

APPENDIX 7

2040 MVRTP Active Transportation Component

ACTIVE TRANSPORTATION COMPONENT

A. Introduction

The DRCOG region, known for its arid climate and abundance of sunshine, is an ideal place for walking and bicycling. Also referred to as active transportation, walking and bicycling are flexible, accessible, healthy, and clean modes of transportation and can be used exclusively or in conjunction with other modes. The cycling culture is especially strong not only in the DRCOG region, but statewide. The number of people who bike to work in the DRCOG region is more than twice the national average and is increasing at a greater rate than any other mode.



Presently, there are about 1.4 million trips made each day by walking or bicycling in the region. Trends point to a continued uptick in the number of people who get around by walking and bicycling. While the region has a robust sidewalk and bicycling network, there are gaps to be filled and needs to be addressed in order to meet the demands for walking and bicycling: (1) provide safe and comfortable options for people of all ages and abilities; and (2) to fulfill the performance measures and targets currently being established as part of Metro Vision 2040.



The Active Transportation component of the 2040 MVRTP addresses the following topics; existing conditions for walking and bicycling in the DRCOG region, future projections for these modes, regional goals for active transportation, and strategies for meeting the goals. There will be an opportunity to delve deeper into active transportation topics during the development of the Active Transportation Plan, scheduled to commence in early 2017. The Active Transportation Plan will eventually become an element of the MVRTP.

B. Defining Active Transportation

Active transportation¹ is defined as a way of getting around powered primarily by human energy, via pedestrian and bicycling modes of travel. Pedestrian travel includes people walking or using wheelchairs², longboards, segways, and other mobility devices, such as walkers or crutches. Bicycling includes any type of wheeled and pedaled cycle, with or without an attached motor. Such means of travel enables multimodal transportation solutions to connect people of all ages, incomes, and abilities to where they need to go.

C. Walking and Bicycling in the DRCOG Region – Existing Conditions

Every day, over 1,400,000 trips are made by walking and bicycling in the DRCOG region (*DRCOG Travel Model, 2015*). The region has a strong walking and bicycling culture, as evidenced by the country's



second-largest annual Bike to Work Day. As the region's population continues to increase, so will the number of people who travel via active transportation modes. While pedestrians and bicyclists make up only ten percent (*DRCOG Travel Model, 2015*) of all person trips, they account for about 25 percent (*National Highway Traffic Safety Administration – Fatality Analysis Reporting System, 2014*) of traffic fatalities, a disproportionately high percentage considering the shorter distances and travel times by these

modes.

1. Miles of Active Transportation Facilities

DRCOG collects and maintains Geographic Information Systems data for the region including pedestrian and bicycle facilities. While there are limitations in determining the exact miles of active transportation facilities, especially sidewalks, the technology and method of data collection is rapidly evolving and improving. Through the *Denver Regional Aerial Photography Project (DRAPP)* endeavor, DRCOG has

Planimetrics and quantifying sidewalk miles

In 2016, DRCOG completed the region-wide Planimetrics project to map infrastructure features and assets, including sidewalk centerlines.

1,308 square miles of the urban core in the DRCOG Region were mapped. Within that area, there are approximately 17,700 miles of sidewalk.

¹ "Active transportation" and "bicycling and walking" will be used interchangeably throughout this document.

² All reference to walking and pedestrian travel in this document includes people using wheelchairs.

collected sidewalk data throughout the region.

The method, referred to as planimetrics, currently captures sidewalks that are five feet wide or more. In the future, it might be possible to capture the entire sidewalk system, including total mileage. Regional planimetrics data collected to date can be accessed [here](http://gis.drcoq.org/datacatalog/content/planimetrics-2014-centerline-sidewalks) (<http://gis.drcoq.org/datacatalog/content/planimetrics-2014-centerline-sidewalks>).

Obtaining bicycle facilities data and determining the number of miles is attainable by means of Geographic Information Systems. DRCOG collects Geographic Information Systems data from member governments annually, which includes bicycle facilities. Through this effort DRCOG is able to map and quantify the number of miles of bicycle facilities in the region. The DRCOG region has a robust bicycle network comprised of over 2,300 miles of bicycle facilities. Table 1 classifies the bicycle facilities and associated miles into four categories including: roadways with signed shared lanes; roadways with bicycle lanes, roadways with protected bicycle lanes, and multi-use trails.

Table 1
Miles of Bicycle Facilities in the DRCOG Region

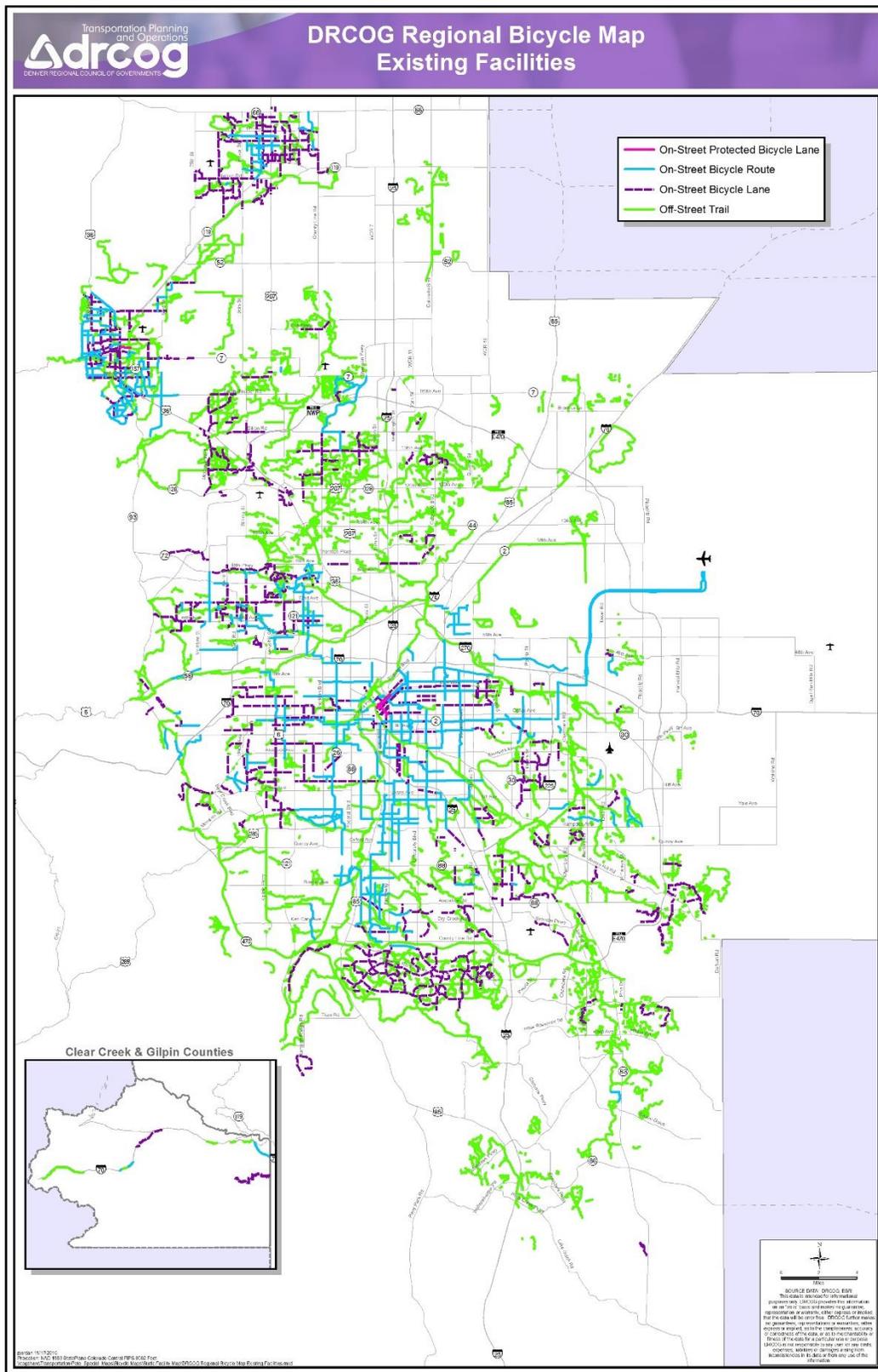
Bicycle Facility Type	Miles
Roadways with Signed Shared Lanes:	
Bicycle Route	325
Marked Shoulder Lanes	28
Roadways with Bicycle Lanes	430
Roadways with Protected Bicycle Lanes	3
Multi-use Trail:	
Wide Sidewalk*	35
Off-street Trail	1523
Regional Total	2344

* The multi-use trail category includes select sidewalks (some communities permit bicycling on wide sidewalks, particularly as connections between other bicycle facilities and along busy major arterials).

2. Maps

DRCOG uses the Geographic Information Systems bicycle facilities data collected to maintain the [Denver Regional Bicycle Map](#), an interactive map of the existing bicycle inventory throughout the region. The method for mapping and classifying bicycle facilities varies among jurisdictions. DRCOG classifies bicycle facilities for mapping purposes into four categories: (1) on-street bicycle route; (2) on-street bicycle lane; (3) on-street protected bicycle lane; and (4) off-street trails. The map also includes bicycle share station locations. Figure 1 is an image of the Denver Regional Bicycle Map.

Figure 1



3. Active Transportation Facility Types in the DRCOG Region

There is a wide cross-section of pedestrian and bicycle facility types throughout the region which can be classified into two main categories. First, there are travelways, which is the infrastructure people walk and bicycle on. Then there is the infrastructure which supports walking and bicycling such as trees and other landscaping along sidewalks, wayfinding, and bicycle parking. Both travelways and the supporting infrastructure are important components in enabling active transportation by making these modes more convenient, accessible, and comfortable.

- **Pedestrian facilities.** The characteristics and quality of pedestrian facilities vary throughout the region. Many new residential and commercial developments incorporate wide sidewalks or buffered multiuse facilities. Conversely, many older neighborhoods have narrow and/or crumbling sidewalks, making it difficult to accommodate large numbers of people using wheelchairs or other mobility devices. In many places, facilities are non-existent and pedestrians are forced to travel along the road or on an unpaved social path.

Conduits for walking

As conduits for pedestrian movement and access, (sidewalks) enhance connectivity and promote walking.

— NACTO Urban Street Design Guide

Pedestrian facilities go beyond the sidewalk. On-street facilities refer to pedestrian treatments and travelways within the street used to improve and enhance pedestrian safety. Table 2 and the corresponding photo gallery include a cross-section of pedestrian facility categories and types found throughout the region.

**Table 2
Pedestrian Facility Types in the DRCOG Region**

Pedestrian Facility Category	Facility Type	Description	Photo #
Sidewalks	<i>Attached Sidewalks</i>	Pedestrian travelways connected to the curb or motor vehicle travel lane edge.	Attached sidewalk #1 Attached sidewalk #2 Attached sidewalk #3
	<i>Detached Sidewalks</i>	Pedestrian travelways separated from vehicle travel lanes using a planting strip or other appropriate buffer treatment.	Detached sidewalk
	<i>Shared-Use Paths</i>	Accommodating both pedestrians and bicyclists, these travelways are physically separated from motorized vehicular traffic by an open space or buffer and are either within the roadway right-of-way or within an independent right-of-way. Shared-use paths can be located (but not limited to) in a park, greenway; along rivers, railroads, utility rights of way; and along roadways.	Shared-use path
On-Street	<i>Crosswalks</i>	Typically defined as the portion of a roadway designated for pedestrians to use in crossing the street at an intersection (conventional), or between intersections (mid-block). Mid-block crosswalks are used to facilitate pedestrian crossings when there is significant distance between designated crossings and/or where there are destinations/places people want to go (pedestrian desire lines) but are not well served by existing traffic signals.	Crosswalk and pedestrian island
	<i>Pedestrian Islands</i>	Pedestrian islands can be located in the middle of a street at an intersection or at mid-block crossings. These islands provide a refuge for individuals moving at a slower speed when crossing a roadway. They are generally applied where there are higher speeds and volumes, but may be used on both wide and narrow streets.	
	<i>Shoulders (rural)</i>	Roadway shoulders provide a gravel or paved area for pedestrians to walk next to the roadway, particularly in rural area where sidewalks and pathways are not feasible (FHWA Safety Program).	N/A
Other	<i>Alleys</i>	Sometimes used by pedestrians (except where prohibited), function primarily as a place for trash collection, service vehicle access, and parking access. In some places such as downtowns and urban areas, alleys have been converted to public spaces for people to walk, play and interact.	Alley transformed to a public space (Source: Downtown Denver Partnership)
	<i>Intersections at Alleys</i>	When an alley crosses a sidewalk, potential conflicts can occur between pedestrians and vehicles. Rumble strips, warning signs, and raising the intersections to the sidewalk grade could mitigate conflict.	N/A
	<i>Pedestrian walkways in parking lots and structures</i>	Sidewalks provided through parking lots to the destination they are serving and to nearby pedestrian facilities, provides a safe place for pedestrians to travel.	Pedestrian walkways in parking lot
	<i>Pedestrian Zones and Plazas</i>	Also known as auto-free zones and car-free zones, are areas of a city or town reserved for pedestrian-only use and limits/prohibits vehicular traffic.	Pedestrian zones and plazas
Pedestrian Support Infrastructure	<i>Wayfinding</i>	Signage and/or pavement markings to guide both pedestrians and bicyclists to their destinations. Many jurisdictions have implemented or are implementing a destination-direction-distance based wayfinding system.	Wayfinding - whimsical

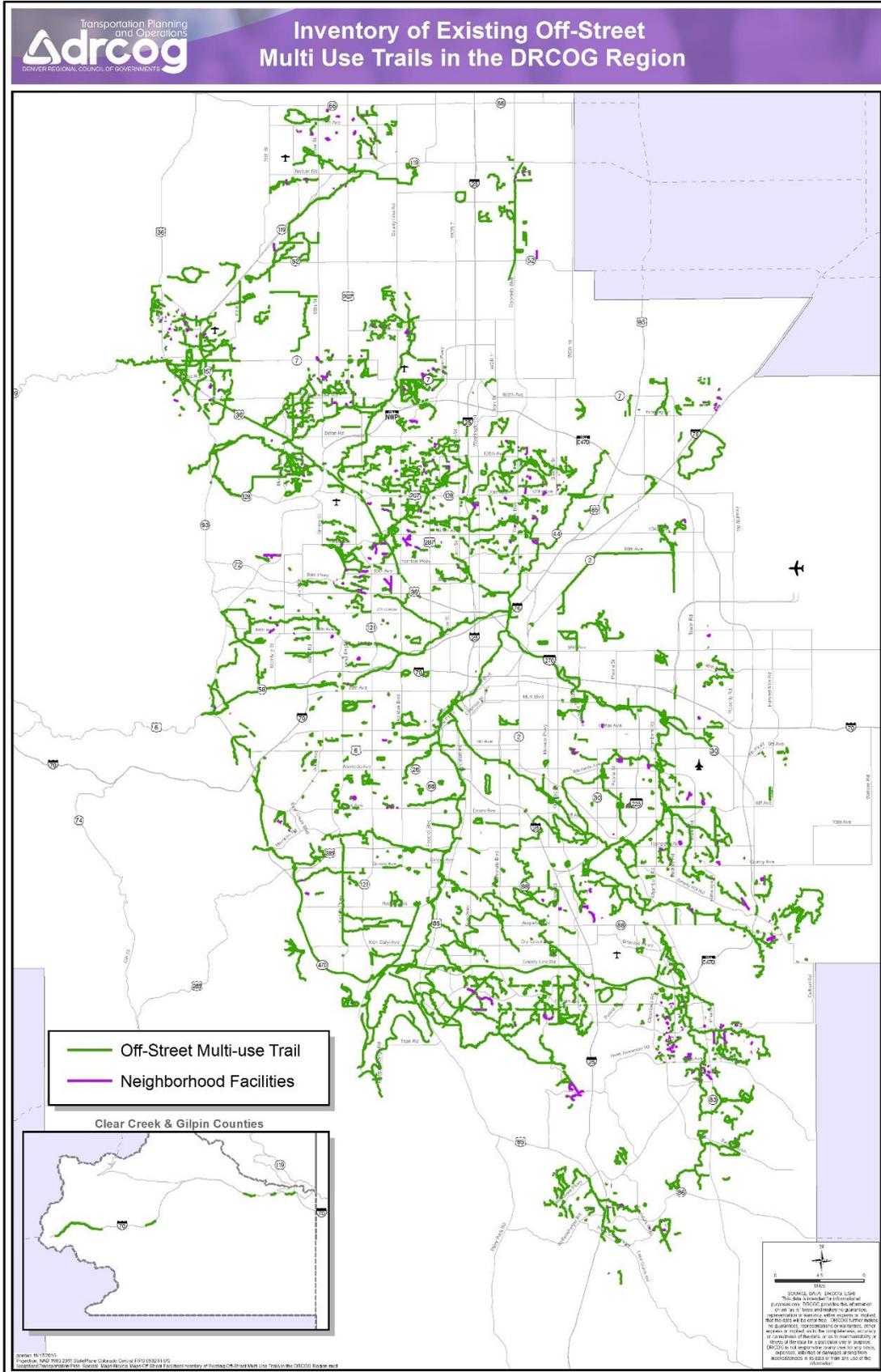


Pedestrian Infrastructure in the DRCOG Region



- ***Bicycle Facilities.*** The DRCOG region has a robust bicycle system comprised of off-street trails, roadways with bicycle lanes, protected bicycle lanes, signed shared lanes, shoulders, and shared-use sidewalks. As illustrated in Table 1 and Figure 1, the majority of the existing bicycle network is comprised of multi-use trails accommodating both pedestrians and bicyclists, either in the form of off-street trails or wide sidewalks. [Figure 2](#) depicts the over 1,500 miles of multi-use trails in the region. [Table 3](#) and the corresponding photo gallery include a cross-section of bicycle facility categories and types within the region.

Figure 2



**Table 3
Bicycle Facility Types in the DRCOG Region**

Bicycle Facility Category	Facility Type	Description	Photo Links
On-Street Bicycle Facilities	<i>Conventional Bicycle Lanes</i>	On-street bike lanes for exclusive use by bicyclists through the use of pavement markings and signage. They are <i>typically</i> on the right side of the roadway, located adjacent to and flow in the same direction as motor vehicle traffic. While less common, bike lanes are sometimes placed on the left side of one-way streets or two-way median divided streets.	Conventional bike lane #1 (Source: City & County of Denver) Conventional bike lane #2
	<i>Buffered Bike Lanes</i>	On-street conventional bike lanes paired with an additional buffer from motor vehicle traffic by means of pavement markings and/or a parking lane. Parking Protected Bike Lanes refer to bike lanes buffered (or protected) from motor vehicle traffic by parked cars. Parking Protected Bike Lanes sometimes fall under the Protected Bike Lane category.	Buffered bike lane
	<i>Protected Bike Lanes (PBL)</i>	These bicycle facilities have three key characteristics: 1.) There is physical, stationary, vertical separation between the bike lane and motor vehicle traffic. Examples of vertical separation may include bollards, curbs, plastic posts, planters, raised bumps or parked cars; 2.) They are exclusively for bicycles; 3.) They are on or immediately adjacent to the roadway. PBL's are part of the street grid and can be at street level, raised to the sidewalk level, or somewhere in between. The three types of protected bike lanes include one-way, two-way and raised.	Protected bike lane with flex tubular markers (Source: City & County of Denver) Protected bike lane w/planters
	<i>Bicycle Boulevards</i>	Also referred to as Neighborhood Bikeways, Neighborhood Greenways, etc., these are streets with low traffic speeds and volumes that are designated and designed to give priority to bicycle travel through a range of design treatments. Typically, there is not a dedicated bike lane, but rather the street is shared by motor vehicles and bikes.	N/A
	<i>Paved Shoulder Bicycle Routes</i>	Paved shoulders are typically applied along roadways in rural communities or less developed areas. They should be striped and signed as a bicycle route and provide adequate space for bicyclists.	Paved shoulder with bike lane
Off-Street Bicycle Facilities	<i>Shared-use Paths</i>	Description provided in Pedestrian Section. There are three categories of shared-use paths: along roadway with buffer; along roadway with no buffer (sidepath); along waterway, railroad, through open space, etc.	Shared-use path along roadway Shared use path-waterway (Source: City & County of Denver)
	<i>Bridges/Overpasses and Underpasses</i>	Provide crossings for bicyclists and pedestrians where barriers exist, both real and perceived, such as: interstates, freeways, arterials with high speeds and volumes, railroads, rivers, and other obstacles.	Underpass - multiuse
Other Bicycling Support Infrastructure	<i>Bike Share</i>	Bicycles available for short-term use from a network of stations within a given geographic area.	Bike share
	<i>Bicycle Libraries</i>	Similar to bike share, but differ in that the bikes are typically checked out at a central location and are intended for longer-term use.	Bicycle library (Source: City of Golden)
	<i>Bicycle Parking</i>	There are many forms of short-term bicycle parking options such as U-racks, bike trees and bike corrals located on sidewalks and streets. These should be both visible and convenient to the businesses and locations they support.	Bicycle parking at transit Bicycle parking corral (Source: City & County of Denver)
	<i>Secure Bicycling Parking</i>	Intended for longer-term bicycle parking offering secure, weather-protected places to park bicycles at locations such as residential buildings, office buildings and at transit stations.	Secure bicycle parking (Source: Boulder County)
	<i>Wayfinding</i>	Signage and/or pavement markings to guide both bicyclists and pedestrians to their destinations. Many jurisdictions have implemented or are implementing a destination- direction-distance based wayfinding system.	Wayfinding



Bicycle Infrastructure in the DRCOG Region



4. Mode Share and Trip Statistics

On a typical day in the Denver region about 1.25 million pedestrian trips and about 162,000 bicycle trips are made (*DRCOG Travel Model, 2016*). As of 2014, the combined percentage of people in the DRCOG region who commute to work by bicycle or walking throughout the year was 3.7 percent (*US Census, Five Year American Community Survey 2010-2014*). This percentage is higher in summer months and also in downtowns like Boulder and Denver. While the percentage is small, the number of people who bicycle or walk to work has increased significantly over the past decade. For example, between 2005 and 2014, there was a 32 percent increase in the number of people who typically walk and bicycle to work (*American Community Survey, One-Year Estimates*).

Pedestrian Travel

Everyone is a pedestrian at some point. Walking is the most flexible mode of travel and part of nearly all trips, even those taken primarily by another mode. Therefore, it is important that people have access to inviting and safe facilities to walk or travel by wheelchair. For some people, pedestrian travel may be the exclusive mode to get from one place to another. For others, pedestrian travel may be used in combination with other travel modes, such as transit, bicycling or driving. Walking is often the first and final mode of travel when combined with other modes.



- **All Trips.** Of the more than 13.5 million total person trips (all modes) made in the region per day, nine percent of these trips are made by walking. Countless more short walking trips are made at the start or finish of trips by other modes. As expected, most walk trips are short, with an average distance of about 0.4 miles (*DRCOG 2010 Front Range Travel Counts*). Of all the daily trips in the region that are 0.4 miles or less, around 100,000 are made by driving alone (*DRCOG Travel Model, 2016*).
- **Work Trips.** On a typical day in the region about 37,000 people, or 2.4 percent, of the working population walk to work (*US Census, 2010-2014 American Community Survey*). This percentage is much higher when weather is nicer and in denser locations with a mix of land uses. Even more people walk to transit to get to work. While the percentage of people walking to work has declined since 1980, trends have remained relatively steady since 2000 with slight fluctuations.

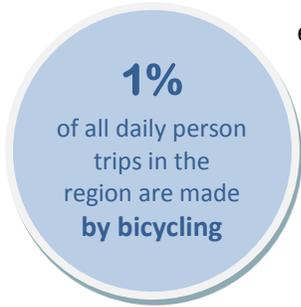
Walk to Work (35-year trend – DRCOG Region)

	1980	1990	2000	2010	2014
Percent of Workers	4.7 %	3.4 %	2.4 %	2.2 %	2.4 %

US Census (1980-2010); 5-Year American Community Survey (2010-2014)

Bicycle Travel

The DRCOG region has one of the highest rates of bicycle use in the nation and a strong bicycling culture. The climate, relatively concentrated urban development, extensive off-street trail system,



expanding bike share systems, and health-oriented population contribute to the popularity of bicycling. Bicycles provide an efficient means of transportation for short- to medium-length trips. The number of people who bike to work has doubled in the DRCOG region between 2000 and 2014; the greatest percentage increase of all modes. Like pedestrian travel, bicycling may also be used in combination with other modes of transportation, especially transit.

- All Trips.** Of the more than 13.5 million total person trips (all modes) made in the region per day, about 162,000, or one percent of these trips, are made by bicycling. The average bike trip distance in the DRCOG region is about two miles (*DRCOG 2010 Front Range Travel Counts*). There are more than one million drive-alone trips of two miles or less made each day in household vehicles (*DRCOG Travel Model 2016*). There is potential to convert some of these short drive-alone trips to bicycle trips.
- Work Trips.** The number of people who bike to work is increasing at a greater rate than any other mode. On a typical day in the region about 20,000 people or 1.3 percent of the working population bike to work (*US Census, 2014*) which is more than double the national average of 0.6 percent (*US Census, American Community Survey – Five Year 2010-2014*). This percentage is much higher in warm weather months and in denser locations where there is a mix of land uses, mobility options such as bikeshare, and bicycle infrastructure. There is a clear gender gap in bicycle commuters. In the DRCOG region, 71 percent of bicycle commuters are male, whereas 29 percent are female (*American Community Survey, Five Year, 2010-2014*). This characteristic is typical nationwide.

Bike to Work (35-year trend – DRCOG Region)

	1980	1990	2000	2010	2014
Percent of Workers	.7 %	.7%	.7 %	1.1%	1.2%

US Census, 1980 – 2000; American Community Survey Data 2010 – 2014

SUMMARY
Pedestrian Crash
Characteristics
in the DRCOG Region

20% of traffic fatalities were pedestrians

61% of pedestrian crashes occur mostly on arterial streets

63% of pedestrian crashes occur at an intersection

77% of **fatal** pedestrian crashes involved a vehicle going straight

60% of **fatal** pedestrian crashes occur mid-block

17% of all traffic fatalities are those 65 and older, who currently make up 10% of the regional population



5. Safety

Pedestrians and bicyclists are particularly vulnerable transportation system users due to the high level of injury severity in the event of a crash. Active transportation users account for a disproportionately high percentage of traffic fatalities, considering the distance and time of travel by these modes. Lack of adequate sidewalks and crosswalks could lead pedestrians to compromise their safety by walking in the street or crossing mid-block. Lack of adequate bicycling infrastructure can result in bicyclists taking to the sidewalks due to safety concerns, creating unintended conflict with pedestrians. Also, bicycling on sidewalks could potentially lead to conflicts with turning vehicles at intersections if the bicyclist rides through the crosswalk.

Pedestrian Crash Statistics in the DRCOG Region

From 2010-2014, there were 868 traffic fatalities in the DRCOG region. Pedestrians made up 175, or 20 percent, of the fatalities (*National Highway Traffic Safety Administration – Fatality Analysis Reporting System data*), yet only nine percent of all trips were made by walking (*DRCOG Travel Model, 2015*). The majority of pedestrian crashes occur on arterial streets (61%) and at intersections (63%). The vast majority of fatal pedestrian crashes occurred with a vehicle travelling straight (77%), with many occurring at mid-block (60%). While those 65 or older make up only ten percent of the regional population, they comprise 17 percent of pedestrian fatalities (*CDOT 2010-2012, National Highway Traffic Safety Administration 2014*).

Many factors contribute to collisions involving pedestrians:

- high-volume and high-speed roadways;
- turning vehicles at intersections;
- driver distractions – texting, talking, using the phone; and
- lack of dedicated crossing areas, such as significant gaps between crossing locations; and streets designed primarily for motor vehicles.

Bicycle Crash Statistics in the DRCOG Region

During the period from 1991 to 2014, about 80 percent of bicycle crashes resulted in injury. Like pedestrians, bicyclists are considered vulnerable transportation system users, due to the high level of injury severity in the event of a crash. There are approximately 100 bicyclists seriously injured in reported traffic crashes each year in the DRCOG region.

Of the 868 total traffic fatalities in the DRCOG region from 2010-2014, thirty, or 3.5 percent of the fatalities, were bicyclists (*Fatality Analysis Reporting System data*). Around 12 percent of bicycle crashes results in a fatality or serious injury. (*CDOT 2010-2012*). The majority of bicycle crashes occur on arterial streets (53%) and at intersections (74%). Fatal bicycle crashes usually involved a vehicle going straight (71%). Bicyclists age 15 to 24 had the highest crash involvement. (*CDOT 2010-2012, Fatality Analysis Reporting System data through 2014*).

Many factors contribute to collisions involving bicyclists. Some examples include:

- high-volume and high-speed roadways;
- turning vehicles at intersections;
- driver distractions (texting, talking, using the phone); and
- driver or bicyclist failure to signal or stop.

Understanding crash characteristics (how, why, where, and who) and trends is important in understanding how to apply appropriate mitigation strategies and countermeasures. Roadway types, existing infrastructure, crash history, pedestrian activity, and bicyclist usage (existing and anticipated) should also be considered when determining mitigation strategies.

More details on pedestrian and bicycle safety, including statistics and mitigation strategies, are available in the [Pedestrian and Bicycle Safety in the Denver Region Report](#) (to be updated as part of the Active Transportation Plan).

SUMMARY **Bicycle Crash** **Characteristics** **in the DRCOG Region**

80% of bicycle crashes result in injuries

100 bicyclists **seriously injured** in reported traffic crashes each year

12% of bicycle crashes results in a fatality or serious injury

53% of bicycle crashes occur on arterial streets

74% of bicycle crashes occur at an intersection

71% of **fatal** bicycle crashes involved a vehicle going straight

Those ages **15 to 24** had the highest crash involvement



Safety Initiatives

Safety concerns are a leading barrier to more people walking and bicycling as a mode of travel. Many people are discouraged from walking and bicycling because of the real or perceived danger of vehicle traffic. This concern is most prevalent for bicycling. Many local and national organizations are striving to improve safety for all transportation users, with bicyclists and pedestrians being no exception. Two leading national efforts are Towards Zero Deaths and Vision Zero Initiatives. These efforts, aiming to reduce and eliminate traffic deaths and severe injuries, have been gaining traction throughout the United States.

- **[Toward Zero Deaths](#)**. Toward Zero Deaths, supported by Federal Highway Association, is a highway safety vision in the U.S. that includes numerous organizations committed to reducing annual U.S. traffic fatalities to zero. The Toward Zero Deaths Plan provides organizations in the fields of engineering, law enforcement, education and emergency medical services with initiatives and safety countermeasures designed to eliminate traffic fatalities. Colorado joined this national effort in March 2015. CDOT's Strategic Highway Safety Plan incorporates Moving Towards Zero Deaths as a core value within the plan. CDOT's plan establishes a 2.9 percent annual reduction rate of all traffic fatalities starting in 2014 through 2019.
- **[Vision Zero](#)**. Vision Zero is an initiative which aims to eliminate traffic-related fatalities and serious injuries on the roadways while increasing safe, healthy, equitable mobility for all. Vision Zero, started in Sweden and implemented throughout Europe, is now gaining momentum in major U.S. cities. In early 2016, Denver joined other major U.S. cities that have adopted a Vision Zero policy.

A safe active transportation system is paramount in reducing and eliminating pedestrians and bicyclists from being seriously injured or killed, and in instilling confidence in more people to get around by walking and bicycling.

D. Benefits of Active Transportation

Active transportation is a key component in a robust transportation system providing mobility options for all people. There are many quality of life benefits associated with active transportation including: personal mobility, environmental quality, public health, and economic benefits.

Personal Mobility

Some people choose not to drive, while others cannot drive. According to the 2010 Census, about 70,000 households in the region did not have an automobile available. A robust and safe pedestrian and bicycle infrastructure network can provide cost-effective mobility options for people of all ages, abilities, and incomes, especially when combined with the region's transit network. Walking and bicycling are essential modes of travel for many people to access jobs, school, groceries, health care, and other activities of daily living.

Environmental Benefits

Active transportation is an important tool to help the region address environmental challenges related to transportation, such as reducing air pollution, greenhouse gas emissions, and vehicle miles of travel. About one million drive-alone trips are made each day that are equal to or less than the average bicycle trip distance (1.8 miles) and over 100,000 drive-alone trips that are equal to or less than the average walk trip distance (0.4 miles). There are a number of factors as to why these trips are made by driving alone; however, there is potential to shift some of these trips to walking and bicycling.

Health Benefits

One out of every two U.S. adults is living with a chronic disease such as heart disease, cancer or diabetes and more than two-thirds of American adults are either overweight or obese. While Colorado leads the nation in terms of healthy people, obesity rates in the state are projected to more than double by 2030 (Surgeongeneral.gov, 2016). Additionally, the percentage of overweight children in the United States is growing at an alarming rate, with more than one-third of children and adolescents considered overweight or obese. In Colorado, 27% children ages 2 – 14 were considered overweight or obese in 2013 (Colorado Department of Health, March 2015). Walking and bicycling can be one factor in helping to reduce or mitigate stress, obesity, and chronic disease. Children who ride a bike two or more times a week are less likely to be overweight. Adolescents who bike are 48% less likely to be overweight as adults (*People for Bikes, Statistics Library*). The health benefits of

Comfort and Safety

The 8 to 80 rule is a litmus test that involves imagining a public space, especially a busy city street or intersection, and asking whether it is suitable for children, persons with disabilities, and older adults alike.

– Citylab, *The 8 to 80 Problem: Designing Cities for Young and Old*

Opportunity for Change

There are over 1 million trips made each day by driving alone that have the potential to shift to bicycling or walking.

active transportation are no longer isolated to the health care field and have become a central topic in planning and policy.

Economic Benefits

Walking and bicycling are cost effective options for getting around, can help people save money, and benefit local economies. Opting to bicycle or walk instead of driving can help reduce motor vehicle ownership costs, such as gasoline, maintenance and parking. These savings can equate to more money spent on local goods and services. Additionally, while the cost to construct these facilities greatly varies,

Economic Development

“The number one thing they want is bike lanes. Ten years ago we never would have thought that walkability or bike lanes would be economic development tools.”

— Tami Door, Downtown Denver Partnership, on what tech companies say they want in order to locate to or stay in Denver

Good Design

“Decisions and plans made by the transportation, land use, and community design sector can affect whether communities and streets are designed to support walking.

This sector can change the design of communities and streets through roadway design standards, zoning regulations, and building codes and improve the pedestrian experience through landscaping, street furniture, and building design.

This sector is also integral in the planning and implementation of public transit systems.”

— Surgeon General, 2015

many roadways can easily be retrofit to accommodate bicycles and pedestrians through the use of low-cost materials such as paint, planters and trees.

Demonstration, pilot and interim design projects are low-cost options to test out projects and applications where budgets are limited, or public education and buy-in is necessary.

Supporting the Framework of Metro Vision

In addition to the aforementioned benefits, a robust, safe and well-connected active transportation system supports the framework of DRCOG’s Metro Vision Plan. Active transportation is a key component in many of the Outcomes and Regional Objectives developed as part of the draft Metro Vision Plan. Additionally, an expanded active transportation system and increased use of these modes are essential elements in meeting the Performance Measures and Targets in the plan, such as increasing non-single occupant vehicle mode share to work, and reducing greenhouse gas emissions, vehicle miles of travel, and number of traffic fatalities.

E. Future Trends for Active Transportation – Projections for 2040

Looking forward to 2040, total person trips are forecast to increase by 37 percent, whereas walking and bicycling trips combined are projected to increase by about 48 percent. Currently, about 1.25 million, or nine percent of trips are made by walking. By 2040, nearly two million trips will be made by walking each day, accounting for 10 percent of all weekday person trips. Bicycle trips are also projected to increase, from around 162,000 to 215,000 trips per day (*DRCOG Travel Model 2016*).

Estimated Daily Walking and Bicycling Trips: 2015 and 2040

Daily DRCOG region trips	2015	2040
Total Person Trips	13,810,400	18,986,600
Walking Trips	787,700	1,109,800
Bicycling Trips	148,500	192,500
Walking to/from Transit Trips	460,300	757,300
Bicycling to/from Transit Trips	13,200	22,200
Total Walking and Bicycling Trips	1,409,700	2,081,800

DRCOG Travel Model 2016

To summarize active transportation in the DRCOG region:

- By 2040, the region’s population is projected to increase by 37% and the number of active transportation trips is projected to increase by 48%.
- While the DRCOG region has a robust pedestrian and bicycle network, there are many gaps in the system and barriers to bicycling and walking.
- There are numerous quality of life benefits associated with walking and bicycling.
- A mode share increase in walking and bicycling is necessary in order to meet *Metro Vision* outcomes, objectives, and performance measures and targets.
- Pedestrians and bicyclists are vulnerable transportation system users and are more susceptible to being killed or seriously injured in the event of a crash.

F. Active Transportation Goals

In order to address the demands and challenges associated with regional growth, the demand for active transportation options, and support the framework of *Metro Vision*, the following objectives must be

addressed:

- Increase walking and bicycling mode share and trips beyond what is projected.
- Provide a robust walking and bicycle network for people of all ages and abilities.
- Improve the safety of the pedestrian and bicycle network thereby reducing (and ultimately striving to eliminate) serious injuries and deaths as a result of crashes.

These three objectives are synergistic; where, for example, a robust and safe active transportation network should result in a mode share increase for both bicycling and walking. How does the region:

- achieve and maximize the benefits of walking and bicycling?
- improve the safety of the network?
- create a network where people of most ages and abilities feel comfortable walking and bicycling?
- and ultimately, increase the active transportation mode share?

G. Elements to Fulfill Active Transportation Goals

This section identifies some of the elements that are necessary to fulfill the three objectives identified. These and additional elements will be further explored and expanded upon in the development of DRCOG's Active Transportation Plan, scheduled to commence in early 2017.

1. Low Stress (or High Comfort) Network

One of the most important elements in attracting more people to walking and bicycling is a low-stress network of active transportation facilities. Low-stress facilities, also referred to as high-comfort facilities, induce the least amount of stress on the users, and attract a wider segment of the population to walk and bicycle. Low-stress facilities are *typically* on or adjacent to roadways with lower traffic volumes and lower speeds (especially if the facility is on-street) and can include wide sidewalks buffered by landscaping, protected bike lanes, sidepaths, multiuse facilities, buffered bike lanes, bicycle boulevards, and neighborhood bikeways. Pedestrian and bicycle bridges and underpasses also provide a low-stress experience, allowing active transportation users to avoid busy intersections and roadways, and enabling mostly uninterrupted

Low-stress Connectivity – *Attracts the Widest Possible Segment to Bicycling*

In a 2012 study from Northeastern University, *Low Stress Bicycle Bicycling and Network Connectivity*, researchers write: “For a bicycling network to attract the widest possible segment of the population, its most fundamental attribute should be low-stress connectivity. That is, providing routes between people’s origins and destinations that do not require cyclists to use links that exceed their tolerance for traffic stress, and that do not involve an undue level of detour.”

—Furth et al., *Network Connectivity for Low-Stress Bicycling*, Submitted to TRB for the 2013 Annual meeting and publication in Transportation Research Board

travel.

Over the past few years, there has been a regional focus on constructing, expanding and connecting a low-stress network of facilities to appeal to a wide audience of ages and abilities. Pedestrian and bicycle facilities alike should be planned and developed for the most vulnerable users: children, older adults, and people with disabilities.

2. Connecting the Active Transportation Network

Also essential to attracting more people to walking and bicycling is continuity and consistency in the active transportation system achieved by connecting the low-stress network. In addition to filling in gaps and connecting facilities, it is important to identify and connect to desirable destinations and to other modes of transportation. A low-stress, well-connected network of active transportation facilities can be obtained through the following actions:

- Taking inventory of the existing bicycle and pedestrian network.
- Identifying missing segments and barriers in the existing network.
- Filling in gaps and removing barriers to the existing network.
- Identifying gaps and barriers to first and final mile connections.
- Filling in gaps and removing barriers to first and final mile connections.
- Create a consistency in the network.
- Expanding the active transportation network, ideally with low-stress facilities.

3. Multimodal Transportation Nodes

Having a mix of transportation options and amenities conveniently available and located at popular destinations, in urban and town centers, and at transit stations, can make walking and bicycling more feasible. People might be willing to get around more by walking or bicycling if modes were clustered together and easily accessible, such as carshare, transit, transportation network companies (Uber, Lyft) and taxis, bike share and secure bicycle parking. Denver Union Station is a premier example of a multimodal transportation node in the Denver region. However, multimodal transportation nodes are not reserved only for urban cores, and they have the potential to be successful in suburban town centers and suburban transit-oriented development.

4. Complete Streets

Complete streets are designed to safely accommodate both motorized and active modes of transportation. According to the National Complete Streets Coalition, complete streets are those designed and operated to enable safe access and travel for all users. Pedestrians, bicyclists, motorists,

transit users, and travelers of all ages and abilities will be able to move along the street network safely. Although the Federal Highway Association does not have an official complete streets policy, the concept is closely associated with the principles promoted by the Interagency Partnership for Sustainable Communities, a joint endeavor involving the U.S. Department of Transportation, U.S. Department of Housing and Urban Development, and U.S. Environmental Protection Agency ([Federal Highway Association, Public Roads, July/August 2010](#)). All modes, including walking and bicycling, should be considered in new roadway and reconstruction projects to enable safe travel for all transportation users. As of 2016, the only known jurisdictions in the DRCOG region to have adopted or incorporated complete streets in policies, resolutions, or plans include the City of Denver and City of Golden.

5. Supporting Infrastructure and Technology

Infrastructure and amenities supporting active transportation are influential to their usage. Examples of supporting infrastructure include: pedestrian shelters at transit stops; shade trees and landscaping along sidewalks; bicycle racks and secure bicycle parking; and wayfinding. Additionally, real-time multimodal transportation applications and routing capabilities further support and enable walking and bicycling as stand-alone modes or used in conjunction with another mode. For example, technology could easily enable people using transit to reserve a bicycle (bikeshare) or car (carshare) at the end of the trip to access their final destination. Supporting infrastructure, amenities, and technology should be convenient, easily accessible and intuitive.

H. Role of DRCOG in Implementing Active Transportation Projects

DRCOG plays an integral role in both supporting and funding active transportation in the DRCOG region. Projects categorized as pedestrian and bicycle infrastructure are funded directly through the Transportation Improvement Plan process. The percentage of funds allocated to pedestrian and bicycle projects has increased over the past three TIP cycles. In the current Transportation Improvement Plan (2016-2021), 22 percent of funds are allocated to projects classified as bicycle and/or pedestrian infrastructure and all of the projects were either protected or grade separated from the roadway. Pedestrian and bicycle projects are also constructed as elements of larger Transportation Improvement Plan projects, such as roadway projects. Roadway projects have been incentivized in the Transportation Improvement Plan application process to include multimodal features like bicycle and pedestrian travelways and support facilities.

In 2017, DRCOG will prepare an Active Transportation Plan. The Active Transportation Plan will become an element of the MVRTTP. The Active Transportation Plan will expand upon the elements of this section

of the MVRTP and incorporate additional components and products such as a Regional Bicycle Network Vision. DRCOG staff will work closely with member jurisdictions and other stakeholders in the development of the Active Transportation Plan.

I. Design Guidelines and Resources

Pedestrian and bicycling facilities are not one size fits all. Designs will vary depending on local community factors such as existing and planned land uses, density, adjacent roadway types and widths, and usage. Recognizing the great diversity in the region, DRCOG does not prescribe blanket design guidelines and requirements that apply equally to all jurisdictions and projects. The Transportation Improvement Plan policy does establish certain design requirements for project eligibility, such as minimum widths for multiuse facilities, and directs jurisdictions to follow design standards set forth by American Disability Act and the American Association of State Highway and Transportation Officials. Additionally, there are a variety of design resources (Figures 4 and Figure 5) available which are continually evolving. In addition to local guidelines and requirements, jurisdictions should use these guides in the planning and design process of pedestrian and bicycle facilities. DRCOG encourages jurisdictions to communicate and coordinate on pedestrian and bicycle plans and projects with neighboring jurisdictions and other applicable stakeholders to achieve consistency and connectivity across boundaries.

Figure 4

DESIGN GUIDE RESOURCES FOR PEDESTRIAN FACILITIES

- [*Guide for the Planning, Design, and Operation of Pedestrian Facilities*](#), July 2004, (AASHTO Pedestrian Guide)
- [*Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*](#). (ITE Guide). This guide is useful in gaining an understanding of the flexibility that is inherent in the AASHTO "Green Book," [*A Policy on Geometric Design of Highways and Streets*](#).
- *Urban Street Design Guide*, 2013, (National Association of City Transportation Officials)
- *Guidance Memorandum on Promoting the Implementation of Proven Safety Countermeasures*, 2012, (FHWA)
- [*2010 ADA Standards for Accessible Design*](#), (Department of Justice)
- [*Proposed Guidelines for Pedestrian for Pedestrian Facilities in the Public Right-of-Way \(PROWAG\)*](#), (United States Access Board), 2011

Figure 5

DESIGN GUIDE RESOURCES FOR BICYCLE FACILITIES

- *Guide for the Development of Bicycle Facilities*, 2012 – Fourth Edition, (American Association of State Highway and Transportation Officials)
- [*Urban Bikeway Design Guide*](#), 2014 – Second Edition, (National Association of City Transportation Officials)
- *CDOT Roadway Design Guide – Chapter 14 Bicycle and Pedestrian Facilities*, Jan 2013, Revision 1, (CDOT).