Selected Survey Responses by Selected Respondent Characteristics*. In general, greater comfort riding in a specific situation was associated with a greater likelihood of riding in that situation, and those who had ridden a bicycle in a certain situation were more likely to rate their comfort for riding in that situation higher.

Other researchers have used a question set about comfort riding in various scenarios similar to what was included on the Active Transportation Survey to classify respondents into one of four types of bicyclists. These “Four Types of Cyclists” were originally proposed by Roger Geller with the City of Portland’s Bureau of Transportation and tested by Jennifer Dill and Nathan McNeil from Portland State University. This typology places individuals into four categories determined in large part by their comfort cycling on the different kinds of facilities shown in the figure on the previous page. This typology is based on a person’s stated comfort level bicycling in different environments and not on their current bicycling behavior. The Four Types of Cyclists hypothesized by Geller and studied further by Dill & McNeil can be briefly described as follows:

- **Strong & Fearless:** Will ride a bicycle regardless of the conditions
- **Enthusied & Confident:** Somewhat comfortable sharing the roadway with vehicle traffic, but prefer to have dedicated bicycle facilities.
- **Interested But Concerned:** Curious about bicycling, like cycling, but afraid to bicycle.
- **No Way No How:** Not interested in bicycling or comfortable doing so, or physically unable to do so.

As Geller described them, the separation between the groups is “not generally as clear-cut . . . there is likely quite a bit of blurring” (Geller, page 3).

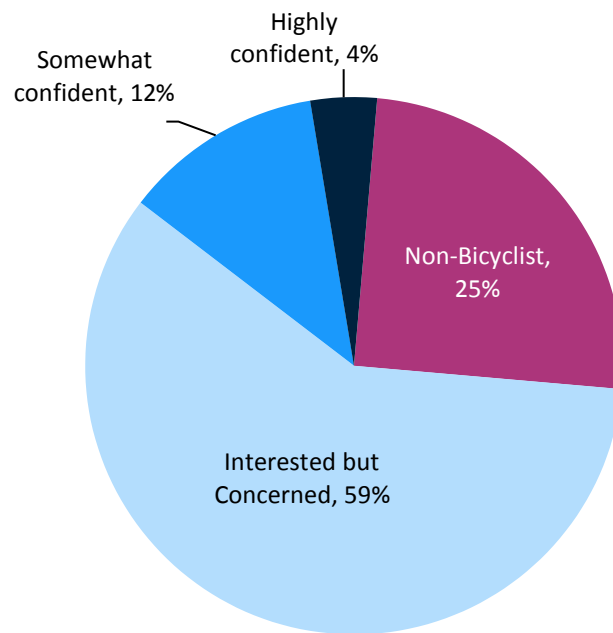
The draft American Association of State Highway and Transportation Officials (AASHTO) Bike Guide has slightly revised the terminology for these typologies. It was felt that while the Geller labels were effective in demonstrating the concept, they needlessly intermingled skill level with other ideas (strength, fear, enthusiasm) and more objective terminology was needed. The draft definitions are:

- **Highly Confident Bicyclist:** Denotes bicyclists who have the most tolerance for traffic stress and are generally comfortable operating in mixed traffic. It is thought this group represents 4%-7% of the general population.
- **Somewhat Confident Bicyclist:** Denotes bicyclists who have some tolerance for traffic stress and generally prefer physical separation from traffic but are comfortable operating in bicycle lanes. It is thought this group represents 5%-9% of the general population.
- **Interested But Concerned Bicyclist:** Denotes bicyclists who have the lowest tolerance for traffic stress and prefer physical separation from traffic or bicycling on low-volume, low-speed residential streets. It is thought this group represents 51%-56% of the general population.



For the Active Transportation Survey, bicyclists were placed into one of these three bicyclist categories, with a fourth category for those who were unable to bicycle or who did not do so currently and were not interested bicycling. One-quarter of people fell into this category. The “highly confident” category included those who were “very comfortable” riding on a four-lane roadway with no bicycle lane, which included 4% of respondents. The “somewhat confident” group included those who said they were not very uncomfortable on a four-lane roadway **and** were somewhat or very comfortable with the thought of bicycling on a bicycle lane on a four-lane roadway **and** were very comfortable with the idea of bicycling on a bicycle lane on a two-lane roadway. There were 12% in the somewhat confident category. The remaining 59% of respondents were placed in the category “interested but concerned.” See *Appendix E Survey Methodology* for more details on how the sorting was determined.

Figure 11: Type of Bicyclists, Based on Comfort Bicycling in Various Scenarios



## Perception of Neighborhood as Bicyclist and Pedestrian Friendly

Survey participants were asked a set of questions about their perceptions of features of their neighborhood that would might make it more or less conducive to bicycling or walking and how many types of destinations they felt they could easily bike from their home.

All of those surveyed, whether or not they were current bicyclists or pedestrians, were asked whether they agreed or disagreed with twelve statements about their neighborhood. Most of these items were phrased positively (e.g., I feel safe from traffic while walking in my neighborhood) while four were phrased negatively (e.g., There is a high crime rate in my neighborhood). Figure 12 on the next page shows the percent of respondents who somewhat or strongly agreed with each item; in order to clearly show those items where low agreement signifies a more positive response, darker blue bars are used for those items negatively phrased (e.g., agreeing that there are bike lanes that are easy to get to means the neighborhood is **more** bicyclist and pedestrian friendly; agreeing that the crime rate makes it unsafe to walk or bike means the neighborhood is **less** bicyclist and pedestrian friendly.)

A majority of respondents rated each aspect positively, but there was no single factor that was rated positively by all respondents, indicating that all neighborhoods in which respondents resided had some perceived deterrents to active transportation.

The aspect of the neighborhoods considered conducive to active transportation by the greatest proportion of respondents, nearly 9 in 10 (87%), was the neighborhood aesthetics, that the neighborhood is pleasant to look at while walking or biking.

Nearly 8 in 10 respondents felt safe from traffic while walking in their neighborhood (meaning about 2 in 10 did not feel safe), while about two-thirds felt safe from traffic while bicycling. About 4 in 10 felt the traffic in their neighborhood made walking or bicycling unpleasant, while 6 in 10 did not consider this a problem.

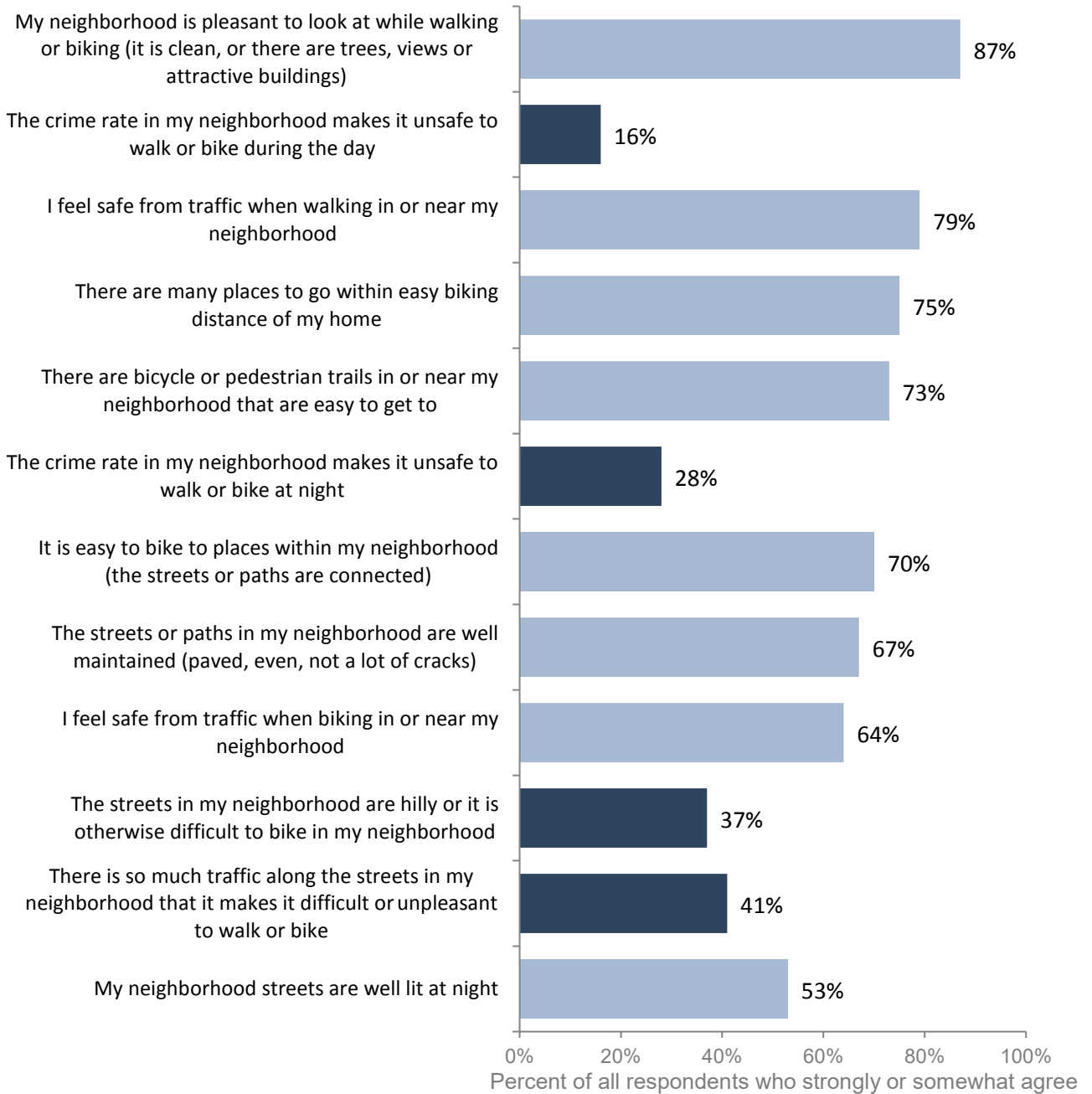
Perceptions of the crime rate was a deterrent to walking or bicycling during the day for 16% of respondents and a deterrent at night for 28% of respondents. About half of respondents felt their neighborhood streets were well-lit at night.

Maintenance of the streets and paths, access to trails and connectivity of the street and path systems were viewed positively by 67% to 73% of respondents, with one-third to one-quarter of respondents viewing the situations in their neighborhoods less favorably. Three-quarters of respondents felt there were many places to go within easy biking distance of their home.

An index score was created from the ratings of the items rated in Figure 12. This score was calculated to have a range from 0 to 100, where 0 would indicate a respondent rated all items very negatively (strongly agreed with the negative items and strongly disagreed with the positive ones), and 100 would indicate a respondent rated all items very positively. The average index score was 64 on the 100-point scale, meaning, on average, respondents rated their neighborhoods as somewhat bicyclist and pedestrian friendly.

**Figure 12: Perceived Bicycle and Pedestrian Friendliness of Neighborhood**

Would you say you strongly agree, somewhat agree, somewhat disagree or strongly disagree with the each of the following statements about your neighborhood.



Legend:

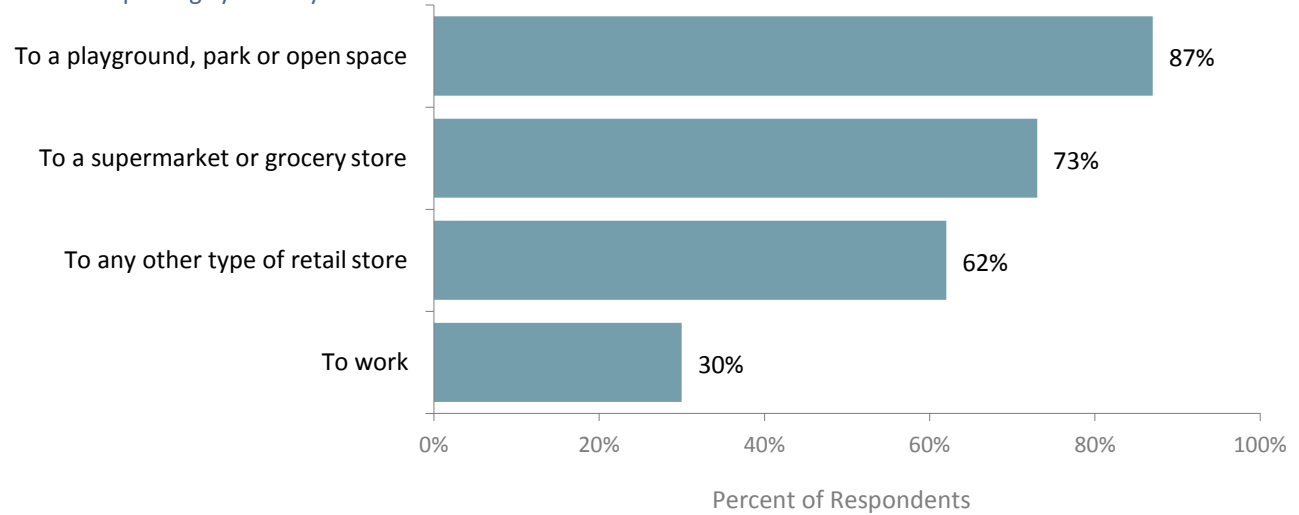
- Positive statement; agreement indicates greater bicycle-friendliness
- Negative statement; agreement indicates lesser bicycle-friendliness

Survey respondents were asked more specifically about four types of destinations to which they could safely bicycle from their home. Nearly 9 in 10 thought they could safely bicycle to a playground, park or open space. About three-quarters of participants could safely bicycle to a grocery store, and 62% could safely bicycle to other types of retail stores. Only about 30% felt they could safely bicycle to work from their home.

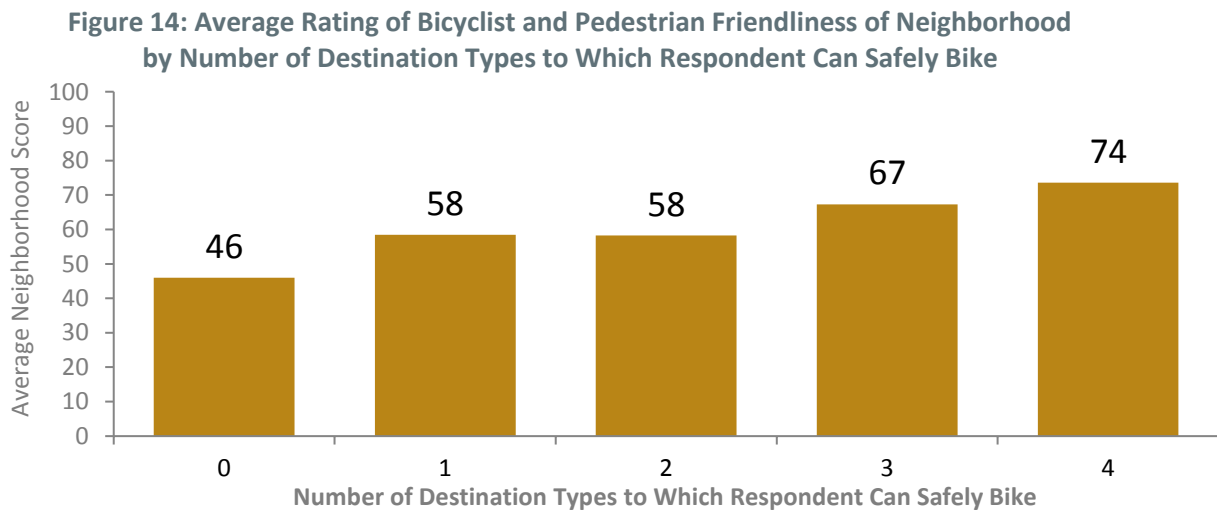
**Figure 13: Accessibility of Destination Types by Bicycle from Home**

If you wanted to, could you safely bike to each of the following destinations from your home?

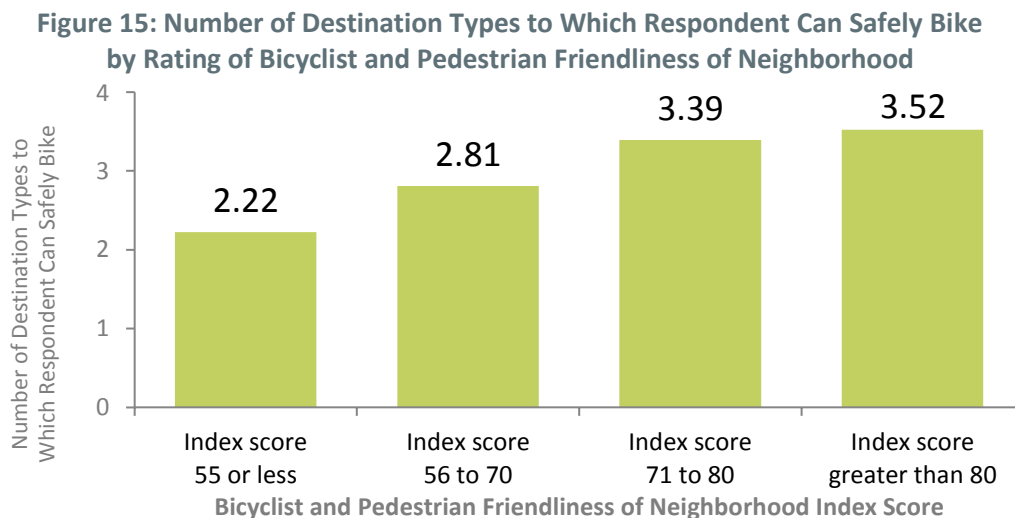
Percent reporting “yes” they could.



As shown in Figure 14 and Figure 15 below, there was a correlation between the number of destination types to which respondents felt they could safely bicycle and their ratings of the bicyclist and pedestrian friendliness of their neighborhood. Figure 14 shows the average bicyclist and pedestrian friendliness score of the neighborhood by the number of destination types to which respondents felt they could safely bicycle. The greater the number of destinations, the higher the neighborhood score, with an average neighborhood score of 46 for respondents who felt there were no destination types to which they could safely bicycle to 74 for those who thought they could safely bicycle to all four destination types.



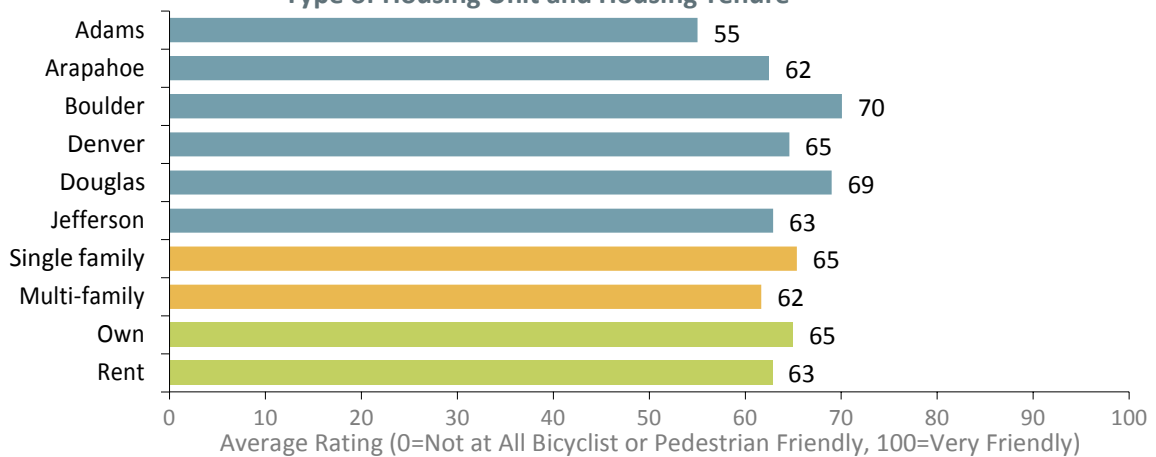
The neighborhood scores were categorized into four groups with roughly equal proportions of respondents in each. These categories were then used to examine the average number of destination types to which respondents felt they could safely bicycles, shown in Figure 15 below. (Figure 15 is essentially “the flip” of Figure 14.) For those whose neighborhood scores were in the lowest quartile of scores (55 or less) the average number of destination types to which one could safely bicycle was 2.22, but was 3.52 for among those whose neighborhood scores were in the highest quartile (81 or higher).



Shown in Figure 16 and Figure 17 below are the average bicyclist and pedestrian friendliness neighborhood scores and number of destinations types to which one could safely bicycle from home by county of residence, type of housing unit and housing tenure. There were fewer than 40 respondents from the DRCOG counties not shown in these graphs; too few to show reliable estimates.

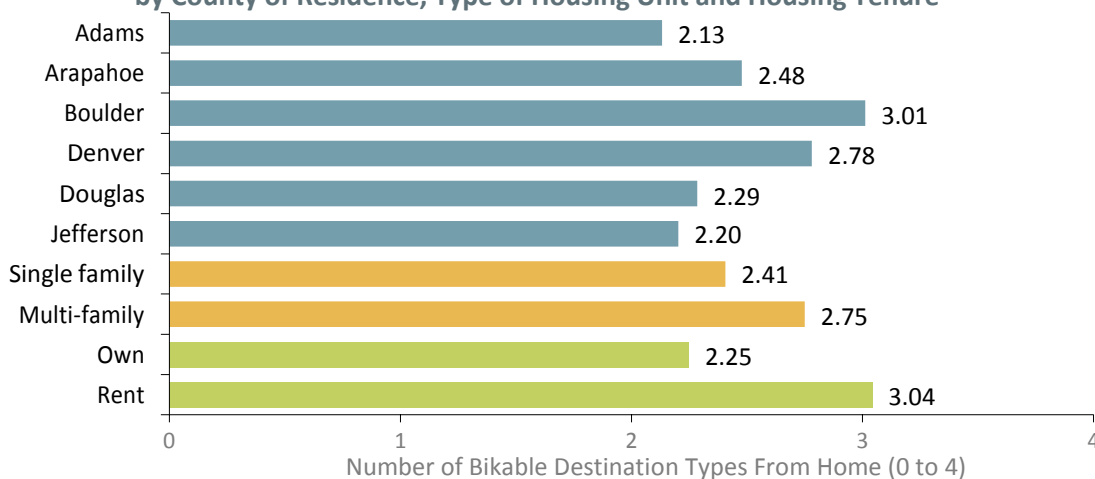
Respondents living in Adams County gave the lowest scores to the bicyclist and pedestrian friendliness of their neighborhoods, while those in Boulder County and Douglas County gave the highest ratings. There was little difference the scores of those who lived in single-family or multi-family homes or in those who owned or rented their homes.

**Figure 16: Bicyclist and Pedestrian Friendliness of Neighborhood by County of Residence, Type of Housing Unit and Housing Tenure**



Those living in Boulder County and the City and County of Denver felt they had the highest number of destination types to which they could safely bicycle from home compared to those living in the other counties. Those who rented their home or lived in multi-family housing had more destinations to which they could safely bicycle than those in single family homes or who owned their home.

**Figure 17: Number of Destination Types To Which Respondent Can Safely Bike by County of Residence, Type of Housing Unit and Housing Tenure**



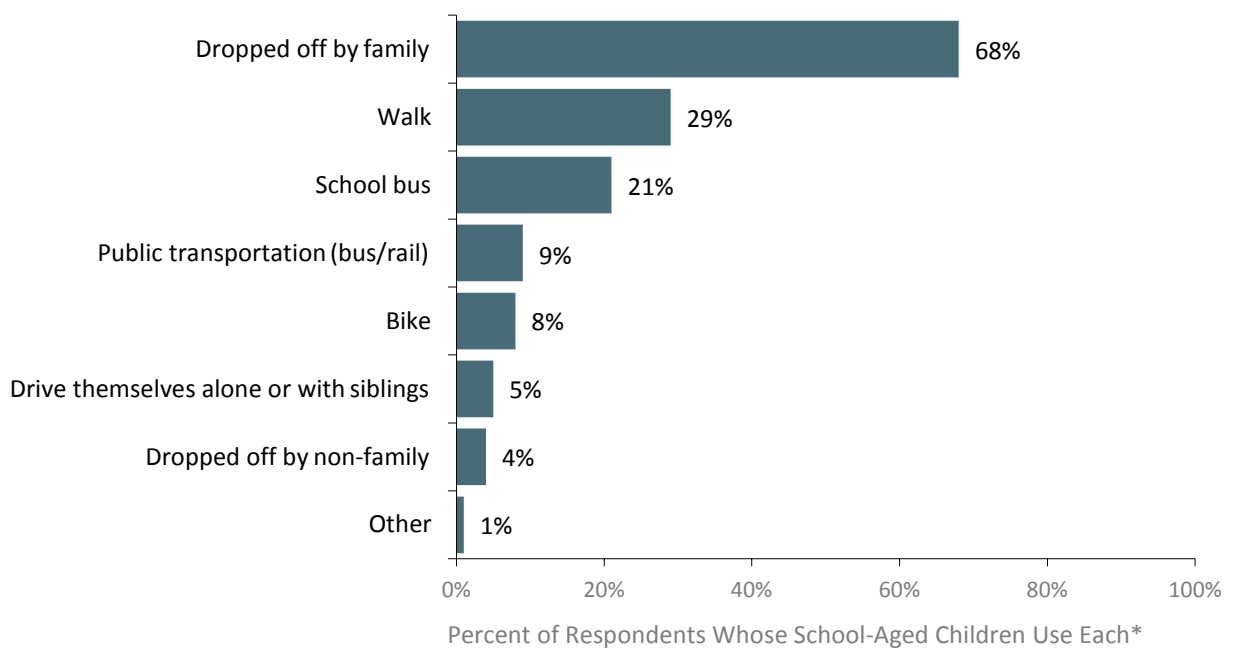
## Transportation of School-Aged Children

A set of questions on the survey was dedicated to assessing the school commute of children. Twenty-five percent of respondents said they had one or more school-aged children (see Table 18). These respondents were then asked what modes of transportation were used by those children to get to and from school. As with the work commute, respondents could choose more than one mode, which may have indicated that a child traveled to school using various modes of transportation or, in households with more than one child, different children used different modes.

A private vehicle was used for most of the school trips, with about 7 in 10 being dropped off by a family member, 5% of respondents’ children driving themselves and 4% dropped off by non-family members. However, about 3 in 10 respondents’ children walk to school, and nearly 1 in 10 respondents’ children bike to school. About 2 in 10 respondents indicated that their child or children use a school bus, and about 1 in 10 reported that their child or children use public transportation.

**Figure 18: Modes of Transportation for Children Traveling To/From School**

How do your child(ren) typically travel to/from school? (Please select all that apply.)\*

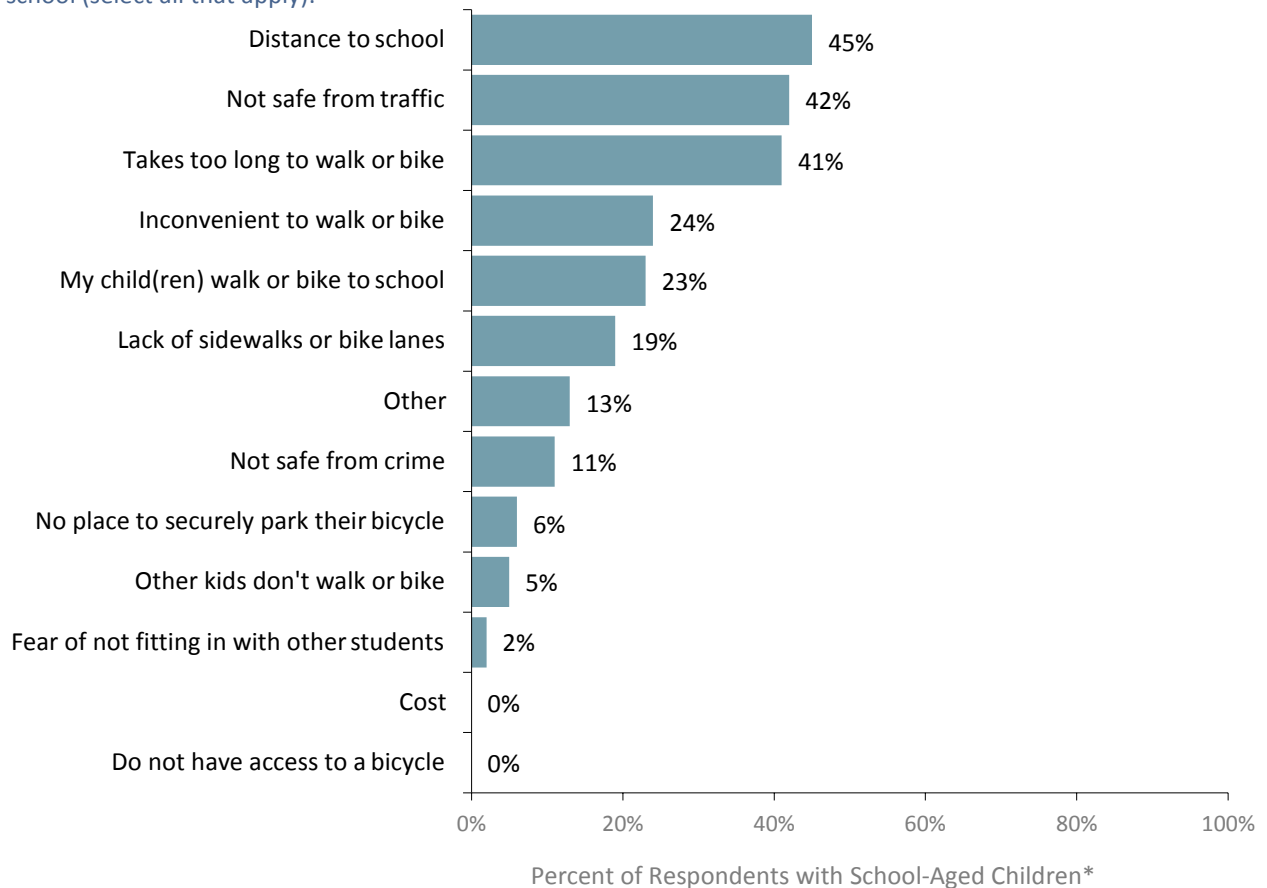


\*Percentages may add to more than 100% as respondents could choose more than one travel mode.

Perceived barriers to using modes other than driving for children’s school transportation were examined through the survey. Distance to the school, not feeling safe from traffic and the time needed to use other modes were the most frequently cited reasons for not using alternatives to driving.

**Figure 19: Barriers to Using Modes Other Than Driving for Children’s School Transportation**

Please indicate which, if any, of the following factors discourage your child(ren) from walking or bicycling to/from school (select all that apply):



\*Percentages may add to more than 100% as respondents could choose more than one travel mode.



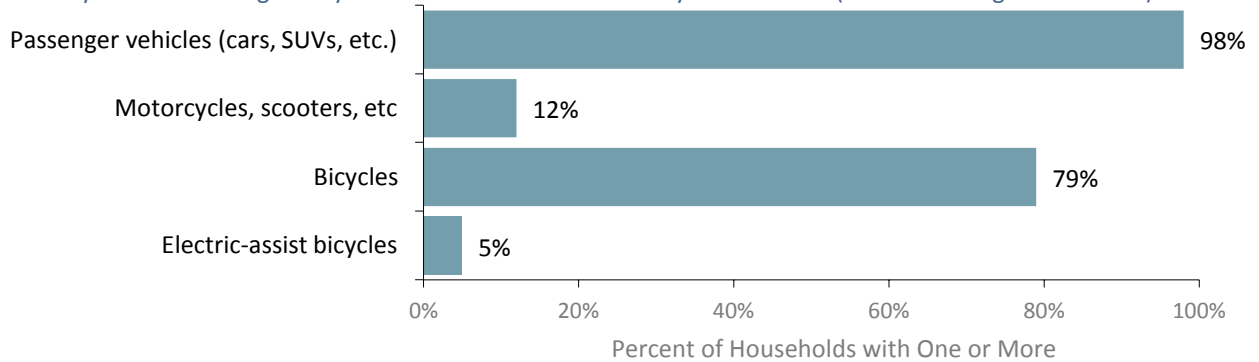
## Factors Influencing Mode Choices

The survey included a couple of questions that asked about items that might impact a person’s transportation choices.

Nearly all (98%) respondent households owned or had use of at least one passenger vehicle. About 8 in 10 had access to one or more usable bicycles, and 5% reported having an electric-assisted bicycle. Twelve percent of households had a motorcycle or scooter.

**Figure 20: Availability of Private Vehicles and Bicycles in the Household**

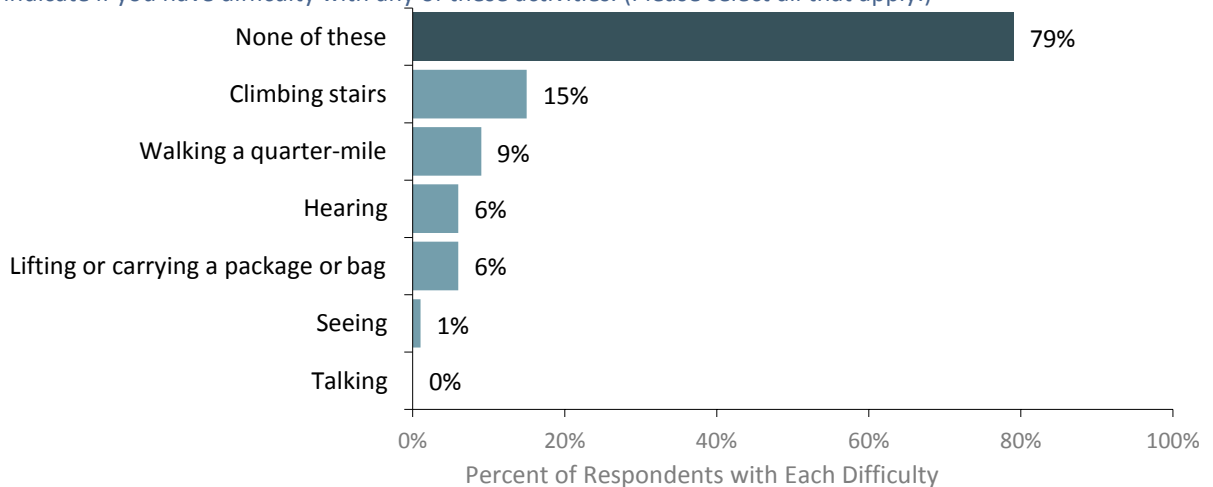
How many of the following does your household own or normally have use of? (Percent having one or more)



Those completing the questionnaire were asked if they had difficulty with various daily activities, like climbing stairs or walking. As shown below, 21% of respondents said they had difficulty with one or more of the six activities included on the survey. Fifteen percent had difficulty climbing stairs, while 9% had difficulty walking a quarter-mile. Six percent of survey participants had difficulty lifting or carrying a package, and six percent had difficult hearing. Only 1% had difficulties seeing, but this survey was conducted online with printed invitation, and those who could not see would be unlikely to be able to participate in the survey.

**Figure 21: Percent of Respondents with Difficulties That Might Impact Transportation Choices**

Please indicate if you have difficulty with any of these activities. (Please select all that apply.)



As shown in Figure 22 through Figure 30 on the following pages, the proportion of respondents who engage in active transportation was examined by a number of respondent characteristics. There were fewer than 40 respondents from the DRCOG counties not shown in these graphs; too few to show reliable estimates.

As would be expected, those who had one or more mobility-related limitations, those who were over age 55, and those with no bicycles in the household were less likely to have bicycled than those with no mobility-related limitations, those younger than age 55 and those with bicycles in the household.

Again, as would be expected, those who had one or more mobility-related limitations and those who were over age 55 were less likely to have walked, jogged or ran than those with no mobility-related limitations and those younger than age 55. Those with no bicycles in the household were also less likely to have walked, jogged or ran than those with bicycles, perhaps because those who do not have a bicycle are less mobile or active than those with a bicycle.

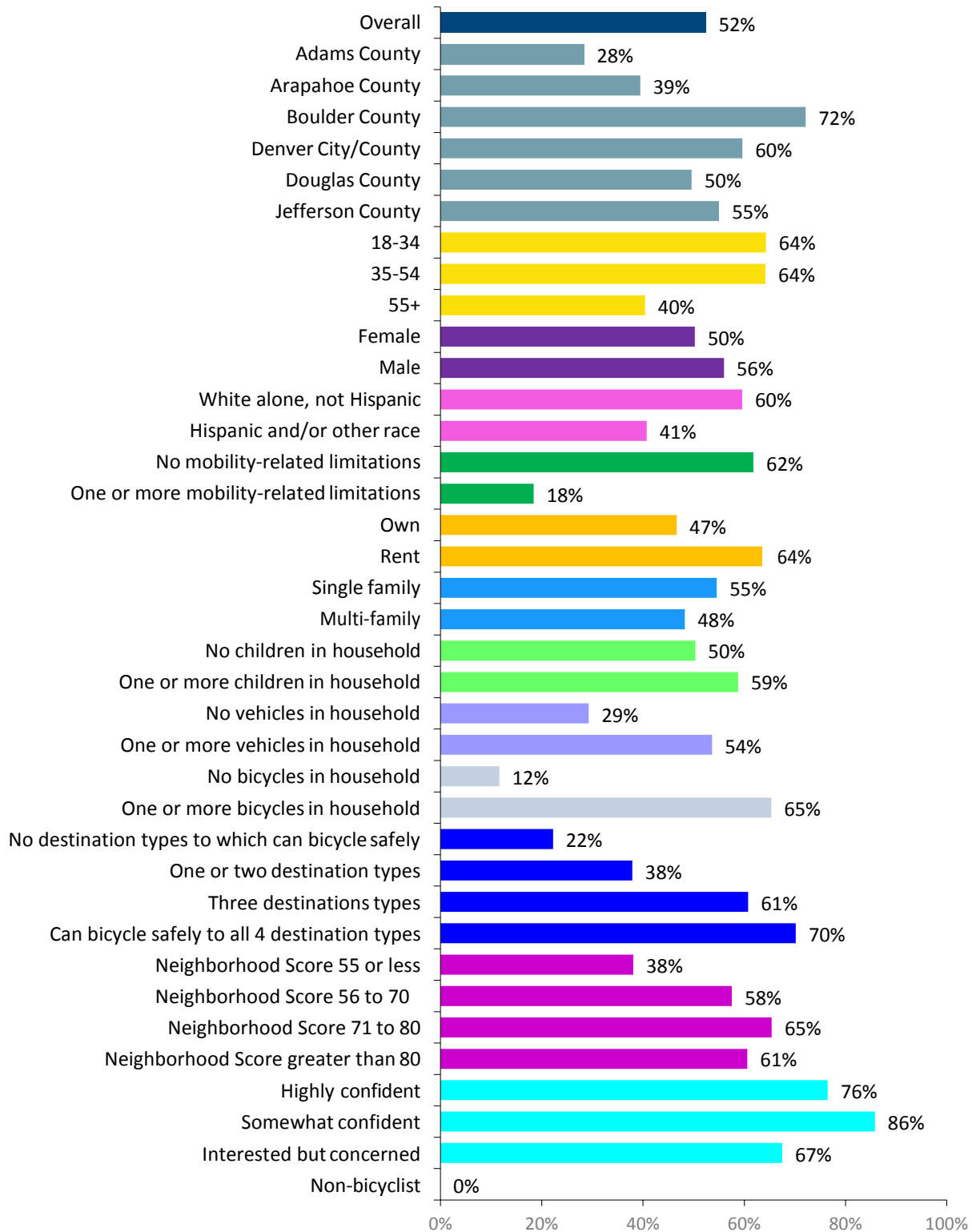
Respondents who identified as White race only and not Hispanic were more likely to have reported bicycling for any purpose than were their counterparts. However, but when it came to bicycling for work, the differences were non-significant when asked about bicycling for work in a typical month, and when looking at the modes used for the work commute in the previous week, non-Anglo respondents were more likely to have bicycled than were non-Hispanic Whites. There were few differences between respondents who identified as Non-Hispanic White and other respondents in rates of walking.

In general, the higher the score for Bicyclist and Pedestrian Friendliness of Neighborhood, and the larger the number of destination types to which one could safely bicycle from home, the greater proportion of respondents who had bicycled. The relationship was present but much milder when looking at the proportion of respondents who walked for any purpose. The number of types of bicycling destinations was associated with the proportion of respondents who walk for various purposes, likely because many of the facilities are shared by bicyclists and respondents, but the Neighborhood Score was not associated with walking for transportation or work.

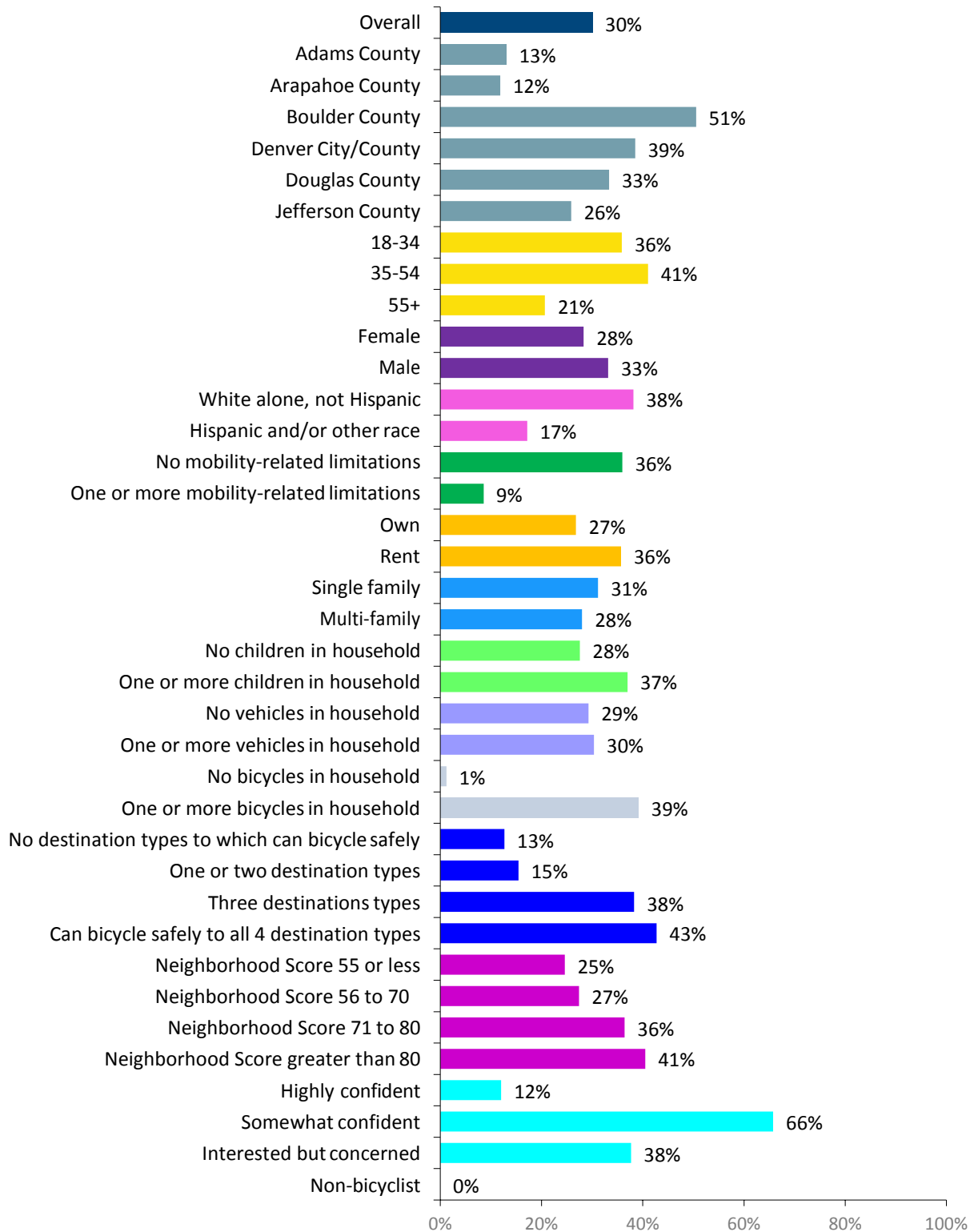
Most commonly, those who lived in Boulder County were the most likely to be bicyclists and those who lived in Adams or Arapahoe County were the least likely. Those who lived in the City and County of Denver were much more likely to have walked for the work commute than were those who lived in other counties.

Those who were “highly confident” bicyclists were more likely to have bicycled for work than were the other types, but when it came to overall bicycling rates there were fewer differences, and the “somewhat confident” types were the most likely to have bicycled for transportation.

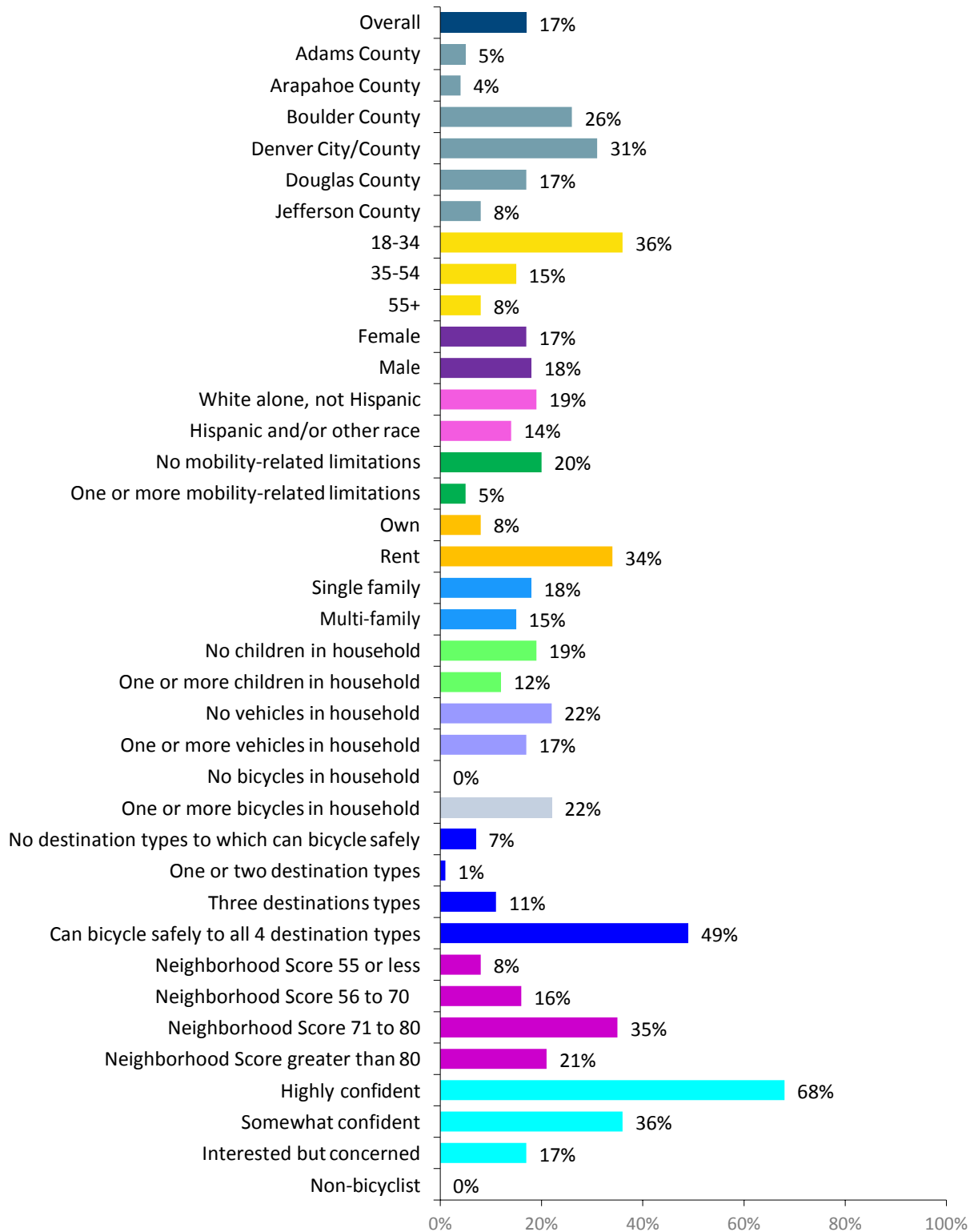
**Figure 22: Percent of Respondents Who Biked for Any Purpose in a Typical Month, by Respondent Characteristics**



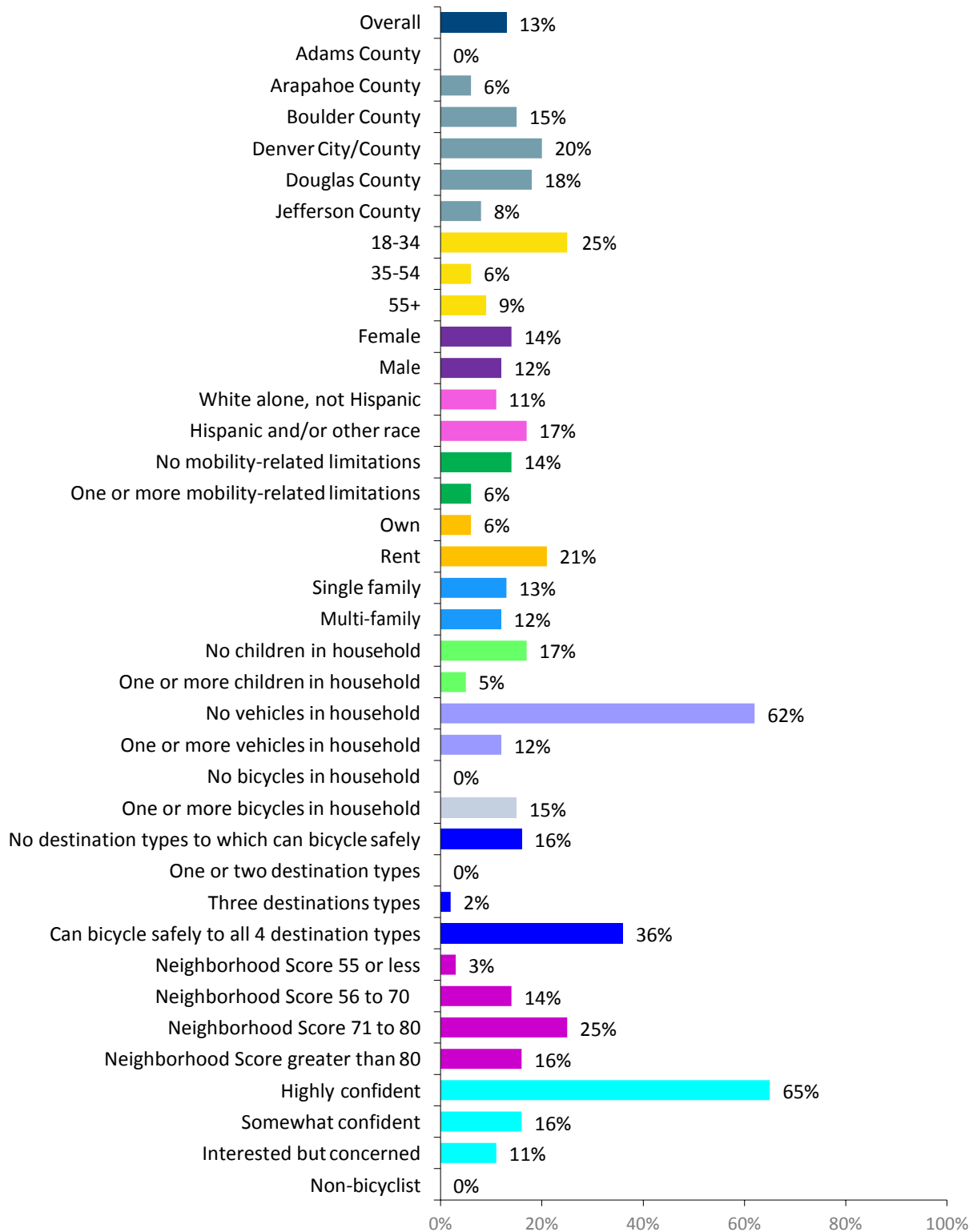
**Figure 23: Percent of Respondents Who Biked for Transportation in a Typical Month, by Respondent Characteristics**



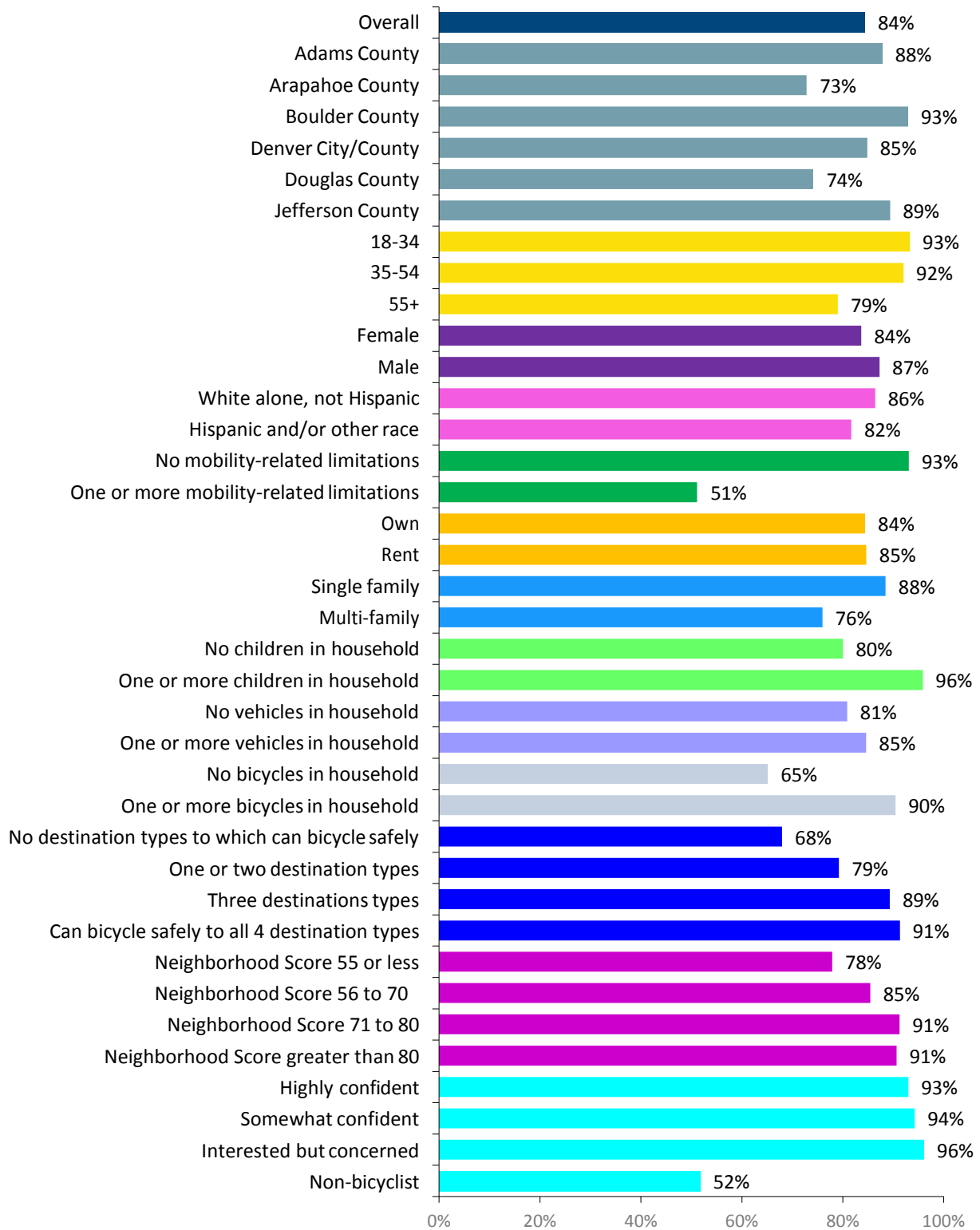
**Figure 24: Percent of Respondents Who Biked for Work in a Typical Month, by Respondent Characteristics**



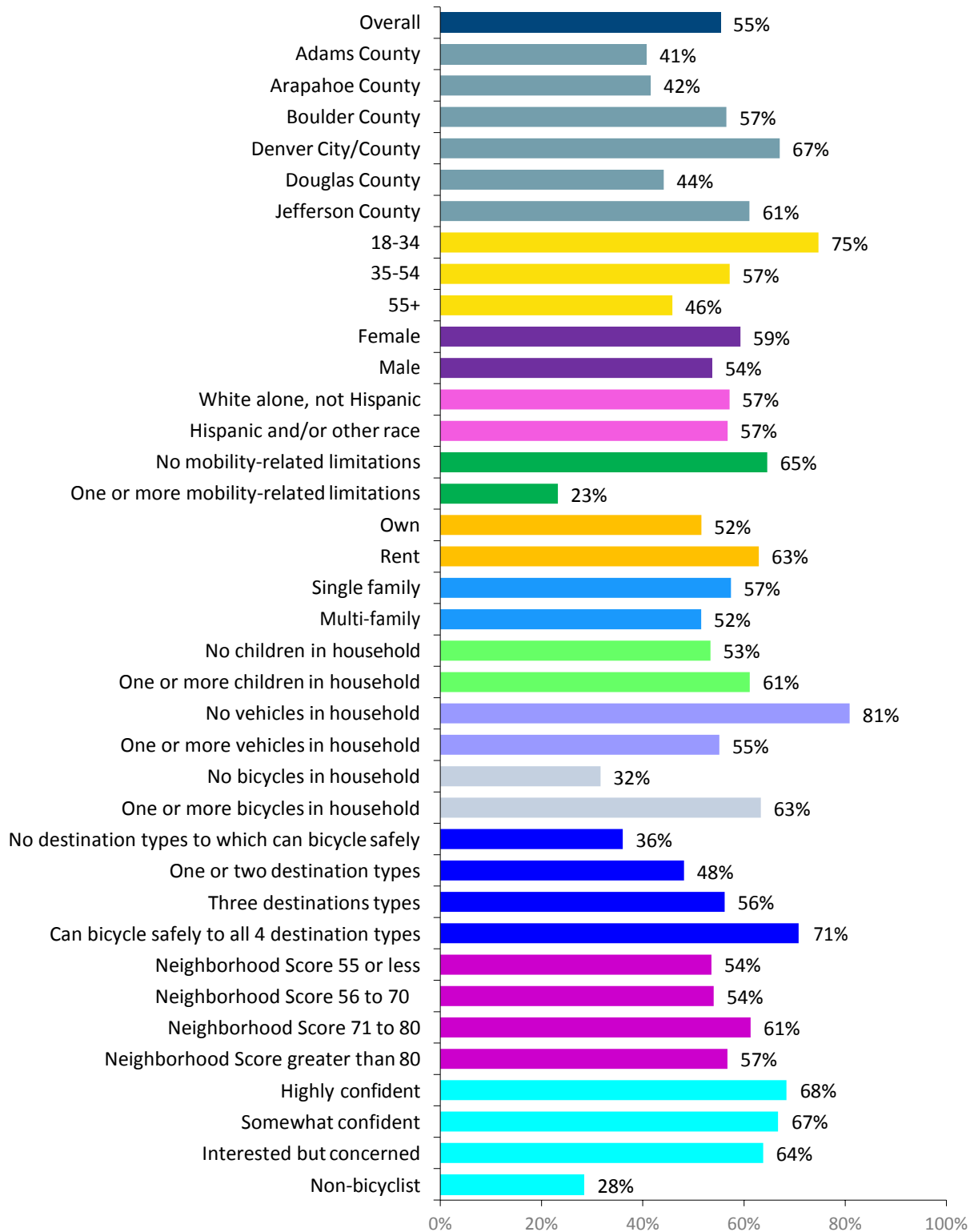
**Figure 25: Percent Making Any Work Commute Trips in Last Week by Bike, by Respondent Characteristics**



**Figure 26: Percent Who Walked, Jogged or Ran for Any Purpose in a Typical Month, by Respondent Characteristics**

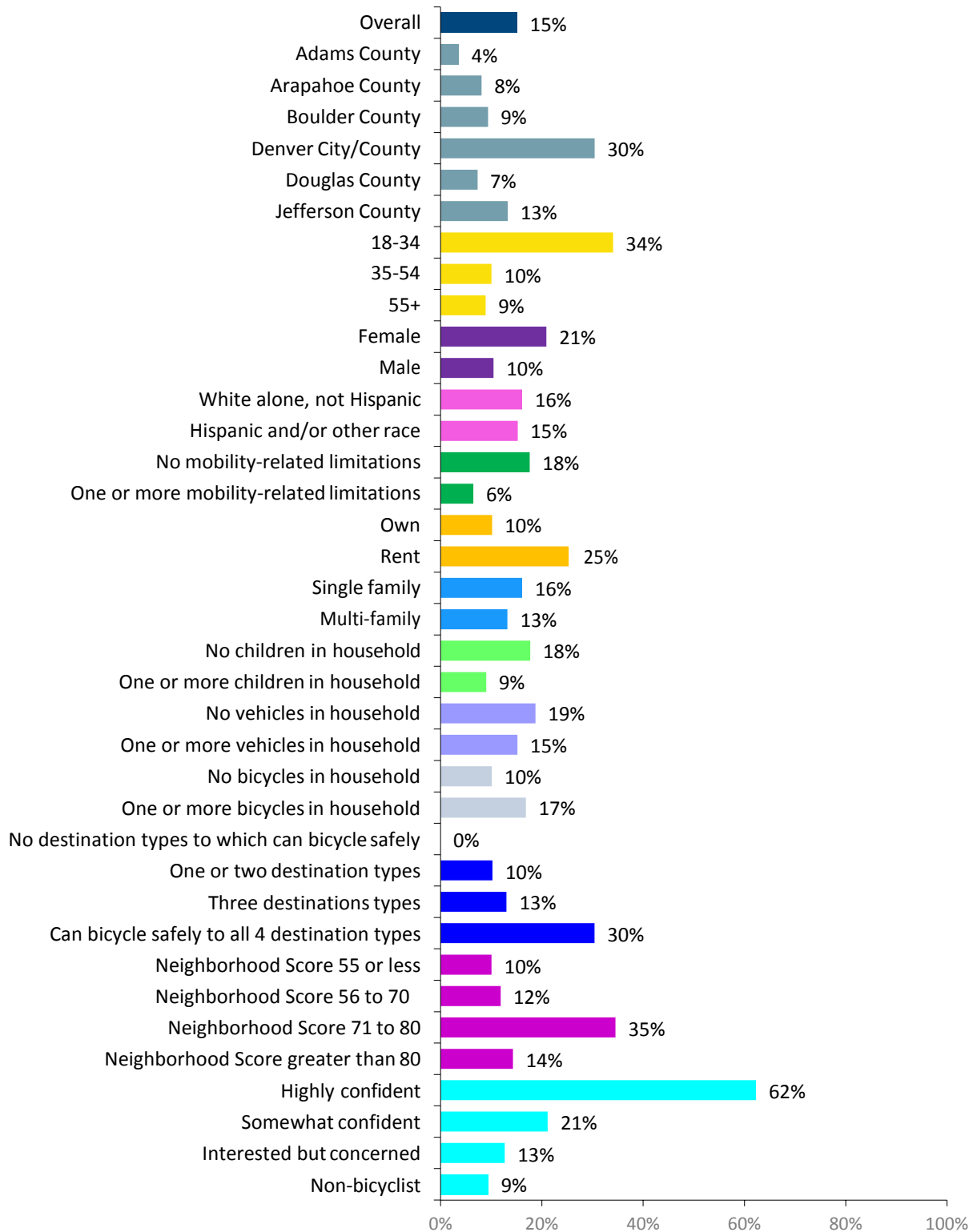


**Figure 27: Percent of Respondents Who Walked for Transportation, by Respondent Characteristics**

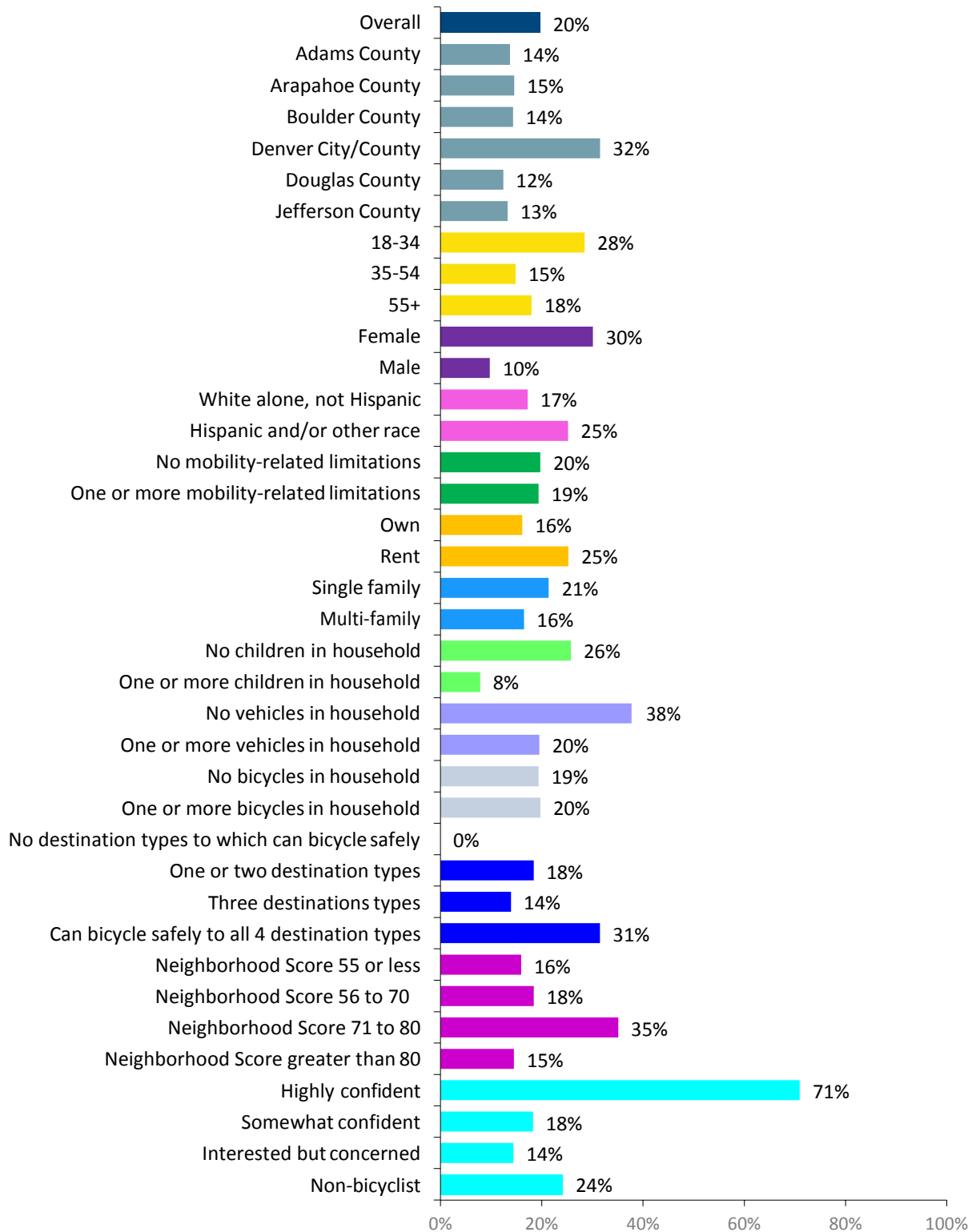




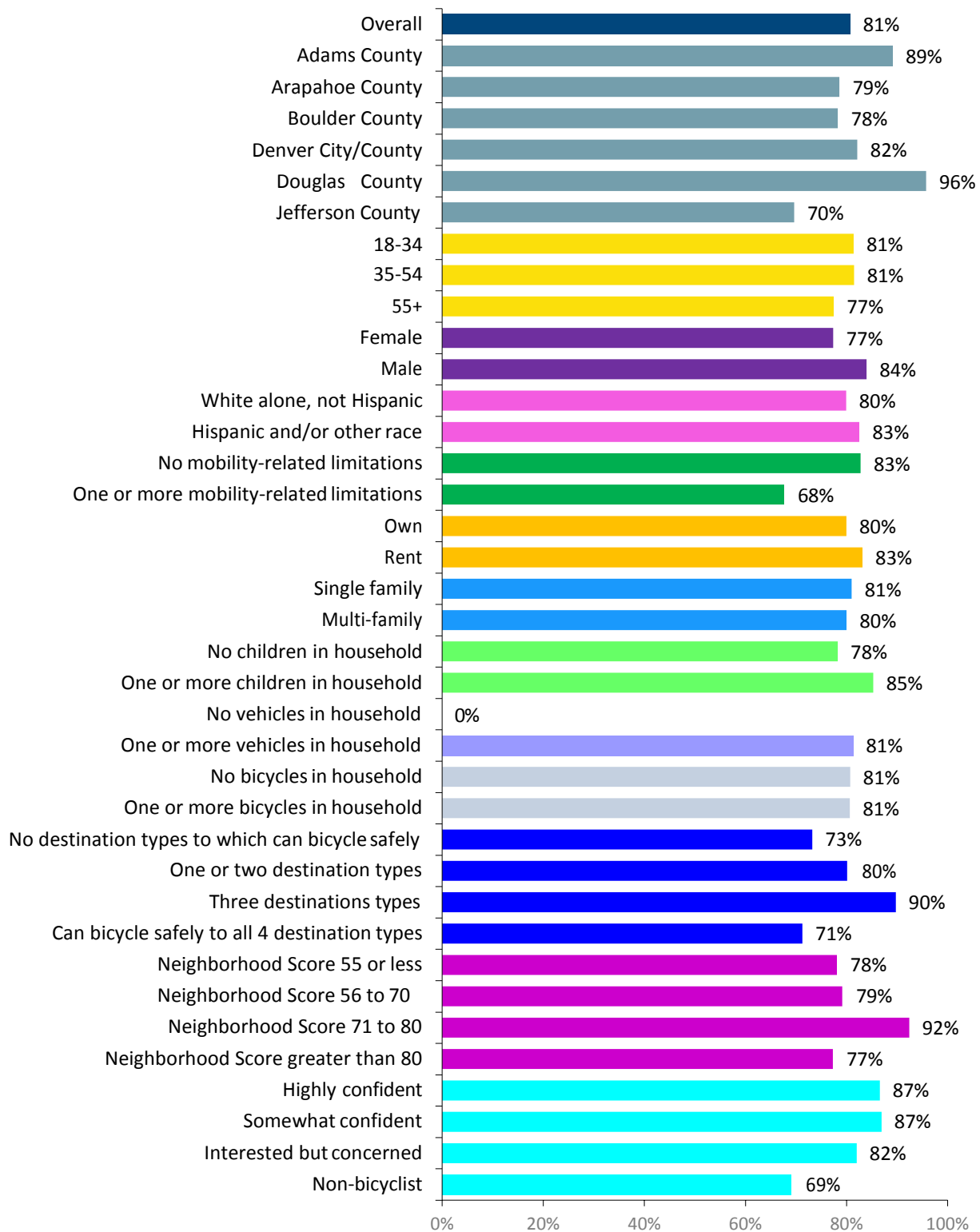
**Figure 28: Percent of Respondents Who Walked for Work in a Typical Month, by Respondent Characteristics**



**Figure 29: Percent Making Any Work Commute Trips in Last Week by Walking, by Respondent Characteristics**



**Figure 30: Percent Making Any Work Commute Trips in Last Week by Driving Alone, by Respondent Characteristics**



## References

- Dill, J. (2012 ). Categorizing Cyclists: What do we Know? Insights from Portland, OR Presentation to Velo-City Global 2012, Vancouver, BC, June 26, 2012.
- Dill, J. (2015). Four Types of Cyclists NITC Webinar, August 11, 2015 Portland, OR: Portland State University.
- Dill, J., & McNeil, N. (2012). Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential. Portland State University.
- Dill, J., & McNeil, N. (2013). Four Types of Cyclists? Examination of Typology for Better Understanding of Bicycling Behavior and Potential Transportation Research Record: *Journal of the Transportation Research Board* No. 2387 (pp. 129-138). Washington, D.C.
- Dill, J., & McNeil, N. (2016). Revisiting the Four Types of Cyclists: Findings from a National Survey. *Transportation Research Record: Journal of the Transportation Research Board*, No. 2587 (pp. 90-99). Washington, D.C.
- Geller, R. Four Types of Cyclists. Portland Bureau of Transportation, Portland, Ore., 2006, updated 2009 <https://www.portlandoregon.gov/transportation/article/264746>. Accessed July 10, 2017.
- Maus, J. What Type of Cyclist Are You? BikePortland.Org, Dec. 7, 2006. <https://bikeportland.org/2006/12/07/what-type-of-cyclist-are-you-2650>. Accessed July 10, 2017.

For additional information or appendices to the Survey of Residents about Active Transportation report, please inquire with DRCOG staff.





---

# DENVER REGIONAL ACTIVE TRANSPORTATION PLAN

---

Appendix C: Technical Documentation

## CONTENTS

|  |          |
|--|----------|
| <b>Active Transportation Network development process</b>       | <b>1</b> |
| <b>Regional Active Transportation Corridors</b>                | <b>1</b> |
| Step 1: Identify regional origins and destinations             | 1        |
| Step 2: Identify and map major trails                          | 2        |
| Step 3: Create a conceptual network                            | 3        |
| Step 4: Gather and map input from stakeholders                 | 3        |
| Step 5: Refine the Regional Active Transportation Corridor map | 3        |
| <b>Pedestrian Focus Areas</b>                                  | <b>5</b> |
| <b>Short-Trip Opportunity Zones</b>                            | <b>6</b> |
| <b>Performance Measures</b>                                    | <b>7</b> |

# ACTIVE TRANSPORTATION NETWORK DEVELOPMENT PROCESS

Separate processes were used to identify regional active transportation corridors, pedestrian focus areas, and short-trip opportunity zones. The key steps are described separately for each geography type.

## REGIONAL ACTIVE TRANSPORTATION CORRIDORS

Regional Active Transportation Corridors were identified through an iterative and data-driven process. The process included the following steps:

1. Identify regional origins and destinations
2. Identify and map major trails
3. Create a conceptual network
4. Gather and map input from stakeholders
5. Refine the Regional Active Transportation Corridor map

Each step is described below in greater detail and a visual example is provided in Figure 1.

### STEP 1: IDENTIFY REGIONAL ORIGINS AND DESTINATIONS

The first step to identify Regional Active Transportation Corridors was to understand where in the DRCOG region people might want to walk or bicycle to and from. The focus in this step of the analysis was on significant regional origins and destinations. ‘

A GIS-based process was used to identify these origins and destinations. The data and associated values (weights) used in the subsequent analysis are listed in Table 1.

**Table 1. Regional origin and destination factors**

| Factor                         | Data source                  | Description   | Value  |
|--------------------------------|------------------------------|---|--|
| <b>Urban Center</b>            | DRCOG Urban Centers          | Areas in the region that DRCOG has identified as an existing or emerging urban center | 1  |
| <b>Transit Station or Stop</b> | RTD                          | Locations within a ¼ mile to a rail station, regional bus stop or Park-n-Ride         | 1  |
| <b>Population Density</b>      | DRCOG Traffic Analysis Zones | The number of people per square mile  | 0-1 (based on population density percentile) |
| <b>Employment Density</b>      | DRCOG Traffic Analysis Zones | The number of jobs per square mile  | 0-1 (based on population density percentile) |
| <b>Low Vehicle Ownership</b>   | DRCOG Traffic Analysis Zones | The five percent of households that have low vehicle ownership                        | 1  |



## APPENDIX C | TECHNICAL DOCUMENTATION

|                             |  |   |   |
|-----------------------------|--|---|---|
| <b>Low Income Household</b> | DRCOG Traffic Analysis Zones                                 | The five percent of households that are identified as in poverty  | 1 |
| <b>Civic Institution</b>    | OpenStreetMap  | Locations within a ¼ mile to a county courthouse or the presence of a higher education institution, high school, or recreation center | 1 |
| <b>Major Trail</b>          | DRCOG Bicycle Facility Inventory, Colorado Front Range Trail | Locations within ¼ mile to a major trail (defined in Step 2)  | 1 |

### Origins and destinations analysis

The data sets identified in Table 1 were compiled and analyzed to identify areas with a high concentration of regional origins and destinations. To account for varying geography levels in the underlying data, the data was smoothed and then aggregated to the census block level. More specifically, an evenly-spaced point grid covering the entire DRCOG region was developed and overlaid with each of the above data sets, and the results were summed. The maximum possible value of a given point was 8, reflecting the sum of all possible inputs. A kernel density estimation process was used to create a continuous surface (raster) of values from the point grid, and the results were then aggregated at the census block level. Census blocks were mapped based on these scores, with those having the highest value serving regional origins and destinations.

## STEP 2: IDENTIFY AND MAP MAJOR TRAILS

The next step to identify regional corridors was to map existing and planned major trails in comparison to the origins and destinations identified in Step 1. DRCOG worked with the Active Transportation Stakeholder Committee (ATSC) to define which trails should be considered as a ‘major trail’ for this effort, and these are listed below.

- Bear Creek Trail
- Big Dry Creek Trail
- Boulder Creek Path
- Broomfield Trail
- C 470 Trail
- Centennial Trail
- Cherry Creek Trail
- Clear Creek Trail
- Coal Creek Trail
- Colorado Front Range Trail
- E 470 Trail
- East-west Trail
- Farmers' High Line Canal Trail
- Golden Bike Path
- High Line Canal
- Kipling Parkway
- Lakewood Gulch Trail
- Lefthand Greenway
- Little Dry Creek Trail
- Longmont to Boulder Trail
- Mary Carter Greenway
- Plum Creek Trail
- Ralston Creek Trail
- Rock Creek Trail
- Rocky Mountain Greenway
- Sand Creek Trail
- Signal Creek
- South Platte River Trail
- St Vrain Greenway
- Toll Gate Creek Trail
- US36 Trail
- Westerly Creek

### STEP 3: CREATE A CONCEPTUAL NETWORK

The major trails identified in Step 2 established a strong foundation for the network and highlighted gaps in the regional trail system. At this stage, a conceptual network was developed to show important cross-jurisdictional connections that were needed and to create a blueprint for the identification of specific regional active transportation corridor alignments. The conceptual network was intended to be abstract in nature and did not refer to specific roadways or trails.

### STEP 4: GATHER AND MAP INPUT FROM STAKEHOLDERS

In June 2018, the project team met with local jurisdictions to discuss existing and proposed routes in detail. The purpose of these meetings was to review the analysis results and conceptual network, and to understand local priorities and preferences for the regional active transportation corridors. Representatives from local jurisdictions identified significant active transportation corridors in their respective areas.

Also at these meetings, growth areas were identified to ensure the corridor recommendations would address the region's anticipated long-term needs for bicycling and walking facilities.

Based on the conceptual network map and stakeholder conversations, the project team produced a draft regional active transportation network map representing a wide range of potential regional corridors.



Local agency staff suggest modifications to the draft regional corridor map.

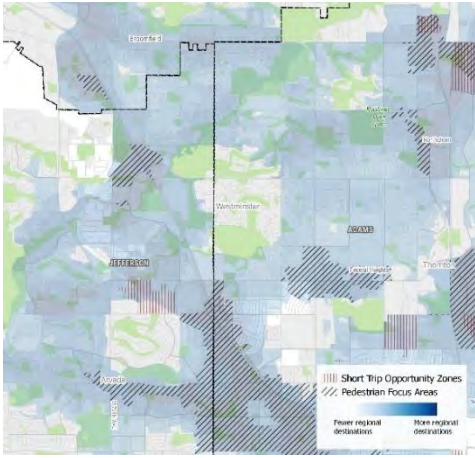
### STEP 5: REFINE THE REGIONAL ACTIVE TRANSPORTATION CORRIDOR MAP

With a goal of identifying connections that were regional in nature and creating a network that highlights the most prominent local facilities, a revised network was developed. This updated network was shared with stakeholders through an online, interactive map for an additional round of stakeholder input and feedback. Respondents from across the region registered 146 comments on the online map. As a result, the regional corridor was further refined. At this point, additional data was provided by some agencies to ensure their highest priority routes were reflected in the regional map. The project team developed a final regional active transportation corridor map based on these inputs (Figure 1).

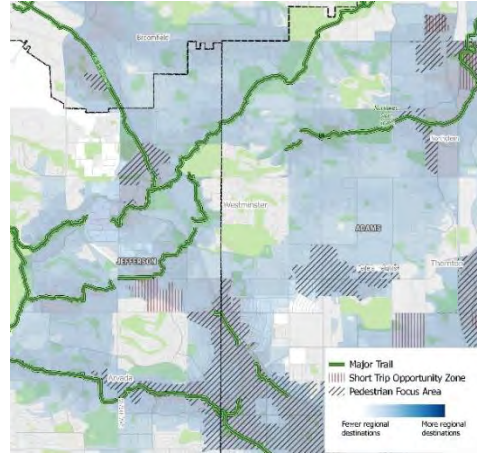
# APPENDIX C | TECHNICAL DOCUMENTATION

**Figure 1. Regional active transportation corridor development process**

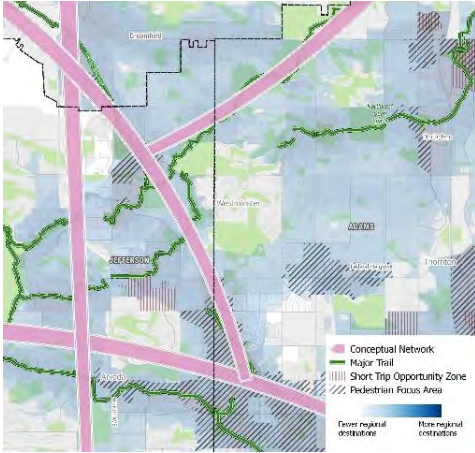
**Step 1: Identify regional origins and**



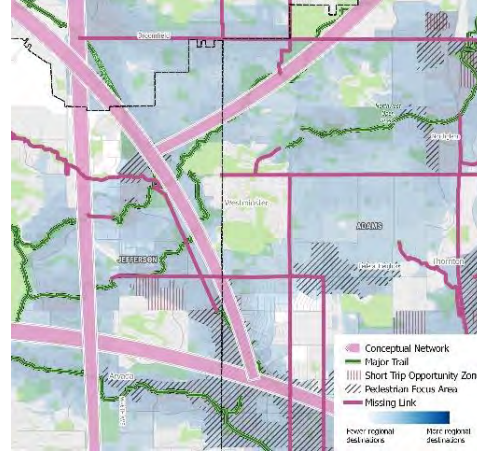
**Step 2: Identify and map major trails**



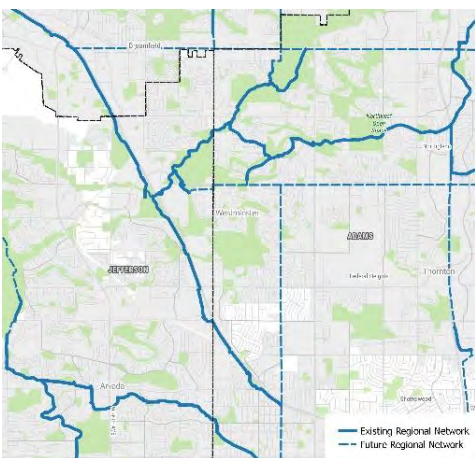
**Step 3: Create a conceptual network**



**Step 4: Gather and map input from**



**Step 5: Refine the Regional Active Transportation Corridor map**



## PEDESTRIAN FOCUS AREAS

Pedestrian focus areas represent areas where a high level of pedestrian activity currently occurs or where it would be likely to occur if comfortable and safe walking facilities were present. The process to identify pedestrian focus areas at the regional scale was similar to Step 1 of the Regional Active Transportation Corridor identification process. After the initial data shown in Table 2 were compiled, a point grid covering the entire DRCOG region was overlaid with each data set, and the results were summed. The maximum possible value of a given point was 10, reflecting the sum of all possible inputs. A kernel density estimation process was used to create a continuous surface (raster) of values from the point grid, and the results were then aggregated at the census block level. Census blocks were ranked based on these scores, and those within the top 10<sup>th</sup> percentile were identified as pedestrian focus areas. In addition, the top 5<sup>th</sup> percentile within each county were identified, and a few areas were added based on stakeholder feedback.

**Table 2. Pedestrian Focus Area Factors**

| Factor                                | Data source  | Description  | Value   |
|---------------------------------------|--|--|---|
| <b>Pedestrian high-crash corridor</b> | CDOT/DRCOG; processed by Toole Design Group                  | Corridors with a high concentration of pedestrian crashes  | 1   |
| <b>Transit Station or Stop</b>        | RTD  | Locations within a ¼ mile to a rail station, bus stop, or Park-N-Ride  | 2 (rail station or park-n-ride); 1 (bus stop)       |
| <b>Urban Center</b>                   | DRCOG Traffic Analysis Zones                                 | Areas in the region that DRCOG has identified as an existing or emerging urban center  | 1   |
| <b>Population Density</b>             | DRCOG Traffic Analysis Zones                                 | The number of people per square mile   | 0-1 (based on population density percentile)        |
| <b>Employment Density</b>             | DRCOG Traffic Analysis Zones                                 | The number of jobs per square mile   | 0-1 (based on population density percentile)        |
| <b>Senior Population Density</b>      | DRCOG Traffic Analysis Zones                                 | The number of adults equal to or older than 65 years old per square mile   | 0-1 (based on senior population density percentile) |
| <b>Low Vehicle Ownership</b>          | Open Street Map  | The percent of households that have low vehicle ownership  | 1   |
| <b>Low Income Households</b>          | DRCOG Bicycle Facility Inventory, Colorado Front Range Trail | The percent of households that are identified as in poverty  | 1   |
| <b>Civic Institutions</b>             |  | Locations within a ¼ mile to a county courthouse or the presence of a higher education institution, high school or recreation center | 1   |
| <b>Major Trail</b>                    |  | Locations within ¼ mile to a major trail (as defined above)  | 1   |

## SHORT-TRIP OPPORTUNITY ZONES

Short-trip opportunity zones are areas with a high percentage of trips 2 miles or less. Research has found that short trips are more likely than longer trips to be converted from vehicle to bicycling,<sup>1</sup> and the average bicycle trip length in the Denver region is 1.8 miles.

Short-trip opportunity zones were identified using data from DRCOG's regional travel demand model. Trips of 2 miles or less were aggregated by traffic analysis zones (TAZs). This process was repeated for DRCOG's current travel demand model estimates and its projected (2040) estimates. A short trip was assigned to a zone if it began or ended within the zone. For consistency with other geographic areas used in the ATP, the results were aggregated by census block and those within the top 10<sup>th</sup> percentile were identified as Short-Trip Opportunity Zones. Additionally, areas within ½ mile of the following parks were identified as Short-Trip Opportunity Zones, because they are known to attract a high volume of short trips but are not well accounted for in DRCOG's model: Cheesman Park, Washington Park, Sloan's Lake, Chautauqua Park, City Park, and Civic Center.

---

<sup>1</sup> M Winters, M Brauer, E Setton, K Teschke. 2010. Built Environment Influences on Healthy Transportation Choices: Bicycling Versus Driving. Journal of Urban Health.

# PERFORMANCE MEASURES

The methods and data sources used to calculate performance measures for the ATP are shown in Table 3.

**Table 3. Performance measure methods and data sources**

| Performance Measure | Method   | Data Source  |  |
|---------------------|--|--|--|
| 1                   | Number of pedestrian and bicyclist fatalities & serious injuries         | Pulled 2015 Incapacitating Injury and Fatal Crash numbers from Tables 3 and 4 of DRCOG Bicycle and Pedestrian Crash Report   | DRCOG Bicycle and Pedestrian Crash Report, 2015 data   |
| 2                   | Number of pedestrian fatalities and serious injuries per 100K residents. | Pulled 2015 Incapacitating Injury and Fatal Crash numbers from Table 3 of DRCOG Bicycle and Pedestrian Crash Report (251) and divided by ACS 2015 5-year population estimate (Table B01003) for DRCOG (3,016,316)        | DRCOG Bicycle and Pedestrian Crash Report, 2015 data; ACS 2015 5-year population estimate  |
| 3                   | Number of bicyclist fatalities and serious injuries per 100K residents.  | Pulled 2015 Incapacitating Injury and Fatal Crash numbers from Table 4 of DRCOG Bicycle and Pedestrian Crash Report (123) and divided by ACS 2015 5-year population estimate (Table B01003) for DRCOG region (3,016,316) | DRCOG Bicycle and Pedestrian Crash Report, 2015 data; ACS 2015 5-year population estimate  |
| 4                   | Percent of population using non-SOV mode to work                         | Calculated total non-SOV commuters for each county; summed and divided by total workers 16+. Used ACS Table S0801 for full Counties; isolated portion of Weld County within DRCOG boundary using Census block data       | ACS 2016 5-year  |
| 5                   | Daily VMT per capita   | 2015 Model-wide Daily VMT (83,049,238) divided by ACS 2015 5-year population estimate (Table B01003) for DRCOG (3,016,316)   | DRCOG model: Focus 2.1 (January 2018) 2015 model-wide Daily VMT; ACS 2015 5-year population estimate   |
| 6                   | Number of schools participating in bike/walk to school day               | Count of schools registered by County in Walk & Bike to School Day   | <i>Walk &amp; Bike to School.</i> "Who's Walking". <a href="http://152.2.173.188/walkbiketoschool/registration/whoswalking.php?sid=CO">http://152.2.173.188/walkbiketoschool/registration/whoswalking.php?sid=CO</a> |
| 7                   | Miles of existing regional active transportation corridors               | Summed miles of regional active transportation corridors flagged as existing   | ATP/ DRCOG Bicycle Facility Inventory  |

## APPENDIX C | TECHNICAL DOCUMENTATION

|           |   |   |   |
|-----------|---|---|---|
| <b>8</b>  | Miles of bicycle facilities in the DRCOG Bicycle Facility Inventory | Used DRCOG bike facilities inventory provided to project team. Created new field called Total_Miles. Calculated total miles for bicycle facilities within the DRCOG regional boundary, including Paved trail - 'Paved Trail - Waterway, RR, Utility', 'Paved Trail Next to Road', 'Path or Cul-De-Sac Links', 'Multi-Purpose Sidewalk', 'Separated Sidewalk', 'Neighborhood Trail' Unpaved trail- 'Unpaved Trail Next to Road', 'Unpaved Trail - Waterway, RR, Utility' Protected bike lane - 'Protected Bicycle Lane' Bike lane- 'Bike Lane'                         | DRCOG Bicycle Facility Inventory  |
| <b>9</b>  | Miles of sidewalk along arterials and collector streets             | Downloaded CDOT major roads shapefile, which only includes collector and arterial roads. Clipped roads file to DRCOG regional Boundary. Downloaded DRCOG sidewalk centerline shapefile (2016). Created 100-foot buffer around road centerline (a 100-foot buffer captured most of the sidewalk lines that fell on collector/arterial roads). Clipped sidewalks to roads buffer layer and saved new shapefile. Created new field called Total Miles. Calculated total miles of sidewalks that fall on collector and arterial roads within the DRCOG regional boundary. | DRCOG Sidewalk Inventory ( <a href="https://data.drcog.org/datasets/sidewalk-centerlines-2016">https://data.drcog.org/datasets/sidewalk-centerlines-2016</a> );CDOT major roads ( <a href="http://dtdapps.coloradodot.info/otis/catalog">http://dtdapps.coloradodot.info/otis/catalog</a> ) |
| <b>10</b> | Miles of sidewalk in pedestrian focus areas                         | Broke out the top 10% of pedestrian focus areas using the Ped_meanme attribute field. Exported the pedestrian focus areas to a new shapefile. Performed overlay analysis to get total number of miles of sidewalk within focus areas. Added a new field called Tot_Miles. Calculated the sum of sidewalk segments.  | ATP/ Pedestrian Focus Areas; DRCOG Sidewalk Inventory   |

**APPENDIX C | TECHNICAL DOCUMENTATION**

|                  |  |   |  |
|------------------|--|---|--|
| <p><b>11</b></p> | <p>Miles of high-comfort bicycle facilities (shared use paths, sidepaths, separated bicycle lanes, bicycle boulevards)</p> | <p>Used DRCOG bike facilities inventory provided to project team. Selected "high-comfort" facilities. (shared use paths, sidepaths, separated bicycle lanes, bicycle boulevards), based on the following DRCOG facility types: Paved Trail - Waterway, RR, Utility, Paved Trail Next to Road, Path or Cul-De-Sac Links, Multi-Purpose Sidewalks, Separated Sidewalks, Neighborhood Trails, Protected bike lanes. Total miles were calculated from this selected set of bike facilities.</p>   | <p>DRCOG Bicycle Facility Inventory</p>  |
| <p><b>12</b></p> | <p>Percentage of arterial and collector streets with bicycle facilities within one mile of transit stations</p>            | <p>Consolidated all transit stops (RTD Park-n-Rides &amp; RTD light rail stations) into one file. Created 1-mile buffer around transit stops. Performed overlay analysis with DRCOG bike facilities and with arterial/collector roads (Only used on-street bike facilities, removed trails). Only kept roads where bike facilities were present in 1-mile buffer of transit stops. Calculated total miles of bike facilities that fell on arterial/collector roads within 1-mile buffer (112 miles) and divided it by total arterial/collector roads within 1-mile buffer of transit stops (616 miles). The total percentage = 18%.</p>   | <p>CDOT major roads (Only includes arterials and collector roads); DRCOG Bicycle Facility Inventory (Only used on-street bicycle facilities, this included Bike Lanes and Protected Bicycle Lanes ); RTD Transit Stations/Stops &amp; RTD Park-n-Rides</p> |
| <p><b>13</b></p> | <p>Percentage of arterial and collector streets with sidewalks within 1/4 mile of transit stations</p>                     | <p>Consolidated all transit stops (RTD Park-n-Rides &amp; RTD light rail stations) into one file. Created 1/4-mile buffer around transit stops. Performed overlay analysis with DRCOG sidewalk centerlines and with CDOT major roads (Arterials &amp; collectors only), keeping roads where sidewalk centerlines were present in 100-foot buffer. Calculated total miles of sidewalks that fell within a quarter mile buffer along arterial/collector roads (119 miles) and divided it by total arterial/collector roads miles (77 miles*2 = 154 miles) that fell within 1/4-mile buffer of transit stops. Doubled centerline miles to compensate for sidewalks on either side of roadway centerline.</p> | <p>CDOT major roads (Only includes arterial and collector roads); DRCOG Sidewalk centerline Inventory; RTD Transit Stations/Stops &amp; RTD Park-n-Rides</p>   |



## APPENDIX C | TECHNICAL DOCUMENTATION

|           |   |  |   |
|-----------|---|--|---|
| <b>14</b> | Number of member governments with Complete Streets policies/regulations/codes                           | As reported by Member Governments  | Member Governments  |
| <b>15</b> | Number of member governments with bikeshare/dockless mobility policies.                                 | As reported by Member Governments  | Member Governments  |
| <b>16</b> | Percent of the population within ½ mile distance of an existing regional active transportation corridor | Joined ACS_15_5YR_B01003 Total Population table to census block groups shapefile. Calculated total acres. Performed overlay analysis with census block groups and 1/2-mile buffer of regional active transportation corridors (existing). Calculated new acres for buffer areas. Divided new acres by total acres multiplied by total population to get total population within buffered area. Divided new population by total population to get percentage of population within regional active transportation corridors. | Census population (block groups); ATP/ DRCOG Bicycle Facility Inventory |

**APPENDIX C | TECHNICAL DOCUMENTATION**

|                  |   |   |   |
|------------------|---|---|---|
| <p><b>17</b></p> | <p>Percent of transportation-disadvantaged population within ½ mile distance of an existing regional active transportation corridor</p> | <p>The following census tables were downloaded from the US Census Bureau for block groups: ACS_16_5YR_B17017 (Poverty Status), ACS_16_5YR_B01001 (Below 18 &amp; 65+), ACS_16_5YR_B02001 (Race), ACS_16_5YR_B25044(Zero Vehicle Households). The following table was downloaded from the US census bureau for census tracts: ACS_16_5YR_S1810 (Disabilities). Census tables were joined to census block groups and census tracts based on Geoid. Total Acres was calculated for both. Due to mixed geographies (census block groups and census tracts an overlay process (Union) must be applied to sync the disability population to the other criteria. After the union process occurs a new acres field must be created to account for the census tracts being changed to census block groups. Overlap polygons will be removed. Once a new acres or factored acres is calculated, it is important to re-calculate the disabled population. Create a new field for new disabled population, divide the new factored acres by the total acres multiplied by the disabled population to get a new disabled population. Six new fields need to be created to calculate the population densities for each criterion. Divide the populations of each by new factored acres to get population densities. Break out each criterion using ranges and using 4 classes as quantiles. Create six new fields for scoring. A score of 1-4 should be applied based on range break outs. Lowest range gets a 1 and highest range gets a 4. Do this for each criterion. Create new field called Total score. Sum all scores across to get a total. Take the top 10% of total score and do a selection by location using intersect the source feature (1/2-mile Buffer of existing corridors). Sum the total population of selected records to get dis-advantaged percent population. Divide the selected population records with the total disadvantaged population to get final percentage.</p> | <p>ATP/ DRCOG Bicycle Facility Inventory; various census layers</p> |
|------------------|---|---|---|



**APPENDIX D:**  
**ACTIVE TRANSPORTATION PLAN**  
**BICYCLE AND PEDESTRIAN CRASH REPORT**

---





## ABOUT THE DATA IN THIS REPORT

The data source for this report is the Denver Regional Council of Governments-Colorado Department of Transportation traffic crash database. This database is a collaborative effort among multiple agencies. When crashes involving vehicles occur, officers fill out a crash form and send it the Department of Revenue, which processes the records and enters the into the state's DRIVES database. CDOT receives crash data from DRIVES, then processes the data. This process adds an additional crash type field, corrects common errors, updates location information and normalizes the data <sup>1</sup> CDOT sends the Denver regional crash data to DRCOG, which geocodes the data. Once geocoded, CDOT verifies the final product. The database does not include records for crashes not reported to, or by, law enforcement agencies.

This report presents data on motor vehicle crashes involving pedestrians and bicyclists from calendar years 2010 through 2015. During those six years, 5,573 pedestrian crashes and 5,387 bicycle crashes were reported. Pedestrian crashes refer to crash types that were classified as "pedestrian" or if a pedestrian was involved in a harmful event that took place during the crash. Bicycle crashes refer to crash types that were classified as "bicycle" or if a bicycle was involved in a harmful event that took place during the crash.

Given data limitations, it is not possible to determine which individual or person type (for example, the driver, passenger, pedestrian or bicyclist) was injured in a specific crash. For data tabulations, it was assumed that the most vulnerable person was the most likely to suffer the most severe injury. Detailed injury data were not available for this crash report. There are also gaps in the data, as most of the crashes do not have all detailed fields available. For example, the age of the person associated with a crash may be available for one crash but not for another. All numbers in this report were derived from available data. Readers are encouraged to consider these data constraints while reading the results of this crash report.

---

<sup>1</sup> CDOT. *The Colorado Department of Transportation Crash Data Process.*

<https://www.codot.gov/library/traffic/safety-crash-data/crash-data/crash-data-request-process>

## TABLE OF CONTENTS

|   |           |
|---|-----------|
| <b>INTRODUCTION</b> .....                                 | <b>6</b>  |
| Report Purpose.....                                       | 6         |
| DRCOG Safety Performance Measures and Targets.....        | 7         |
| Traffic Fatalities and Other Leading Causes of Death..... | 8         |
| Economic Cost .....                                       | 8         |
| Safety Initiatives .....                                  | 8         |
| <b>TRENDS IN REGIONAL TRAFFIC FATALITIES</b> .....        | <b>9</b>  |
| Fatalities by Mode.....                                   | 10        |
| Nonmotorized Fatalities .....                             | 10        |
| <b>OVERVIEW</b> .....                                     | <b>12</b> |
| Travel Trends.....  | 12        |
| County Crash Numbers.....                                 | 13        |
| Injury Severity .....                                     | 14        |
| Comparison with Other Regions .....                       | 16        |

|  |           |
|--|-----------|
| <b>LOCATION OF CRASHES</b> .....                       | <b>18</b> |
| Roadway Facility Type .....                            | 18        |
| Midblock versus Intersection .....                     | 20        |
| Proximity to Schools .....                             | 24        |
| Proximity to Transit.....                              | 26        |
| Interactive Crash Viewer .....                         | 27        |
| <b>VEHICLE MOVEMENT</b> .....                          | <b>28</b> |
| <b>AGE AND SEX OF PEOPLE INVOLVED IN CRASHES</b> ..... | <b>30</b> |
| <b>CONDITIONS</b> .....                                | <b>34</b> |
| When Crashes Occur.....                                | 38        |
| Crashes Involving Impaired Driving.....                | 42        |
| Crashes Involving Human Contributing Factors.....      | 44        |
| <b>NEXT STEPS</b> .....                                | <b>46</b> |



## INTRODUCTION

This report summarizes bicycle and pedestrian crash analysis prepared as part of the Denver Regional Council of Governments Active Transportation Plan. Over 2 million bicycle and walking trips are made each day in the Denver region. The percent of people who bicycle to work in the region is more than twice the national average and bicycling is the fastest-growing mode for work trips. Population and employment continue to grow and have brought more commuters to the region's roads. With an increase in pedestrians and bicyclists using the transportation system comes an increased risk of pedestrians and bicyclists being involved in crashes likely to result in injury or death. Identifying where crashes are taking place and other crash trends will allow the region to better organize its efforts and prioritize its projects to reduce the number of pedestrian and bicycle crashes.

Walking and bicycling are essential to the overall multimodal transportation system and have a significant effect on achieving regional goals. DRCOG helps local member jurisdictions plan for active transportation by providing crash information, policy guidance, tools, data and analysis. Metro Vision and the Metro Vision Regional Transportation Plan highlight opportunities to improve pedestrian and bicycle networks throughout the region, and to enhance connectivity and accessibility, safety and quality of life. In 2018, DRCOG kicked off the development of the first-ever regionwide Active Transportation Plan. When complete, the plan will highlight critical opportunities and strategies to improve active transportation across the region. DRCOG's commitment to expand active transportation is demonstrated through the breadth of its investment in shared-use paths, other bicycle and pedestrian facilities, and multimodal components of on-street transportation projects. In the 2016-2021 Transportation Improvement Program, 22 percent of TIP funds were dedicated to active transportation projects, in addition to those projects which had active transportation components.

DRCOG hosts the second-largest annual Bike to Work Day in the nation. Among DRCOG's efforts to change behavior and encourage smart commute options is its Way to Go partnership with seven local transportation management associations. The regional partnership facilitates local

coordination to reduce traffic congestion, improve air quality and make life better for the region's residents. It promotes commute options including bicycling, walking, riding public transit, carpooling and vanpooling.

DRCOG has also increased its efforts to improve pedestrian connectivity to, and from, transit. First- and final-mile connectivity is not a new concept, but increased emphasis on such connectivity is evident in DRCOG's efforts to fund Urban Center/Station Area Master Plans and through participation in local and regional first- and final-mile studies

### Report Purpose

DRCOG is committed to providing a safe multimodal transportation network and prioritizing safety and safety initiatives to reverse recent traffic-related fatality trends. DRCOG's commitment is illustrated by the TIP focus areas:

1. Improve mobility infrastructure and services for vulnerable populations (including improved transportation access to health services).
2. Increase the reliability of existing multimodal transportation network.
3. Improve transportation safety and security.

Safety concerns are a leading inhibitor to more people walking and bicycling for transportation. A survey conducted by Toole Design Group revealed that 70 percent of respondents would bicycle more if they felt safer from traffic while riding a bicycle and 66 percent of respondents would walk more if there were more off-street walking and shared-use paths.

This report examines crashes in the Denver region that involve pedestrians and bicyclists to provide data to inform decision-makers and inspire the region to expand and improve its safety efforts. It identifies the context for crash characteristics and trends, providing insight into where and why pedestrian and bicycle crashes are happening in the region.

## DRCOG Safety Performance Measures and Targets

The DRCOG Board adopted the regional Metro Vision plan in January 2017. Metro Vision guides DRCOG’s work and establishes a shared aspirational vision among the counties and municipalities of the Denver region. Metro Vision promotes regional cooperation on issues, such as safety, that extend beyond jurisdictional boundaries.

Metro Vision includes regional objectives that identify areas in the region that require continuous improvement, and strategic initiatives that identify voluntary opportunities for regional and local organizations and governments to support local contributions. To track and determine the regional progress toward identified outcomes, Metro vision establishes a series of performance measures based on:

- relevance to plan outcomes and objectives
- availability of regularly updated and reliable data sources
- use of measurable, quantitative information, rather than anecdotal insights

For each performance measure, a baseline indicates the region’s current status and a 2040 target establishes the desired future outcome.

*Regional Objective 5: Operate, manage and maintain a safe and reliable transportation system.* This objective directly relates to safety, as one of its three supporting objectives is “Improve transportation safety and security.” **Table 1** shows the performance measure, baseline and 2040 target associated with traffic fatalities

**Table 1. Metro Vision Traffic Fatality Performance Measure**

| Measure                      | Where are we today? (baseline) | Where do we want to be? (2040 target) |
|------------------------------|--------------------------------|---------------------------------------|
| Number of traffic fatalities | 185 (2014)                     | Fewer than 100 annually               |

The Federal Highway Administration’s Transportation Performance Management program uses transportation system performance outcomes to make investment and policy decisions to achieve national performance goals. Effective April 14, 2016, federal regulations established requirements for performance measures, targets and reporting. The federal regulations require CDOT and DRCOG to annually set targets for five safety measures and report on progress toward achieving the targets.

To develop 2018 safety targets, DRCOG staff worked with the Transportation Advisory Committee over several meetings to develop a methodology for setting the targets for the DRCOG transportation management area. Based on Metro Vision’s 2040 target of fewer than 100 traffic fatalities annually, the methodology considered how much fatalities would need to decrease each year to achieve the 2040 Metro Vision target. **Table 2** shows DRCOG’s 2018 safety targets based on a five-year moving average.

**Table 2. DRCOG’s 2018 Transportation Management Area Safety Targets - Five-Year Moving Averages**

| Measures   | Targets        |
|--|----------------|
| Fatalities   | 242            |
| Fatality rate per 100 million vehicle miles traveled       | 0.90           |
| Serious injuries   | 1,948          |
| Serious injury rate per 100 million vehicle miles traveled | 7.20           |
| Nonmotorized fatalities and serious injuries               | 59 + 287 = 346 |

Evaluation and reporting related to its progress toward target achievement will take place in 2019. The Federal Highway Administration will review all performance as part of the ongoing transportation planning process reviews.

## Traffic Fatalities and Other Leading Causes of Death

Traffic fatalities are one of the leading causes of death in the United States. This is especially true for younger Americans. According to the National Highway Traffic Safety Administration: “motor vehicle crashes were the 13th leading cause of death from 2012 to 2014. When ranked by age, motor vehicle traffic crashes were the number one cause of death among people 16 to 24 years old for each year 2012 to 2014. Motor vehicle crashes were also the number one leading cause of death for 11-year-old children in 2014, as well as for 4-year-old children in 2013. Similarly, motor vehicle traffic crashes were the number one leading cause of death for 13-year-olds and those 16 to 25 in 2012.”<sup>2</sup> The National Center for Health Statistics groups traffic fatalities with accidents (unintentional injuries). According to 2016 long-term health trends, such accidents are the fourth-leading cause of death behind heart disease, cancer and chronic lower respiratory diseases.

Where do pedestrian and bicyclist fatalities fall in these trends? The National Highway Traffic Safety Administration notes that, in 2016, “pedestrian fatalities increased by 492 (a 9.0 percent increase) and are at their highest number since 1990. Pedalcyclist fatalities increased by 11 (a 1.3 percent increase), and are at their highest number since 1991.”<sup>3</sup>

## Economic Cost

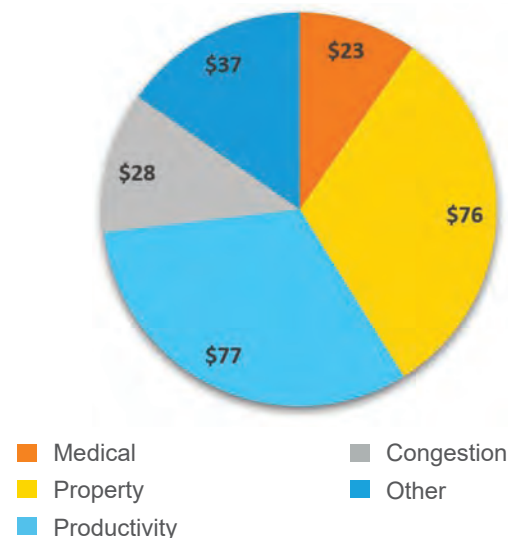
Not only do traffic crashes have devastating effects on victims and their loved ones, crashes are also associated with significant economic costs including property damage, workplace and household productivity loss of the victim, medical costs and traffic congestion. The National Highway Traffic Safety Administration’s study, *The Economic and Societal Impact of Motor Vehicle Crashes* accounts for the \$242 billion cost of traffic-related crashes in 2010 by category as illustrated in **Figure 1**. If the cost was

distributed to every person in the United States, the cost would be close to \$800 per person. Injuries involving pedestrians and bicyclists cause 7 percent of the economic cost and 10 percent of the societal harm.

## Safety Initiatives

With trends showing an overall increase in traffic-related fatalities throughout the United States, the implementation of safety initiatives has correspondingly risen. Local and national agencies have made such initiatives high priorities with the goal of making long-term change to traffic-related fatality trends. Vision Zero is a multinational traffic safety project to achieve a target of no fatalities or serious injuries involving road traffic, organized around the principle that “it can never be ethically acceptable that people are seriously injured when moving within the road transport system.”<sup>4</sup> In 2015, the City and County of Denver initiated a Vision Zero plan and in February 2016, Mayor Michael Hancock announced Denver’s commitment to the five-year action plan to achieve zero deaths and serious injuries by 2030. In October 2017, Denver released the Denver Vision Zero Action Plan.

**Figure 1. Economic Cost of Motor Vehicle Crashes in Billions of Dollars in the United States (2010)<sup>5</sup>**



Source: National Highway Traffic Safety Administration

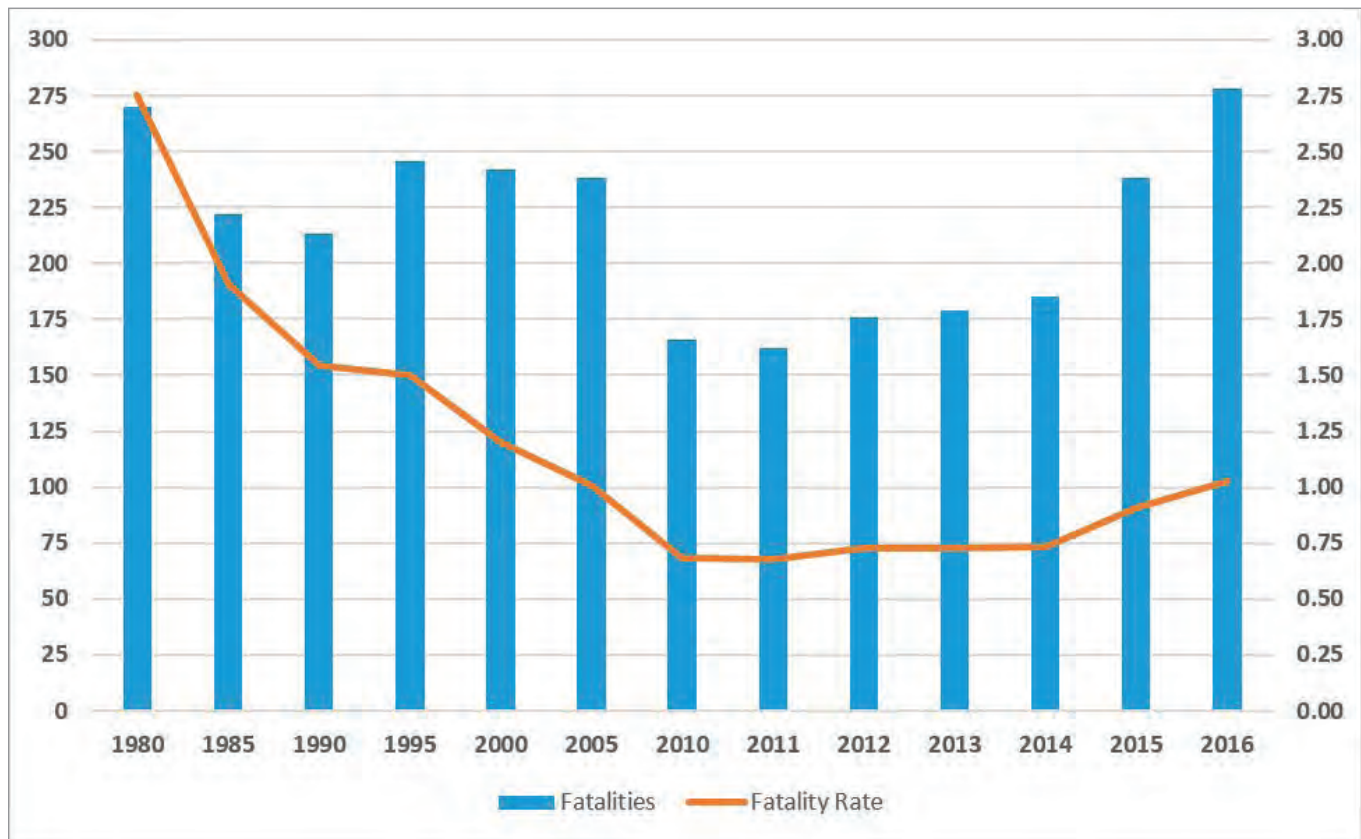
<sup>2</sup> 2016. National Highway Traffic Safety Administration. “Motor Vehicle Traffic Crashes as a Leading Cause of Death in the United States, 2012-2014”

<sup>3</sup> 2017. National Highway Traffic Safety Administration. “2016 Fatal Motor Vehicle Crashes: Overview”

<sup>4</sup> 2016. Monash University Accident Research Center. “Vision Zero – An ethical approach to safety and mobility”

<sup>5</sup> 2015. National Highway Traffic Safety Administration. “The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised)”

**Figure 2. Number of Annual Fatalities and Fatality Rate for the Denver Region**



The Toward Zero Deaths National Strategy on Highway Safety, an initiative intended to provide a roadmap for the future that identifies key safety focus areas to ensure progress and unite the efforts of a wide array of stakeholders nationwide.<sup>6</sup> The Colorado Department of Transportation made Moving Towards Zero Deaths a core value of the state’s Strategic Highway Safety Plan, which provides innovative and data-driven approaches to improving highway safety. Strategies in the plan include demonstrating and measuring progress by setting realistic interim goals, such as reducing fatalities in the state of Colorado from 548 in 2008 to 416 by 2019.<sup>7</sup>

## TRENDS IN REGIONAL TRAFFIC FATALITIES

Data for the Denver region as presented in this report include Adams, Arapahoe, Boulder, Broomfield, Clear Creek Denver, Douglas, Gilpin and Jefferson counties, and the southwest portion of Weld County. The fatality trend in the

Denver region has fluctuated over the last 30 years. From 1990 to 2000 the number of annual traffic fatalities in the region increased 12 percent, then decreased 46 percent from 2000 to 2010. There was a 46 percent increase in annual fatalities from 2010 to 2016. In 2011, annual fatalities fell to 162 and in 2016 they increased to 278. Growth in population and annual vehicle miles traveled contributed to the recent increase in annual fatalities.

Per 2010 census data, the Denver region’s population was 2.8 million, with an estimated population of 3.2 million for 2016. By 2040 the population is expected to increase to 4.3 million. The substantial population growth has resulted in a simultaneous increase in vehicle miles traveled.

Another way to present crash information is to calculate the rate of crashes or fatalities by dividing the number of fatalities by the number of vehicle miles traveled. From 1990 to 2000 the fatality rate decreased from 1.54 to 1.20

<sup>6</sup> 2014. Federal Highway Administration. *Toward Zero Deaths: A National Strategy on Highway Safety*

<sup>7</sup> 2014. CDOT. *Colorado Strategic Highway Safety Plan*

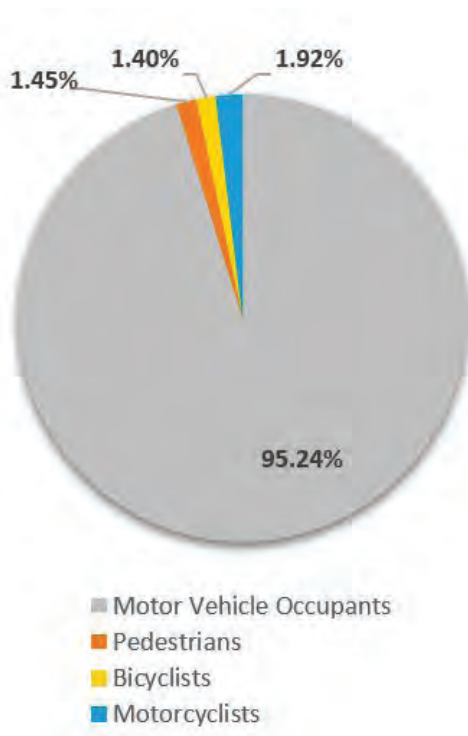
and continued to decrease significantly to 0.69 in 2010. In 2012, 2013 and 2014, the fatality rate remained at 0.73 and rose to 0.91 in 2015. **Figure 2** shows the number of fatalities and how they compare to the annual fatal crash rate per 100 million vehicle miles traveled from 1980 to 2016.

## Fatalities by Mode

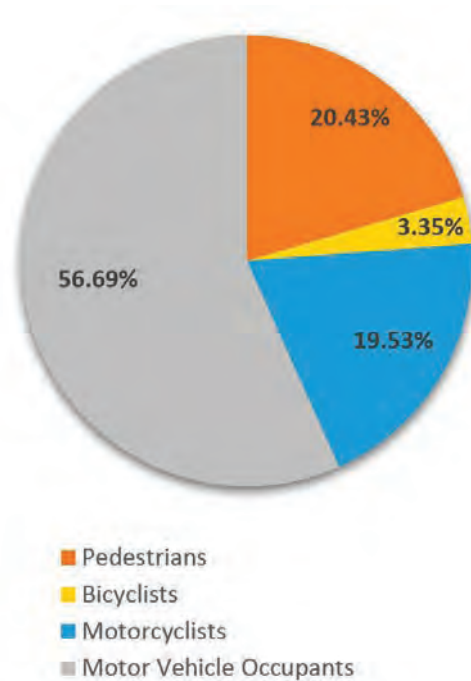
There were 1,106 traffic fatalities in the Denver region from 2010 through 2015. Around 77 percent of those deaths were from individuals inside a motor vehicle or people riding motorcycles. The remaining 23 percent were pedestrians or bicyclists. In 2015, pedestrian and bicycle trips made up only 14 percent of all trips in the DRCOG region<sup>8</sup>, while 22 percent of traffic-related fatalities in 2015 were associated with pedestrians and bicycles.

When fatalities by mode are compared to the overall crashes by mode, **Figure 3** and **Figure 4** illustrate that while pedestrians and bicyclists account for only 2.85 percent of overall crashes, 23 percent of fatalities involve pedestrians and bicyclists.

**Figure 3. Distribution Crashes by Mode, 2010-2015**



**Figure 4. Distribution Fatalities by Mode, 2010-2015**



## Nonmotorized Fatalities

The number of bicycle fatalities in the Denver region have been relatively consistent, while pedestrian fatalities vary from year to year. **Figure 5** shows the number of fatalities by mode and **Figure 6** shows the fatality rate per 100,000 residents by mode from 2000 to 2015.

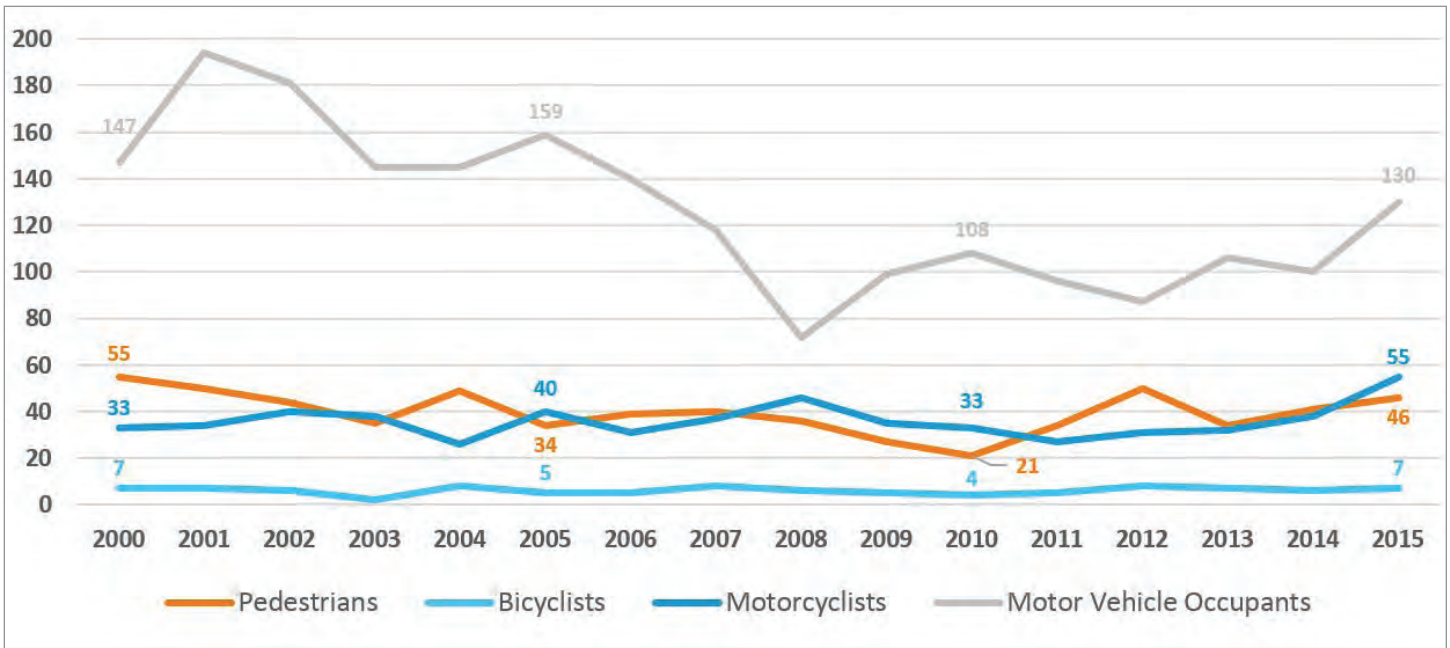
For pedestrians, the number of fatalities has ranged from a high of 55 (in 2000) to a low of 21 (in 2010). Since 2010, as few as 34 pedestrians died annually (in 2011 and 2013) to as many as 41 (in 2014) and 46 (in 2015).

Bicycle fatalities in the Denver region hit a low of four fatalities in 2010 and remained low with five in 2011. Since then, bicycle fatalities have ranged from six to eight per year.

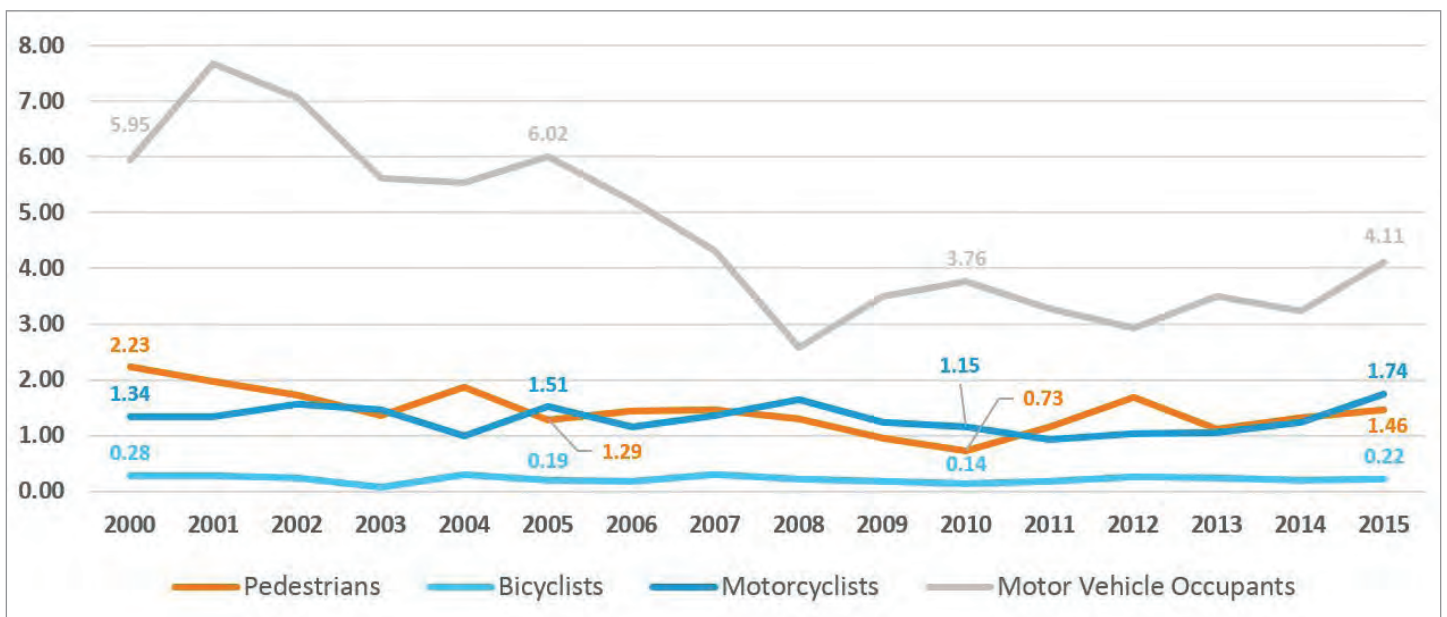
Data limitations make it difficult to identify the cause of the increase of nonmotorized fatalities, but factors such as sociodemographic changes, increased exposure (increase in walking and bicycling), unsafe environments and unsafe actions have consistently contributed to fatalities.

<sup>8</sup> DRCOG Travel Model, 2015

**Figure 5. Number of Fatalities by Mode, 2000-2015**



**Figure 6. Fatality Rate per 100,000 Residents by Mode, 2000-2015**



## OVERVIEW

Pedestrians and bicyclists are among the most vulnerable users of the transportation system. Pedestrian and bicyclist crashes and the resulting deaths and injuries are an essential issue in the Denver region.

The number of pedestrian crashes has been sporadic since 2010, ranging between 27 and 55 deaths per year. In 2016, the state of Colorado had 76 pedestrian fatalities, of which 52 happened in the Denver region.<sup>9</sup>

The number of annual bicycle fatalities are somewhat consistent, ranging from four to eight deaths a year since 2010. In 2016, the state of Colorado had 16 bicycle fatalities, 14 of which happened in the Denver region.<sup>10</sup>

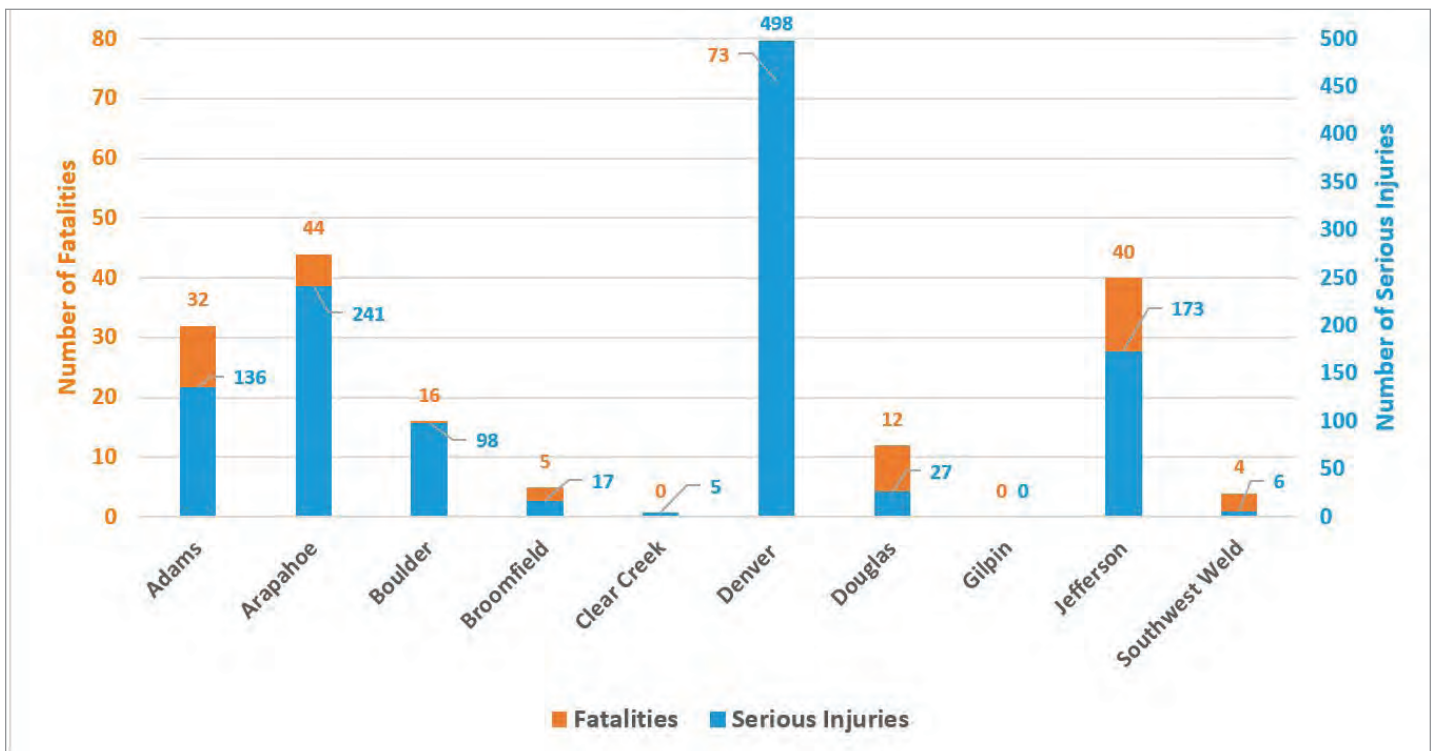
For the purposes of this report, a pedestrian crash is any crash that has been identified as a “pedestrian accident type” or a crash that has a harmful event involving a

pedestrian. A bicycle crash is any crash identified as being a “bicycle accident type” or a crash that has a harmful event involving a bicycle.

## Travel Trends

On a typical day in the Denver region, more than 1.9 million pedestrian trips account for around 13 percent of all trips.<sup>11</sup> These trips are, on average, just under a half-mile and include trips that range from daily commutes, to short trips to the store, to walking trips to or from transit. There are approximately 150,000 bicycle trips, accounting for around 1 percent of all trips.<sup>12</sup> These trips are, on average, just under 2 miles and include daily trips that range from daily commutes, to short trips to the store, to bicycle trips to or from transit.

**Figure 7. Pedestrian Serious Injuries and Fatalities by County, 2010-2015**



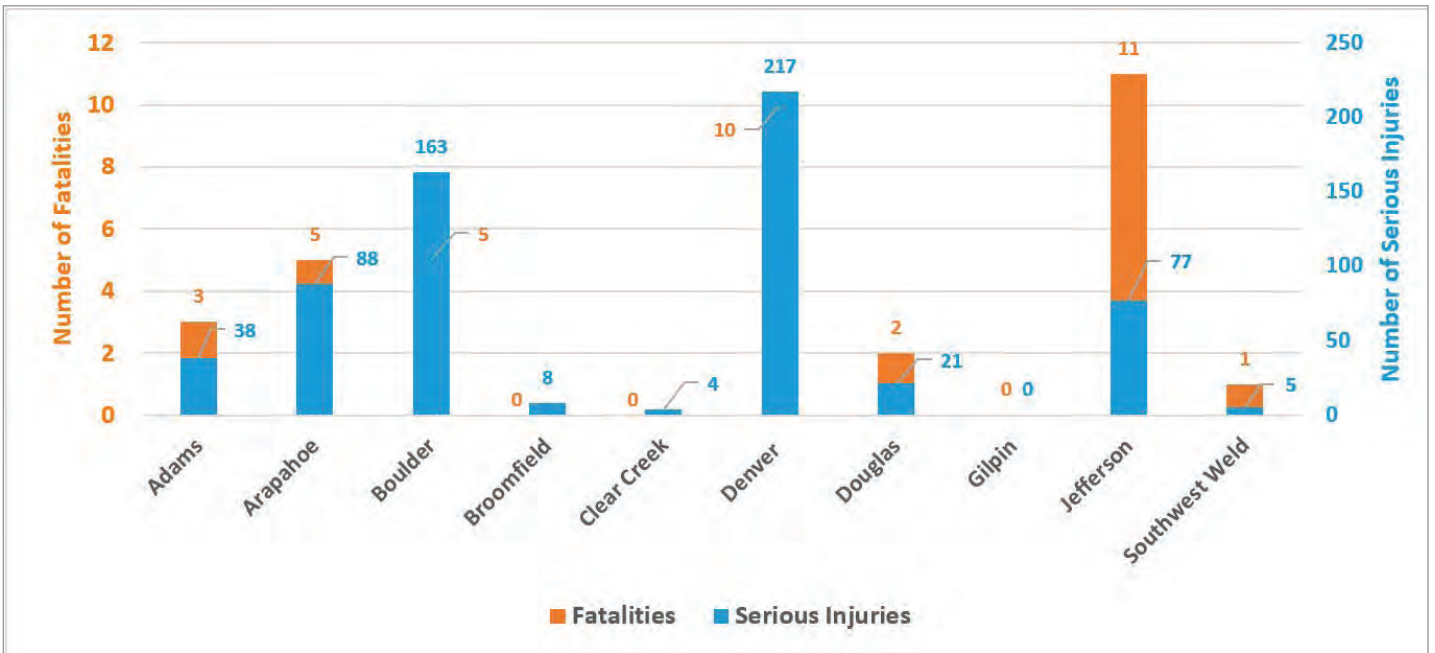
<sup>9</sup> 2016. National Highway Traffic Safety Administration, Fatality Analysis Reporting System.

<sup>10</sup> 2016. National Highway Traffic Safety Administration, Fatality Analysis Reporting System.

<sup>11</sup> DRCOG Travel Model, 2015

<sup>12</sup> DRCOG Travel Model, 2015

**Figure 8. Bicyclist Serious Injuries and Fatalities by County, 2010-2015**



Walk-to-work trips in the Denver region peaked at 4.7 percent of all work trips in 1980 and declined through 2010 to 2.2 percent. Since then, the percentage of commuters walking to work remained relatively steady. On a typical day, around 2.5 percent of the working population commutes by walking.<sup>13</sup>

The number of bicycle-to-work trips in the Denver region is continuing to grow. In 1980, 0.7 percent of workers commuted by bicycle. Currently, on an average day, 1.2 percent of workers commute by bicycle.<sup>14</sup> The number of workers who commute by bicycle is about double the national average and the share of Denver region commuters who bicycle to work is increasing faster than any other mode.

## County Crash Numbers

**Figure 7** shows serious injuries and fatalities among pedestrians by county from 2010 to 2015. For these years, the data reveal that Denver, Arapahoe and Jefferson counties have the most pedestrian crashes, serious injuries and fatalities.

**Figure 8** shows serious injuries and fatalities among bicyclists by county from 2010 to 2015. The City and County of Denver had significantly more bicycle crashes resulting in serious injuries than all the other counties. Jefferson County had the most bicyclist fatalities; Denver had one fewer bicyclist fatality over the six-year period.

<sup>13</sup> U.S. Census Bureau. American Community Survey Five-Year Estimates (2012-2016).

<sup>14</sup> U.S. Census Bureau. American Community Survey Five-Year Estimates (2012-2016).



## Injury Severity

Due to their lack of external protection pedestrians and bicyclists are among the most exposed and vulnerable users of the transportation system. **Table 3** and **Table 4** illustrate the severity of injury to bicyclists and pedestrians. In the DRCOG-CDOT crash database, five levels of injury may be identified in each crash. Frequently, multiple people are involved in a single crash resulting in multiple injuries. For this report, the most severe injury was considered. For example, if a single crash had a fatality and a serious injury (incapacitating injury), the crash’s severity would be considered fatal.

The crash data from 2013 through 2015 illustrated in **Figure 9** show that 63 percent of pedestrian crashes result in some level of injury and 25 percent in an incapacitating injury or death.

**Figure 10** shows that 66 percent of bicycle crashes result in some level of injury and 13 percent in a death or an incapacitating injury.

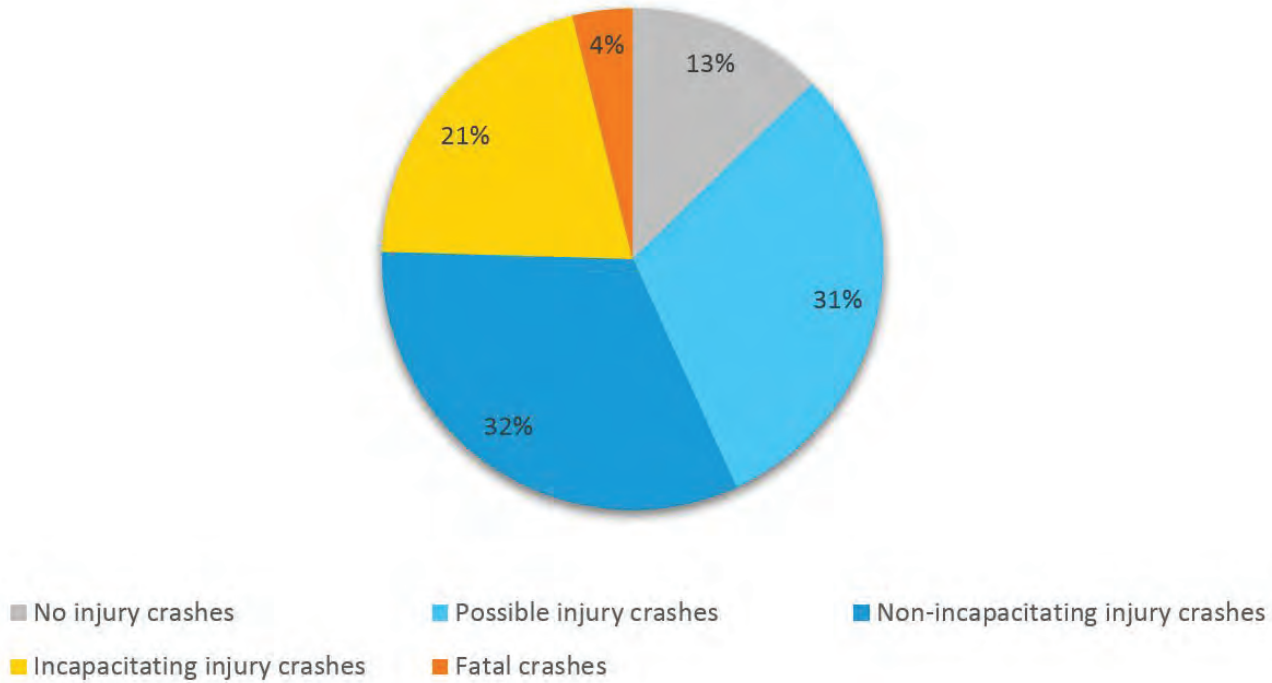
**Table 3. Pedestrian Crash Severity, 2013-2015**

| Year | No injury crashes | Possible injury crashes | Non-incapacitating injury crashes | Incapacitating injury crashes | Fatal crashes |
|------|-------------------|-------------------------|-----------------------------------|-------------------------------|---------------|
| 2013 | 128               | 324                     | 329                               | 217                           | 33            |
| 2014 | 144               | 309                     | 356                               | 218                           | 41            |
| 2015 | 121               | 324                     | 314                               | 205                           | 46            |

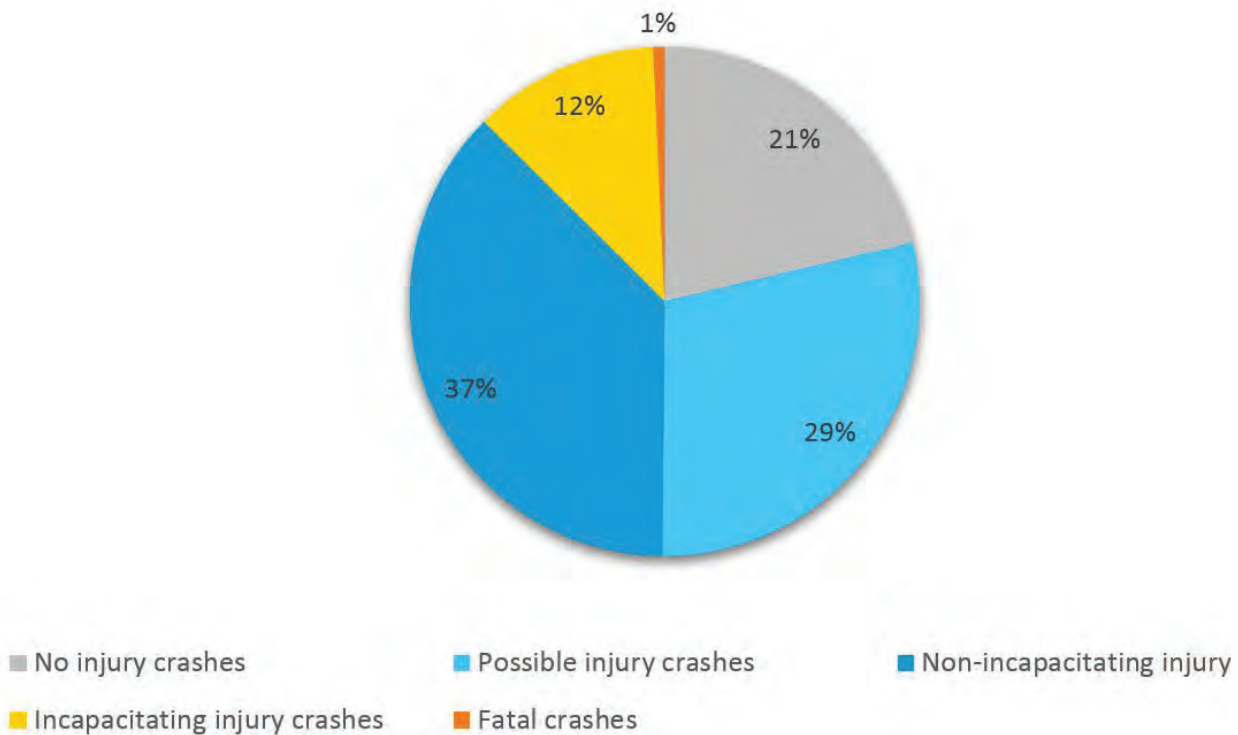
**Table 4. Number of Bicycle Crash Severity, 2013-2015**

| Year | No injury crashes | Possible injury crashes | Non-incapacitating injury crashes | Incapacitating injury crashes | Fatal crashes |
|------|-------------------|-------------------------|-----------------------------------|-------------------------------|---------------|
| 2015 | 189               | 280                     | 370                               | 116                           | 7             |
| 2014 | 196               | 261                     | 350                               | 122                           | 6             |
| 2013 | 213               | 269                     | 328                               | 94                            | 7             |

**Figure 9.** Distribution of Pedestrian Crash Severity, 2013-2015



**Figure 10.** Distribution of Bicycle Crash Severity, 2013-2015



## Comparison with Other Regions

To better understand how the Denver region compares with other metropolitan areas, DRCOG assessed corresponding bicycle and pedestrian fatality rates across the nation.

In 2015, the number of pedestrian fatalities for each metropolitan area ranged from 14 to 98, representing rates of 0.46 to 2.20. The Denver region had a pedestrian fatality rate of 1.46 fatalities per 100,000 residents. Compared to peer metropolitan planning organization planning areas, DRCOG placed in the middle. The pedestrian fatality rates, by metropolitan area, are illustrated in [Table 5](#).

**Table 5.** Pedestrian Fatality Rate Across Peer Metropolitan Areas, 2015

| Metropolitan planning organization           | Metropolitan area                 | Pedestrian fatality rate (per 100,000 people) |
|--|-----------------------------------|---|
| Atlanta Regional Commission                  | Atlanta, Georgia                  | 2.20  |
| Wasatch Front Regional Council               | Salt Lake City, Utah              | 1.84  |
| Metro  | Portland, Oregon                  | 1.47  |
| Denver Regional Council of Governments       | Denver, Colorado                  | 1.46  |
| Puget Sound Regional Council                 | Seattle, Washington               | 1.40  |
| Delaware Valley Regional Planning Commission | Philadelphia, Pennsylvania        | 0.86  |
| Metropolitan Council                         | Minneapolis-Saint Paul, Minnesota | 0.46  |

Source: National Highway Traffic Safety Administration – Fatality Analysis Reporting System, 2015 and American Community Survey – Population Estimates, 2015

In 2015, the number of bicycle fatalities for each metropolitan area ranged from three to nine, representing rates of 0.13 to 0.19. The Denver region had a bicyclist fatality rate of 0.19 fatalities per 100,000 residents.

**Table 6** compares DRCOG to peer metropolitan planning organizations and their associated metropolitan areas. DRCOG had the highest bicyclist fatality rate among the other metropolitan planning organizations.

**Table 6. Bicyclist Fatality Rate Across Peer Metropolitan Areas, 2015**

| Metropolitan planning organization           | Metropolitan area               | Bicyclist fatality rate (per 100,000 people) |
|--|---------------------------------|--|
| Denver Regional Council of Governments       | Denver, Colorado                | 0.19   |
| Wasatch Front Regional Council               | Salt Lake City, Utah            | 0.18   |
| Metro  | Portland, Oregon                | 0.17   |
| Delaware Valley Regional Planning Commission | Philadelphia, Pennsylvania      | 0.17   |
| Puget Sound Regional Council                 | Seattle, Washington             | 0.15   |
| Atlanta Regional Commission                  | Atlanta, Georgia                | 0.13   |
| Metropolitan Council                         | Minneapolis-St. Paul, Minnesota | 0.13   |

Source: National Highway Traffic Safety Administration – Fatality Analysis Reporting System, 2015 and American Community Survey – Population Estimates, 2015

## LOCATION OF CRASHES

### Roadway Facility Type

Analyzing functional classification helps identify the roadway capacity, speed and surrounding land use areas on which pedestrian and bicycle crashes take place.

Although many variables affect traffic-related crashes, speed primarily determines how severe a crash will be.

For bicycle or pedestrian crashes, speed elevates the likely severity of the crash. A pedestrian hit by a vehicle traveling at 25 mph has an 89 percent chance of survival, while a pedestrian hit by a vehicle traveling at 45 mph has a 35 percent chance of survival.<sup>15</sup>

**Tables 7 and 8** show the number and severity of pedestrian and bicyclist injuries by functional classification. Freeways, also known as express highways with controlled access, with the highest roadway capacity and traveling speeds, experienced the least amount of crashes with 53 pedestrian crashes and 26 bicycle crashes.

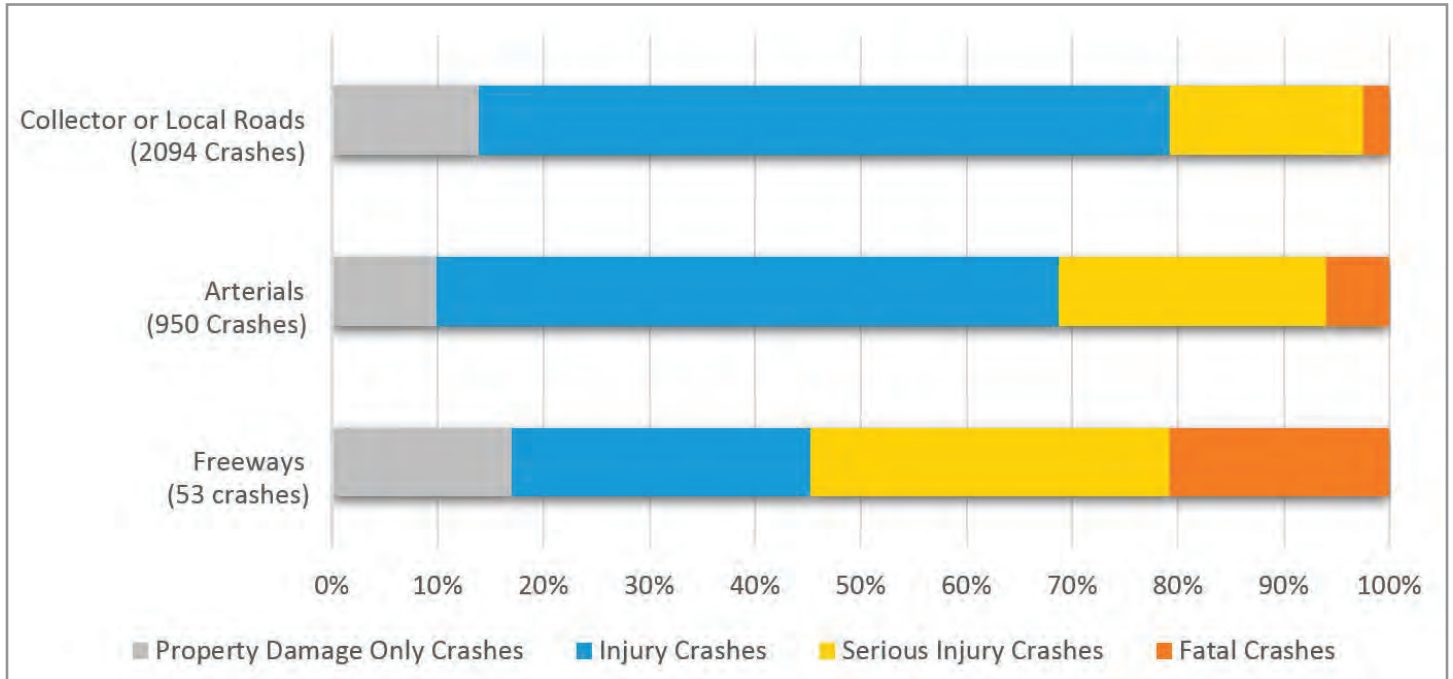
**Figure 11** shows that more than half of the 53 pedestrian crashes resulted in serious injuries or fatalities. Individuals who respond to traffic incident and who are associated with construction zones are particularly vulnerable to harm

on freeways. The majority of pedestrian and bicycle crashes occurred on collector or local roadways, with more than 2,000 crashes for each mode. Collector or local roads have low to moderate capacity and lower speeds which likely contributed to the 79 percent of the pedestrian crashes and 88 percent of bicycle crashes resulting in injury or property damage only, as opposed to serious injury or fatal crashes.

Arterial roadways are high-capacity, often busy, urban roadways. Motorists, bicyclists and pedestrians using arterial roads encounter a high number of intersections, turning vehicles, driveways, buses, pedestrian activity and visual distractions. In the Denver region, the largest number of pedestrian fatalities occurred on arterial roads, despite arterial roads having less than half of the total pedestrian crashes as collector or local roads. Arterials accounted for 23 percent of bicycle crashes, 15 percent of which resulted in serious injuries or fatalities.

<sup>15</sup> 2013. Tefft, Brian. *Impact Speed and a Pedestrian's Risk of Severe Injury or Death*. <https://nacto.org/wp-content/uploads/2012/06/Tefft-B.C.-2011.pdf>

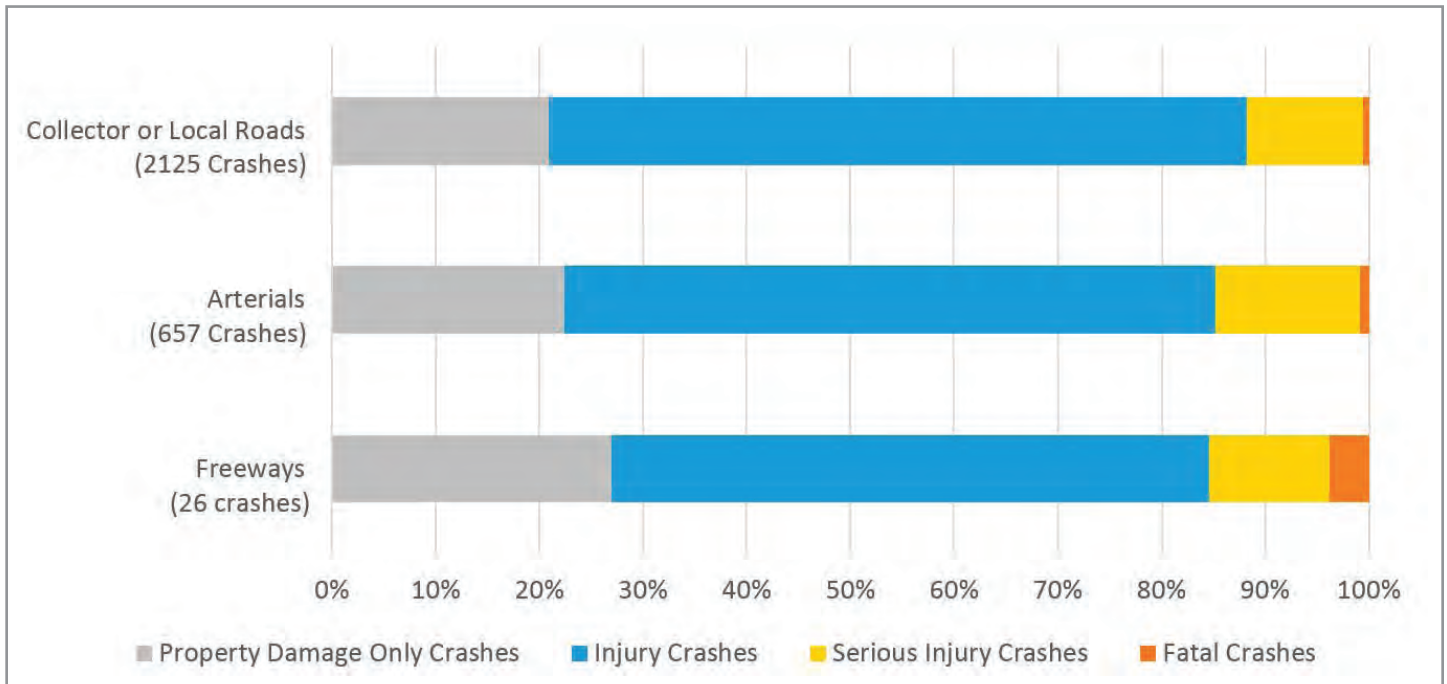
**Figure 11. Pedestrian Injury Severity by Functional Classification, 2013-2015**



**Table 7. Number of Pedestrian Injuries by Severity and Functional Classification, 2013-2015**

| Facility type            | Property damage only crashes | Injury crashes | Serious injury crashes | Fatal crashes |
|--------------------------|------------------------------|----------------|------------------------|---------------|
| Freeways                 | 9                            | 15             | 18                     | 11            |
| Arterials                | 94                           | 559            | 240                    | 57            |
| Collector or local roads | 290                          | 1,370          | 382                    | 52            |
| Totals                   | 393                          | 1,944          | 640                    | 120           |

**Figure 12.** Bicyclist Injury Severity by Functional Class, 2013-2015



**Table 8.** Number of Bicyclist Injuries by Severity and Functional Class, 2013-2015

| Facility type            | Property damage only crashes | Injury crashes | Serious injury crashes | Fatal crashes |
|--------------------------|------------------------------|----------------|------------------------|---------------|
| Freeways                 | 7                            | 15             | 3                      | 1             |
| Arterials                | 147                          | 413            | 91                     | 6             |
| Collector or local roads | 444                          | 1429           | 238                    | 13            |
| Total                    | 598                          | 1857           | 332                    | 20            |

### Midblock versus Intersection

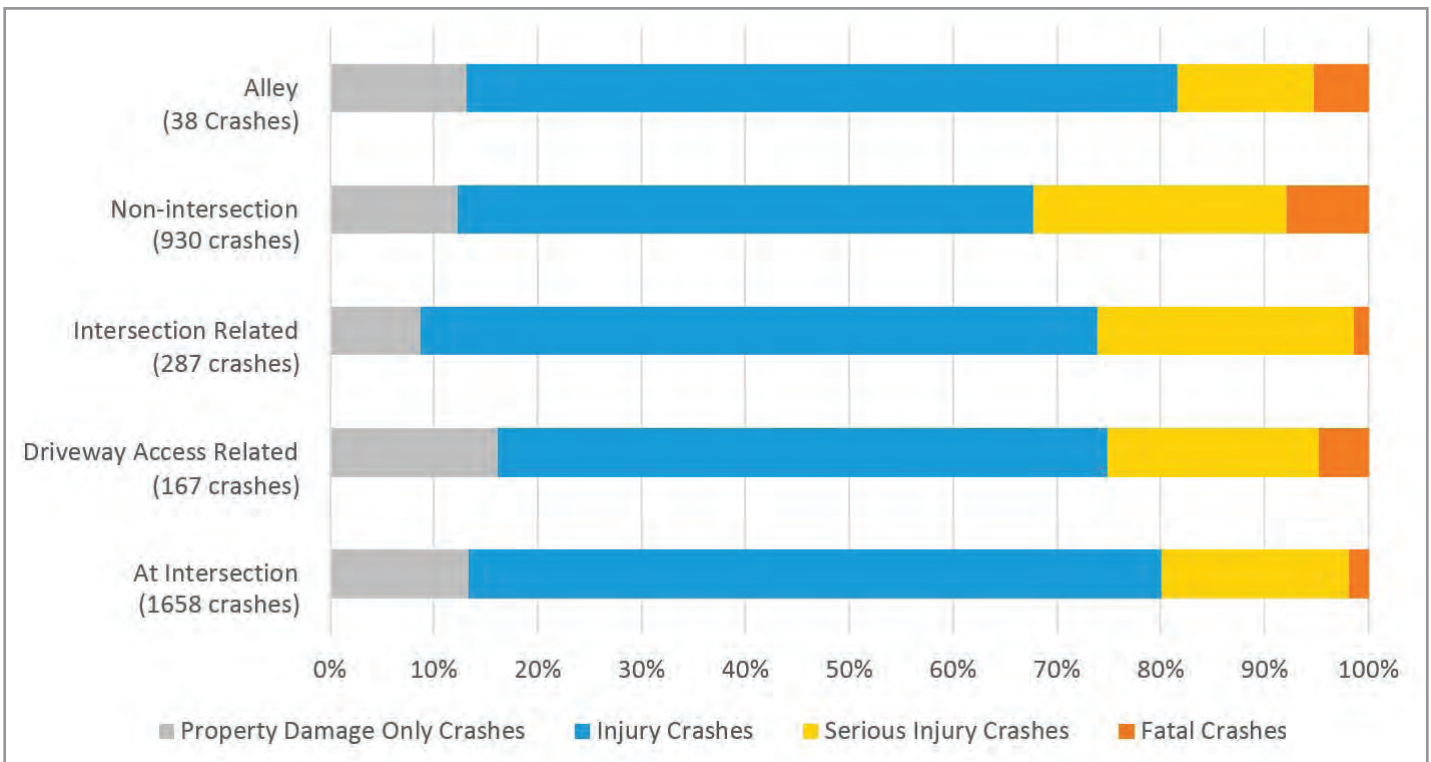
Tables 9 and 10 and Figures 13 and 14 include additional detail on the location of pedestrian and bicyclist crashes by identifying specific locations on roadways where crashes occurred from 2013 through 2015. Among the categories listed, “driveway-access related” “non-intersection” “alley” and “other” refer to midblock locations.

The data reveal that 63 percent of all pedestrian crashes occurred at, or are related to, intersections. Yet only 30 percent of the total pedestrian fatalities result from such crashes. In contrast, only 30 percent of pedestrian crashes took place at midblock locations but accounted for 61 percent of fatal pedestrian crashes.

**Table 9.** Number of Pedestrian Injuries by Severity and Location, 2013-2015

| Facility Type           | Property Damage Only Crashes | Injury Crashes | Serious Injury Crashes | Fatal Crashes |
|-------------------------|------------------------------|----------------|------------------------|---------------|
| At intersection         | 221                          | 1,106          | 299                    | 32            |
| Driveway-access related | 27                           | 98             | 34                     | 8             |
| Intersection related    | 25                           | 187            | 71                     | 4             |
| Non-intersection        | 114                          | 516            | 227                    | 73            |
| Alley                   | 5                            | 26             | 5                      | 2             |
| Other                   | 1                            | 11             | 4                      | 1             |
| Totals                  | 393                          | 1,944          | 640                    | 120           |

**Figure 13.** Pedestrian Injury Severity by Locations, 2013-2015





**Table 10** shows that the majority of bicycle crashes occurred at, or related to, intersections.

Of the 1,821 bicycle crashes that occurred at intersections, less than 1 percent were fatal crashes, 78 percent resulted in injuries or serious injuries and

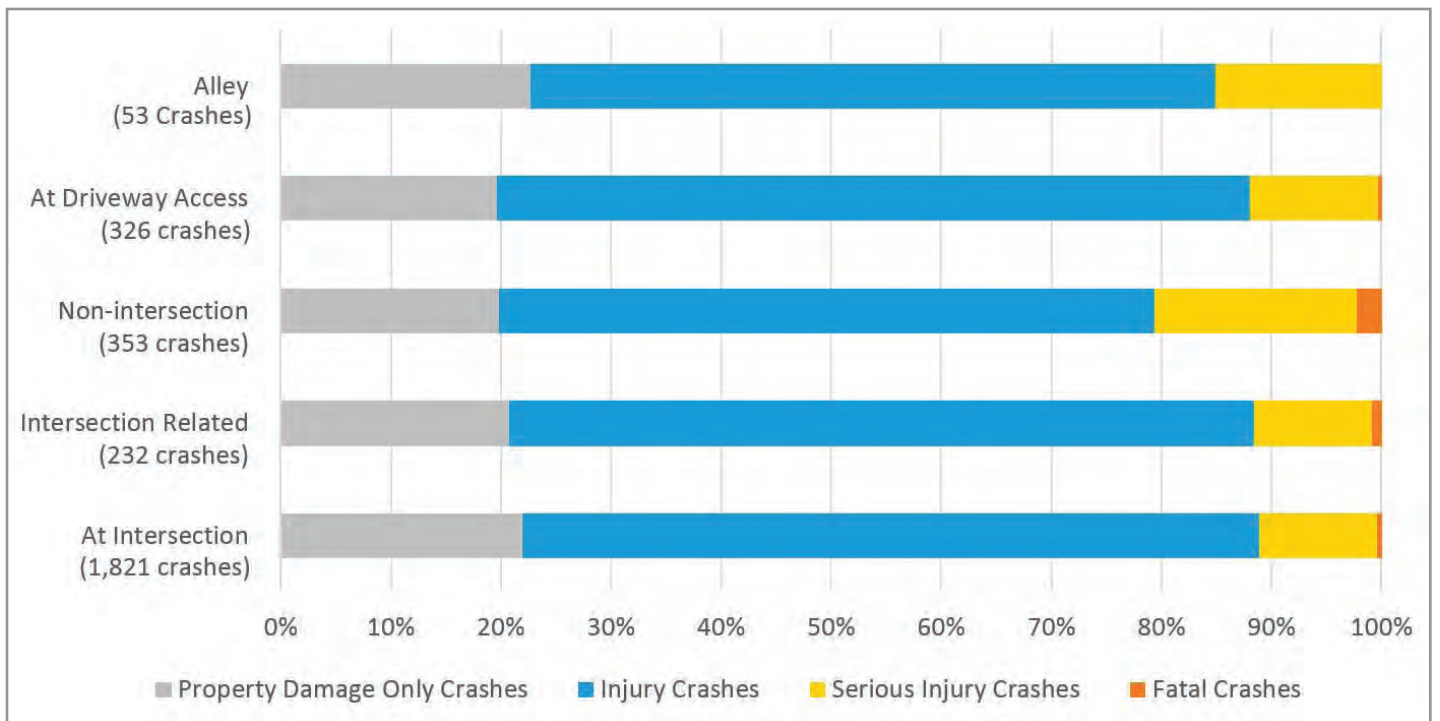
22 percent involved property damage only. Bicycle crash location distributions are illustrated in **Figure 14**.

Compared with pedestrian crashes, significantly more bicycle crashes are related to driveway access (326 bicycle crashes versus 167 pedestrian crashes at driveway access).

**Table 10. Number of Bicyclist Injuries by Severity and Locations, 2013-2015**

| Facility type        | Property damage only crashes | Injury crashes | Serious injury crashes | Fatal crashes |
|----------------------|------------------------------|----------------|------------------------|---------------|
| At intersection      | 399                          | 1,216          | 195                    | 8             |
| Intersection related | 48                           | 157            | 25                     | 2             |
| Non-intersection     | 70                           | 210            | 65                     | 8             |
| At driveway access   | 64                           | 223            | 38                     | 1             |
| Alley                | 12                           | 33             | 8                      | 0             |
| Other                | 5                            | 16             | 1                      | 1             |
| <b>Total</b>         | <b>598</b>                   | <b>1,855</b>   | <b>332</b>             | <b>20</b>     |

**Figure 14.** Bicyclist Injury Severity by Locations, 2013-2015



## Proximity to Schools

School locations considered for this report include 1,365 K-12 schools and 244 higher education institutions located within the Denver region. Of the region’s population, 95 percent live 1 mile or less from K-12 schools, 84 percent live 0.5 miles away and 54 percent live 0.25 miles from K-12 schools.

**Table 11** shows that, among pedestrians, 46 percent of serious injury crashes and 29 percent of fatal crashes happened within 0.25 miles of K-12 schools. Regarding pedestrian proximity to higher education institutions, 24 percent of serious injury crashes and 14 percent of fatal crashes happened within 0.25 miles.

**Table 11. Proximity of Pedestrian Serious Injury and Fatal Crashes to Schools, 2013-2015**

| Proximity to schools                     | Serious injury crashes (Total: 640) |         | Fatal crashes (Total: 120) |         |
|--|-------------------------------------|---------|----------------------------|---------|
|  | Number                              | Percent | Number                     | Percent |
| 1 mile from K-12 schools                 | 620                                 | 97%     | 107                        | 89%     |
| 0.5 miles from K-12 schools              | 535                                 | 84%     | 82                         | 68%     |
| 0.25 miles from K-12 schools             | 289                                 | 45%     | 31                         | 26%     |
| <b>Higher Education Schools</b>          |                                     |         |                            |         |
| 1 mile from higher education schools     | 483                                 | 75%     | 72                         | 60%     |
| 0.5 miles from higher education schools  | 288                                 | 45%     | 35                         | 29%     |
| 0.25 miles from higher education schools | 148                                 | 23%     | 14                         | 12%     |

Table 12 shows that, similar to pedestrian crashes, a high percentage of bicycle crashes occurred within 1 mile of schools, with the percent of crashes dropping drastically as the distance decreases. Only 15 percent of fatal bicycle crashes occurred within 0.25 miles of schools K-12 or higher education schools.

**Table 12. Proximity of Bicyclist Serious Injury and Fatal Crashes to Schools, 2013-2015**

| Proximity to schools                     | Serious injury crashes (Total: 332) |         | Fatal crashes (Total: 20) |         |
|--|-------------------------------------|---------|---------------------------|---------|
|  | Number                              | Percent | Number                    | Percent |
| 1 mile from K-12 schools                 | 302                                 | 91%     | 15                        | 75%     |
| 0.5 miles from K-12 schools              | 252                                 | 76%     | 10                        | 50%     |
| 0.25 miles from K-12 schools             | 135                                 | 41%     | 3                         | 15%     |
|  |                                     |         |                           |         |
| 1 mile from higher education schools     | 222                                 | 67%     | 10                        | 50%     |
| 0.5 miles from higher education schools  | 133                                 | 40%     | 7                         | 35%     |
| 0.25 miles from higher education schools | 54                                  | 16%     | 3                         | 15%     |

## Proximity to Transit

Transit locations considered for this report include 9,434 bus stops and 68 light rail stations located within the Denver region. Considering the substantial number of bus stops identified in the region, a shorter distance was analyzed.

**Table 13** shows that 23 percent of pedestrian serious injury crashes happened within 100 feet of bus stops and 24 percent of fatal pedestrian crashes happened within that distance. For pedestrians within 50 feet of stops, 4

percent of serious injury crashes and 7 percent of fatal crashes occurred.

There were no serious injury or fatal crashes near light rail stations. Only one serious injury crash and zero fatal crashes occurred 100 feet or less from the light rail stations. Given the substantial amount of infrastructure surrounding stations, the likelihood of motor vehicles traveling at a speed sufficient to cause serious injury or death is lower than in areas with less infrastructure.

**Table 13. Proximity of Pedestrian Serious Injury and Fatal Crashes to Transit Stops, 2013-2015**

| Proximity to transit stops          | Serious injury crashes (Total: 640) |         | Fatal crashes (Total: 120) |         |
|-------------------------------------|-------------------------------------|---------|----------------------------|---------|
|                                     | Number                              | Percent | Number                     | Percent |
| 0.25 miles from bus stops           | 593                                 | 93%     | 91                         | 76%     |
| 100 feet from bus stops             | 146                                 | 23%     | 29                         | 24%     |
| 50 feet from bus stops              | 28                                  | 4%      | 9                          | 8%      |
| <b>Light Rail Stations</b>          |                                     |         |                            |         |
| 0.25 miles from light rail stations | 38                                  | 6%      | 9                          | 8%      |
| 100 feet from light rail stations   | 1                                   | 0%      | 0                          | 0%      |
| 50 feet from light rail stations    | 0                                   | 0%      | 0                          | 0%      |

**Table 14** shows that, among bicyclists, 79 percent of serious injury crashes and 60 percent of fatal crashes happened 0.25 miles from bus stops. Only 3 percent of bicycle serious injury crashes happened within 0.25 miles of light rail stations.

**Table 14.** Proximity of Bicyclist Serious Injury and Fatal Crashes to Transit Stops, 2013-2015

| Proximity to transit                | Serious injury crashes (Total: 332) |         | Fatal crashes (Total: 20) |         |
|-------------------------------------|-------------------------------------|---------|---------------------------|---------|
|                                     | Number                              | Percent | Number                    | Percent |
| 0.25 miles from bus stops           | 263                                 | 79%     | 12                        | 60%     |
| 100 feet from bus stops             | 49                                  | 15%     | 6                         | 30%     |
| 50 feet from bus stops              | 6                                   | 2%      | 1                         | 5%      |
| <b>Light Rail Stations</b>          |                                     |         |                           |         |
| 0.25 miles from light rail stations | 11                                  | 3%      | 0                         | 0%      |
| 100 feet from light rail stations   | 0                                   | 0%      | 0                         | 0%      |
| 50 feet from light rail stations    | 0                                   | 0%      | 0                         | 0%      |

### Interactive Crash Viewer

To explore pedestrian and bicycle crash data from 2010 through 2015 in an interactive viewer, refer to DRCOG’s “Pedestrian and Bicycle Crash” web map at [gis.drcog.org](http://gis.drcog.org).

[gis.drcog.org/crashes](http://gis.drcog.org/crashes). Additional data viewers and geographic information system data downloads are available on DRCOG’s Regional Data Catalog at [data.drcog.org](http://data.drcog.org).

## VEHICLE MOVEMENT

In the DRCOG-CDOT crash database, up to three vehicle movements can be listed per crash. The numbers in [Tables 15](#) and [16](#) consider only the first vehicle's movement listed in each crash.

Assessing pedestrian crossings, 42 percent of serious injury crashes and 29 percent of fatal crashes involved a vehicle going straight. A vehicle turning left or right accounted for 26 percent of serious injury crashes and only 6 percent of fatal crashes involving pedestrians.

The remaining serious injury or fatal crashes —65 percent — involved other vehicle movements such as making a U-turn, backing up, parking or changing lanes.

For bicycle crashes, 54 percent of serious injury crashes and 50 percent of fatal crashes involved a vehicle going straight. A vehicle turning left or right accounted for 35 percent of serious injury crashes and 20 percent of bicycle fatal crashes involving a bicyclist.

**Table 15. Vehicle Movement Involved in Pedestrian Crashes, 2013-2015**

| Vehicle movement            | Serious injury crashes |         | Fatal crashes |         | All pedestrian crashes |         |
|-----------------------------|------------------------|---------|---------------|---------|------------------------|---------|
|                             | Number                 | Percent | Number        | Percent | Number                 | Percent |
| Vehicles going straight     | 271                    | 42%     | 35            | 29%     | 1115                   | 36%     |
| Vehicles turning right      | 46                     | 7%      | 3             | 3%      | 412                    | 13%     |
| Vehicles turning left       | 124                    | 19%     | 4             | 3%      | 685                    | 22%     |
| All other vehicle movements | 198                    | 31%     | 78            | 65%     | 885                    | 29%     |

**Table 16.** Vehicle Movements Involved in Bicycle Crashes

| Vehicle Movement            | Serious injury crashes |         | Fatal crashes |         | All bicycle crashes |         |
|-----------------------------|------------------------|---------|---------------|---------|---------------------|---------|
|                             | Number                 | Percent | Number        | Percent | Number              | Percent |
| Vehicles going straight     | 179                    | 54%     | 10            | 50%     | 1277                | 45%     |
| Vehicles turning right      | 50                     | 15%     | 1             | 5%      | 703                 | 25%     |
| Vehicles turning left       | 66                     | 20%     | 3             | 15%     | 518                 | 18%     |
| All other vehicle movements | 37                     | 11%     | 6             | 30%     | 310                 | 11%     |



## Age and Sex of People Involved in Crashes

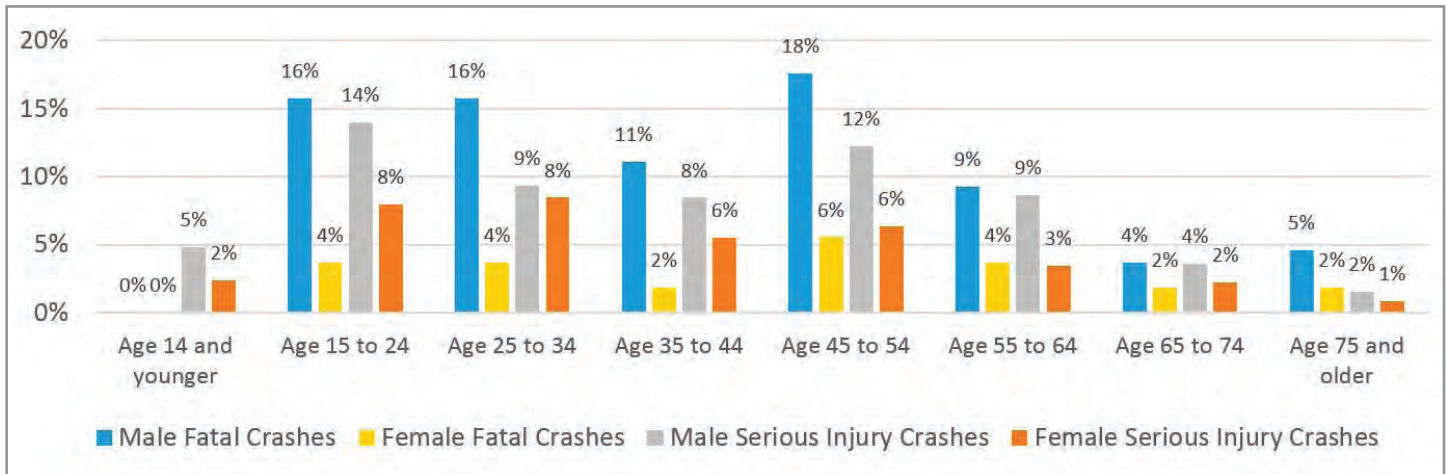
Not all crashes in the database list the age or sex of the individuals involved. This report considers only crashes for which sufficient information was provided.

**Table 17** and **Figure 15** show the numbers and percent of pedestrian crashes by age and sex. In the Denver region, 54 percent of pedestrian commuters are male, whereas 46 percent are female (U.S. Census Bureau, 2012-2016 American Community Survey). Among pedestrian crashes, males accounted for 63 percent of serious injury crashes

and 78 percent of fatal crashes. Females accounted for 37 percent of serious injury crashes and 22 percent of fatal crashes.

Overall, the most serious injury crashes (127) occurred among pedestrians age 15 to 24. The most fatal pedestrian crashes (25) occurred between pedestrians age 45 to 54.

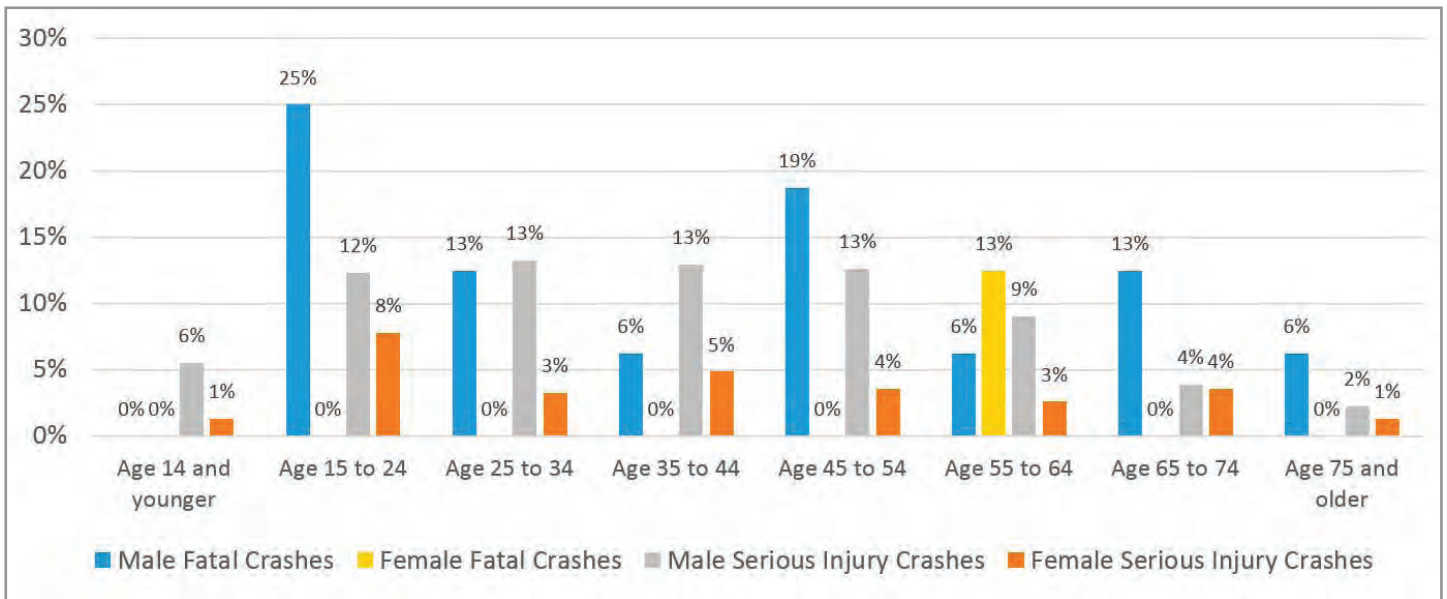
**Figure 15.** Pedestrian Age and Sex as a Percentage of Serious Injury and Fatal Crashes, 2013-2015



**Table 17.** Pedestrian Age and Sex for Serious Injury and Fatal Crashes, 2013-2015

| Male ages:         | Serious injury crashes (Total: 363) | Fatal crashes (Total: 84) |
|--------------------|-------------------------------------|---------------------------|
| Age 14 and younger | 28                                  | 0                         |
| Age 15 to 24       | 81                                  | 17                        |
| Age 25 to 34       | 54                                  | 17                        |
| Age 35 to 44       | 49                                  | 12                        |
| Age 45 to 54       | 71                                  | 19                        |
| Age 55 to 64       | 50                                  | 10                        |
| Age 65 to 74       | 21                                  | 4                         |
| Age 75 and older   | 9                                   | 5                         |
| Female ages:       | Serious injury crashes (Total: 216) | Fatal crashes (Total: 24) |
| Age 14 and younger | 14                                  | 0                         |
| Age 15 to 24       | 46                                  | 4                         |
| Age 25 to 34       | 49                                  | 4                         |
| Age 35 to 44       | 32                                  | 2                         |
| Age 45 to 54       | 37                                  | 6                         |
| Age 55 to 64       | 20                                  | 4                         |
| Age 65 to 74       | 13                                  | 2                         |
| Age 75 and older   | 5                                   | 2                         |

**Figure 16.** Bicyclist Age and Sex as a Percentage of Serious Injury and Fatal Crashes, 2013-2015



**Table 18** and **Figure 16** show the number and percent of bicycle crashes by age and sex. In the Denver region, 71 percent of bicycle commuters are male, whereas 29 percent are female (U.S. Census Bureau, 2012-2016 American Community Survey). Among bicyclists, males

accounted for 72 percent of serious injury crashes and 88 percent of fatal crashes. Females accounted for 28 percent of serious injury crashes and 13 percent of fatal crashes.

The most serious injury crashes (62) and fatal crashes (four) occurred among bicyclists age 15 to 24.

**Table 18. Bicyclist Age and Sex of Serious Injury and Fatal Crashes, 2013-2015**

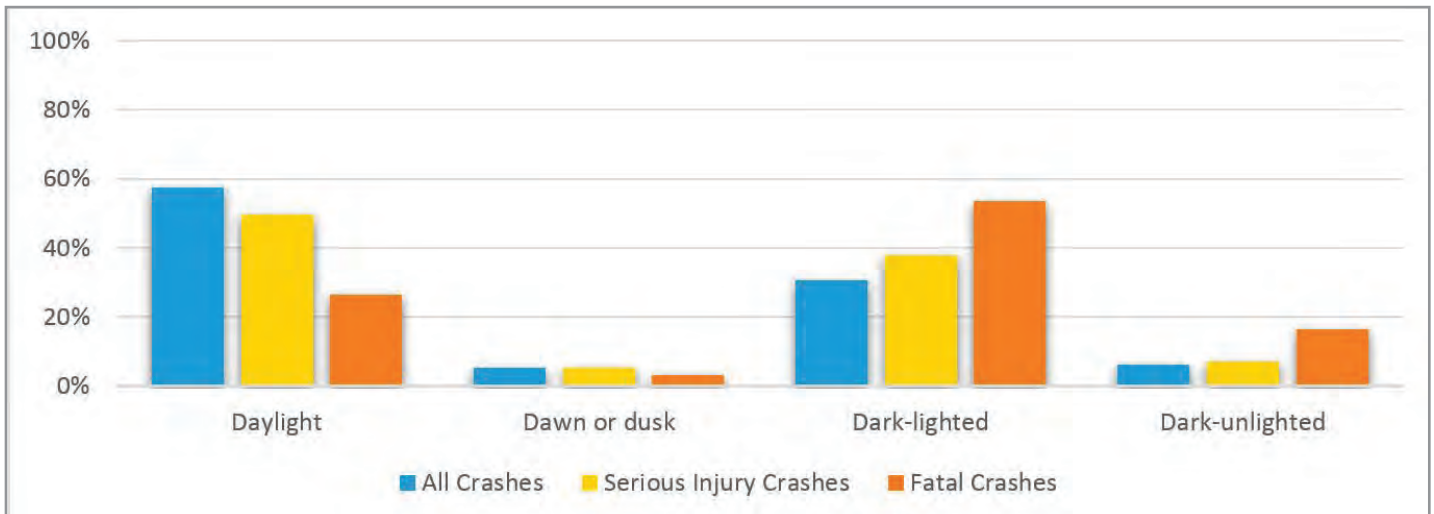
| Male ages:         | Serious injury crashes (Total: 222) | Fatal crashes (Total: 14) |
|--------------------|-------------------------------------|---------------------------|
| Age 14 and younger | 17                                  | 0                         |
| Age 15 to 24       | 38                                  | 4                         |
| Age 25 to 34       | 41                                  | 2                         |
| Age 35 to 44       | 40                                  | 1                         |
| Age 45 to 54       | 39                                  | 3                         |
| Age 55 to 64       | 28                                  | 1                         |
| Age 65 to 74       | 12                                  | 2                         |
| Age 75 and older   | 7                                   | 1                         |
| Female ages:       | Serious injury crashes (Total: 87)  | Fatal crashes (Total: 2)  |
| Age 14 and younger | 4                                   | 0                         |
| Age 15 to 24       | 24                                  | 0                         |
| Age 25 to 34       | 10                                  | 0                         |
| Age 35 to 44       | 15                                  | 0                         |
| Age 45 to 54       | 11                                  | 0                         |
| Age 55 to 64       | 8                                   | 2                         |
| Age 65 to 74       | 11                                  | 0                         |
| Age 75 and older   | 4                                   | 0                         |

## CONDITIONS

Conditions on the roadway affect drivers, pedestrians and bicyclists. Better light quality allows drivers to be better aware of their surroundings, and rain or snow can affect a vehicle’s ability to make sudden stops. The number of pedestrian and bicycle crashes that occurred in various lighting, weather and roadway conditions were analyzed. **Figures 17 through 20** illustrate the distribution of all crashes (disregarding severity), all serious injury crashes and all fatal crashes for pedestrians and bicyclists.

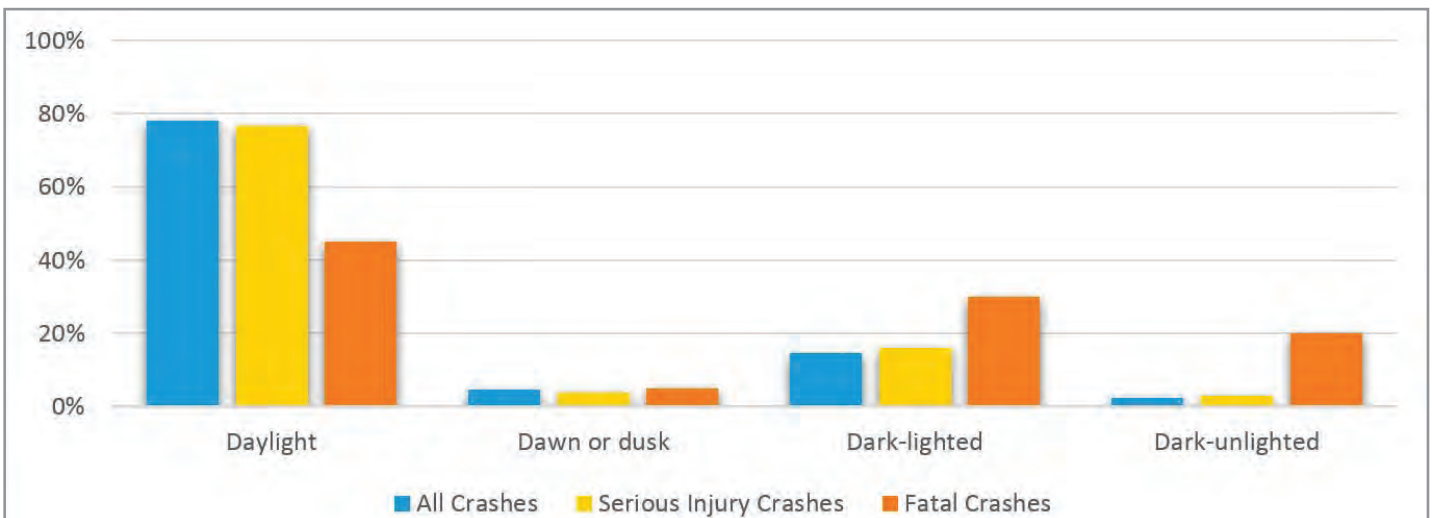
**Figure 17** shows that 58 percent of all pedestrian crashes occurred in daylight and 31 percent occurred in dark-lighted areas (dark areas with adequate lighting). Among fatal pedestrian crashes, 26 percent of happened in daylight, 54 percent in dark-lighted areas and 17 percent in dark-unlighted areas (dark areas with no lighting).

**Figure 17.** Distribution of Pedestrian Crashes in Various Light Conditions, 2013-2015



**Figure 18** shows that 78 percent of all bicycle crashes occurred in daylight and 15 percent occurred in dark-lighted areas. Among fatal bicycle crashes, 45 percent happened in daylight, 30 percent in dark-lighted areas and 20 percent of in dark-unlighted areas.

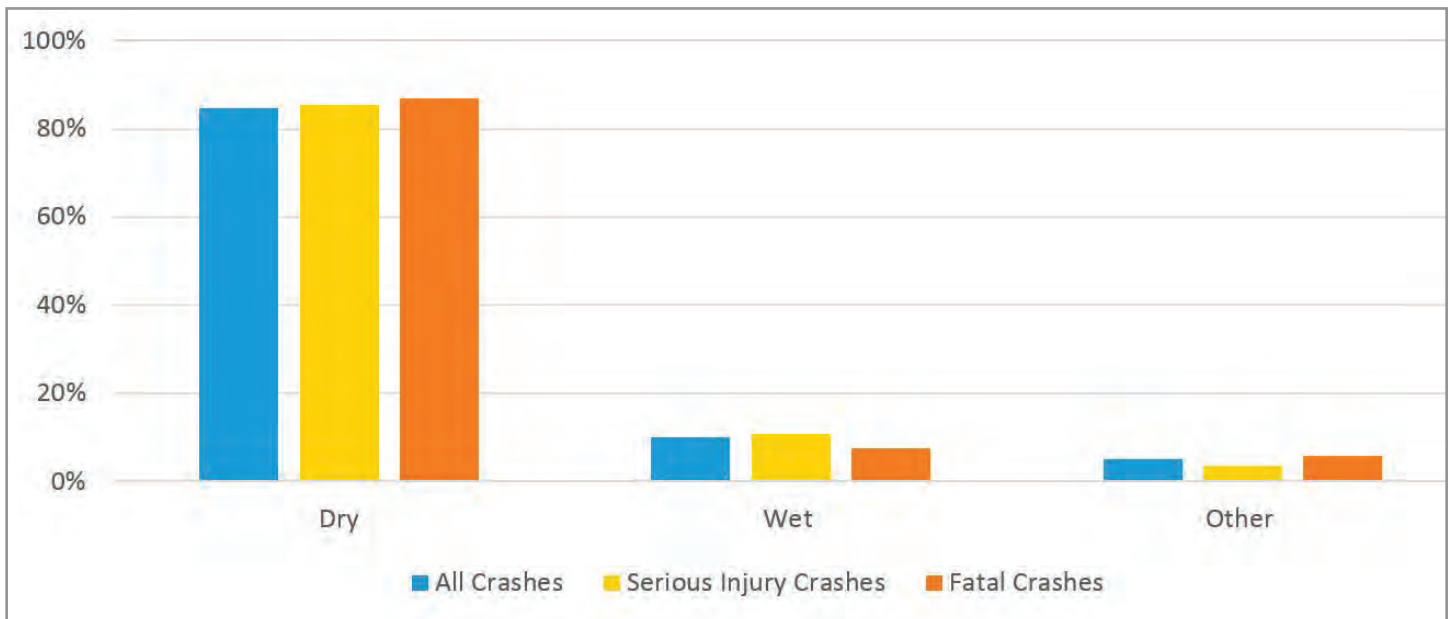
**Figure 18.** Distribution of Bicycle Crashes in Various Light Conditions, 2013-2015



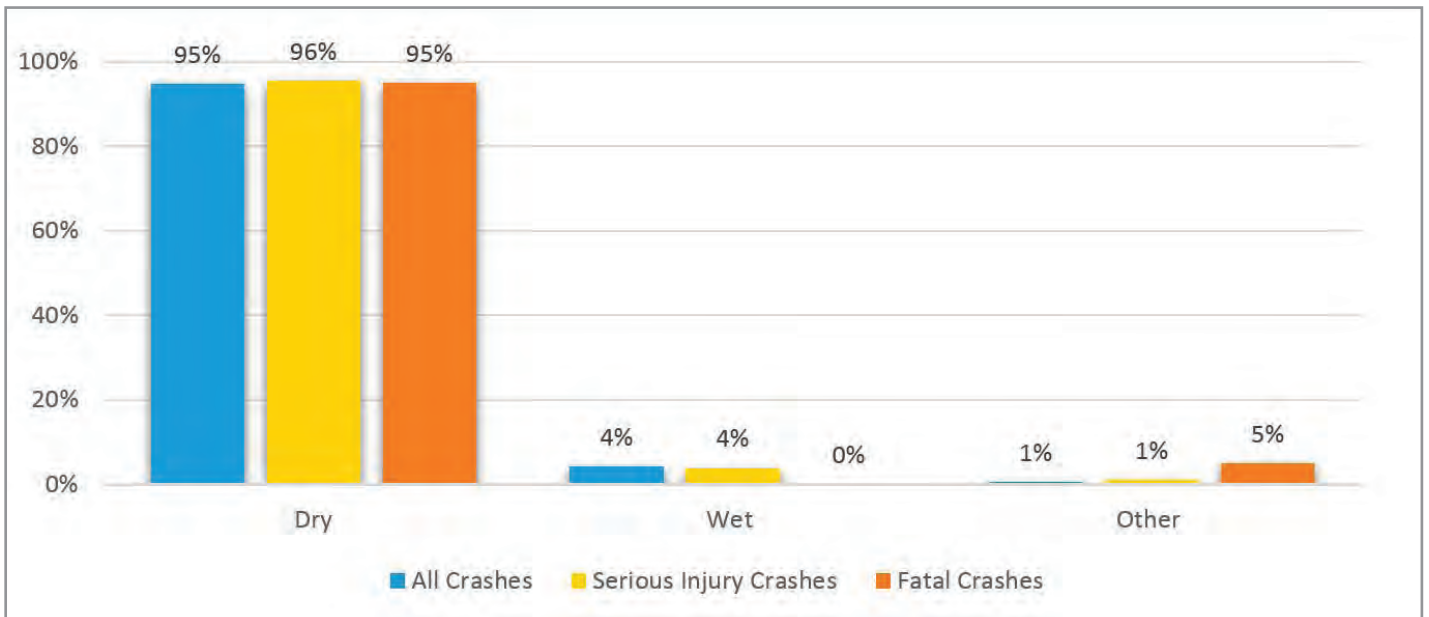
The Denver region's climate is mild and sunny. Weather data collected from 1981 to 2010 for the National Oceanic and Atmospheric Administration National Climate Data Center show Denver averages only 87 days a year with precipitation. **Figures 19** and **20** show that, among

pedestrians, no less than 85 percent of all crashes, serious injury crashes and fatal crashes happened on dry roadways. Among bicycle crashes, no less than 95 percent of all crashes, serious injury crashes and fatal crashes occurred in the absence of rain or snow.

**Figure 19.** Distribution of Pedestrian Crashes in Various Roadway Conditions, 2013-2015



**Figure 20.** Distribution of Bicycle Crashes in Various Road Conditions, 2013-2015





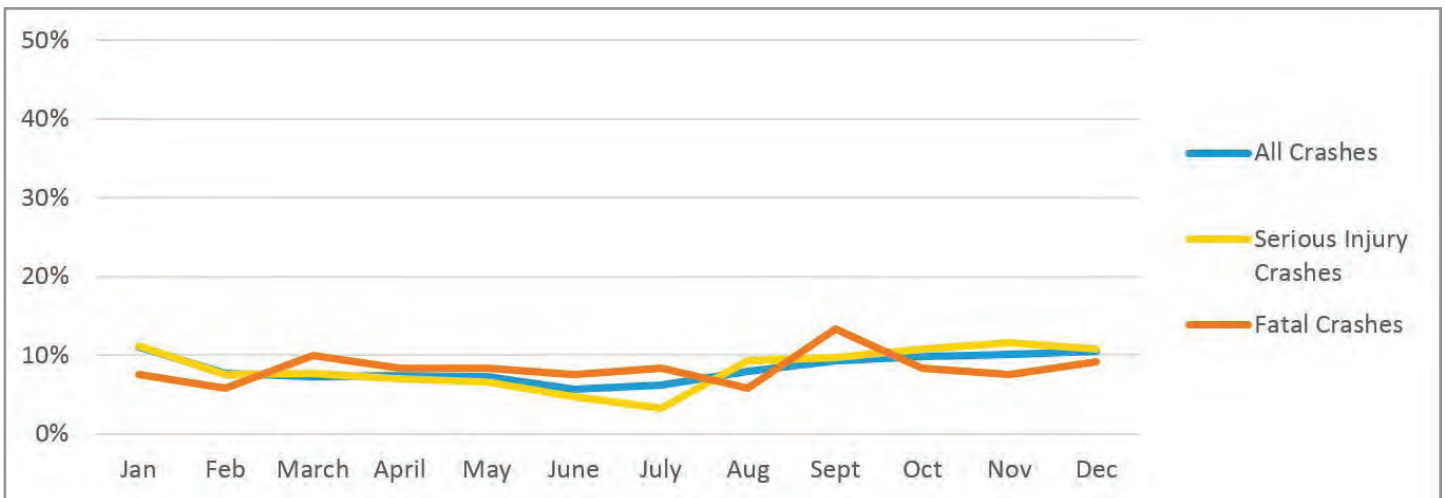
## When Crashes Occur

Figures 21 through 26 illustrate the distribution of all crashes (disregarding severity), all serious injury crashes and all fatal crashes for pedestrians and bicyclists.

For pedestrians, Figure 21 shows that the number of crashes are, for the most part, consistent, month-to-month.

When considering all pedestrian crashes, percentages range from 6 percent (June and July) to 11 percent (January). For pedestrians, November had the highest percent of serious injury crashes (12 percent), and September had the most fatal crashes (13 percent).

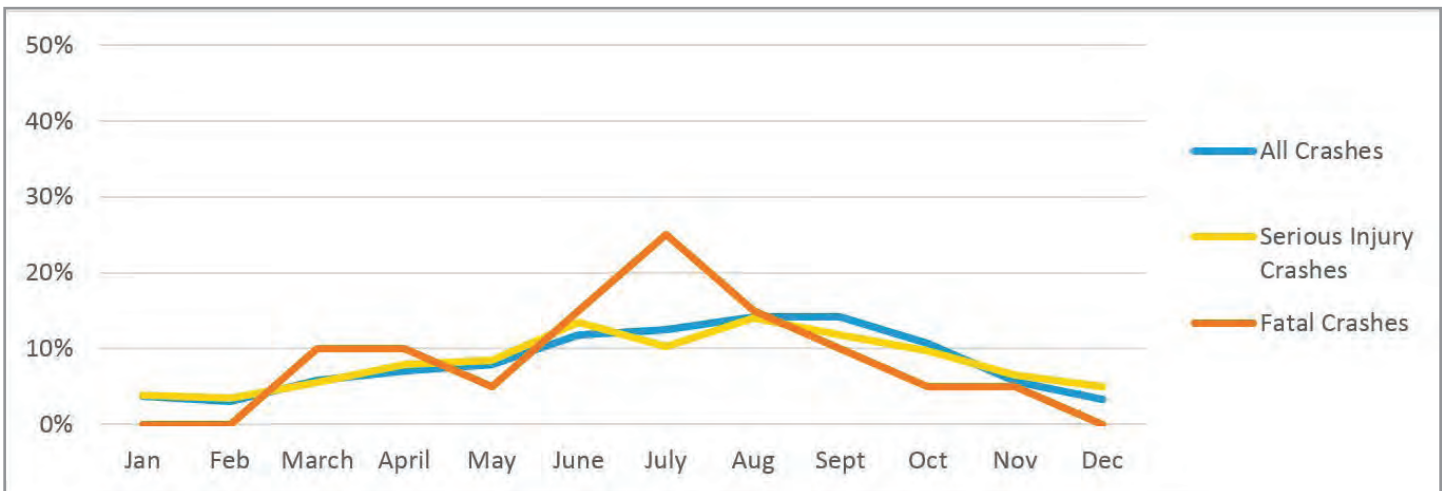
**Figure 21.** Distribution of All Pedestrian Crashes by Month, 2013-2015



For bicyclists, **Figure 22** shows that the month in which crashes occurred fluctuated slightly more than for their pedestrian counterparts. When considering all bicyclist crashes, the percentages range from 3 percent (February

and December) to 14 percent (August and September). For bicyclists, the highest percent of serious injury crashes occurred in August (14 percent), and the most fatal bicyclist crashes occurred in July (25 percent).

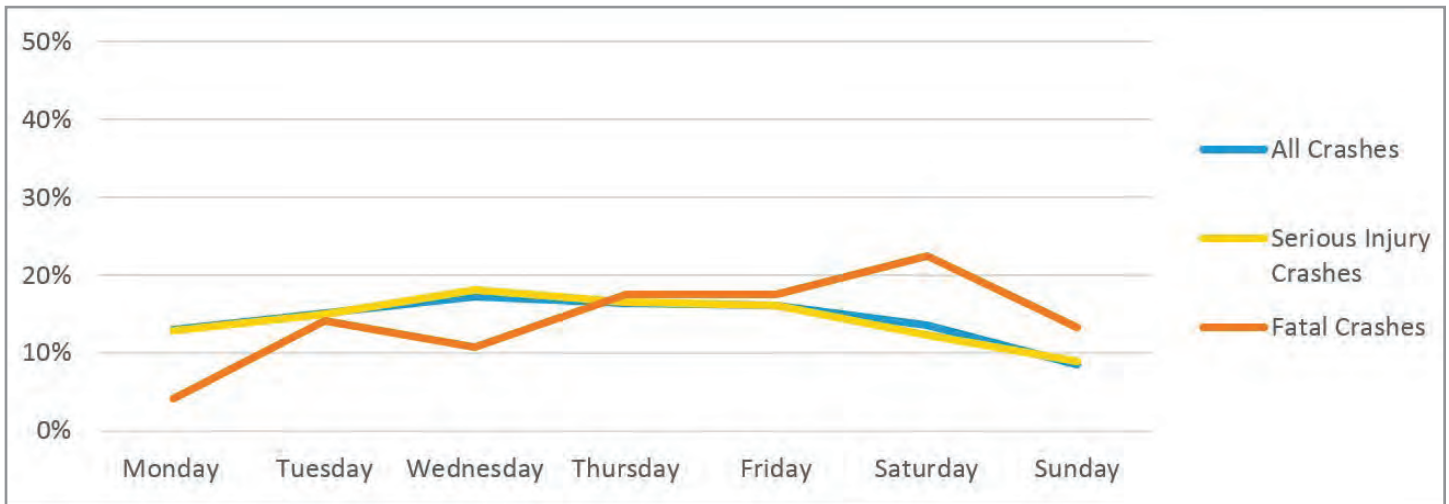
**Figure 22.** Distribution of All Bicyclist Crashes by Month, 2013-2015



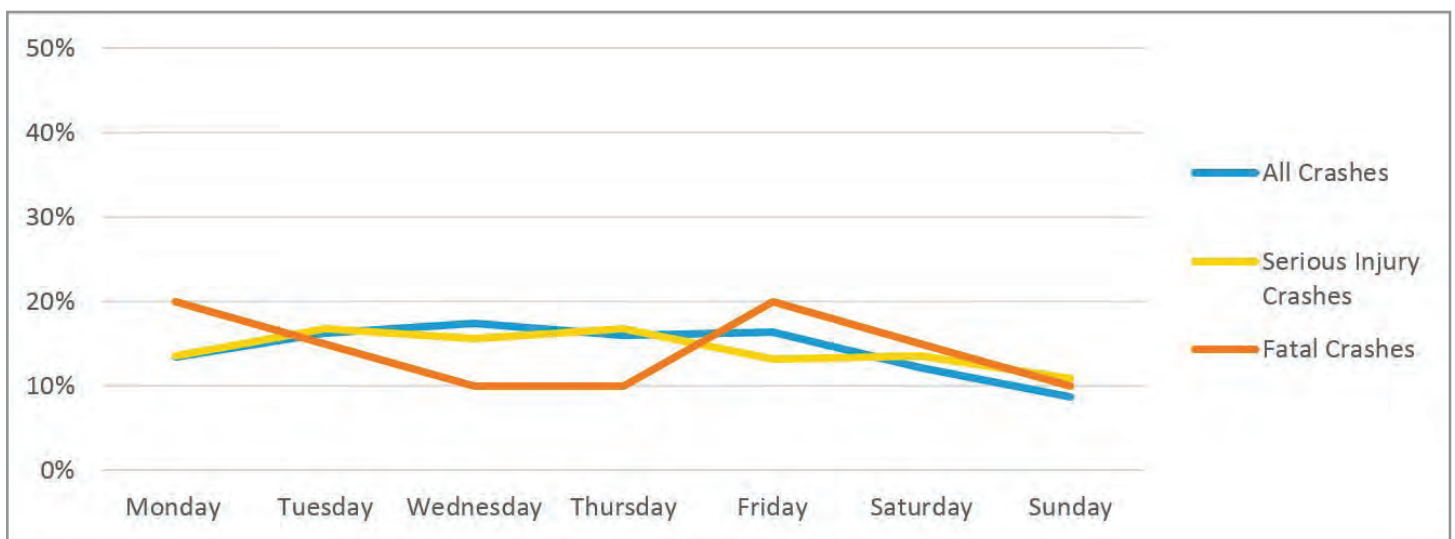
Figures 23 and 24 illustrate consistency among the days pedestrian and bicycle crashes took place. For both modes, crashes ranged from 12 to 17 percent for every day except Sunday which had a low of 8 percent for pedestrian

crashes and 9 percent for bicyclist crashes. The most fatal pedestrian crashes occurred on Saturday and the most fatal bicyclist crashes occurred on Monday and Friday.

**Figure 23.** Distribution of Pedestrian Crashes by Day of Week, 2013-2015



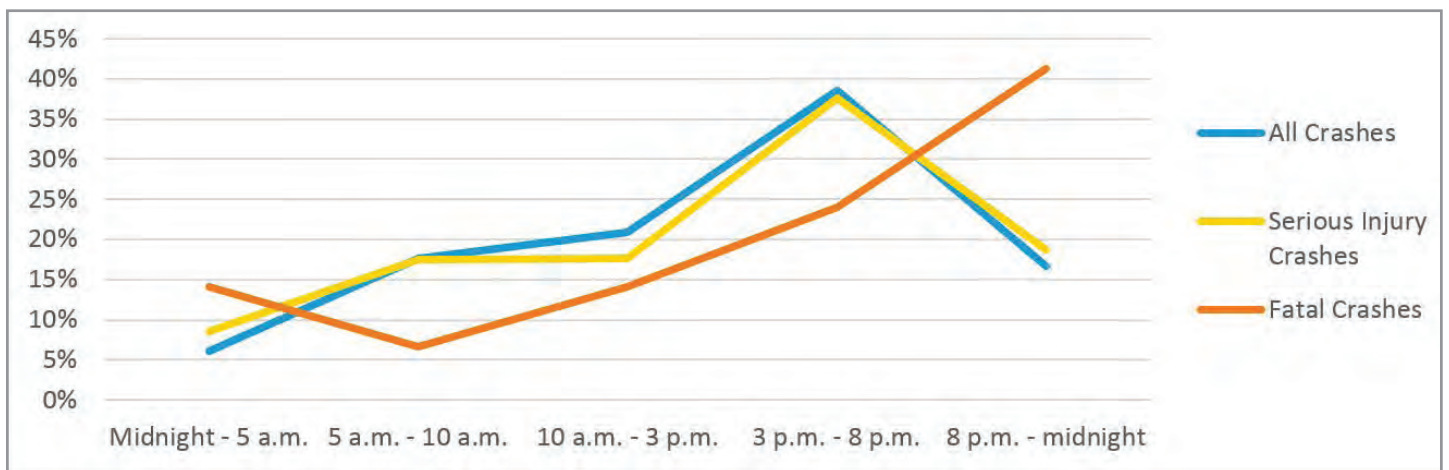
**Figure 24.** Distribution of Bicyclist Crashes by Day of Week, 2013-2015



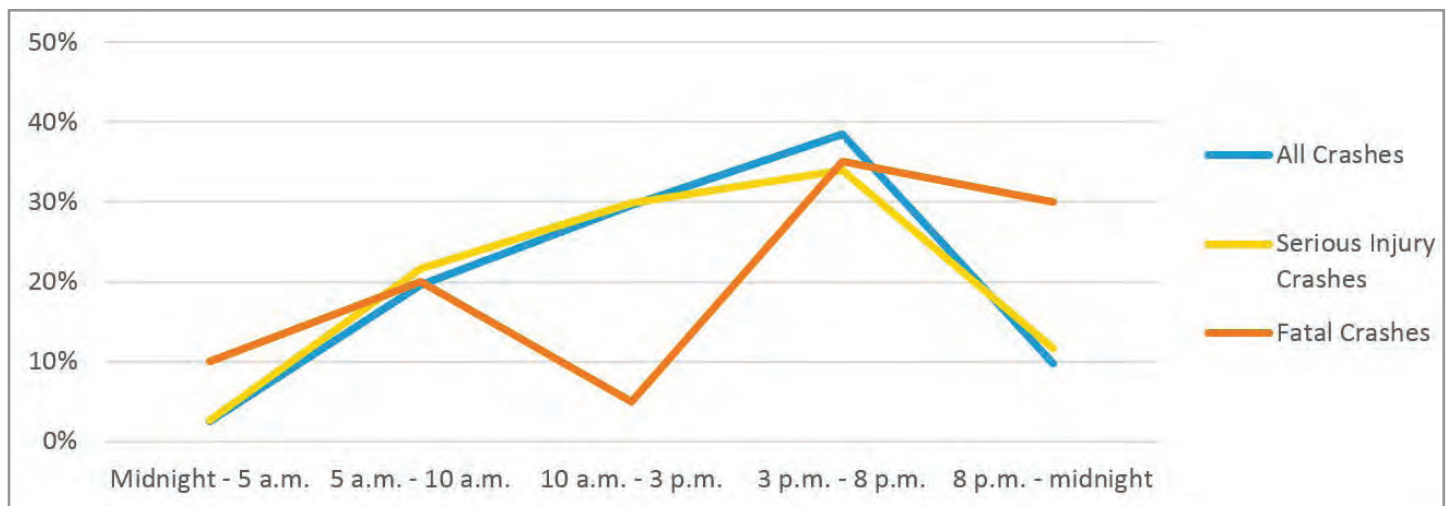
Figures 25 and 26 show that among all crashes and serious injury crashes, most occurred between 3 p.m. and 8 p.m. for both bicyclists and pedestrians. For pedestrians, about 40 percent of all crashes and serious injury crashes occurred between 3 p.m. and 8 p.m., and 41 percent of

fatal crashes happened between 8 p.m. and midnight. Among bicyclists, the highest percentage of all crashes, serious injury crashes and fatal crashes occurred between 3 p.m. and 8 p.m. For fatal bicycle crashes, 65 percent occurred between 3 p.m. and midnight.

**Figure 25.** Distribution of Pedestrian Crashes by Time of Day, 2013-2015



**Figure 26.** Distribution of Bicyclist Crashes by Time of Day, 2013-2015

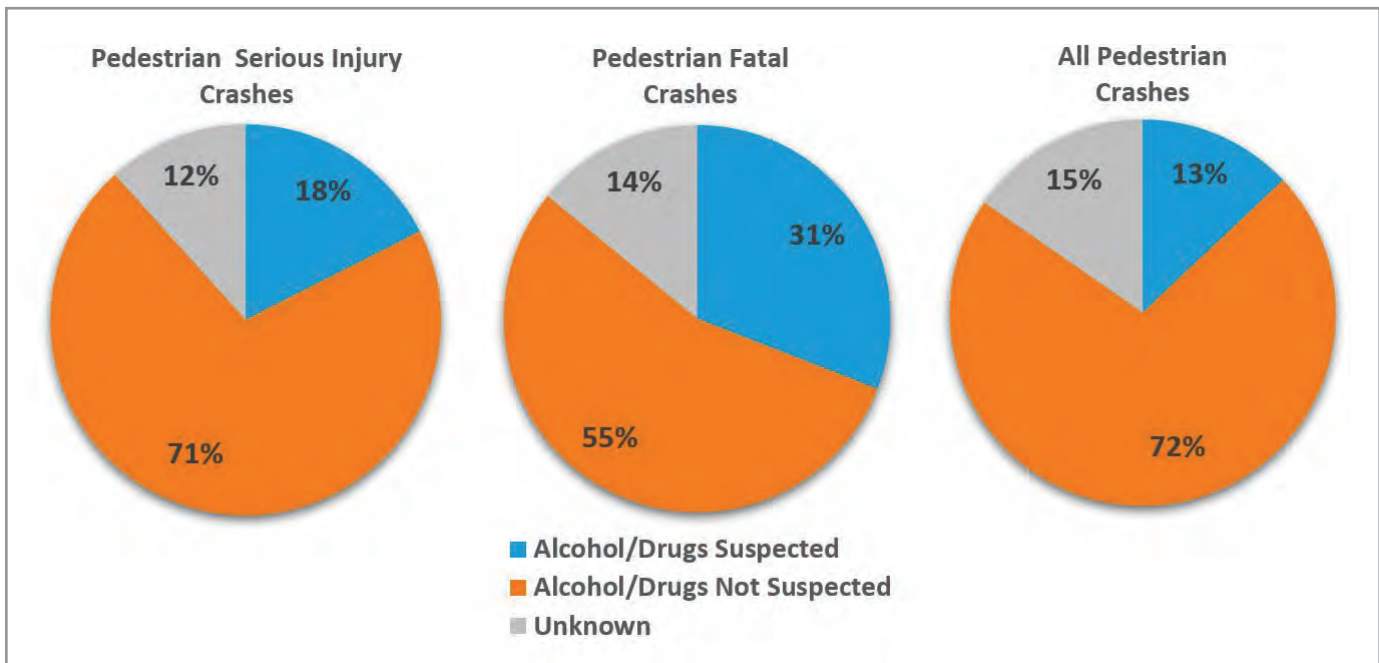


## Crashes Involving Impaired Driving

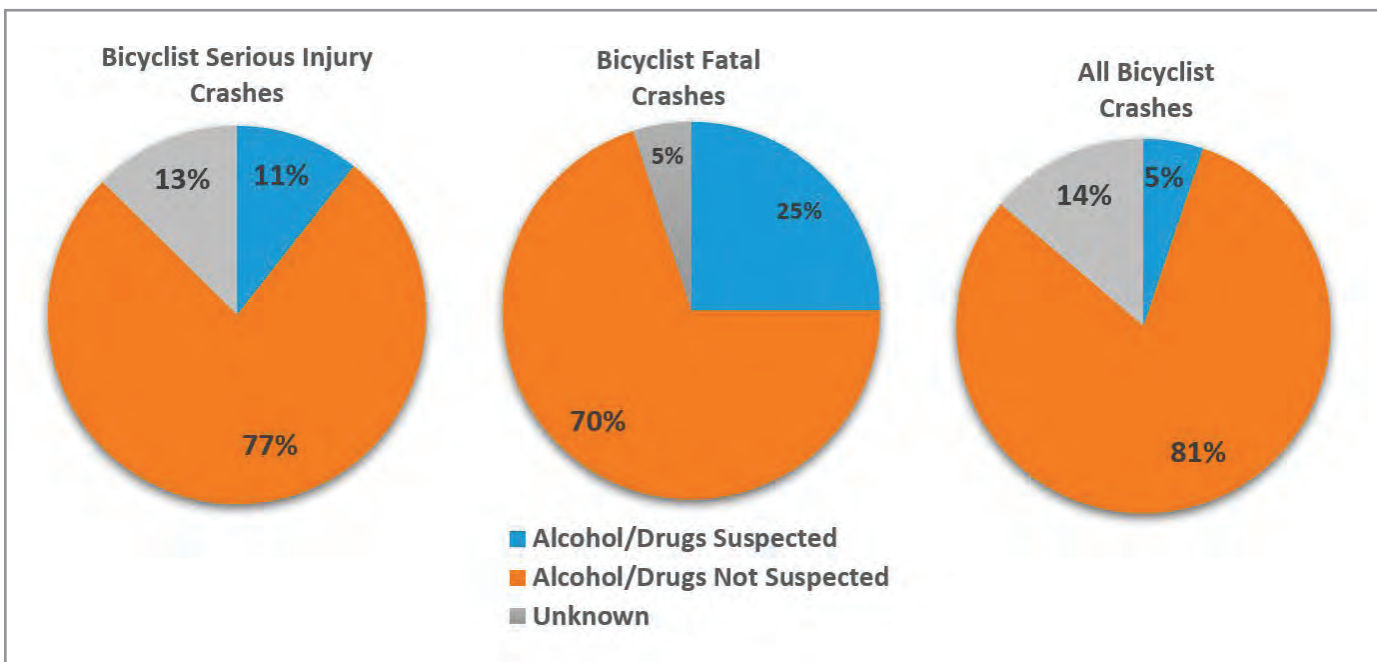
**Figure 27** shows the percentage of pedestrian crashes that involved drivers impaired by alcohol or drugs, which accounted for 31 percent of fatal pedestrian crashes.

**Figure 28** shows the percentage of bicycle crashes that involved drivers impaired by alcohol or drugs which accounted for one in four fatal bicycle crashes.

**Figure 27.** Pedestrian Crashes Involving Alcohol and Drugs, 2013-2015



**Figure 28.** Bicycle Crashes Involving Alcohol or Drugs, 2013-2015



## Crashes Involving Human Contributing Factors

In some crashes, the behavior of the motor vehicle driver causes crashes that involve pedestrians or bicyclists. Such contributing factors include, but are not limited to, falling asleep at the wheel, driver inexperience, aggressive driving, texting while driving and physical impairment.

**Table 19** shows the number of pedestrian crashes affected by such factors from 2013 through 2015. Among pedestrians, human behavior or contributing factors accounted for 42 percent of all crashes, 44 percent of serious injury crashes and 42 percent of fatal crashes.

**Table 19.** Pedestrian Crashes Involving Human Contributing Factors, 2013-2015

| Pedestrian crashes involving human contributing factors                            | Serious injury crashes | Fatal crashes | All pedestrian crashes |
|--|------------------------|---------------|------------------------|
| Asleep at wheel  | 3                      | 0             | 4                      |
| Driver fatigue   | 1                      | 0             | 8                      |
| Illness/medical  | 5                      | 1             | 12                     |
| Driver inexperience  | 24                     | 3             | 109                    |
| Aggressive driving   | 23                     | 2             | 122                    |
| Driver unfamiliar with area  | 5                      | 0             | 34                     |
| Driver emotionally upset   | 4                      | 0             | 15                     |
| Evading law enforcement  | 2                      | 0             | 12                     |
| Physical disability  | 3                      | 1             | 12                     |
| Driving under influence of alcohol, while impaired or under the influence of drugs | 36                     | 16            | 104                    |
| Distracted driver (for example, due to passenger, phone radio)                     | 4                      | 0             | 19                     |
| Other factors  | 141                    | 21            | 601                    |

**Table 20** shows the number of bicycle crashes affected by human contributing factors from 2013 through 2015. Among bicyclists, human contributing factors accounted for 50 percent of all crashes, 59 percent of serious injury crashes and 40 percent of fatal crashes.

**Table 20. Bicycle Crashes Involving Human Contributing Factors, 2013-2015**

| Bicycle crashes involving human contributing factors                                   | Serious injury crashes | Fatal crashes | All bicycle crashes |
|--|------------------------|---------------|---------------------|
| Asleep at wheel  | 2                      | 0             | 10                  |
| Driver fatigue   | 0                      | 0             | 6                   |
| Illness/medical  | 2                      | 0             | 5                   |
| Driver inexperience  | 25                     | 1             | 267                 |
| Aggressive driving   | 27                     | 1             | 144                 |
| Driver unfamiliar with area  | 10                     | 0             | 64                  |
| Driver emotionally upset   | 0                      | 0             | 6                   |
| Evading law enforcement  | 0                      | 0             | 3                   |
| Physical disability  | 0                      | 0             | 3                   |
| Driving under the influence of alcohol, while impaired or under the influence of drugs | 23                     | 4             | 64                  |
| Distracted driver (for example, due to passenger, phone or radio)                      | 18                     | 0             | 196                 |
| Other factors  | 86                     | 2             | 602                 |



## NEXT STEPS

This report provides fundamental information on pedestrian and bicycle crashes in the Denver region, representing DRCOG's intent is to increase awareness among planners, engineers and elected officials as they contemplate safety issues in their communities and decide what action to take to resolve identified issues. This report uses the CDOT-DRCOG regional data sets and may not include detailed crash information available in some communities. DRCOG encourages local jurisdiction staff or elected officials who are interested in more detailed inquiries related to bicycle and pedestrian safety in their community to consult their local data, which often provide additional crash-level details.

DRCOG helps local member jurisdictions plan for active transportation by providing crash information, policy guidance, tools, data and analysis to local communities and stakeholders. Pedestrian and bicycle safety is multidisciplinary in nature; therefore, government agencies, law enforcement, drivers and educators will need to continue to work together to provide a transportation system which is safe and comfortable for all road users.





1001 17th St.  
Suite 700  
Denver, Colorado 80202

TPO-RP-ATPBIKEPEDCRASH-18-10-15



---

# DENVER REGIONAL ACTIVE TRANSPORTATION PLAN

---

Appendix E: Stakeholder Engagement Process

**CONTENTS**

|  |           |
|--|-----------|
| <b>Introduction</b>                                | <b>1</b>  |
| <b>Active Transportation Stakeholder Committee</b> | <b>1</b>  |
| <b>Member Agency Survey</b>                        | <b>2</b>  |
| <b>Regional Stakeholder Meetings</b>               | <b>4</b>  |
| <b>Online, interactive map</b>                     | <b>7</b>  |
| <b>Scientific and Opt-in Surveys</b>               | <b>8</b>  |
| <b>Bike to Work Day Outreach</b>                   | <b>8</b>  |
| <b>Public Comment Period</b>                       | <b>12</b> |

# INTRODUCTION

Over the course of the Active Transportation Plan (ATP) planning process, Denver Regional Council of Governments (DRCOG) staff and the project team worked with local government partners, stakeholders and members of the general public to inform and develop the ATP. The following is a description of the stakeholder and public engagement that took place during the planning process.

## ACTIVE TRANSPORTATION STAKEHOLDER COMMITTEE

The Active Transportation Stakeholder Committee (ATSC) served as the primary advisory body for the duration of the project. Representatives from the following agencies and organizations participated in ATSC meetings:

- Arapahoe County
- City of Aurora
- Bicycle Colorado
- Bike JeffCo
- Boulder County
- City and County of Broomfield
- Town of Castle Rock
- Center on Aging, UC Denver
- Colorado Department of Transportation
- Colorado Department of Public Health and Environment
- Colorado Parks and Wildlife
- City and County of Denver
- Denver South Transportation Management Association
- Douglas County
- Downtown Denver Partnership
- Denver Regional Council of Governments
- City of Federal Heights
- Town of Frederick
- City of Golden
- Jefferson County
- City of Lakewood
- City of Littleton
- Livewell Colorado
- City of Longmont
- Mile High Connects
- Northeast Transportation Connections
- City of Northglenn
- Town of Parker
- Regional Transportation District
- Smart Commute Metro North
- Town of Superior
- City of Thornton
- University of Colorado
- WalkDenver
- City of Westminster

The ATSC met seven times from November 2017 through October 2018, providing input that shaped the project. Table 1 lists the dates and topics covered at each ATSC meeting.

**Table 1. ATSC Meetings**

| ATSC Meeting Date     | Topics Covered   |
|-----------------------|--|
| <b>Nov. 8, 2017</b>   | project background, project scope/timeline, ATSC role, overview of active transportation in the region, regional bicycle network vision, desired outcomes, data and information                  |
| <b>Dec. 7, 2017</b>   | public engagement, TIP regional share eligible bicycle corridors, local plans and policies, active transportation organizations in the region, resident survey, cross-jurisdictional connections |
| <b>Feb. 14, 2018</b>  | planning framework, stakeholder/agency survey resident survey, State of the Practice preview, facility inventory   |
| <b>March 14, 2018</b> | regional network analysis – origins and destinations, mapping exercise   |
| <b>May 22, 2018</b>   | resident survey, upcoming outreach, bicycle and pedestrian crash summary, regional bicycle and pedestrian network development, implementation  |

## APPENDIX E | STAKEHOLDER ENGAGEMENT PROCESS

|                      |  |
|----------------------|--|
| <b>Aug. 15, 2018</b> | recap of stakeholder outreach and Bike to Work Day engagement, ATP outline, strategies and performance measures, county profile example, tools for local implementation, regional bicycle and pedestrian network |
| <b>Oct. 10, 2018</b> | draft ATP review, discussion   |

The ATSC provided direction on key elements of the plan, such as the planning framework, opportunities for local and regional action, performance measures, regional origins and destinations, pedestrian focus areas and regional active transportation corridors. The committee also identified key topics to be addressed in the plan and reviewed the draft Active Transportation Corridors map and the draft ATP. The ATSC was essential in providing data for the plan and connecting the project team with additional stakeholders from their respective jurisdictions.

### MEMBER AGENCY SURVEY

In February 2018, an electronic survey was distributed to DRCOG member agencies. The intent of the survey was to understand member agencies' active transportation priorities and to inform the direction of the ATP to ensure it would fulfill their needs.

The survey was completed by 27 respondents, representing cities and counties throughout the region. While there was some overlap among survey respondents and the ATSC, most respondents were not part of the ATSC and thus offered a different viewpoints. Several key themes emerged from the survey:

- strong support for development of a regional bicycle network
- roughly equal emphasis on trails/shared-use paths and on-street facilities
- maintenance, access to transit, safety also important
- regional network will help cross-jurisdictional coordination, help identify projects
- regional network should address both long-distance trips and opportunities to replace short trips, support access to transit; comfort ranked in middle; access to local destinations less important
- interest in ongoing coordination and technical assistance
- technical assistance needs oriented toward data collection and analysis

A summary of survey responses by question is listed below:

#### *Effectiveness of strategies to reduce single-occupant vehicle mode share from 75 percent to 65 percent by 2040 (most to least important)*

- constructing trails/shared-use paths
- maintaining existing sidewalks and bicycle facilities
- adding on-street bicycle facilities
- improving access to transit (first and last mile improvements)
- improving or implementing wayfinding
- supporting bicycle and pedestrian education and encouragement programs
- land use and zoning decisions
- constructing sidewalks in areas without them
- developing and implementing an ADA transition plan
- implementing or supporting a bike-sharing program
- adopting a Complete Streets policy
- transportation demand management (TDM) programs
- implementing a bicycle and pedestrian counting program
- parking pricing

#### *Value of Active Transportation Plan (high to low priority)*

- Create a regional bicycle network.

## APPENDIX E | STAKEHOLDER ENGAGEMENT PROCESS

- Identify geographic or other barriers to bicycling and walking in the region.
- Identify strategies for improving safety for bicyclists and pedestrians.
- Identify areas where pedestrian improvements are needed.
- Convey the benefits of investing in active transportation.
- Improve regional bicycle inventory data set and other data offerings (such as bicycle/pedestrian count data, facility data, web mapping, data visualization tools).
- Provide bicycle facility design best practices.
- Identify strategies to address ADA compliance that will improve the pedestrian network for people of all ages, incomes and abilities.
- Provide pedestrian facility design best practices.
- Establish performance measures and targets to monitor active transportation progress over time.
- Provide guidance on identifying underrepresented populations to ensure provision of safe and high-quality bicycle and pedestrian infrastructure.
- Provide guidance for how to reach groups that are underrepresented in bicycle and pedestrian planning efforts.
- Develop a matrix of local active transportation-related plans, policies and contact.

### *Value of regional bicycle network (most to least important)*

- It will help our community coordinate with adjacent communities to create a cohesive, connected network.
- It will help identify potential projects for funding.
- It will help communicate the value of investing in active transportation to elected officials and the public.
- It will help our community prioritize local investments.

### *Regional network factors (most to least important)*

- Identify long-distance routes or corridors that cross jurisdictions.
- Identify locations with the best opportunity to replace car trips with bicycle trips.
- Focus on access to transit stations and stops.
- Focus on connectivity of low-stress networks that support users of all ages, incomes and abilities.
- Identify facilities providing safer access to schools, libraries, parks and other local destinations.
- Focus on the needs of commuter and utility trip bicyclists.
- Focus on areas with limited or no transit access.

### *Local assistance needed (most to least important)*

- providing an ongoing forum for coordination among local governments and partners
- technical assistance (such as data collection, mapping and analysis)
- planning and design assistance for smaller communities
- developing example policy guidance related to active transportation (such as a Complete Streets policy) for local governments' use
- development and implementation of a regional Vision Zero plan
- providing guidance for local governments to coordinate safe walking and biking routes to schools with local school district(s)

### *Which areas of technical assistance would be of value to your community? (most to least important)*

- data collection (such as bicycle and pedestrian counts, crash data)
- mapping of existing bicycle and pedestrian facilities (for public use)
- conducting analysis (for example: safety, level of stress)
- data visualization
- development of policy guidance related to active transportation (such as a Complete Streets policy)
- design resources and best practices
- mapping of existing/planned bicycle and pedestrian facilities (for local government use)



## REGIONAL STAKEHOLDER MEETINGS

A series of meetings was held with local agency stakeholders across the Denver region to provide a general project update, obtain input on the active transportation corridor network and to identify opportunities for regional and local implementation. These meetings are listed in Table 2, including which agencies were represented.

**Table 2. Regional Stakeholder Meetings**

| Stakeholder Meeting Date | Location   | Agencies Represented   |
|--------------------------|--|--|
| June 6, 2018             | Denver South Transportation Management Area            | Arapahoe County, Town of Castle Rock, City of Cherry Hills Village, Douglas County, City of Greenwood Village, Tri-County Health Department  |
| June 6, 2018             | Jefferson County Administration and Courts Facility    | City of Arvada, City of Edgewater, Evergreen Parks and Recreation District, Foothills Park and Recreation District, Jefferson County, City of Lakewood, City of Wheat Ridge                        |
| June 7, 2018             | Adams County Community and Economic Development Office | Adams County, City of Brighton, City of Commerce City, City of Northglenn, Smart Commute Metro North, City of Thornton, City of Westminster  |
| June 7, 2018             | Martin Luther King, Jr. Library                        | City of Aurora   |
| June 23, 2018            | City of Louisville City Hall                           | City of Boulder, Boulder County, Boulder Transportation Connections, Commuting Solutions University of Colorado Boulder, City of Longmont, City of Louisville, Town of Nederland, Town of Superior |

Input from the regional stakeholder meetings was used to improve base data, develop the draft regional active transportation corridor map and prioritize actions for regional and local implementation. To help identify actions to be included in the plan, participants received six sticky dots to allocate to their highest-priority actions. The results are shown in tables 3 and 4.

APPENDIX E | STAKEHOLDER ENGAGEMENT PROCESS

Table 3. Stakeholder Voting Results for Regional Actions

| Category               | Regional Action   | Average Score |
|------------------------|---|---------------|
| Collaboration          | Provide opportunities for local governments to <b>learn From adapt local approaches</b> to bicycle and pedestrian planning.     | 1.3           |
|                        | Convene <b>local, regional and statewide planners</b> to ensure cross-jurisdictional coordination.                              | 5.8           |
|                        | Coordinate with local partners and TMAs to <b>expand the regional transportation demand management program.</b>                 | 1.5           |
| Education & Assistance | Collect and share information on <b>local policies, plans and regulations</b> as they pertain to active transportation plans.   | 1.2           |
|                        | Collect and provide data on <b>bicycle connectivity, barriers and level of traffic stress .</b>                                 | 2.0           |
|                        | Summarize and provide data on bicycle and pedestrian <b>crashes</b> regionwide.   | 1.0           |
|                        | <b>Improve bikeway data set</b> to include future facilities to encourage, facilitate and inform cross-jurisdictional planning. | 1.7           |
|                        | <b>Collect</b> bicycle and pedestrian <b>counts</b> and enhance count data sharing.   | 1.5           |
|                        | Provide tools, information and education to local governments on <b>facility design , emerging trends</b> and related topics.   | 2.7           |
| Investments            | Support development of <b>regionwide wayfinding system</b> for regional trails.   | 2.2           |
|                        | Support <b>first- and last-mile connections</b> to transit.   | 3.2           |
|                        | <b>Promote equity</b> in the project selection process.   | 2.2           |
|                        | Encourage <b>high-comfort solutions</b> that address users of all ages, abilities, and incomes.                                 | 3.7           |
|                        | Support projects that encourage <b>ADA accessibility .</b>  | 0.3           |
|                        | Invest in <b>regionally significant</b> bicycle and pedestrian projects.  | 6.8           |

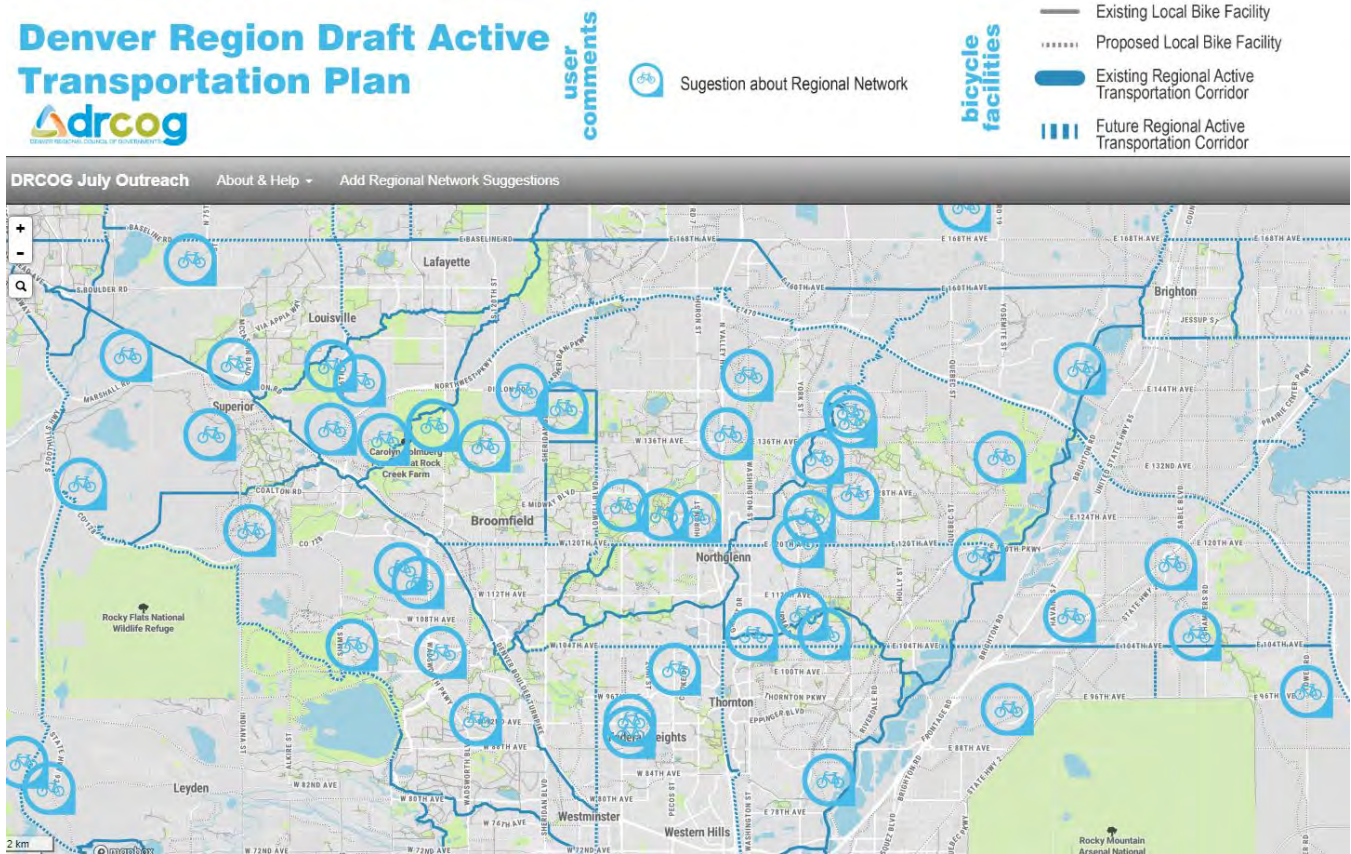
Table 4. Stakeholder Voting Results for Local Actions

| Category                        | Local Action   | Average Score |
|---------------------------------|--|---------------|
| Collaboration                   | Participate in forums that allow other communities to <b>learn from successes</b> in bicycle and pedestrian planning.                | 0.5           |
|                                 | Coordinate with neighboring jurisdictions to ensure <b>continuity</b> and <b>connectivity</b> of the active transportation networks. | 6.2           |
|                                 | Work with RTD and other transit providers on <b>transit - supportive infrastructure</b> , including first-and last-mile connections. | 2.0           |
|                                 | Work with DRCOG and local TMAs to inform and promote the use of <b>TDM</b> strategies and services.                                  | 1.5           |
| Policies, Plans and Regulations | Adopt policies, regulations or standards promoting <b>context-sensitive design</b> for users of all ages, incomes and abilities.     | 1.0           |
|                                 | Adopt <b>local active transportation, bicycle or pedestrian plans</b> to complement comprehensive and master planning efforts.       | 1.8           |
|                                 | Address the needs of mobility-limited residents.   | 0.7           |
|                                 | Consider <b>land use/zoning</b> in planning for active transportation.   | 0.8           |
| Investments                     | Design and build <b>low-stress bicycle networks</b> and <b>complete sidewalk networks</b> .  | 4.3           |
|                                 | Prioritize investment in <b>first- and last-mile connections</b> to transit.   | 2.8           |
|                                 | Improve <b>multimodal connectivity</b> throughout the transportation network.  | 4.3           |
|                                 | Incorporate <b>wayfinding</b> into active transportation projects.   | 2.0           |
|                                 | Promote <b>educational</b> and <b>promotional events</b> to encourage bicycling and walking.   | 1.3           |
|                                 | Implement <b>safety projects</b> that improve conditions for bicyclists and pedestrians.   | 4.5           |
|                                 | Facilitate <b>on- and off-street</b> facility <b>connectivity</b> .  | 1.5           |
|                                 | <b>Maintain existing</b> sidewalks and bicycle facilities.   | 1.7           |

## ONLINE, INTERACTIVE MAP

Based on feedback from the regional stakeholder meetings, the project team developed a draft map of regional active transportation corridors. The map was uploaded to an online, interactive mapping service where stakeholders were directed to provide feedback on proposed corridors. The project team hosted a webinar on Aug. 8, 2018, to demonstrate the functionality of the interactive map and provide instruction on how to provide input. Local governments and other agency stakeholders were asked to provide input on new connections needed, routes that should be removed and routes with incorrect facility status (existing or proposed). Map comments were received through Aug. 17, 2018.

Twenty-five people submitted a combined total of 144 comments via the interactive map. The comments resulted in the addition of several new corridors, removal of a few corridors, alignment corrections and clarification of existing vs. future status.



In addition to online map comments, several agencies provided comments via email or submitted a shapefile indicating their corridor recommendations. These were reviewed by the project team and many were included in the final active transportation corridor map.

## SCIENTIFIC AND OPT-IN SURVEYS

In addition to stakeholder outreach, the project team conducted two surveys to understand attitudes and preferences toward active transportation among the general public. These are described in detail in **Appendix B: Survey of Residents about Active Transportation: Report of Results**.

## BIKE TO WORK DAY OUTREACH

Through a combined effort among DRCOG staff and the project team, outreach was conducted at 10 Bike to Work Day stations throughout the region. This outreach allowed the team to discuss the project with Bike to Work Day participants and better understand their attitudes and concerns about biking in the region. Participants were directed to the online opt-in survey to share their experiences with and opinions regarding biking and walking in the region. Participants were also asked to provide a one-word response to indicate how biking, walking and transit makes them feel.











## **PUBLIC COMMENT PERIOD**

Staff released the draft Active Transportation Plan for a 30-day public comment period beginning Oct. 26 through Nov. 25. During the public comment period, staff utilized e-blasts, newsletters, social media, stakeholder engagement/outreach and flyers to spread the word about the draft plan.

During the comment period, over 15 people submitted comments, ranging from stakeholders to members of the public. After the comment period closed, staff reviewed each comment and noted the resolution/response. The project team then made revisions to the draft document to incorporate changes. The comments received were recorded and resolved in a matrix, which was presented as part of the plan adoption process.

## APPENDIX F:

### ACTIVE TRANSPORTATION-RELATED LOCAL PLANS

---

|                                      |   |
|--------------------------------------|---|
| <b>Adams County</b>                  | <a href="#">Draft Clear Creek Corridor Master Plan (2017)</a><br><a href="#">Open Space, Parks and Trails Master Plan (2012)</a><br><a href="#">Transportation Plan (2012)</a><br><a href="#">Comprehensive Plan (2012)</a>   |
| <b>Arapahoe County</b>               | <a href="#">Bicycle/Pedestrian Master Plan (2017)</a><br><a href="#">Comprehensive Plan (2018)</a>  |
| <b>Boulder County</b>                | <a href="#">Transportation Master Plan (2012)</a><br><a href="#">Comprehensive Plan (2018)</a>  |
| <b>City and County of Broomfield</b> | <a href="#">Transportation Plan (2016)</a><br><a href="#">Open Space, Parks, Recreation, and Trails Master Plan (2005)</a>  |
| <b>Clear Creek County</b>            | <a href="#">Non-motorized Routes Master Plan (1990)</a><br><a href="#">2017 Community Master Plan (2017)</a><br><a href="#">Clear Creek Greenway Plan (2005)</a>  |
| <b>City and County of Denver</b>     | <a href="#">Denver Moves: Bicycle &amp; Pedestrian Connections (2011)</a><br><a href="#">Denver Moves: Enhanced Bikeways Study (2016)</a><br><a href="#">Draft Denver Moves: Pedestrians and Trails (2018)</a><br><a href="#">Draft Denver Moves: Transit (2018)</a><br><a href="#">Denver Vision Zero Action Plan (2017)</a> |
| <b>Douglas County</b>                | <a href="#">2030 Transportation Plan (2009)</a><br><a href="#">2030 Parks, Trails, and Open Space Master Plan (2012)</a><br><a href="#">2040 Transportation Master Plan (in progress)</a>   |
| <b>Jefferson County</b>              | Trails Plan (underway 2018/2019)<br><a href="#">Jefferson County Wayfinding Master Plan (2016)</a><br><a href="#">Evergreen Trails Master Plan (2015)</a><br><a href="#">Bicycle and Pedestrian Planning Purpose and Process (2013)</a>   |
| <b>Gilpin County</b>                 | <a href="#">Gilpin County Master Plan (2017)</a>  |
| <b>Weld County</b>                   | <a href="#">2035 Transportation Plan (2011)</a>   |
| <b>City of Arvada</b>                | <a href="#">Arvada Bicycle Master Plan (2017)</a><br><a href="#">2014 Comprehensive Plan (2014)</a><br><a href="#">Arvada Parks, Trails and Open Space Master Plan (2016)</a>   |
| <b>City of Aurora</b>                | <a href="#">Aurora Bicycle and Pedestrian Master Plan (2012)</a>  |

|                                     |   |
|-------------------------------------|---|
|                                     | <a href="#">Fitzsimons Area Wide Multi-modal Transportation Study (2009)</a><br><a href="#">Northwest Aurora Bicycle and Pedestrian Master Plan (2005)</a>  |
| <b>Town of Bennett</b>              | <a href="#">2015 Town of Bennett Comprehensive Plan (2015)</a><br><a href="#">Bennett Regional Trail Plan (2011)</a>  |
| <b>City of Black Hawk</b>           | <a href="#">Comprehensive Plan (2004)</a>   |
| <b>City of Boulder</b>              | <a href="#">Transportation Master Plan (2014)</a><br><a href="#">Low-Stress Walk and Bike Network Plan (in progress)</a>  |
| <b>Town of Bow Mar</b>              | <a href="#">Community Plan (2015)</a>   |
| <b>City of Brighton</b>             | <a href="#">2016 Transportation Master Plan (2016)</a><br><a href="#">Brighton Greenways and Trails Master Plan (2004)</a>  |
| <b>City of Castle Pines</b>         | <a href="#">Master Transportation Plan (2017)</a><br><a href="#">Parks and Recreation Comprehensive Plan (2017)</a>   |
| <b>Town of Castle Rock</b>          | <a href="#">Transportation Master Plan (2017)</a>   |
| <b>City of Centennial</b>           | <a href="#">Centennial Transportation Master Plan (2013)</a><br><a href="#">Centennial Trails and Recreation Plan (2017)</a>  |
| <b>City of Central City</b>         | <a href="#">City of Central Comprehensive Plan (2017)</a>   |
| <b>City of Cherry Hills Village</b> | <a href="#">City of Cherry Hills Village Trails Inventory (2016)</a><br><a href="#">Cherry Hills Village Master Plan (2008)</a>   |
| <b>Town of Columbine Valley</b>     | <a href="#">Town of Columbine Valley Master Plan (2007)</a>   |
| <b>City of Commerce City</b>        | <a href="#">Walk.Bike.Fit (2012)</a>  |
| <b>City of Dacono</b>               | <a href="#">City of Dacono Transportation Plan (2003)</a><br><a href="#">City of Dacono Parks, Trails and Outdoor Recreation Master Plan (2008)</a><br><a href="#">Dacono Forward: Comprehensive Plan Update (2017)</a> |
| <b>Town of Deer Trail</b>           | <a href="#">Deer Trail Comprehensive Plan (2000)</a>  |
| <b>City of Edgewater</b>            | <a href="#">Edgewater Parks and Recreation Master Plan (2010)</a><br><a href="#">2013 Edgewater Comprehensive Plan (2013)</a>   |
| <b>City of Englewood</b>            | <a href="#">Englewood Walk and Wheel Master Plan (2015)</a>   |
| <b>Town of Erie</b>                 | <a href="#">Parks, Recreation, Open Space, and Trails Master Plan Update (2016)</a><br><a href="#">Erie Transportation Plan (2018)</a>  |
| <b>City of Federal Heights</b>      | <a href="#">City of Federal Heights Comprehensive Plan (1997)</a>   |

|                                  |  |
|----------------------------------|--|
| <b>Town of Firestone</b>         | <a href="#">Master Plan (2013)</a>   |
| <b>Town of Foxfield</b>          | <a href="#">Town of Foxfield Master Plan (2008)</a><br><a href="#">Town of Foxfield 2014 Trails Plan (2014)</a>  |
| <b>Town of Frederick</b>         | <a href="#">Comprehensive Plan (2015)</a><br><a href="#">Parks, Open Space and Trails Master Plan (2010)</a>   |
| <b>Town of Georgetown</b>        | <a href="#">Town of Georgetown Comprehensive Plan (2016)</a>   |
| <b>City of Glendale</b>          | <a href="#">Land Use Master Plan (1996)</a>  |
| <b>City of Golden</b>            | <a href="#">Walkability Task Force Recommendations (2008)</a><br><a href="#">Bicycle Task Force Recommendations (2008)</a>   |
| <b>City of Greenwood Village</b> | <a href="#">Transportation Master Plan (in progress)</a>   |
| <b>City of Idaho Springs</b>     | <a href="#">Envision Idaho Springs (2017)</a>  |
| <b>City of Lafayette</b>         | <a href="#">Comprehensive Plan (2013)</a><br><a href="#">Parks, Recreation, Open Space and Trails Master Plan (2013)</a><br><a href="#">Public Road Strategic Corridor Plan (in progress)</a>  |
| <b>City of Lakewood</b>          | <a href="#">Bicycle System Master Plan (2018)</a><br><a href="#">Lakewood 2025: Moving Forward Together (2015)</a>   |
| <b>Town of Larkspur</b>          | <a href="#">Draft Town of Larkspur Comprehensive Master Plan (2017)</a>  |
| <b>City of Littleton</b>         | <a href="#">City of Littleton Bicycle and Pedestrian Master Plan (2011)</a>  |
| <b>Town of Lochbuie</b>          | <a href="#">Lochbuie Comprehensive Plan (2018)</a>   |
| <b>City of Lone Tree</b>         | <a href="#">Walk &amp; Wheel Report (2015)</a><br><a href="#">Comprehensive Plan (2015)</a>  |
| <b>City of Longmont</b>          | <a href="#">Envision Longmont Multimodal and Comprehensive Plan (2016)</a><br><a href="#">Parks, Recreation and Trails Master Plan (2014)</a>  |
| <b>City of Louisville</b>        | <a href="#">Comprehensive Plan (2013)</a><br><a href="#">42 Gateway Alternative Analysis Report (2013)</a><br><a href="#">McCaslin Boulevard Small Area Plan (2017)</a><br><a href="#">South Boulder Road Small Area Plan (2016)</a> |
| <b>Town of Lyons</b>             | <a href="#">Comprehensive Plan (2010)</a><br><a href="#">Lyons Primary Planning Area Master Plan (2017)</a><br><a href="#">Parks, Open Space and Trails Master Plan Update (2008)</a>  |

|   |   |
|---|---|
| <b>Town of Mead</b>                                       | <a href="#">Town of Mead Open Space, Parks and Trails Master Plan (2011)</a><br><a href="#">Town of Mead Transportation Plan (2013)</a>   |
| <b>Town of Morrison</b>                                   | <a href="#">The Comprehensive Plan for the Town of Morrison (2015)</a><br><a href="#">Connecting the Places Community Trails Master Plan (2015)</a>   |
| <b>Town of Nederland</b>                                  | <a href="#">Town of Nederland Trails Master Plan (2005)</a><br><a href="#">Nederland Parks, Recreation, Open Space and Trails Master Plan (2013)</a>  |
| <b>City of Northglenn</b>                                 | <a href="#">Connect Northglenn Bicycle and Pedestrian Master Plan (2018)</a>  |
| <b>Town of Parker</b>                                     | <a href="#">Bike Lane Plan (2005)</a><br><a href="#">Open Space, Trails and Greenways Master Plan (2010)</a><br><a href="#">Town of Parker Transportation Master Plan (2014)</a>  |
| <b>City of Sheridan</b>                                   | <a href="#">Sheridan Comprehensive Plan (2015)</a>  |
| <b>Town of Superior</b>                                   | <a href="#">Transportation Plan (2014)</a><br><a href="#">Parks, Recreation, Open Space and Trails Master Plan (2005)</a>   |
| <b>City of Thornton</b>                                   | <a href="#">Transportation Plan (2009)</a><br><a href="#">Parks and Open Space Master Plan (2017)</a>   |
| <b>City of Westminster</b>                                | <a href="#">Open Space Stewardship Plan (2014)</a><br><a href="#">Comprehensive Roadway Plan Update (2008)</a><br><a href="#">Mobility Action Plan (2017)</a><br><a href="#">2030 Westminster Bicycle Master Plan (2011)</a><br><a href="#">Comprehensive Plan (2015)</a> |
| <b>City of Wheat Ridge</b>                                | <a href="#">Wheat Ridge Bicycle and Pedestrian Master Plan Update (2017)</a>  |
| <b>Commuting Solutions</b>                                | <a href="#">US 36 First and Final Mile Study (2013)</a>   |
| <b>Denver South Transportation Management Association</b> | North-South Regional Bicycle Corridor Study (in progress)<br>Regional Trail Connections Study (2016)  |
| <b>Regional Transportation District</b>                   | <a href="#">Bicycle Parking and Accessibility Plan (2015)</a><br><a href="#">First and Last Mile Strategic Plan (in progress)</a>   |