Measuring and Visualizing Multimodal Transportation Networks

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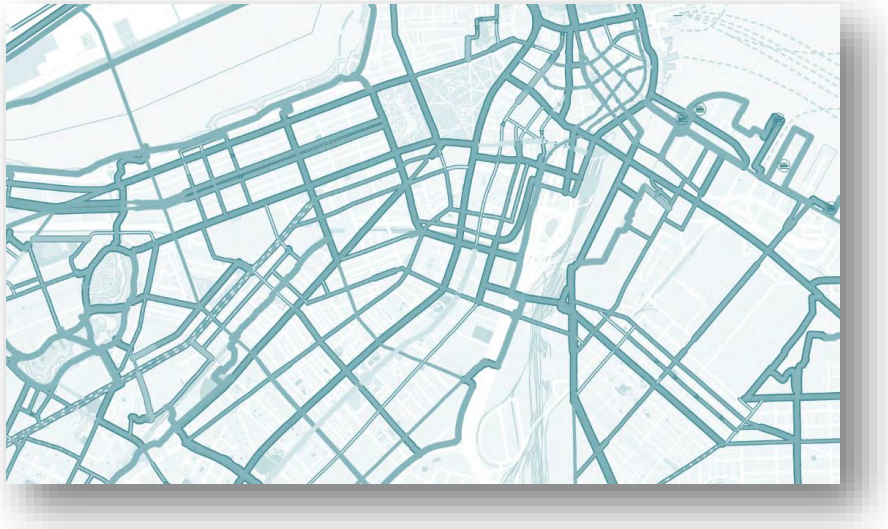

Wednesday, May 17, 2017

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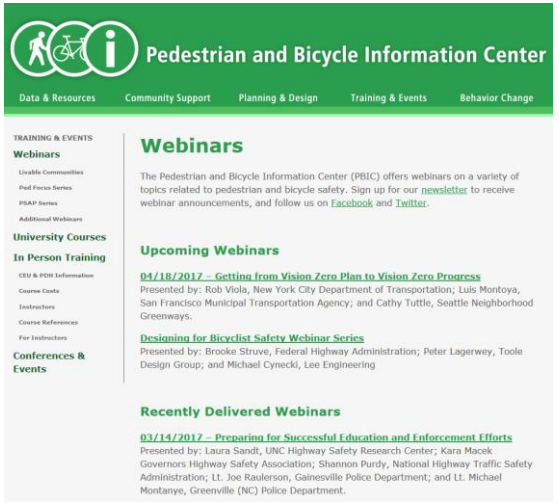

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Improving Safety Using Truck Side Guards

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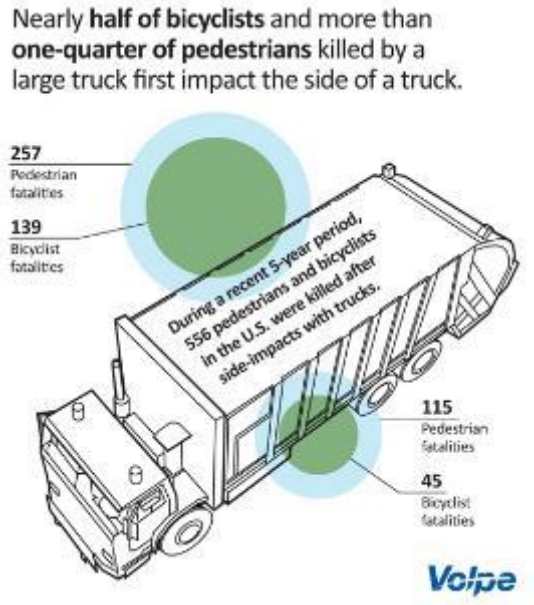
City of Boston



New Connected Networks Info Brief

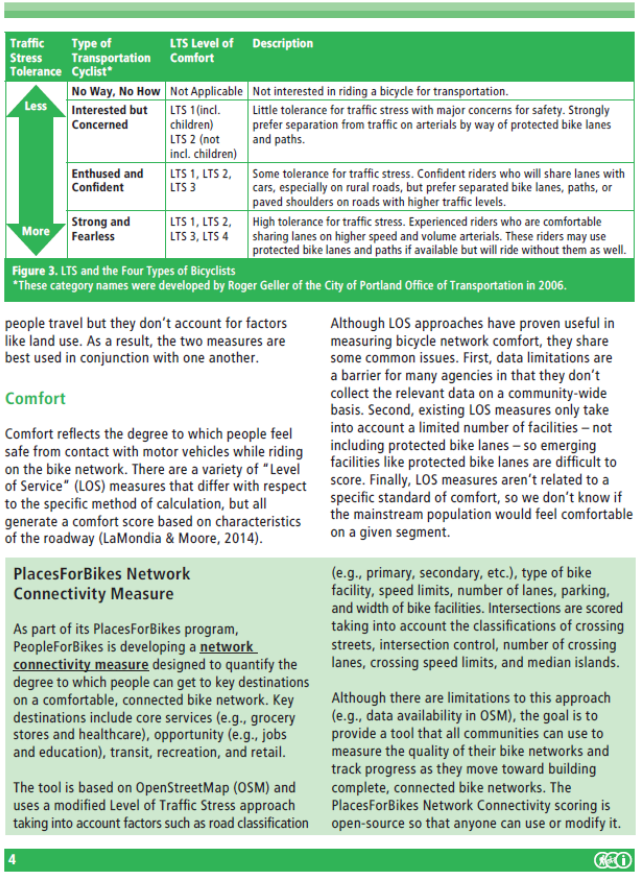
Defining Connected Bike Networks

Pedestrian and Bicycle Information Center & PeopleForBikes

Safety and Mobility
Connected networks support safe, continuous travel

Network Quality Assessment
Evaluate access to destinations, coverage and comfort

New Focus on Networks
Examples of cities and orgs prioritizing and supporting network development



Traffic Stress Tolerance	Type of Transportation Cyclist*	LTS Level of Comfort	Description
Less ↑	No Way, No How	Not Applicable	Not interested in riding a bicycle for transportation.
	Interested but Concerned	LTS 1(incl. children) LTS 2 (not incl. children)	Little tolerance for traffic stress with major concerns for safety. Strongly prefer separation from traffic on arterials by way of protected bike lanes and paths.
	Enthused and Confident	LTS 1, LTS 2, LTS 3	Some tolerance for traffic stress. Confident riders who will share lanes with cars, especially on rural roads, but prefer separated bike lanes, paths, or paved shoulders on roads with higher traffic levels.
More ↓	Strong and Fearless	LTS 1, LTS 2, LTS 3, LTS 4	High tolerance for traffic stress. Experienced riders who are comfortable sharing lanes on higher speed and volume arterials. These riders may use protected bike lanes and paths if available but will ride without them as well.

Figure 3. LTS and the Four Types of Bicyclists
*These category names were developed by Roger Geller of the City of Portland Office of Transportation in 2006.

people travel but they don't account for factors like land use. As a result, the two measures are best used in conjunction with one another.

Comfort

Comfort reflects the degree to which people feel safe from contact with motor vehicles while riding on the bike network. There are a variety of "Level of Service" (LOS) measures that differ with respect to the specific method of calculation, but all generate a comfort score based on characteristics of the roadway (LaMondia & Moore, 2014).

Although LOS approaches have proven useful in measuring bicycle network comfort, they share some common issues. First, data limitations are a barrier for many agencies in that they don't collect the relevant data on a community-wide basis. Second, existing LOS measures only take into account a limited number of facilities – not including protected bike lanes – so emerging facilities like protected bike lanes are difficult to score. Finally, LOS measures aren't related to a specific standard of comfort, so we don't know if the mainstream population would feel comfortable on a given segment.

PlacesForBikes Network Connectivity Measure

As part of its PlacesForBikes program, PeopleForBikes is developing a network connectivity measure designed to quantify the degree to which people can get to key destinations on a comfortable, connected bike network. Key destinations include core services (e.g., grocery stores and healthcare), opportunity (e.g., jobs and education), transit, recreation, and retail.

The tool is based on OpenStreetMap (OSM) and uses a modified Level of Traffic Stress approach taking into account factors such as road classification (e.g., primary, secondary, etc.), type of bike facility, speed limits, number of lanes, parking, and width of bike facilities. Intersections are scored taking into account the classifications of crossing streets, intersection control, number of crossing lanes, crossing speed limits, and median islands.

Although there are limitations to this approach (e.g., data availability in OSM), the goal is to provide a tool that all communities can use to measure the quality of their bike networks and track progress as they move toward building complete, connected bike networks. The PlacesForBikes Network Connectivity scoring is open-source so that anyone can use or modify it.

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www.pedbikeinfo.org/pdf/InfoBrief_PBIC_Networks.pdf

Measuring and Visualizing Multimodal Networks

May 17, 2017

U.S.Department of Transportation

Federal Highway Administration

Context

FHWA Support For

- An integrated, safe, accessible, and convenient transportation system for all users

Background

- Safety is the #1 priority
- State and local demand
- Design flexibility
- Performance Based Practical Design
- System efficiency
- Economic development

Multimodal Networks

Multimodal networks are interconnected pedestrian and/or bicycle transportation facilities that allow people of all ages and abilities to safely and conveniently get where they want to go.

FHWA Case Studies in Delivering Safe, Comfortable, and Connected Pedestrian and Bicycle Networks

Multimodal Network Principles

- Cohesion
- Directness
- Accessibility
- Alternatives
- Safety and Security
- Comfort

FHWA Case Studies in Delivering Safe, Comfortable, and Connected Pedestrian and Bicycle Networks






CITY OF CARY



Pedestrian and Bicycle Funding Opportunities
U.S. Department of Transportation Transit, Highway, and Safety Funds

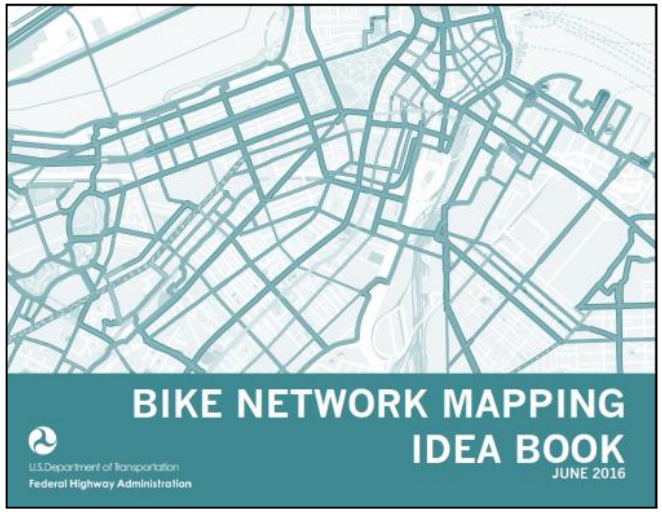
Revised August 12, 2016

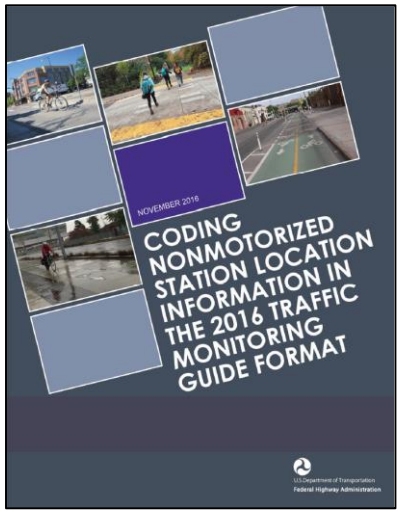
This table indicates potential eligibility for pedestrian and bicycle projects under U.S. Department of Transportation surface transportation funding programs. Additional restrictions may apply. See notes and basic program requirements below, and see program guidance for detailed requirements. Project sponsors should fully integrate nonmotorized accommodation into surface transportation projects. Section 1404 of the Fixing America's Surface Transportation (FAST) Act modified 23 U.S.C. 109 to require federally-funded projects on the National Highway System to consider access for other modes of transportation, and provides greater design flexibility to do so.

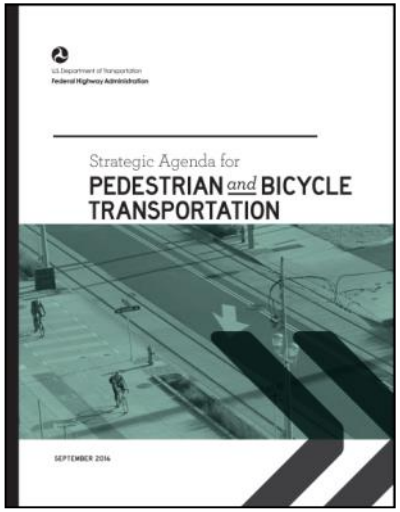
Key: $ = Funds may be used for this activity (restrictions may apply). $* = See program-specific notes for restrictions. ~$ = Eligible, but not competitive unless part of a larger project.

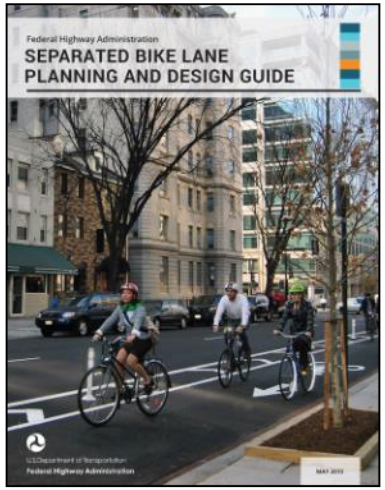
	Pedestrian and Bicycle Funding Opportunities U.S. Department of Transportation Transit, Highway, and Safety Funds														
Activity or Project Type	TIGER	TIFIA	FTA	ATI	CMAQ	HSIP	NHPP	STBG	TA	RTP	SRTS	PLAN	NHTSA 402	NHTSA 405	FLTTP
Access enhancements to public transportation (includes benches, bus pads)	$	$	$	$	$		$	$	$						$
ADA/504 Self Evaluation / Transition Plan								$	$	$		$			$
Bicycle plans			$					$	$		$	$			$
Bicycle helmets (project or training related)								$	$SRTS		$		$*		
Bicycle helmets (safety promotion)								$	$SRTS		$				
Bicycle lanes on road	$	$	$	$	$	$	$	$	$		$				$
Bicycle parking	~$	~$	$	$	$		$	$	$	$	$				$
Bike racks on transit	$	$	$	$	$			$	$						$
Bicycle share (capital and equipment; not operations)	$	$	$	$	$		$	$	$						$
Bicycle storage or service centers at transit hubs	~$	~$	$	$	$			$	$						$
Bridges / overcrossings for pedestrians and/or bicyclists	$	$	$	$	$*	$	$	$	$	$	$				$
Bus shelters and benches	$	$	$	$	$		$	$	$						$
Coordinator positions (State or local)					$ 1 per State			$	$SRTS		$				
Crosswalks (new or retrofit)	$	$	$	$	$*	$	$	$	$	$	$				$
Curb cuts and ramps	$	$	$	$	$*	$	$	$	$	$	$				$
Counting equipment			$	$		$	$	$	$	$	$	$*			$
Data collection and monitoring for pedestrians and/or bicyclists			$	$		$	$	$	$	$	$	$*			$
Historic preservation (pedestrian and bicycle and transit facilities)	$	$	$	$				$	$						$
Landscaping, streetscaping (pedestrian and/or bicycle route; transit access); related amenities (benches, water fountains); generally as part of a larger project	~$	~$	$	$			$	$	$						$
Lighting (pedestrian and bicyclist scale associated with pedestrian/bicyclist project)	$	$	$	$		$	$	$	$	$	$				$
Maps (for pedestrians and/or bicyclists)			$	$	$			$	$		$	$*			
Paved shoulders for pedestrian and/or bicyclist use	$	$			$*	$	$	$	$		$				$

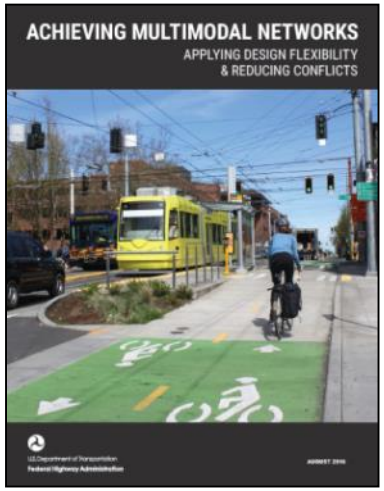
Recent FHWA Pedestrian and Bicycle Resources

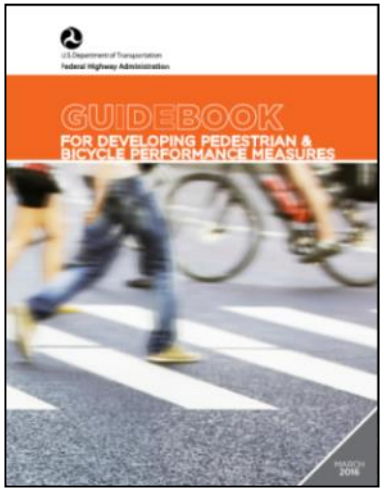


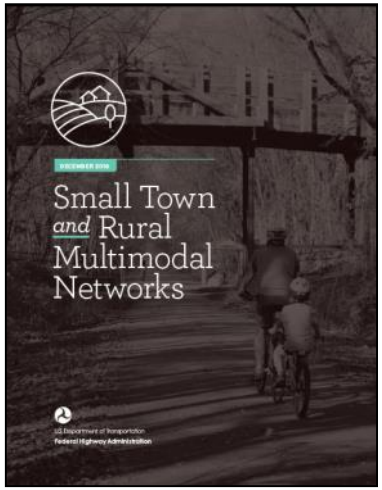


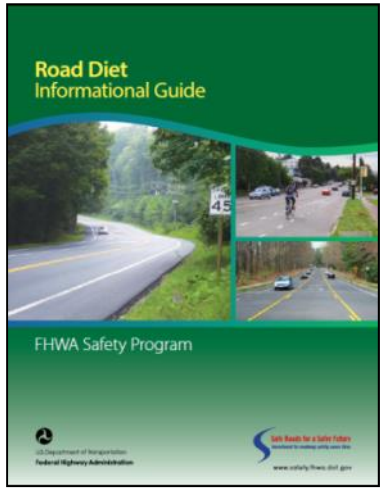












Available at www.fhwa.dot.gov/environment/bicycle_pedestrian

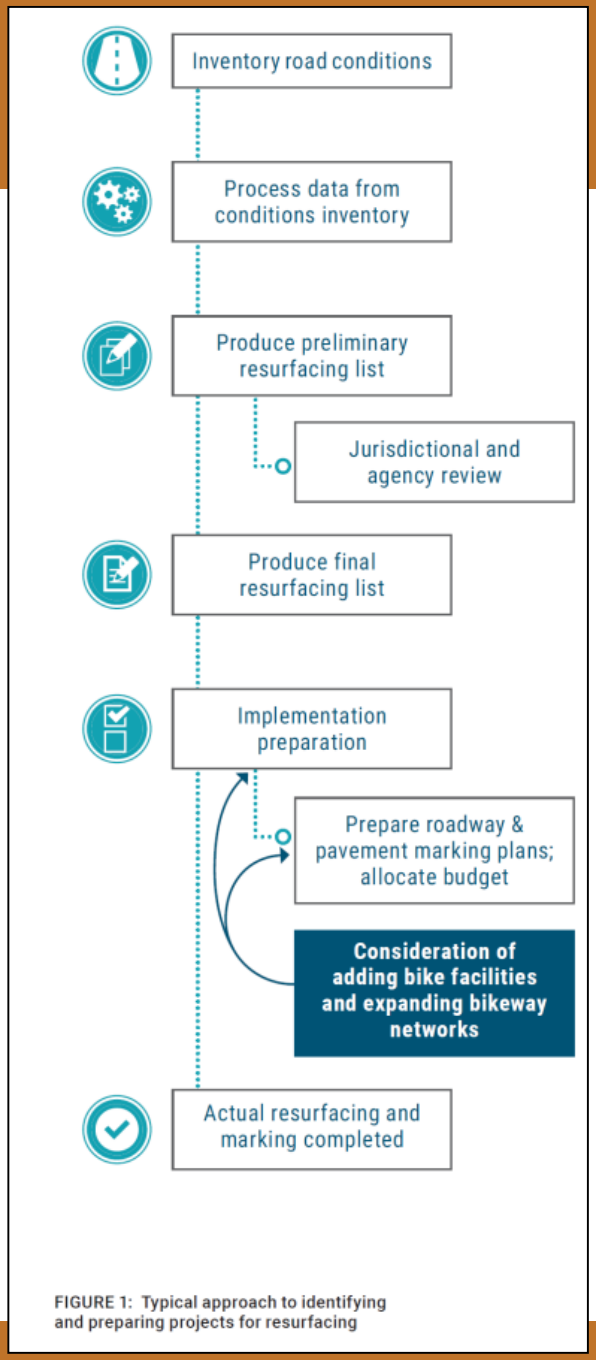


FIGURE 1: Typical approach to identifying and preparing projects for resurfacing

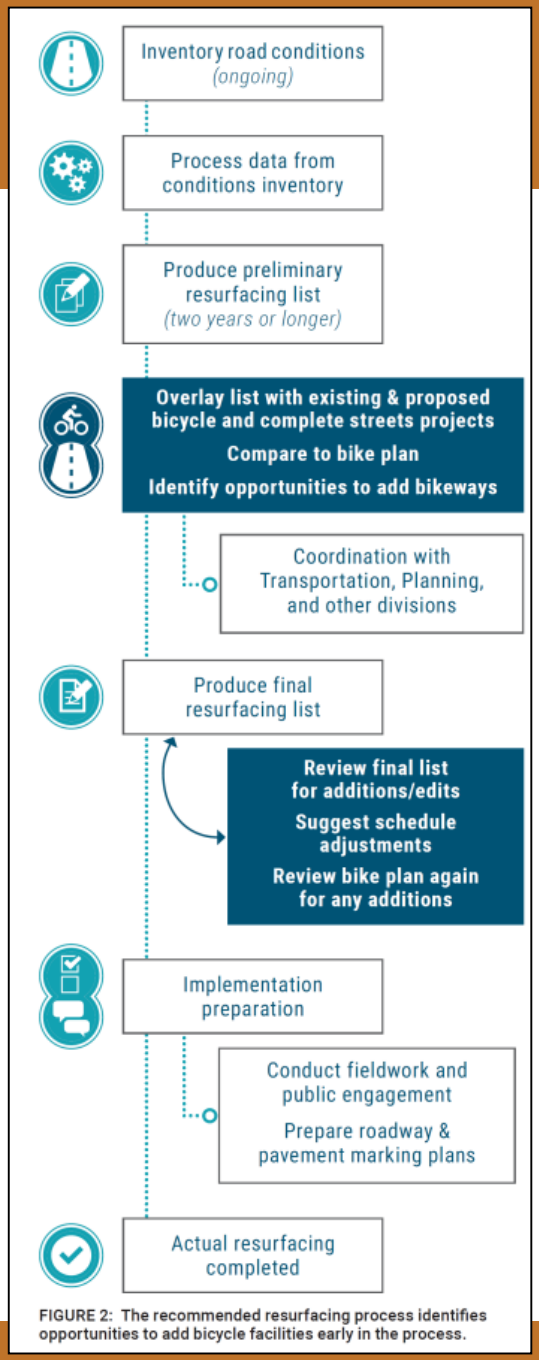
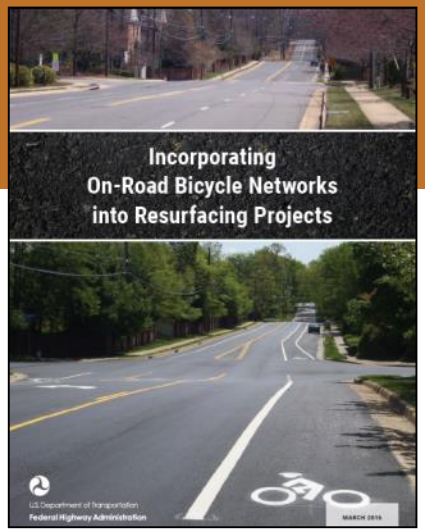
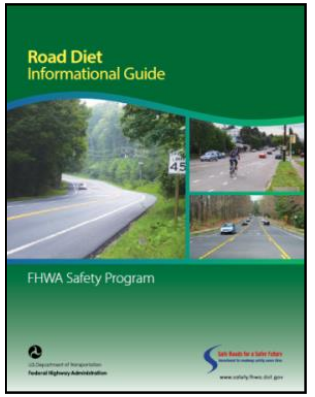


FIGURE 2: The recommended resurfacing process identifies opportunities to add bicycle facilities early in the process.





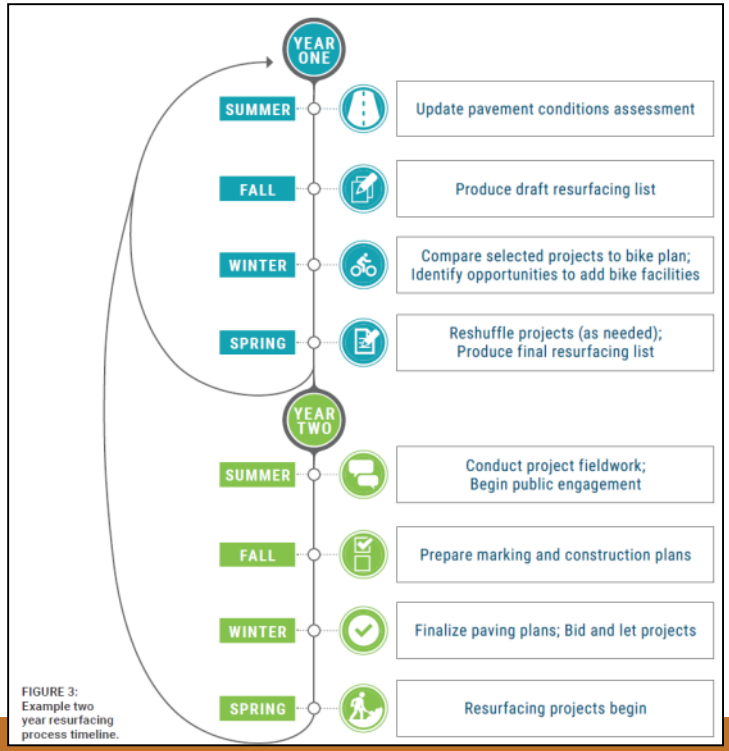
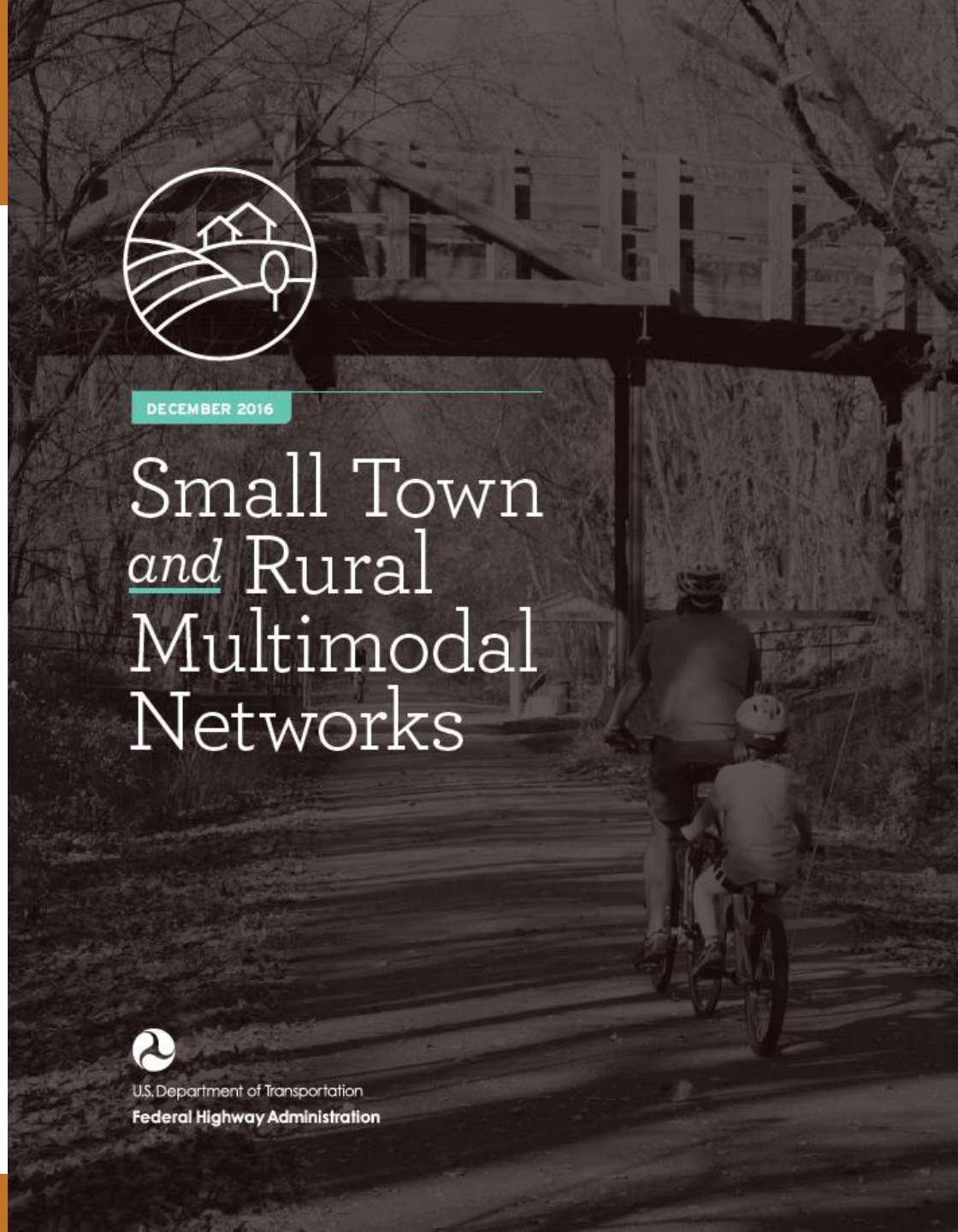


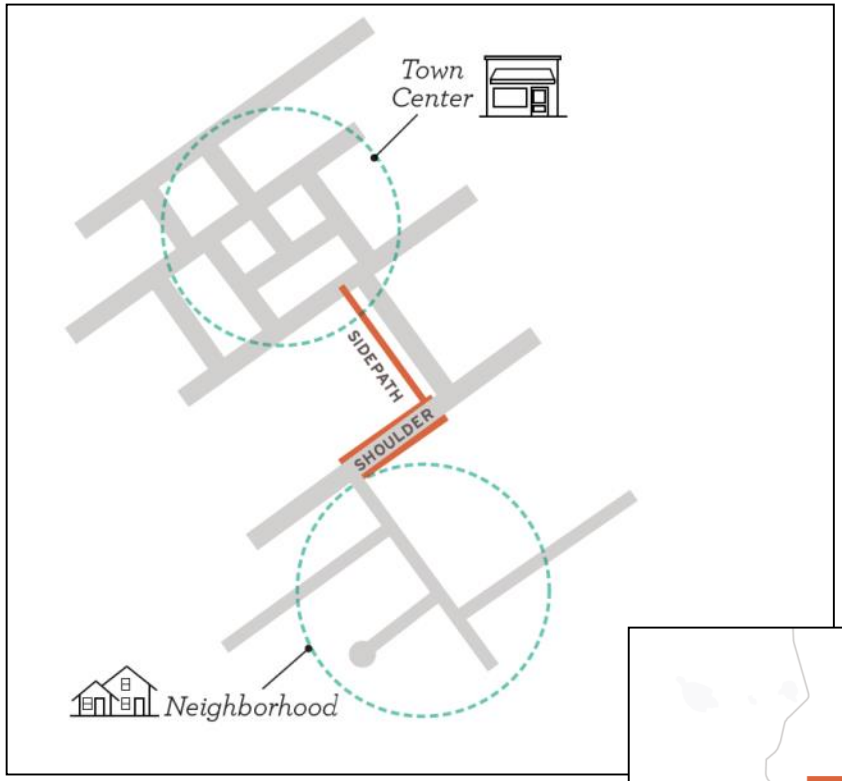
FIGURE 3: Example two year resurfacing process timeline.

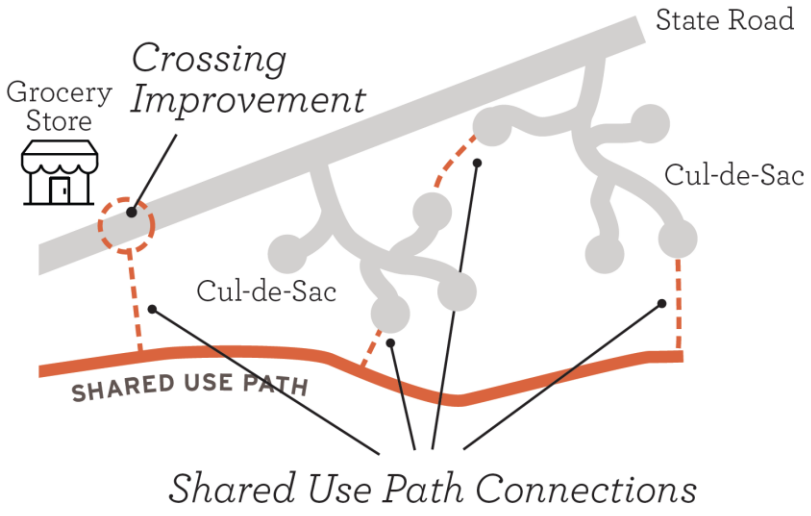
Recently Released

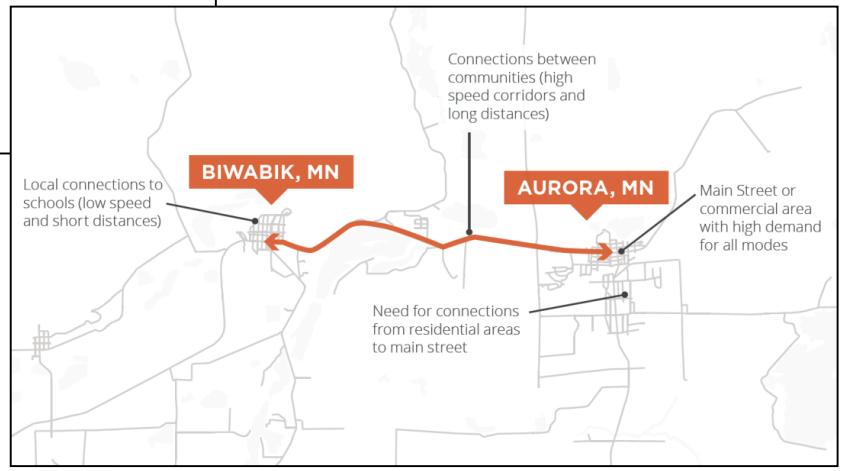
- Provide a bridge between existing guidance on bicycle and pedestrian design and rural practice.
- Encourage innovation in development of safe and appealing networks for bicycling and walking in small towns and rural areas.
- Provide examples of peer communities and project implementation that is appropriate for rural communities.

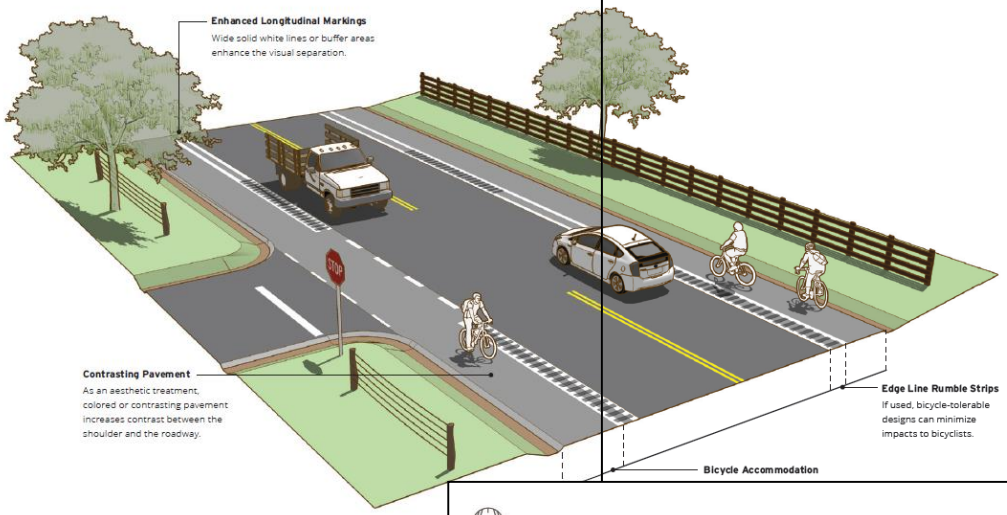


Connected Networks









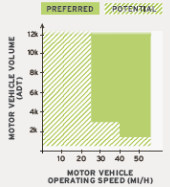
Paved Shoulder

Paved shoulders on the edge of roadways can be enhanced to serve as a functional space for bicyclists and pedestrians to travel in the absence of other facilities with more separation.

APPLICATION

Speed and Volume

Appropriate on roads with moderate to high volumes and speeds and on roadways with a large amount of truck traffic. May function on multilane roads with heavy traffic but fails to provide a low-stress experience in this condition.



Network

Serves long-distance and regional travel.

Paved Shoulder

Shoulders can improve bicyclist comfort and safety when traveling in higher speed and/or volume situations but only when adequate width is provided. If used, locate rumble strips on the edge line or within a buffer area that will not reduce usable space for bicyclists.

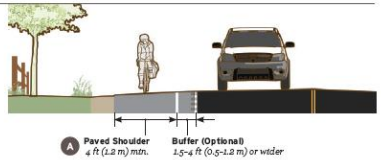


Figure 3-1. When adequate width is provided, shoulders can serve bicycle trips along roads too busy for comfortable shared roadway travel.

GEOMETRIC DESIGN

CLEAR PAVED SHOULDER AREA

Any amount of clear paved shoulder width can benefit pedestrians and bicyclists, however, to be fully functional for their use, the paved shoulder area should be wide enough to accommodate the horizontal operating envelope of these users.

A To accommodate bicyclists and pedestrian use of the shoulder, provide a minimum width of 4 ft (1.2 m) adjacent to a road edge or curb, exclusive of any buffer or rumble strip.

- Where possible, provide greater width for added comfort, user passing, and side-by-side riding.[iii]

Table 3-1. Recommended Minimum Paved Shoulder Widths by Roadway Conditions[iii]

Functional classification	Volume (AADT)	Speed (Mi/h)	Recommended Minimum Paved Shoulder Width
Minor Collector	up to 1,100	35 (55 km/h)	5 ft (1.5 m)
Major Collector	up to 2,600	45 (70 km/h)	6.5 ft (2.0 m)
Minor Arterial	up to 6,000	55 (90 km/h)	7 ft (2.1 m)
Principal Arterial	up to 8,500	65 (100 km/h)	8 ft (2.4 m)

D'Iberville, MS–Population 10,390

Paved Shoulder

GEOMETRIC DESIGN

RUMBLE STRIPS

Rumble strips are an FHWA Proven Safety Countermeasure for reducing roadway departure crashes. Research has shown that installing rumble strips can reduce severe crashes but may negatively impact bicycle travel if they are poorly constructed.

Additional information on rumble strip design can be found in FHWA Technical Advisory 5040.39 and on the FHWA Rumble Strips and Rumble Stripes Website.

B If rumble strips are desired on bicycle network routes optimize the dimension, design, and placement of rumble strips to be more tolerable to bicyclists.[iv]

- > 12 inch spacing center-to-center
- > 6–8 inches long, perpendicular to roadway
- > 6 inch wide, measured parallel to roadway
- > 3/8 inch deep
- Place rumble strips to overlap with the roadway edgeline, also known as edgeline rumble strips or rumble stripes.[v]
- Provide a bicycle gap pattern to allow access into and out of the shoulder area by bicyclists. The gap pattern consists of a 12 ft (3.3 m) clear gap followed by rumbles, typical 40–60 ft (12.1–18.2 m) (NCHRP Synthesis 490, 2016).

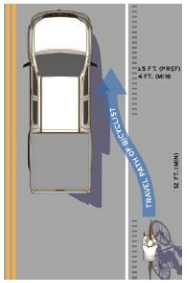


Figure 3-2. Preferred rumble strip dimensions and placement. Figure from FHWA Achieving Multimodal Networks 2016.

PAVEMENT CONTRAST AND COLOR

Contrasting or colored pavement materials may be used to differentiate the shoulder from the adjacent travel lanes (AASHTO Green Book 2011, p. 4-13).

- Colored pavement in a paved shoulder is an aesthetic treatment to enhance awareness and is not intended to communicate a regulatory, warning, or guidance message to road users.

Highway 2, Nebraska

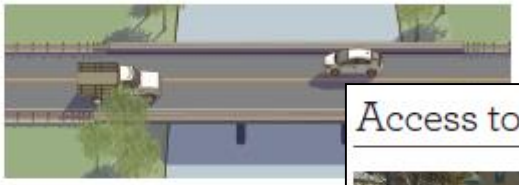
Bridges

CONSTRAINED BRIDGE

Figure 5-11. The following concepts illustrate potential design options for retrofitting highly constrained bridges.

EXISTING CONDITIONS

Some bridges may be so narrow (26 ft or less) as to make any reconfiguration option impossible or too narrow to be of value. Sufficient existing space is only provided for a single travel lane in each direction. No functional sidewalks or shoulders are present.

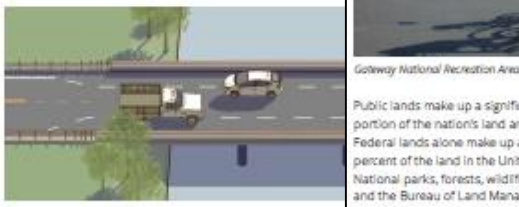


MARKINGS, SIGNS, AND BEACONS

Active warning beacons, R4-11 signs and SLMs may be used to alert bridge users to the likely presence of bicyclists on the roadway. For increased bicyclist comfort, consider reduced or advisory speed limits on the bridge.

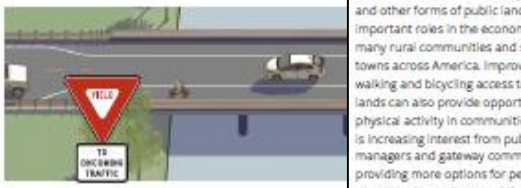
ADVISORY SHOULDERS

Establishing advisory shoulders on the bridge creates dedicated pedestrian and/or bicycle space within the same roadway width. Refer to the guidance on advisory shoulders for additional context.



ONE LANE BRIDGE

Along roadways with low motor vehicle volumes and adequate sight distance, configuring the structure as a one-lane bridge can provide an exclusive separated space for pedestrians and bicyclists. Refer to the FHWA MUTCD section 2C.21.



Access to Public Lands

Gateway National Recreation Area

Public lands make up a significant portion of the nation's land area. Federal lands alone make up almost 30 percent of the land in the United States. National parks, forests, wildlife refuges, and the Bureau of Land Management (BLM) lands, State and County parks, and other forms of public lands play important roles in the economies of many rural communities and small towns across America. Improved walking and bicycling access to public lands can also provide opportunities for physical activity in communities. There is increasing interest from public land managers and gateway communities in providing more options for people to access and experience public lands by foot and bike—creating more seamless multimodal transportation networks.

Federal Lands Transportation Program

The Federal Lands Transportation Program (FLTP) was established under the Moving Ahead for Progress in the 21st Century Act (MAP-21) and continued under the Fixing America's Surface Transportation (FAST) Act (23 U.S.C. § 203), to improve transportation facilities for the following Federal Land Management Agency (FLMA) partners:

- National Park Service (NPS)
- Fish and Wildlife Service (FWS)
- USDA Forest Service (USFS)
- Bureau of Land Management (BLM)
- US Army Corps of Engineers (USACE)
- Bureau of Reclamation (BOR), and
- Independent Federal Agencies with natural resource and land management responsibilities (IFAs)

WHAT MAKES PUBLIC LANDS UNIQUE?

The Transportation Planning Process

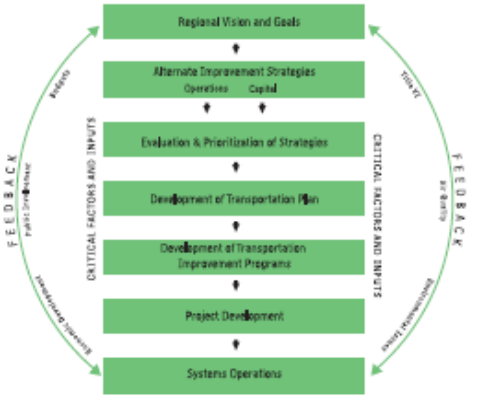
This chapter is intended to ecourage the reader to understand their local, regional, and state process is and what the entry points are for improvements. It is also intended to emphasize the ultimate goal of "mainstreaming" bike and pedestrian planning so that these projects can be systematically and integrally considered alongside motorized enhancements.

Transportation planning is a continuing, cooperative, and comprehensive process that uses a performance-driven approach for decision making. Public agencies that are responsible for the operation, maintenance, and development of transportation systems and facilities work cooperatively to determine long and short-range investments. Public agencies at all scales, from small towns, transit authorities, Metropolitan Planning Organizations (MPOs) to State Departments of Transportation, carry out planning, with active involvement from the traveling public, the business community, community groups, environmental organizations, and freight operators. **Figure 6-1** illustrates the development of products and activities within the transportation planning process.

Transportation planning is critical to creating multimodal networks for all users. Jurisdictions employ a system for categorizing roads by function, and the number of vehicles it can accommodate. However, this approach may not always consider the need for active transportation facilities that provide multimodal connections to jobs and essential services. The planning and design of the transportation network should take a comprehensive approach to the various roadway types of arterial, collector, and local roads and associated active transportation facilities that can be implemented with them. The State is required to consult with affected nonmetropolitan local officials to determine projects that may be of regional significance.

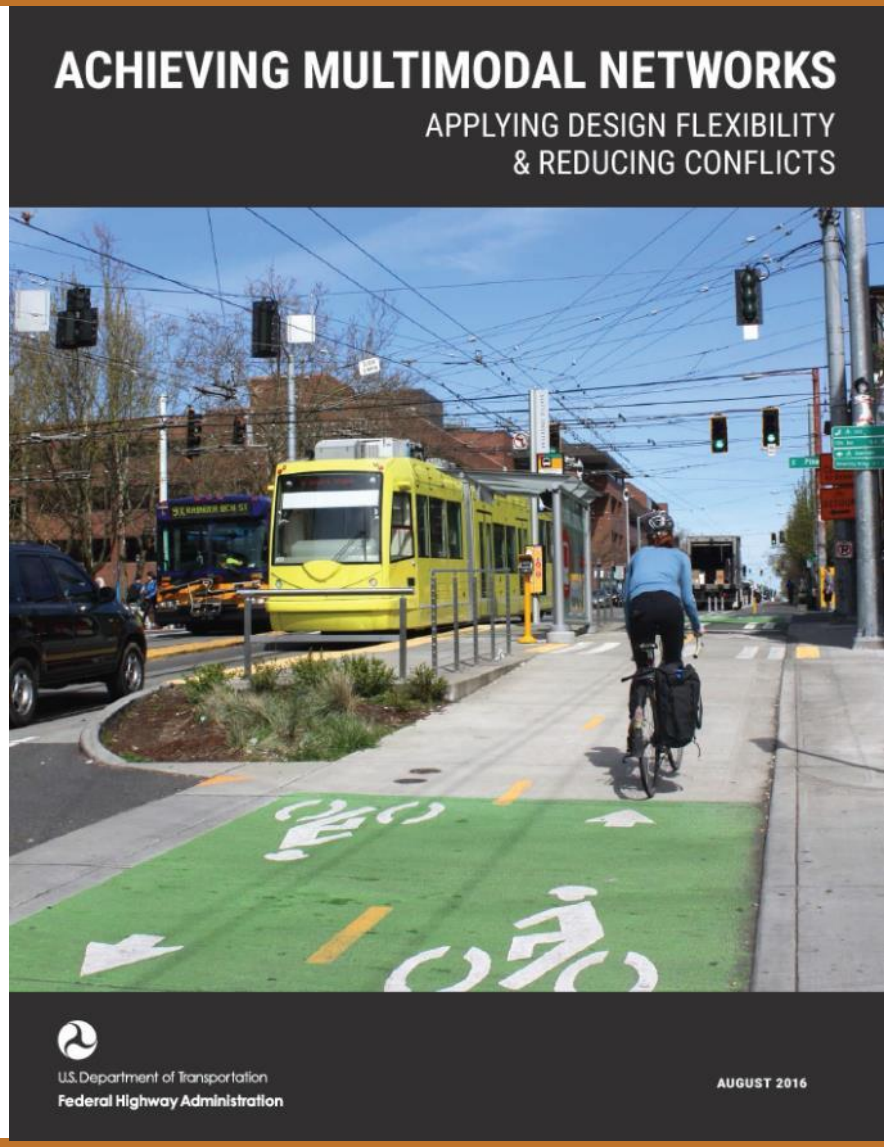
This document includes a number of strategies tailored for small town and rural contexts, for consideration during the transportation planning process. The process itself should address local conditions, regional connections, opportunities, and challenges, and consider the needs of the all people in the study area. Gathering demographics of the study area can provide essential information about the travel needs of the community. Nearly one-third of the general population includes residents that are too young or old to drive, are disabled, traditionally underserved, or don't have access to a vehicle. It is critical that transportation planning efforts pay significant attention to these populations and tailor public involvement strategies to involve these groups, even though they may be difficult to reach through traditional public involvement strategies. Flexibility requires consideration of all transportation users; in some unique rural regions user consideration may include safe access for horse-drawn buggies. Other considerations may include providing safe passage for school students, addressing the needs of tourists, and ensuring access for people with disabilities.

Figure 6-1. The Transportation Planning Process



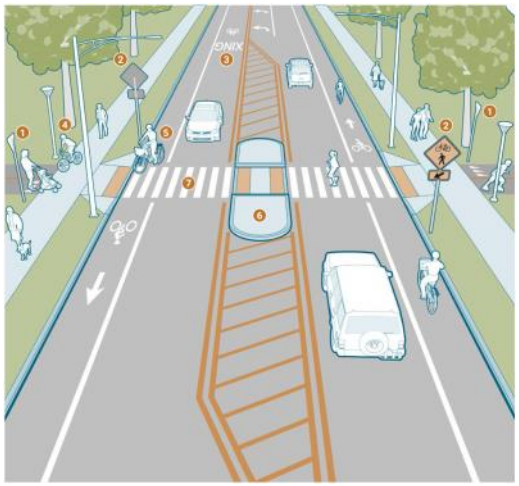
Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts

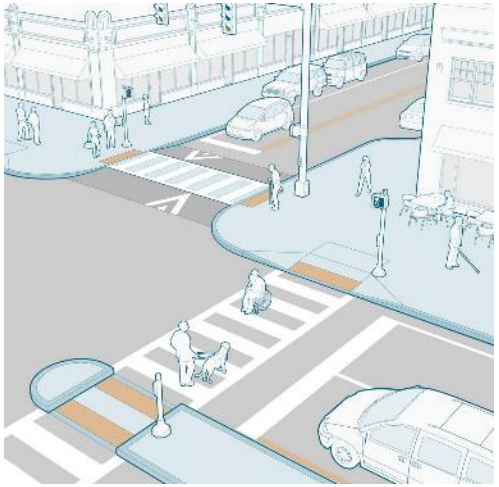
- Highlights ways to apply design flexibility, while focusing on reducing multimodal conflicts and achieving connected networks
- Help practitioners address topics such as:
  - Intersection design
  - Road diets
  - Pedestrian crossing treatments
  - Transit and school access
  - Freight
  - Accessibility

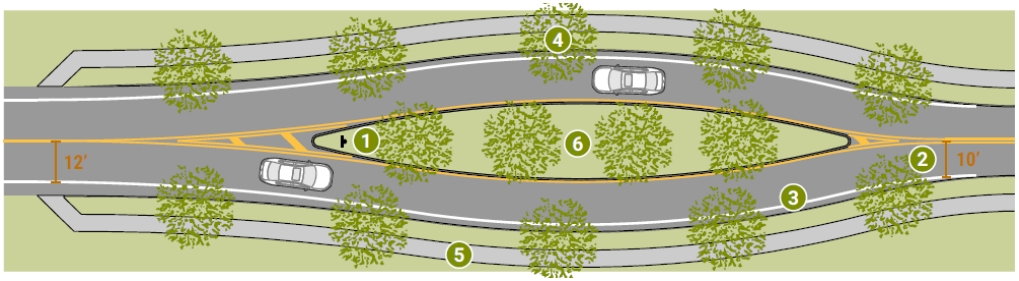


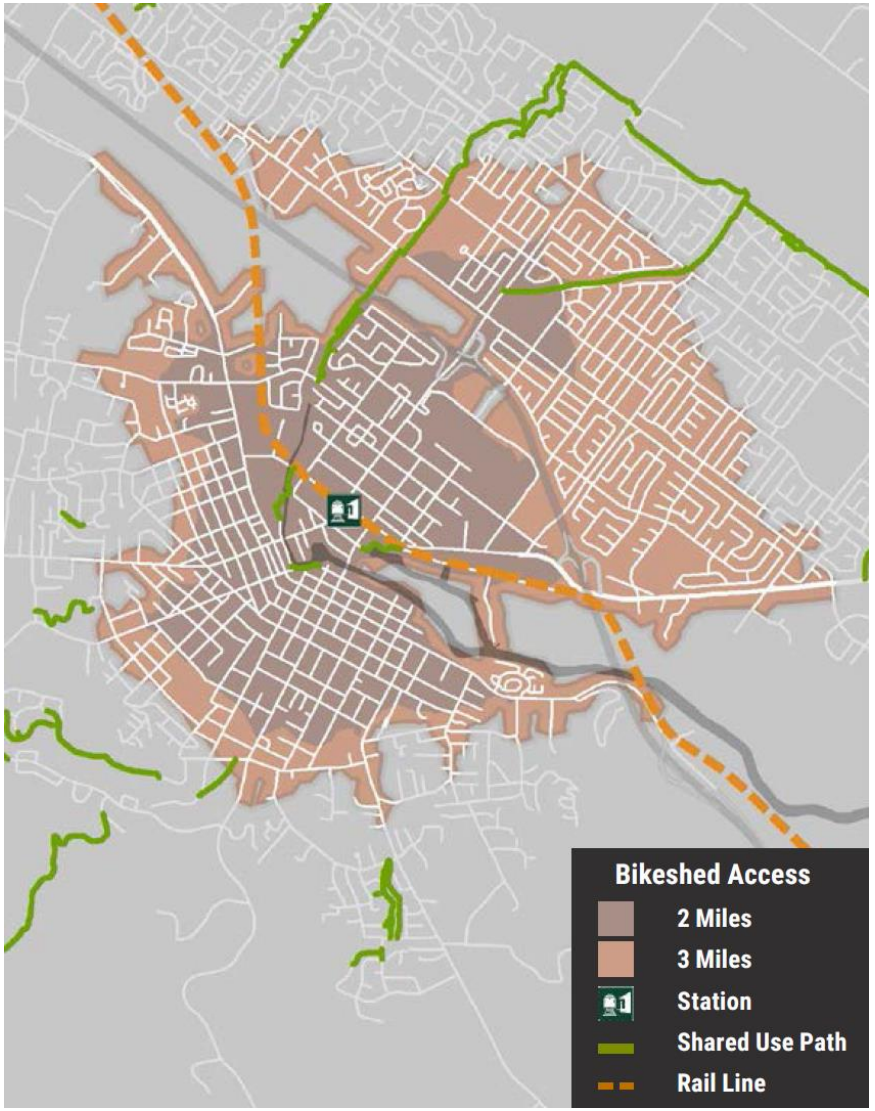
Available at www.fhwa.dot.gov/environment/bicycle_pedestrian

Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts









Available at www.fhwa.dot.gov/environment/bicycle_pedestrian

Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts

PART 1: APPLYING DESIGN FLEXIBILITY

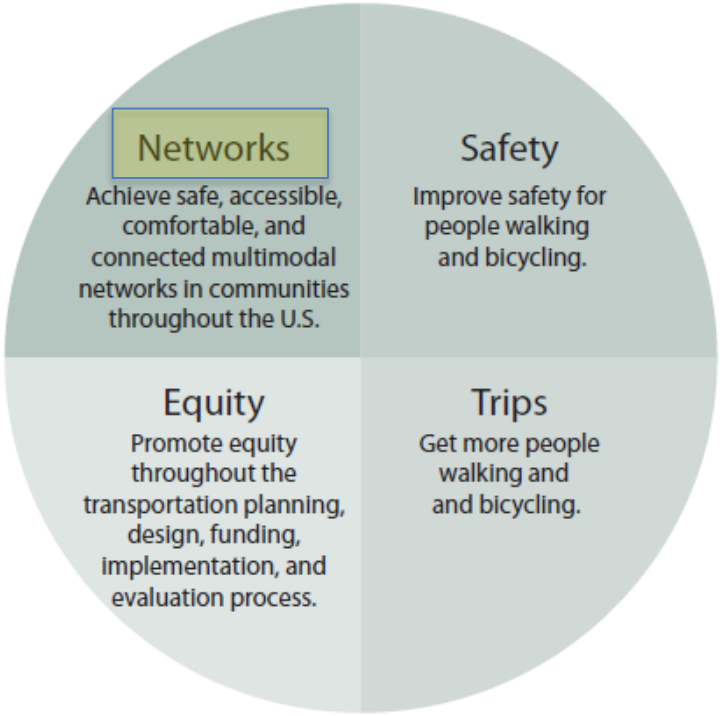
PART 2: REDUCING CONFLICTS

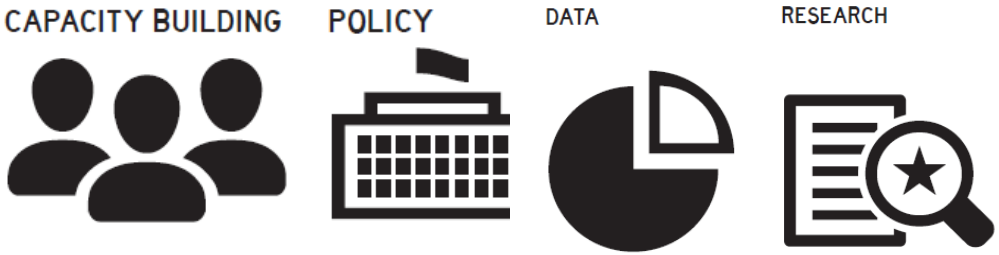
Available at www.fhwa.dot.gov/environment/bicycle_pedestrian

Guidebook for Developing Pedestrian and Bicycle Performance Measures

CONTENTS

Strategic Agenda for Pedestrian and Bicycle Transportation





Aspirational Goals

- Achieve an 80 percent reduction in pedestrian and bicycle fatalities and serious injuries in 15 years and zero pedestrian and bicycle fatalities and serious injuries in the next 20 to 30 years.
- Increase the percentage of short trips represented by bicycling and walking to 30 percent by the year 2025. This will indicate a 50 percent increase over the 2009 value of 20 percent. Short trips are defined as trips 5 miles or less for bicyclists and 1 mile or less for pedestrians.

Available at www.fhwa.dot.gov/environment/bicycle_pedestrian

Are there any concepts that are missing?

* Enter Feedback in the Chat Pod *

Multimodal networks are interconnected pedestrian and/or bicycle transportation facilities that allow people of all ages and abilities to safely and conveniently get where they want to go.

- Cohesion
- Directness
- Accessibility
- Alternatives
- Safety and Security
- Comfort

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For More Information:
www.fhwa.dot.gov/environment/bicycle_pedestrian

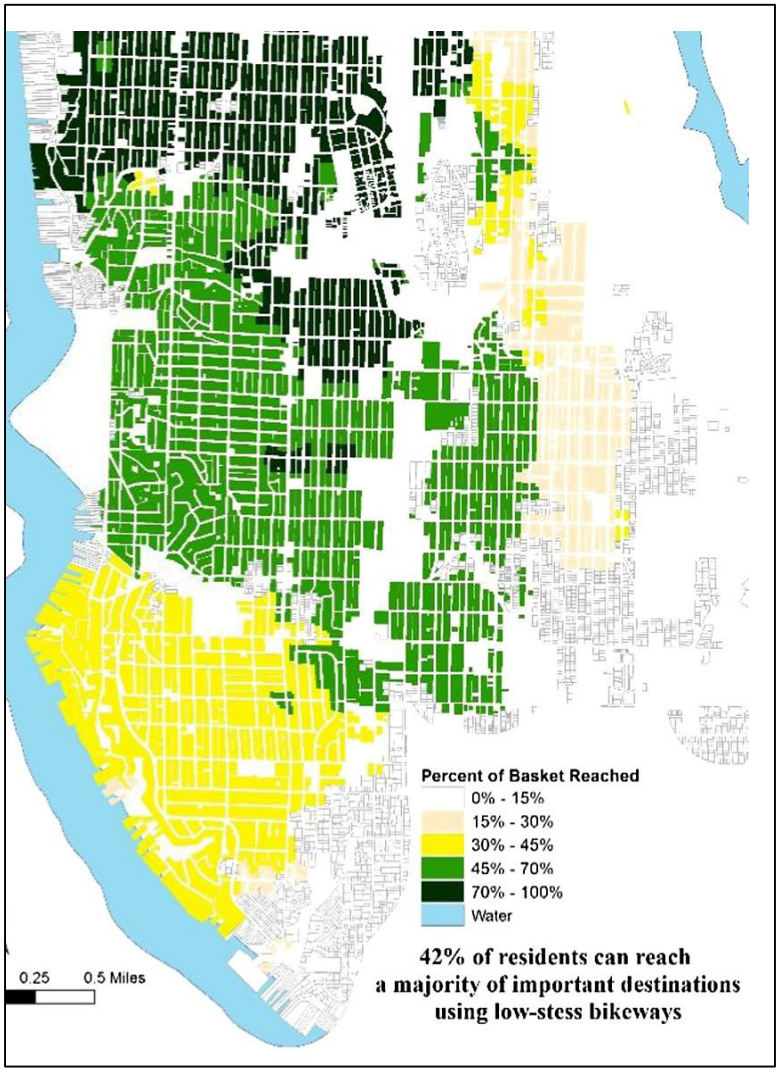
Measuring Multimodal Network Connectivity

U.S. Department of Transportation

Federal Highway Administration

What is multimodal connectivity?

- Multimodal connectivity is the extent to which bicyclists and pedestrians can make comfortable trips from beginning to end when traveling to destinations throughout a community.



Map credit: Lowry 2016

Why is measuring connectivity important?

- Gauging progress towards goals
- Comparing plan alternatives
- Prioritizing projects that close gaps

Photo credit: Second Wave Media

What have we learned so far?

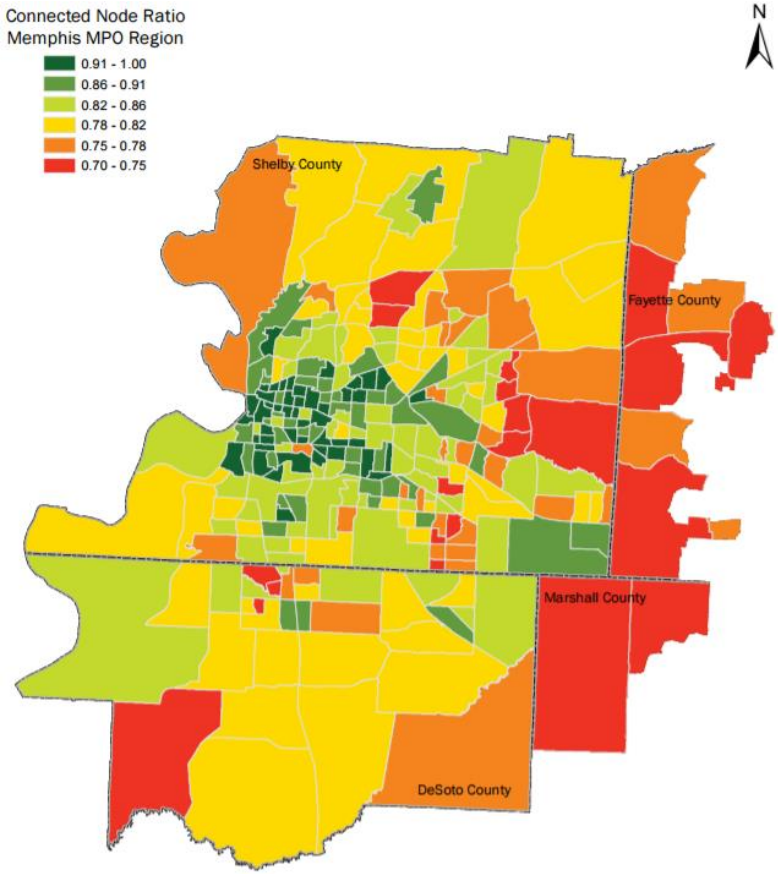
Connectivity is important to transportation agencies, but there's no best-practice way to measure it. Agencies' approach depends on:

- Where they are at in the planning process
- What roles/responsibilities they have
- What projects are being considered
- Relevant policies, goals, and previous efforts
- What data and tools are available
- How big the area being analyzed is
- When the analysis is conducted

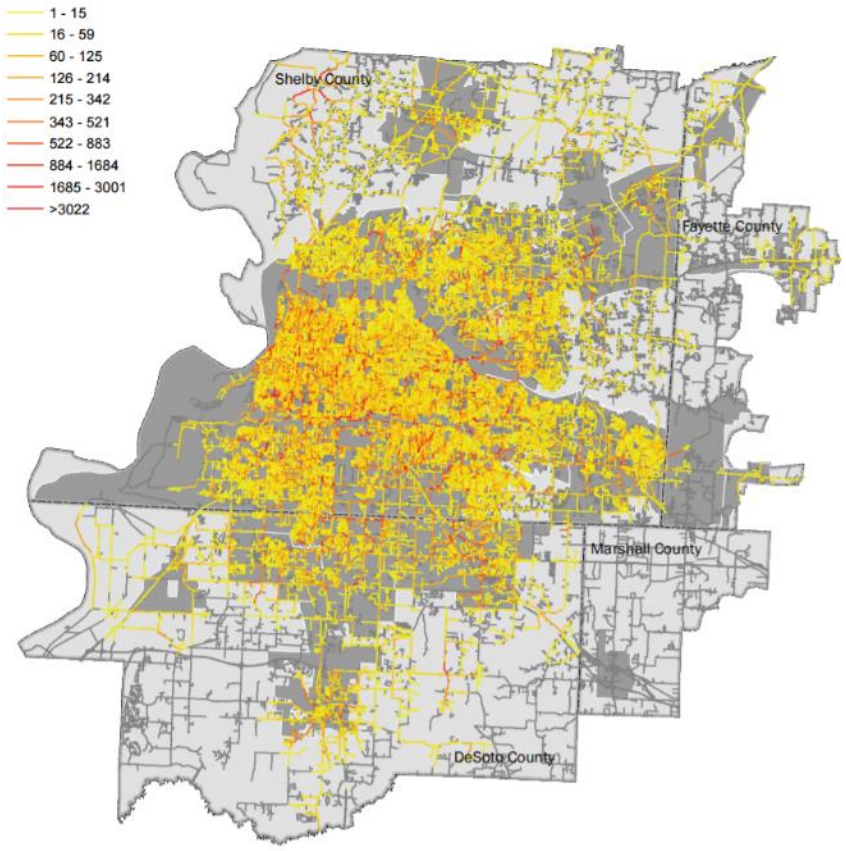
Connectivity is important, but so is context.

Regional connectivity analysis

Memphis MPO used different measures to assess existing conditions.



Connected node ratio

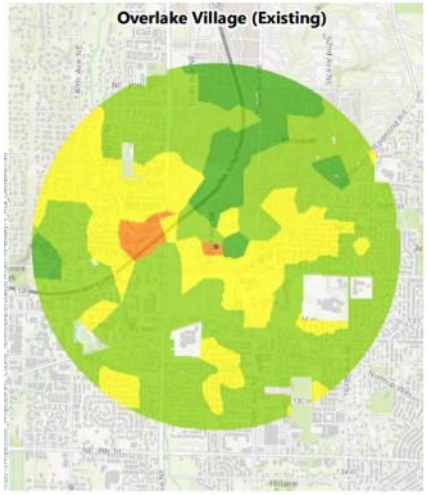


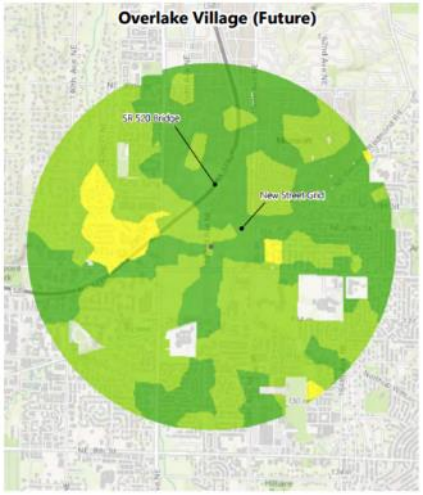
Bicycle shortest path analysis

Map Credit: Memphis MPO 2011

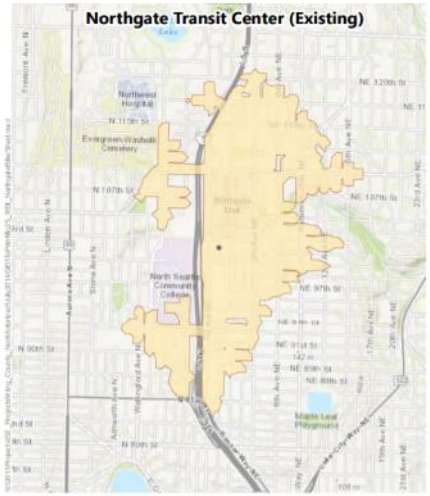
Small area connectivity analysis

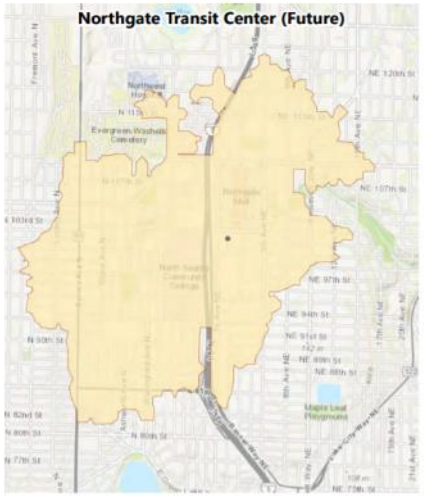
King County Metro used multiple connectivity measures to prioritize projects to improve bike/ped access to transit stations.





Route directness index



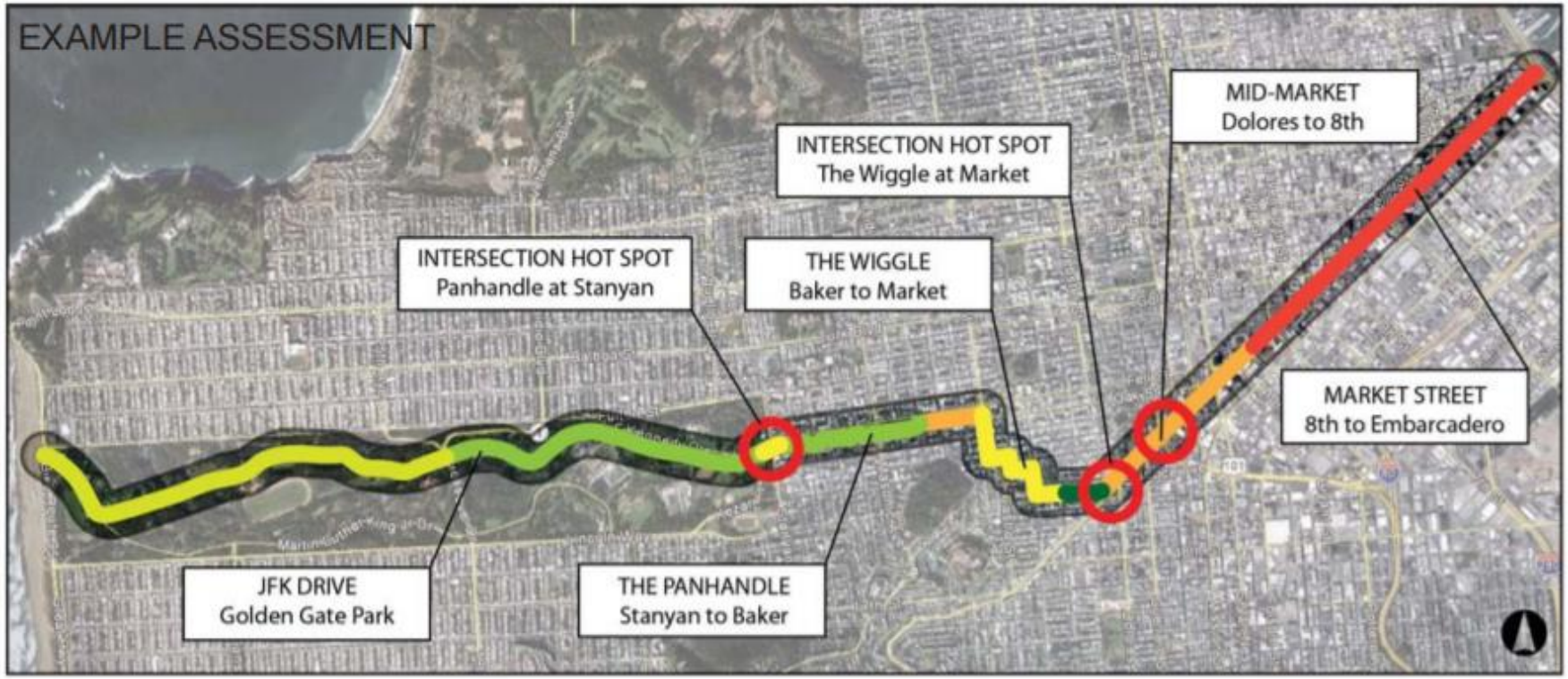


Travelsheds

Map Credit: King County Metro 2014

Facility-level connectivity analysis

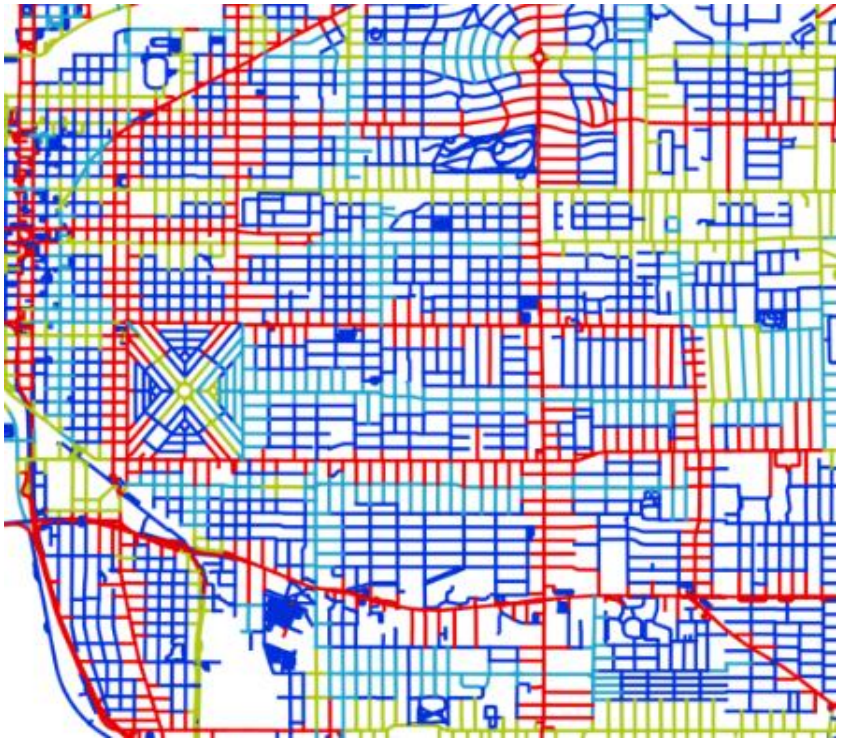
SFMTA analyzed how level of traffic stress varies over the course of a given route to identify barriers.



Map Credit: SFMTA 2013

Do networks consist of *designated* facilities or *high-quality* facilities?

Designated bicycle facilities are shown in blue, green, and purple.



Low-stress bicycle streets are shown in blue and light blue.

Map Credit: Memphis MPO 2011

What are you looking to measure?

- **Facility quality**: Bike/ped level of service, bicycle level of traffic stress
- **Form-based**: Intersection density, connected node ratio, block length, route directness index
- **Destination-based**: Pedestrian Index of the Environment, Walk Opportunities Index, Low-stress connectivity
- **Did we build it?**: % of network complete, miles of pedestrian/bicycle facilities
- **Eyeballing**: Gap analysis

Where are you applying your analysis?

Step	Description	Example	Extent
Assessing existing conditions	Identify areas where bicycling and walking may occur; highlight areas that are more suitable	Kansas City (KS) 2003 Walkability Plan	
Identifying gaps	Identify gaps, barriers and other areas of discontinuity		
Analyzing plans or plan alternatives	Develop and compare different scenarios	Portland (OR) Metro Regional Bicycle Model	
Selecting or prioritizing projects	Rank locations in need of improvement to prioritize investments	Cambridge 2015 Bicycle Plan	
Designing projects	Inform project design (e.g., alignment, etc.)		
Evaluating progress	Quantify progress towards goals and change over time	Lincoln (NE) Complete Streets	

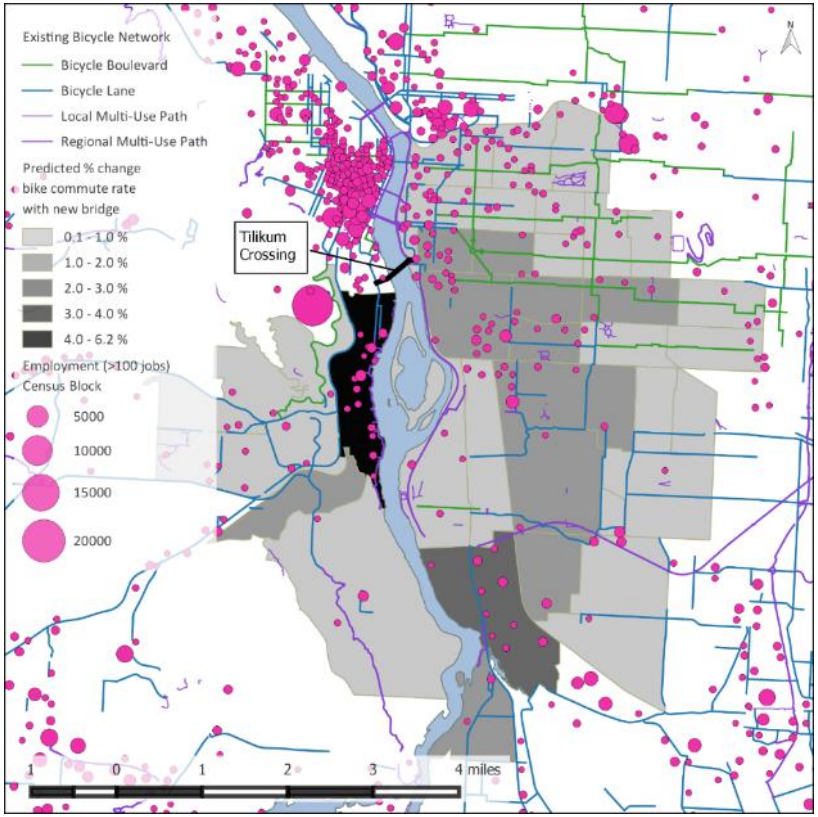
Measuring connectivity is a process

Step	Key questions	Results
1. Vision	• What are your agency's policies related to connectivity? • What is your agency's role in improving connectivity? • In what context will your agency measure connectivity?	• Policies • Measure definitions
2. Define network	• What features should your network include? • What data do you have? • What data do you need to collect?	• GIS network • Database
3. Analyze	• What tools do you have? • What is the best approach given the context and scale?	• Maps • Performance measures
4. Overlay	• What other policy issues do you want to address? • What data do you have on those issues?	• Maps • Performance measures
5. Act		• Decisions

What other priorities are you looking to address?

Connectivity analysis does not directly measure safety, equity, accessibility, or usage, but you can overlay results with other data:

- Safety (injury / fatal collisions)
- Equity (low income / minority populations)
- Access to destinations (employment centers, schools)
- Usage (mode share, counts)



Map Credit: Broach and Dill (2017)

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(503) 525-6167

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Photo Credit www.pedbikeimages.org/Laura Sandt

BIKE NETWORK MAPPING IDEA BOOK

ELI GLAZIER
TOOLE DESIGN GROUP

MAY 17, 2017

PRESENTATION ROADMAP

Bike Map Idea Book Overview

- What is it?
- Goals?
- How were maps collected?

Why Map Existing and Planned Bicycle Infrastructure?

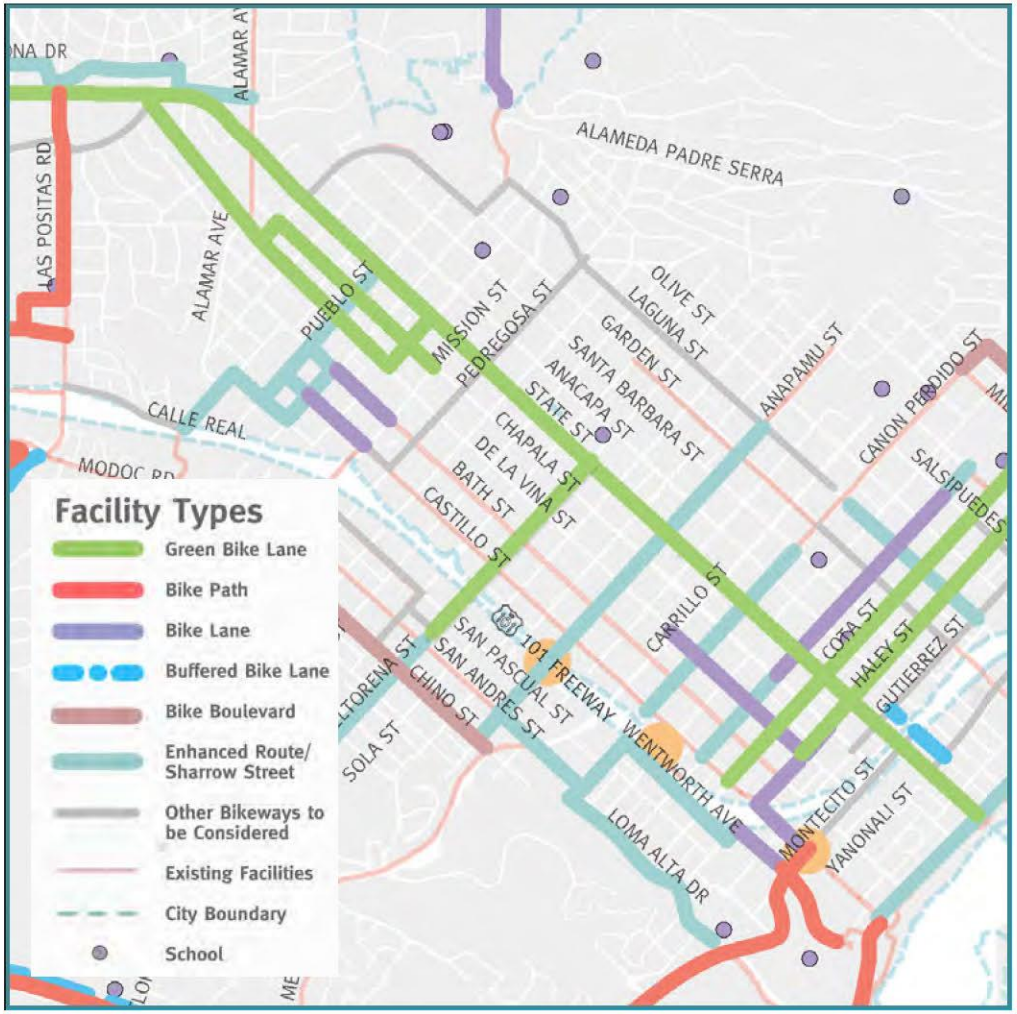
- Visualization
- Prioritization
- Funding & Implementation

Map Examples

- Jurisdictions of all sizes

Mapmaking Tips & Tricks

- Tools, Data, and Decisions

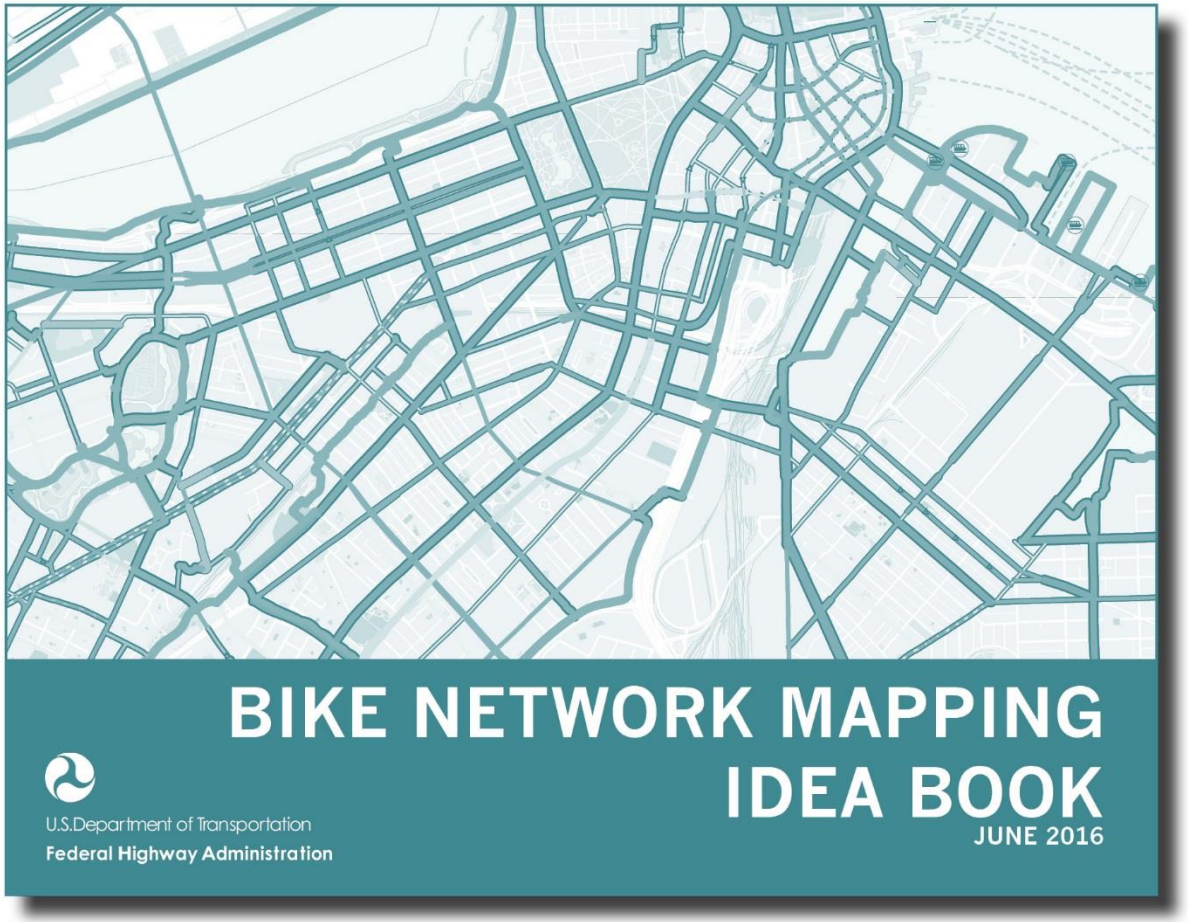


Santa Barbara Bicycle Master Plan. 2016

WHAT IS THE IDEA BOOK?

Collection of bike maps from jurisdictions small and large across the country

- Different mapping techniques
- Used for planning purposes, not user routing
- Document available in high/low resolution



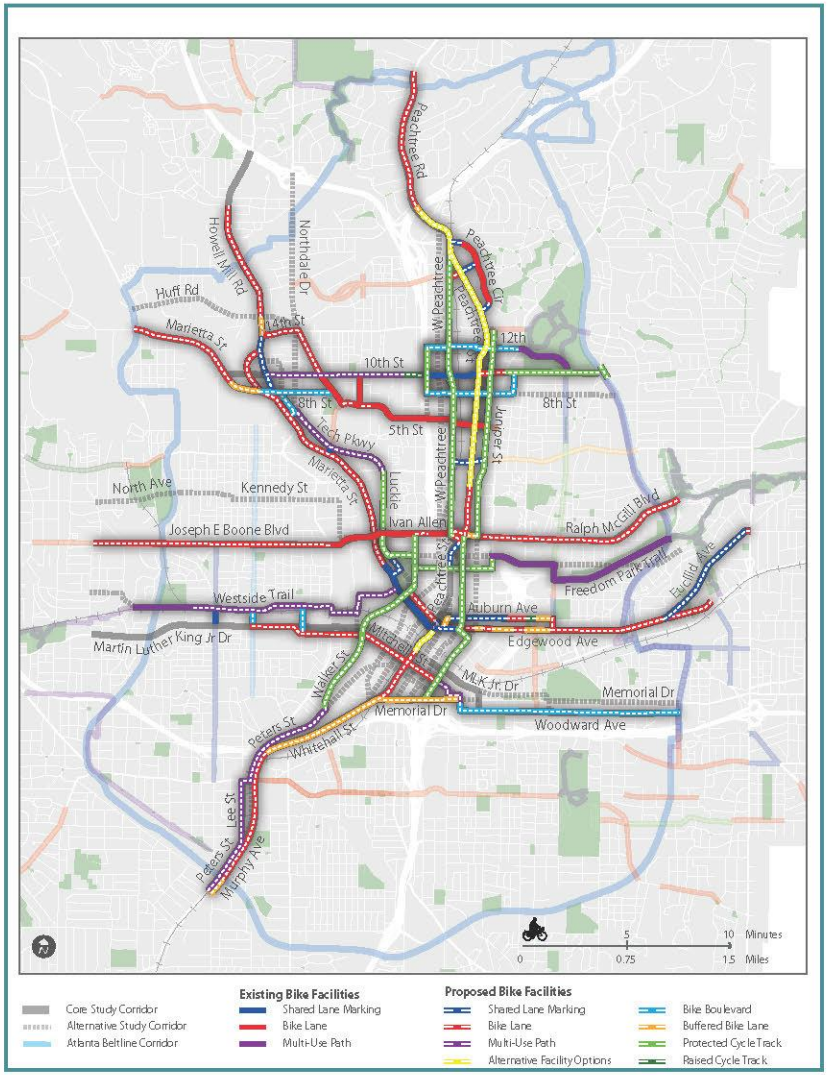
Online resource:
https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/bikemap_book/

IDEA BOOK GOALS

Inspire communities to develop bicycle infrastructure maps

Help communities build connected networks

Maintain current bicycle facility data



Connect Atlanta Plan. 2015.

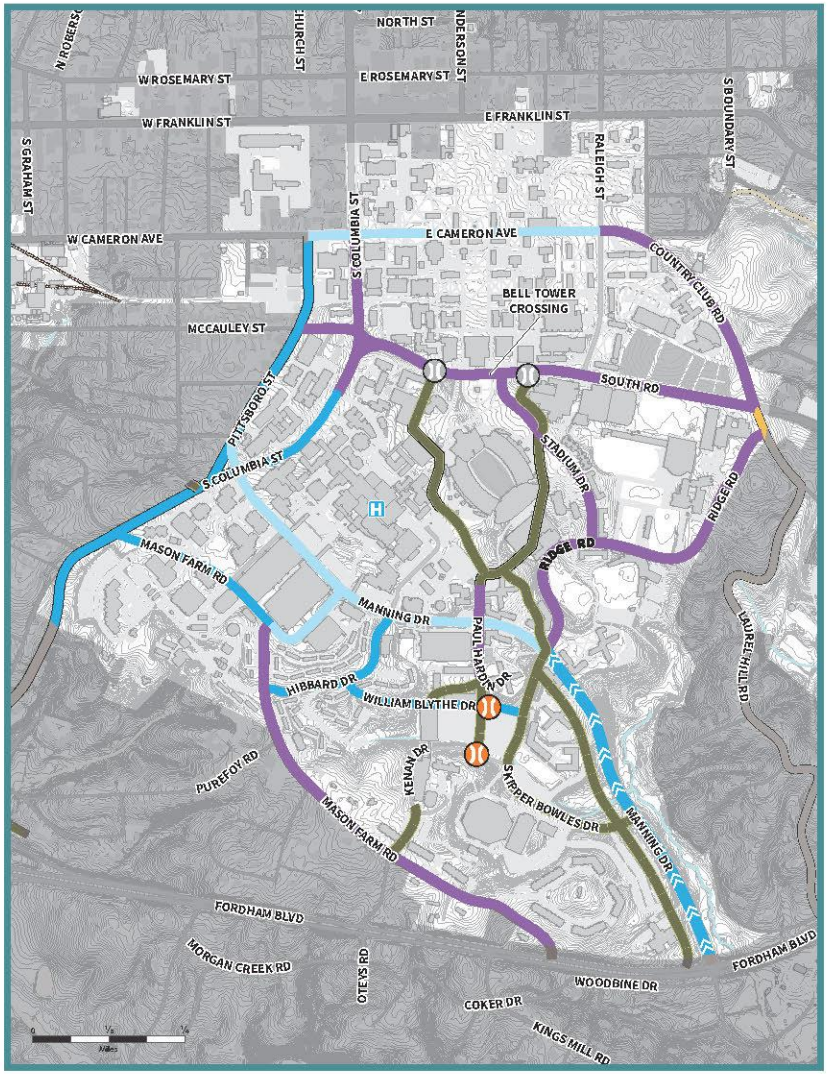
MAP SELECTION

Collected maps that conveyed bikeway information well

- Internal workgroup search
- APBP solicitation
- Internet key term search

Narrowed map list based on

- Map production approach
- Unique map elements
- Jurisdiction size
- Geographic region



UNC-Chapel Hill Bicycle Master Plan. 2014.

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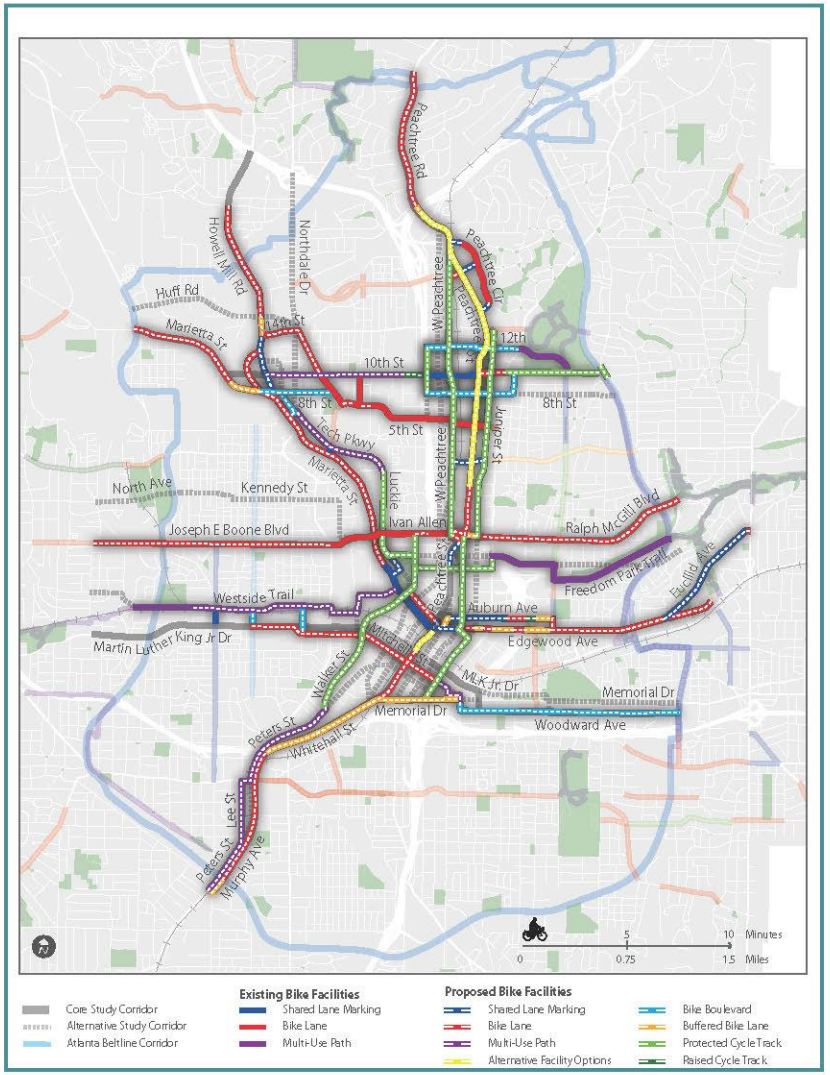

Connect Atlanta Plan. 2015.

WHY MAP EXISTING/PLANNED FACILITIES?

Visualize connected networks

Advance priority projects

Get funding and build infrastructure

Seattle Bicycle Master Plan Update. 2015.

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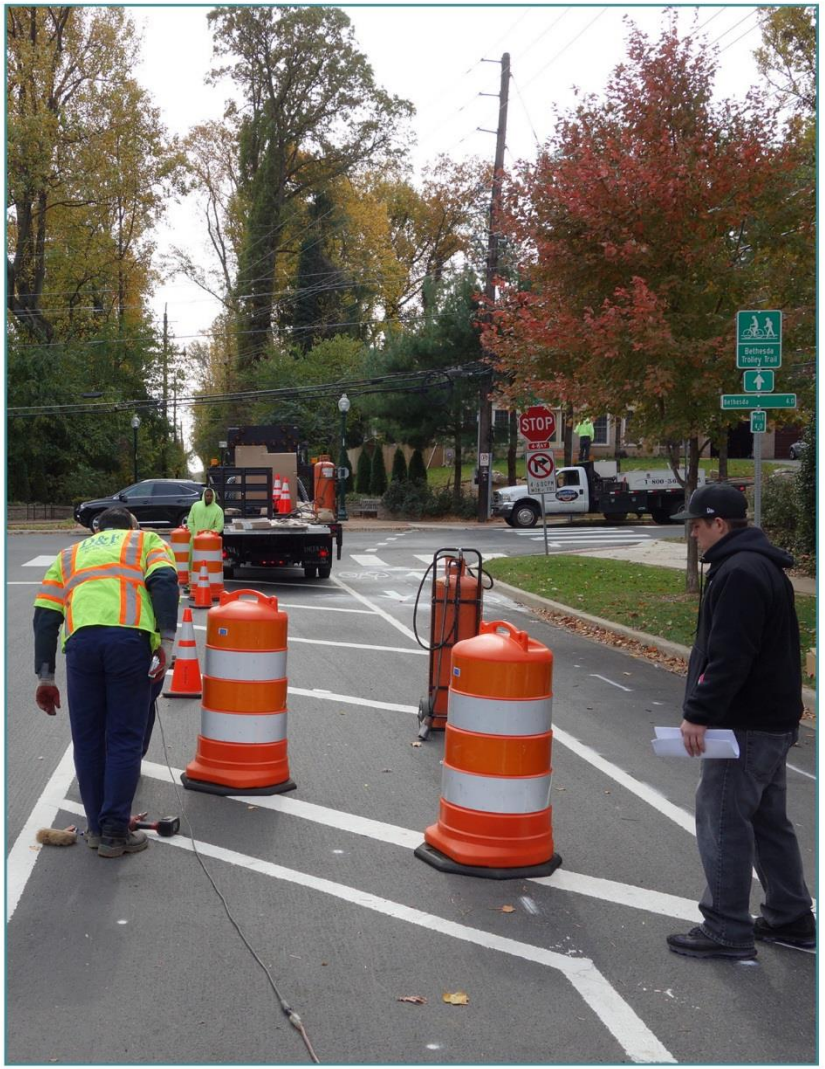


MAP EXAMPLES

PORTLAND, OR

LOCATION	YEAR	PUBLICATION	RESPONSIBLE AGENCY
PORTLAND, OR	2010	CITY OF PORTLAND BICYCLE PLAN FOR 2030	CITY OF PORTLAND

Full Map (Click to view full size)

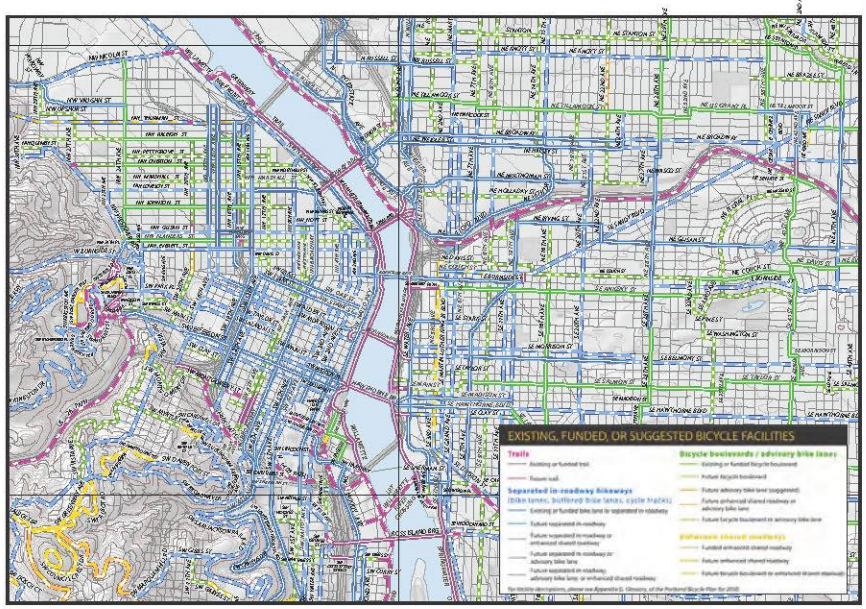
KEY MAP FEATURES

Highlights connections to regional trails and parks

Identifies both 'existing and funded' and 'planned' bike routes

Shows elevation change

CITY



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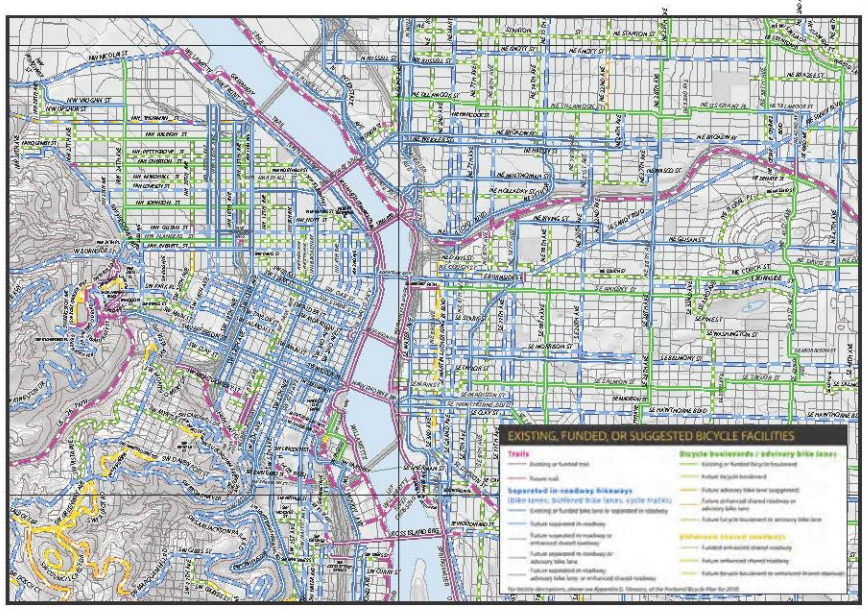

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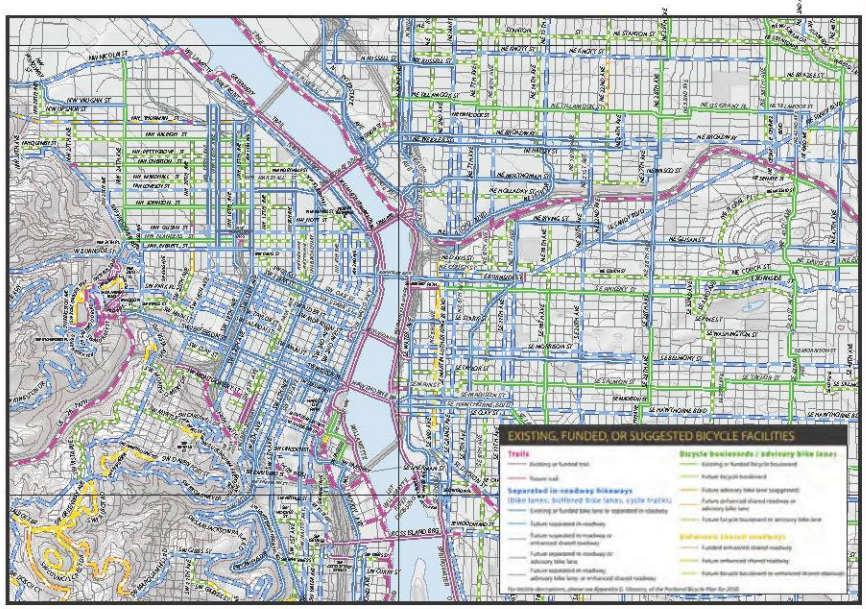

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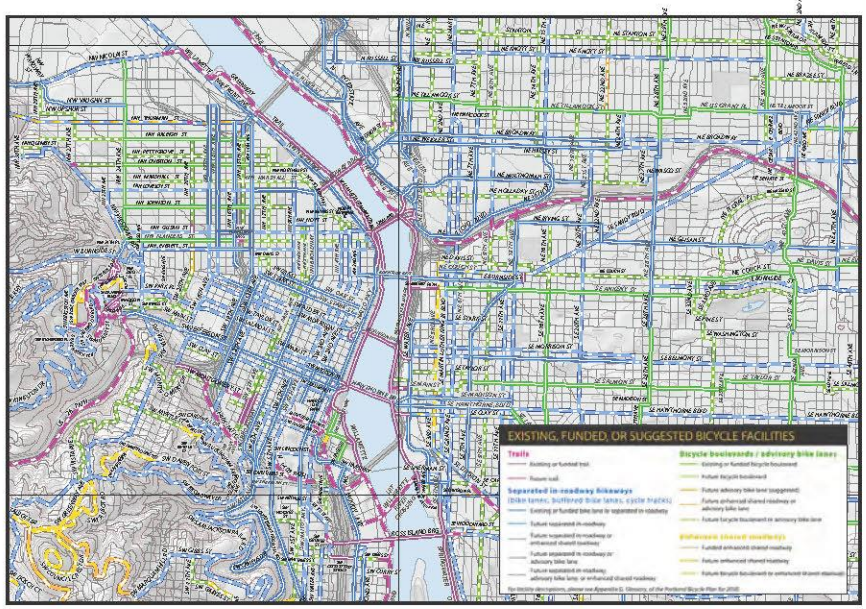

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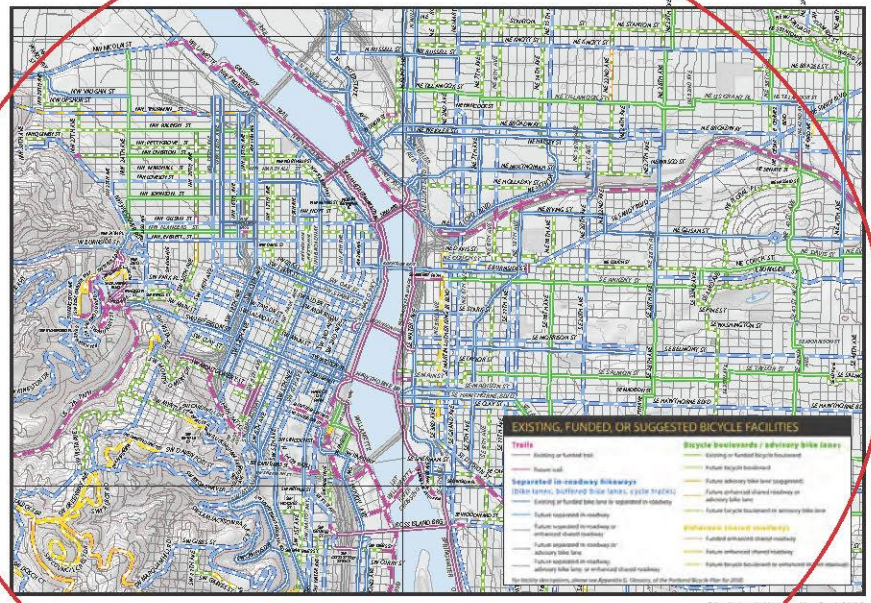
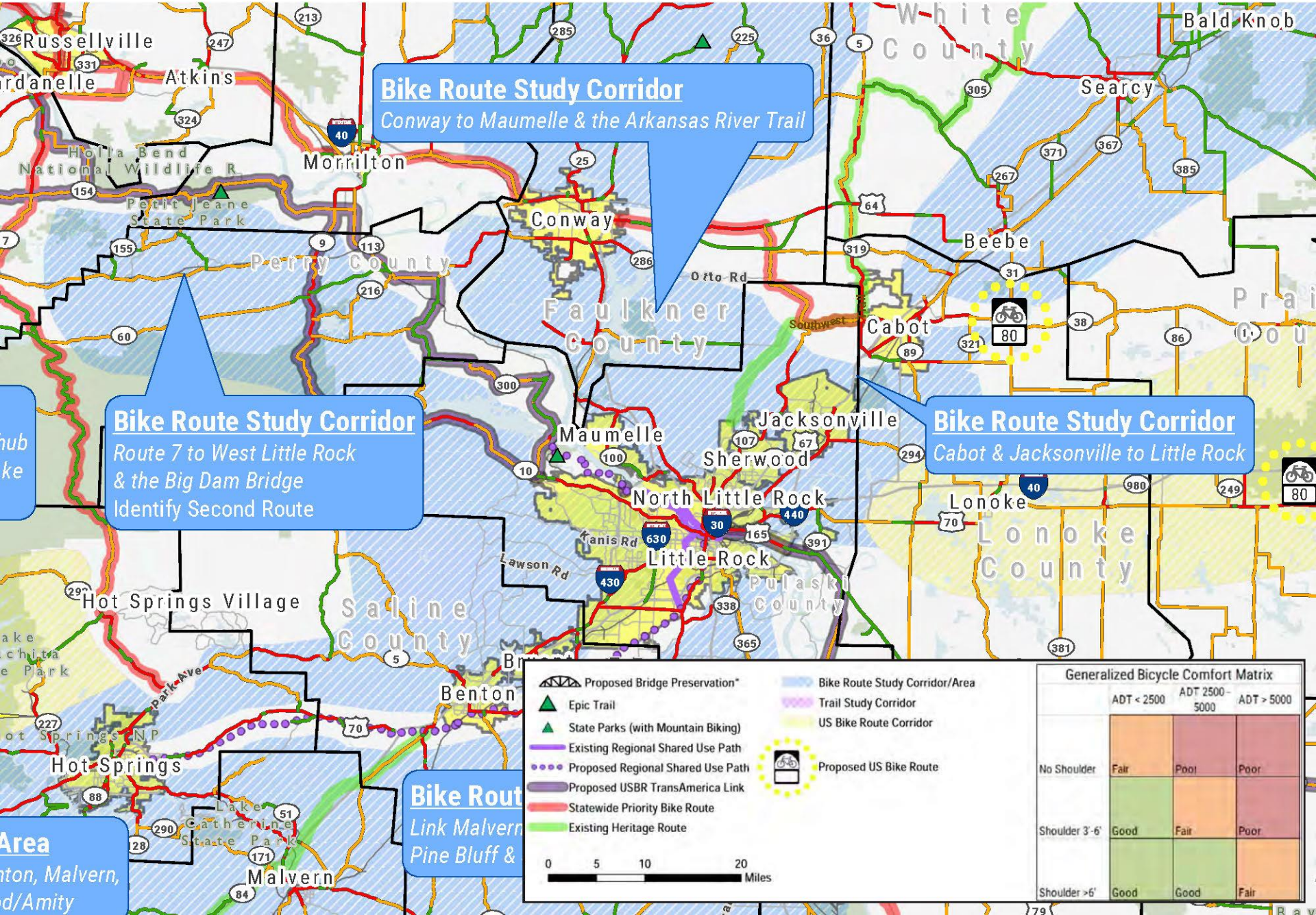
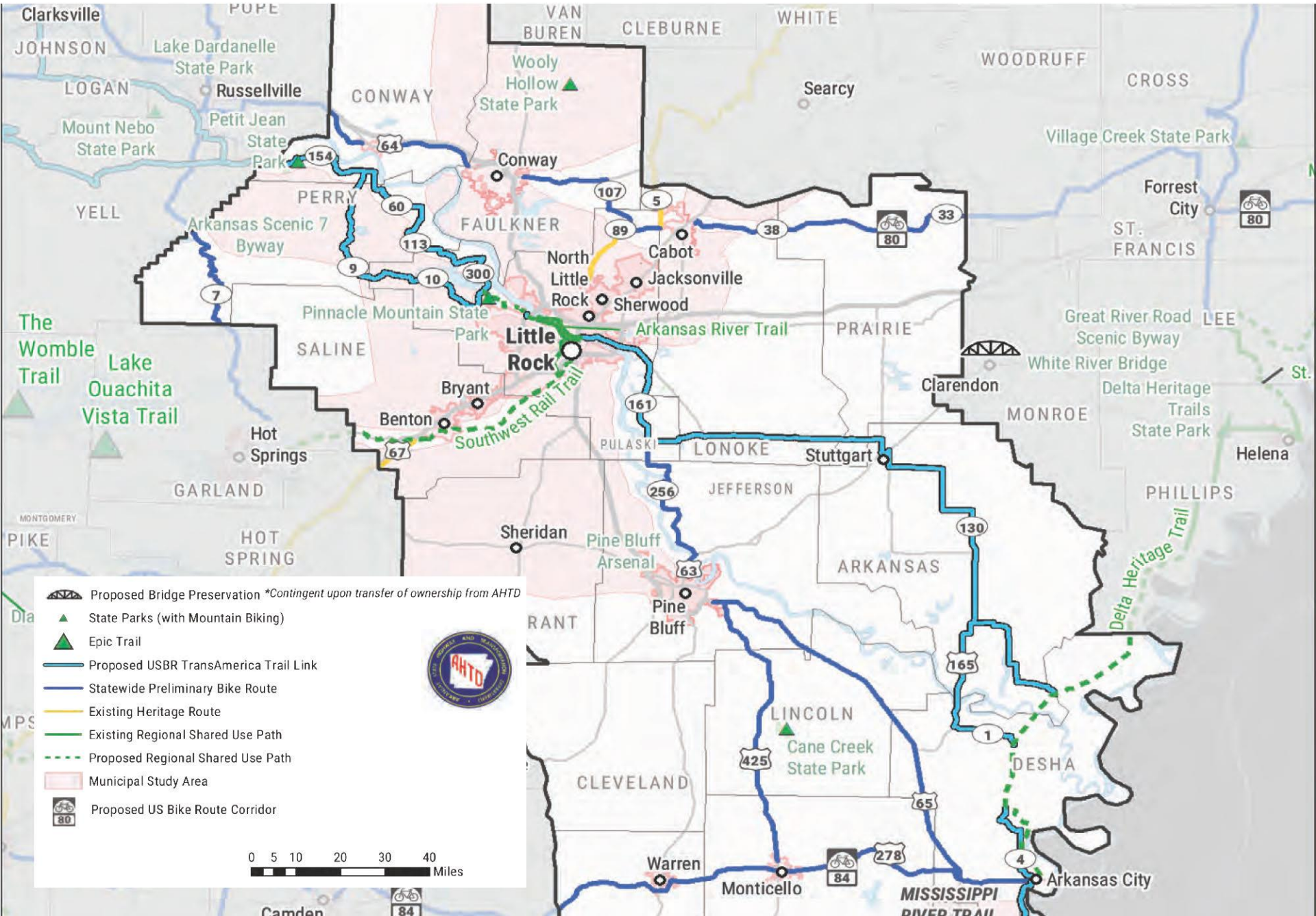


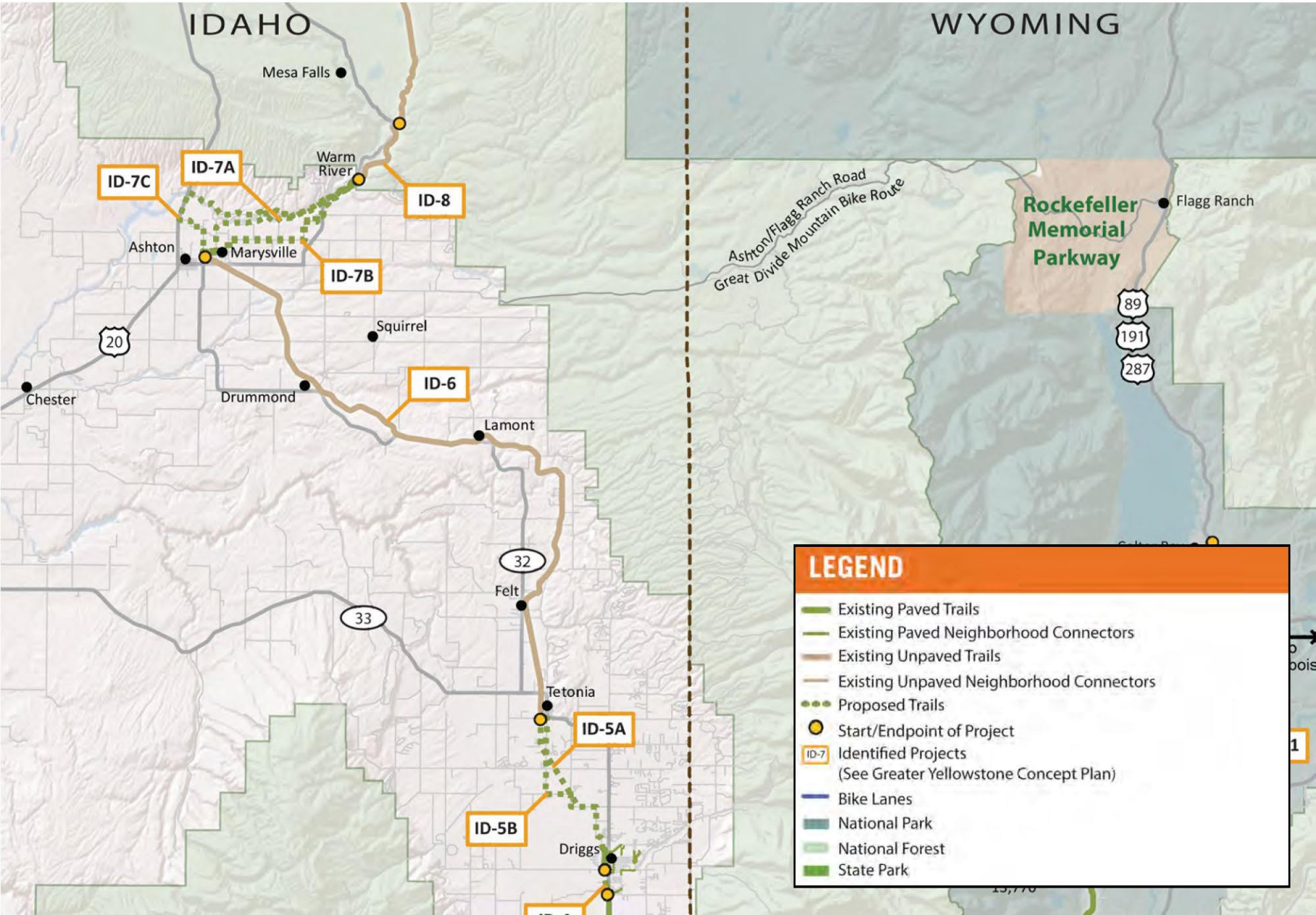
ARKANSAS (2015)



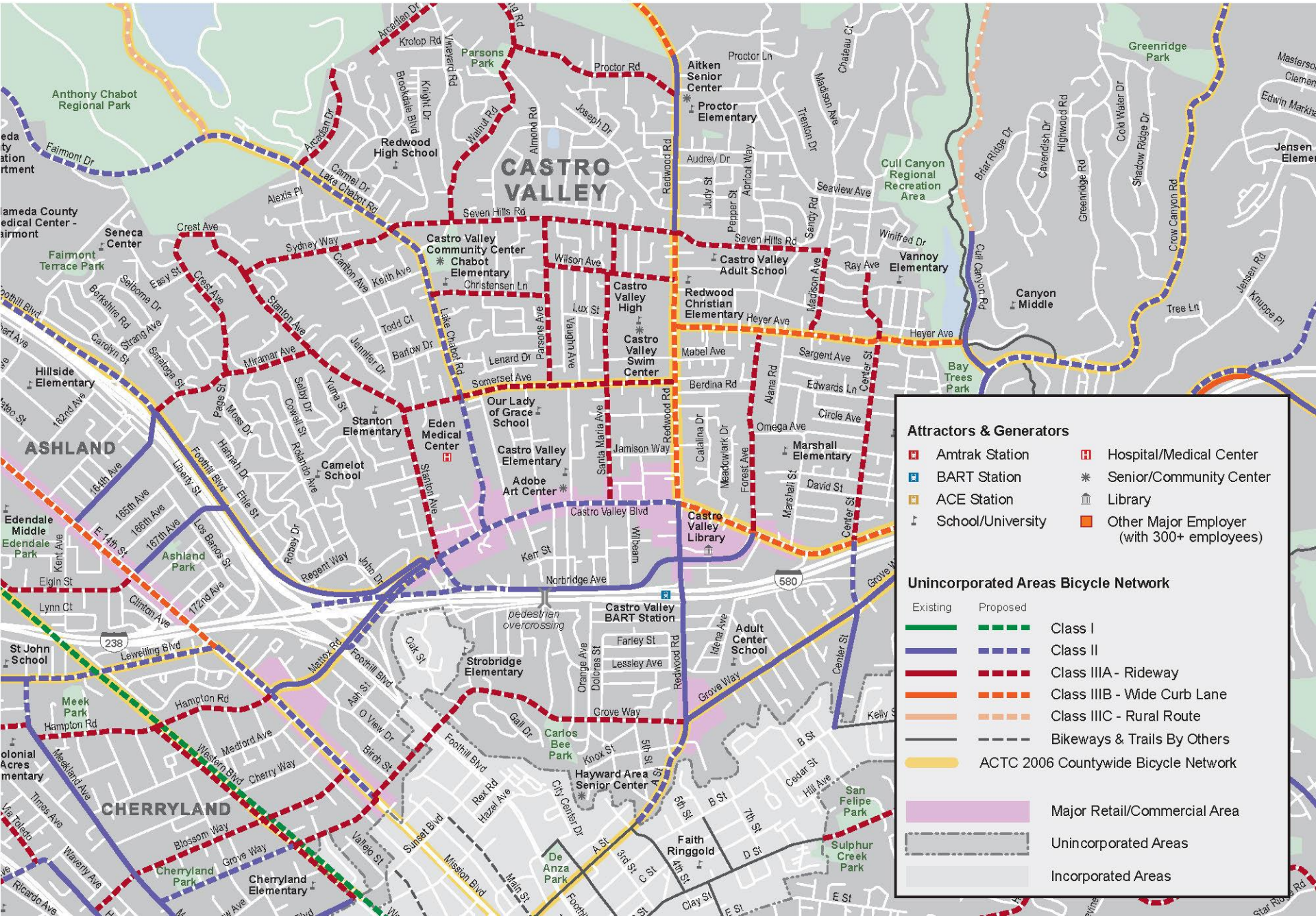
ARKANSAS REGIONAL



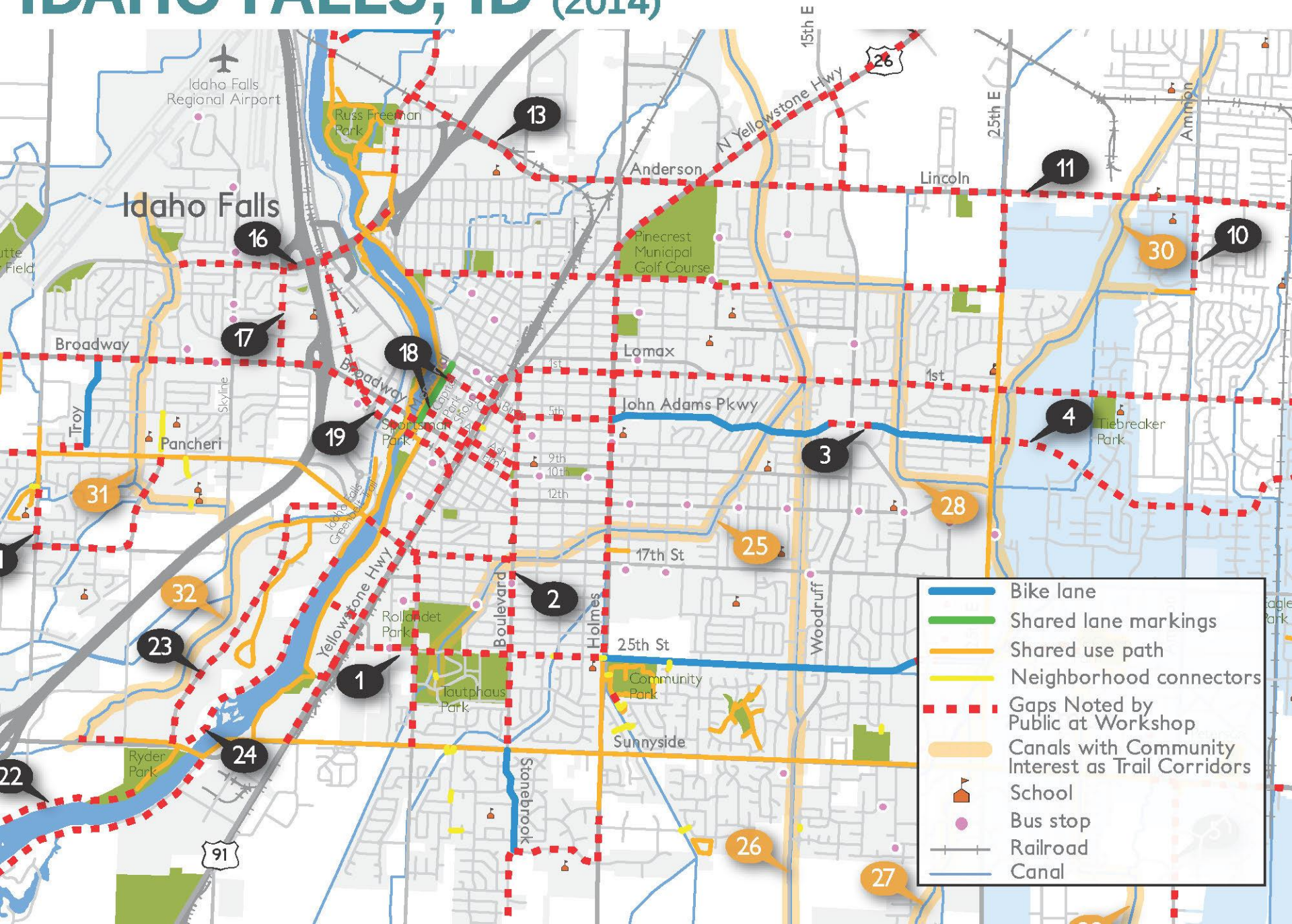
YELLOWSTONE (2015)



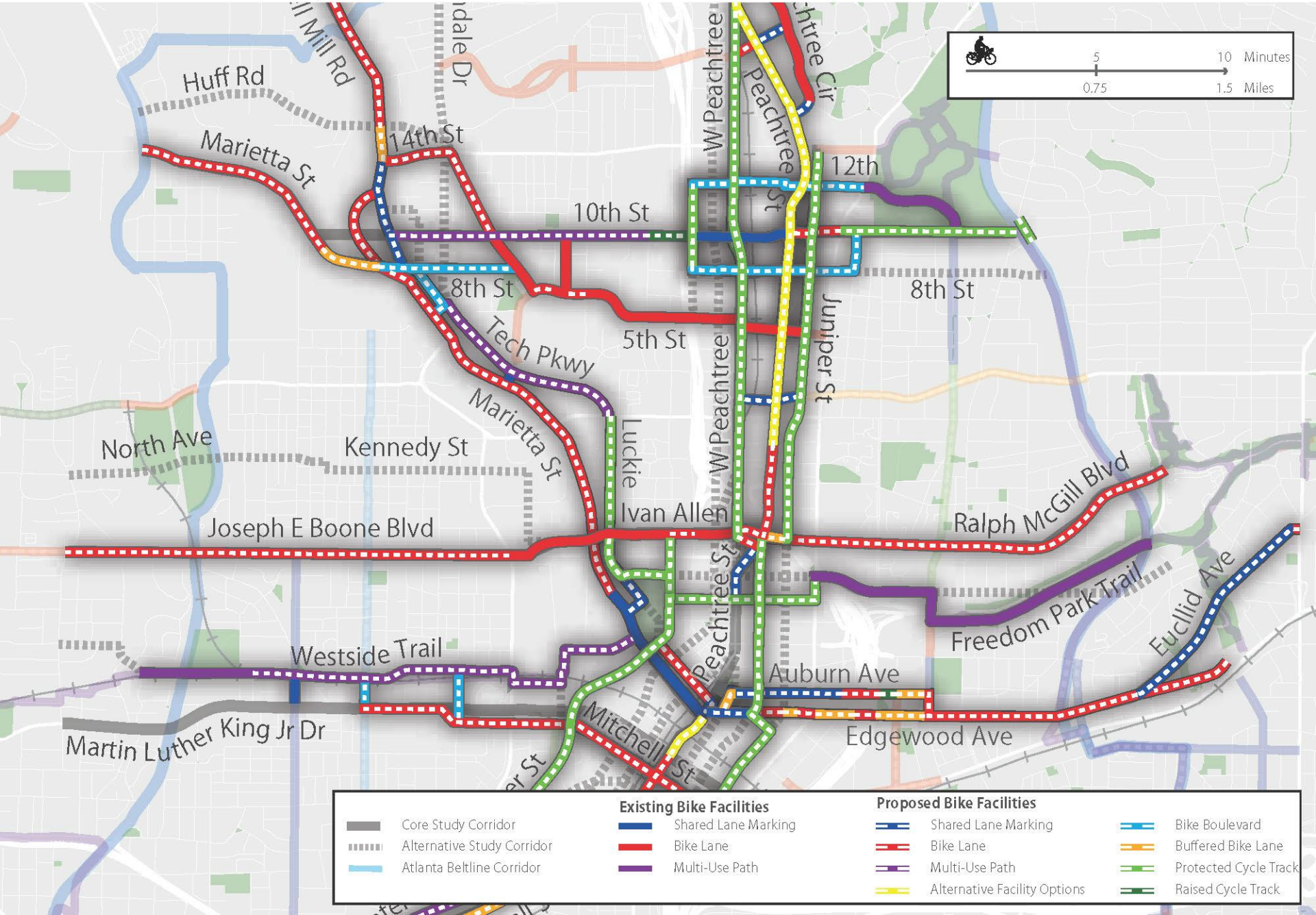
ALAMEDA COUNTY, CA (2012)



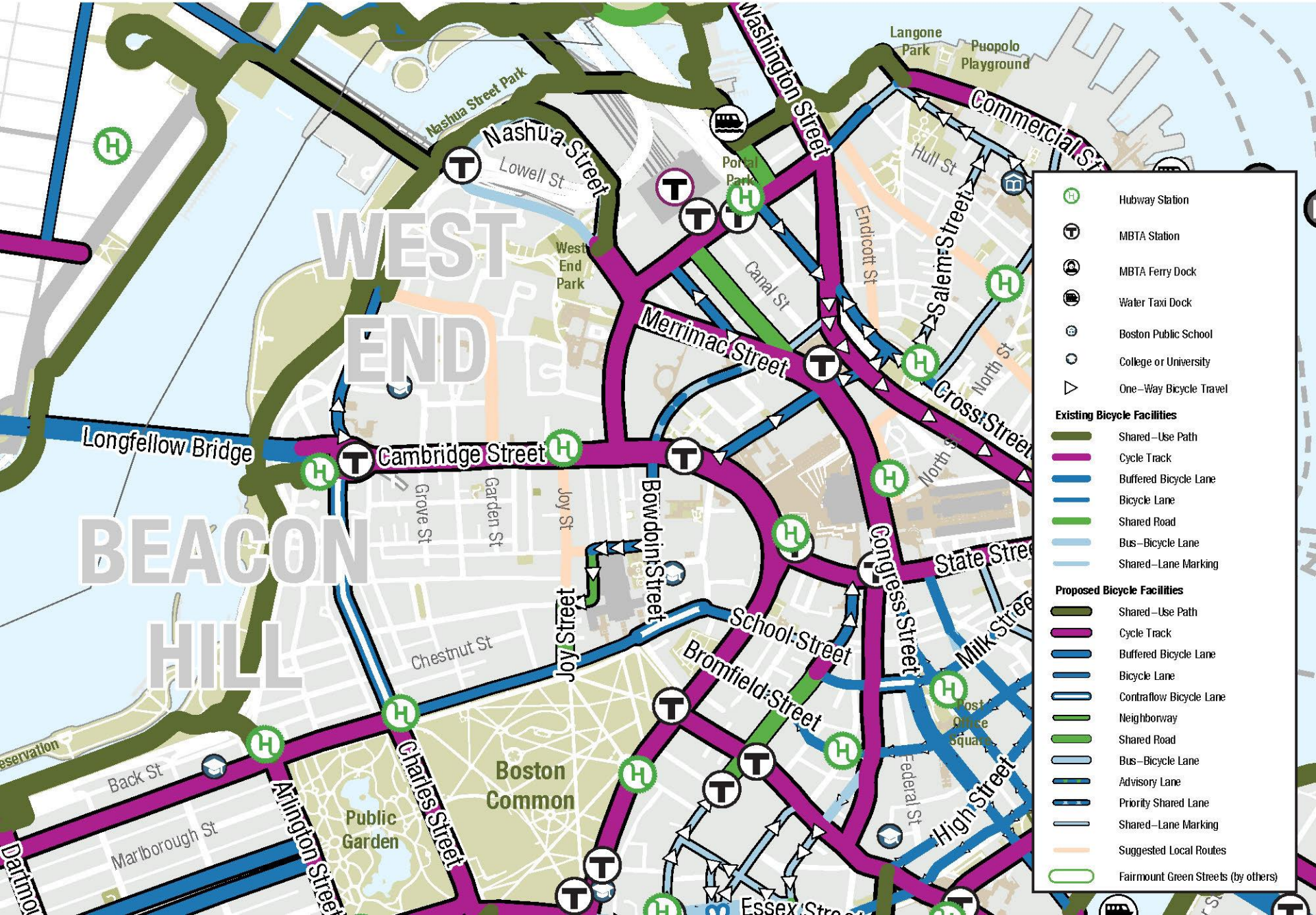
IDAHO FALLS, ID (2014)



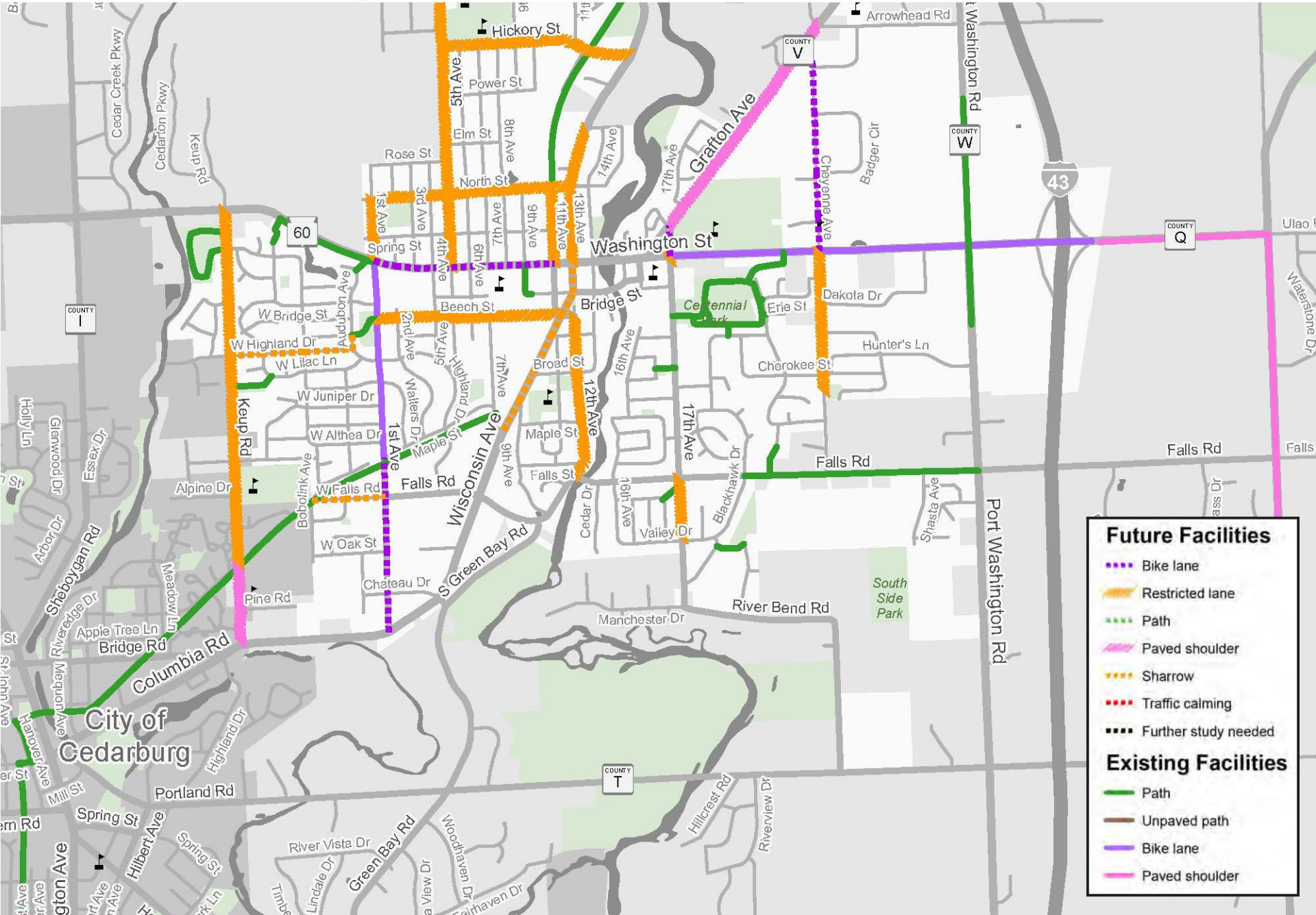
ATLANTA, GA (2015)



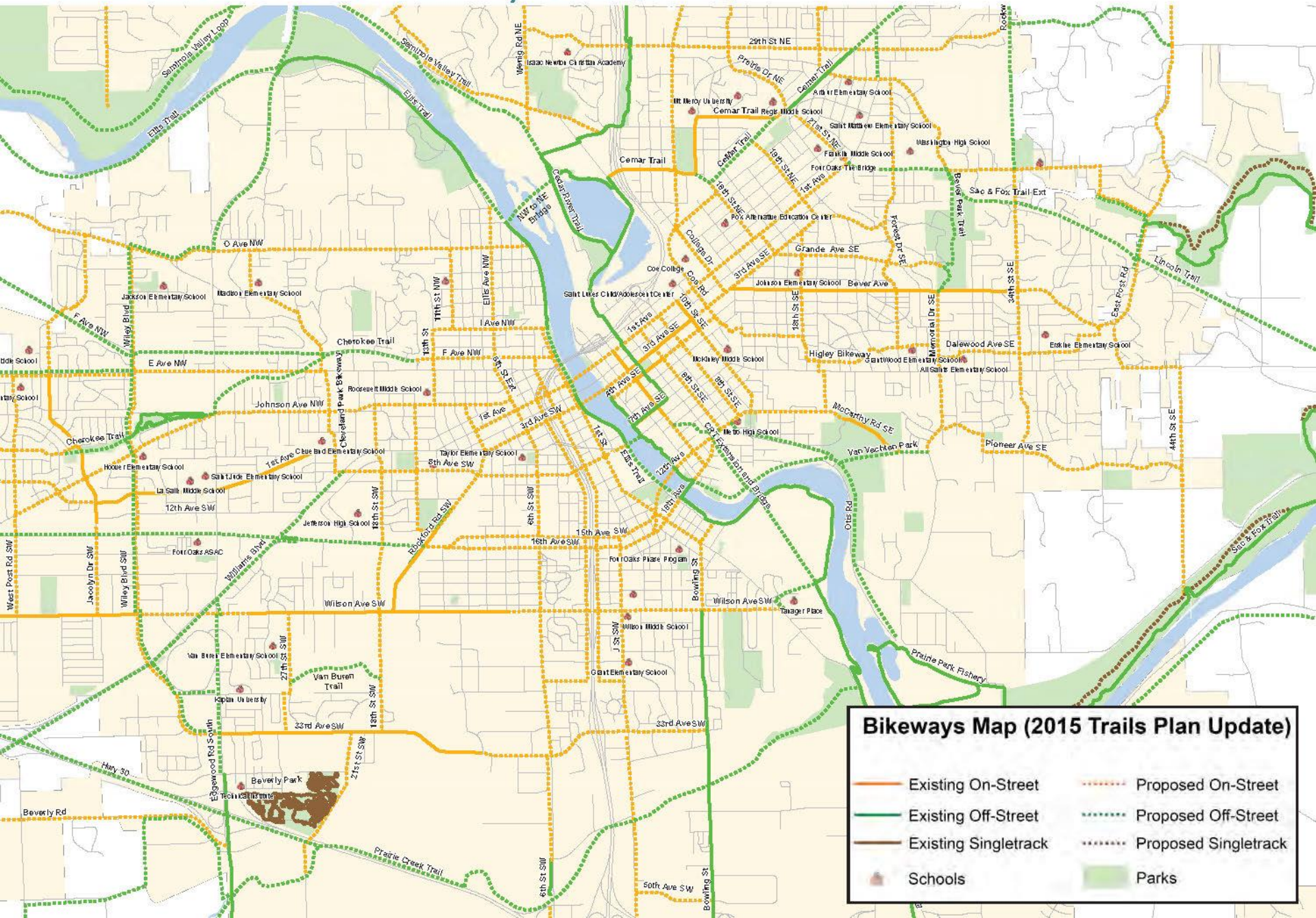
BOSTON, MA (2015)



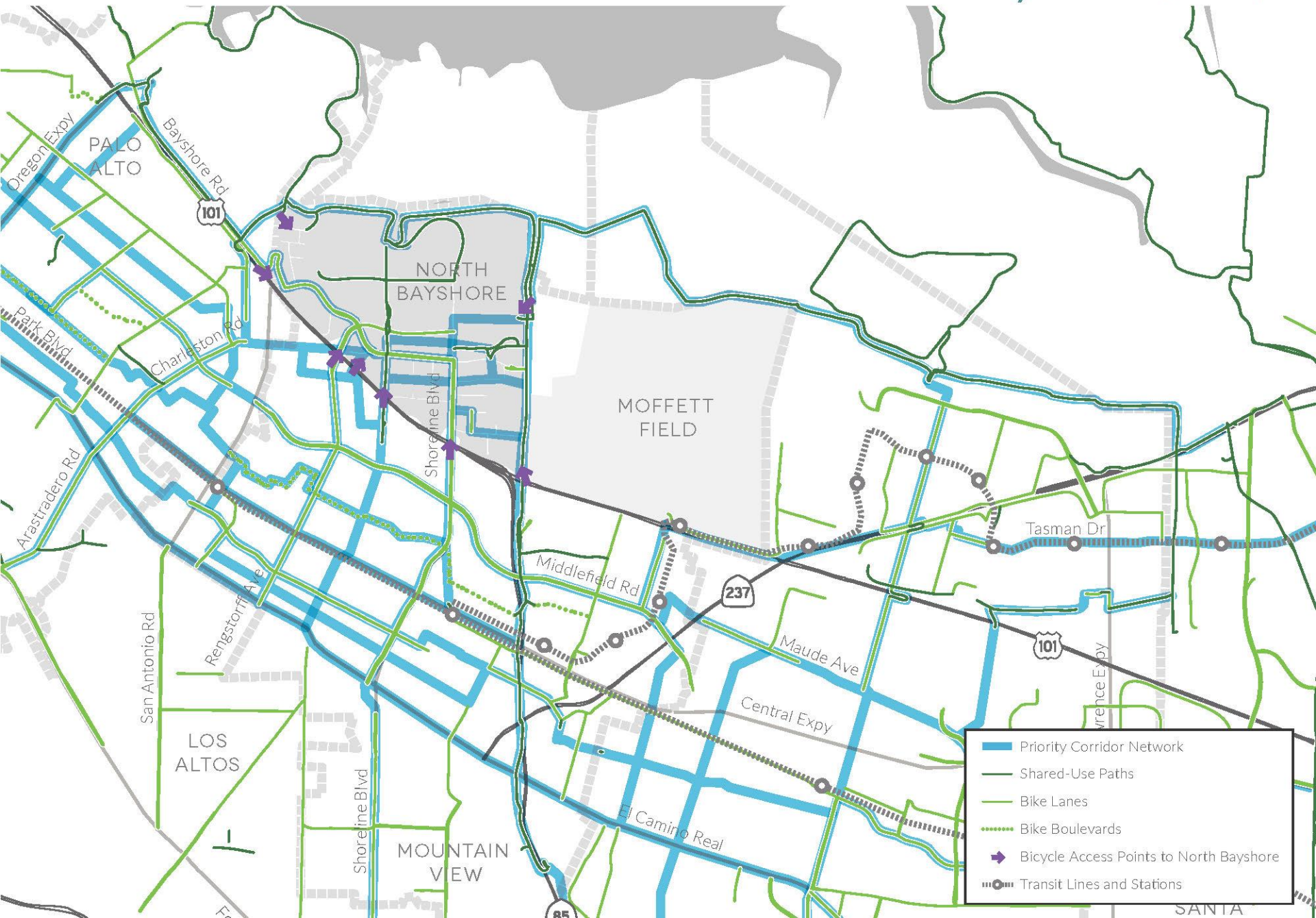
GRAFTON , WI (2015)



CEDAR RAPIDS, IA (2015)



NORTH SANTA CLARA COUNTY, CA (2015)



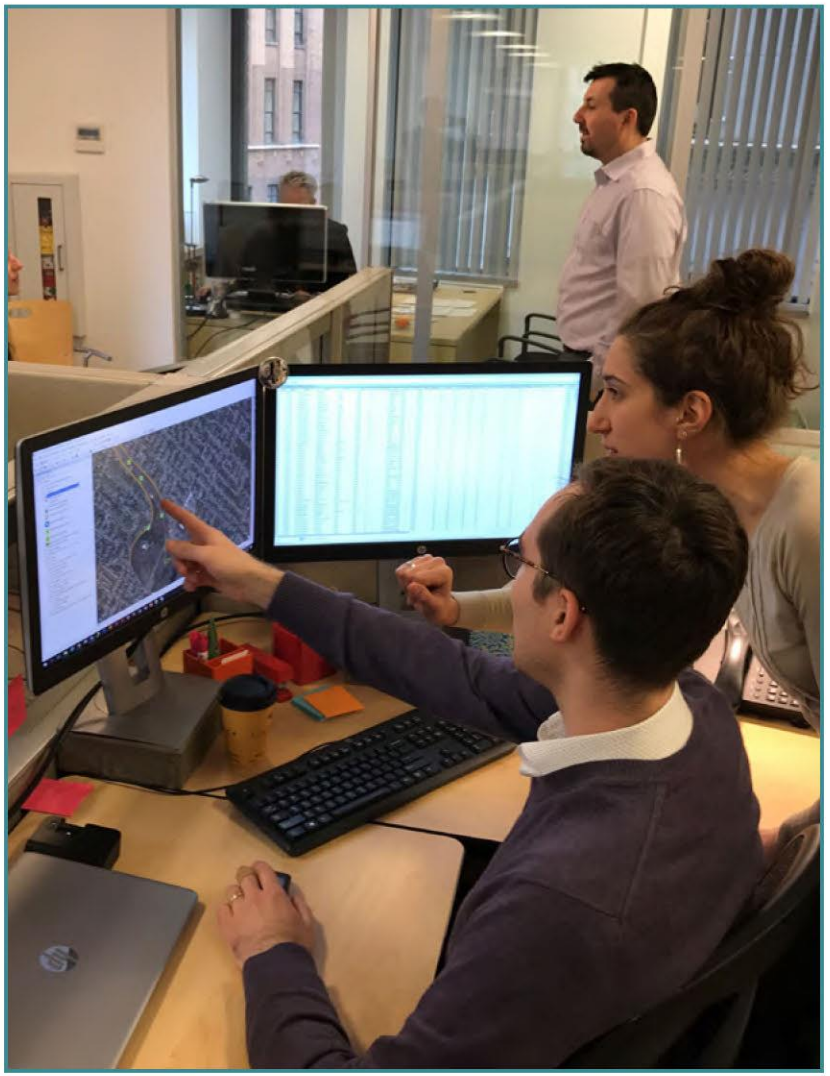
MAPMAKING TIPS & TRICKS

Mapmaking Tools

Data Decisions

Symbology & Legend

Context

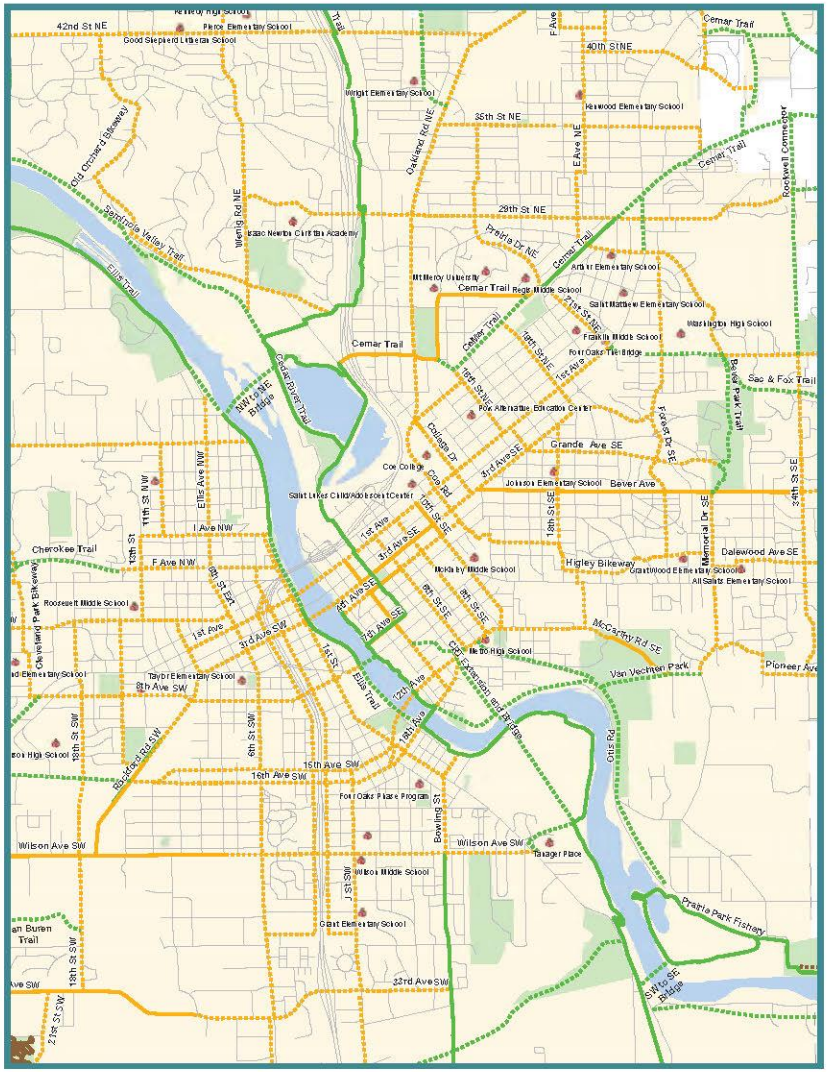


MAPMAKING TOOLS

Standard workflow: GIS to Adobe Illustrator to (potentially) Adobe InDesign

Use depends on technical capacity

Can make maps solely in a GIS



Cedar Rapids Comprehensive Trails Plan. 2015.

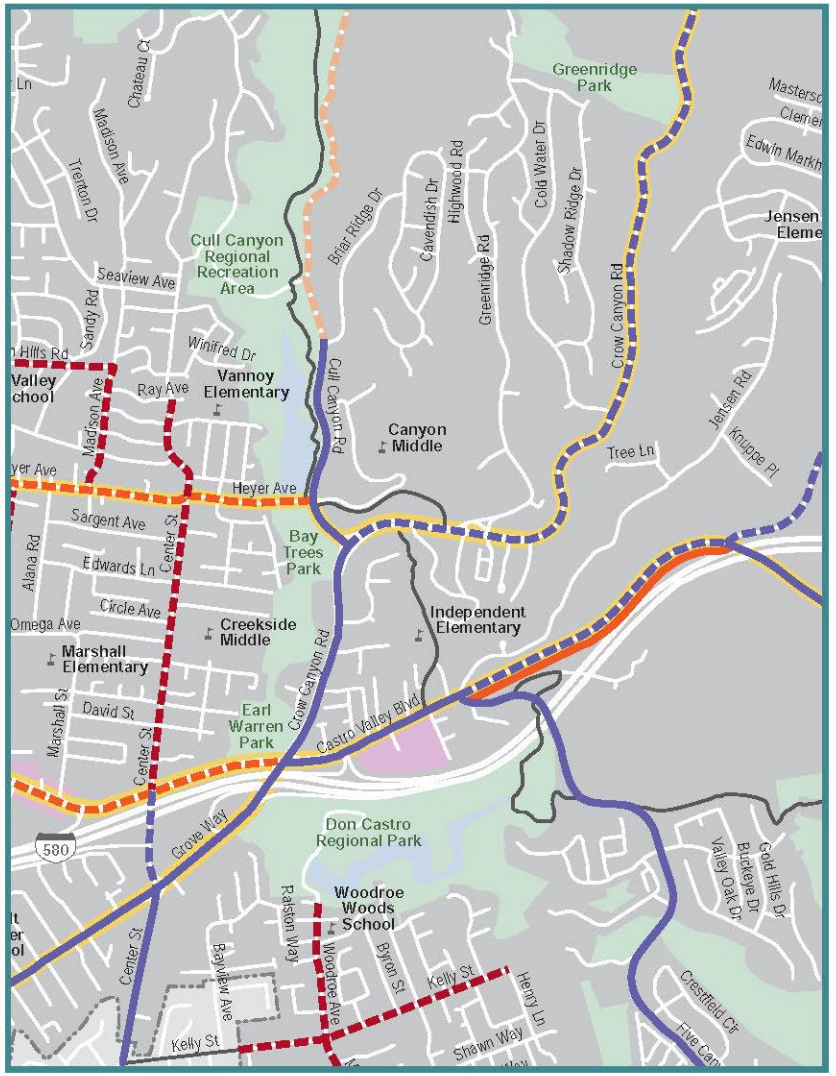
DATA DECISIONS

Consider map scale

One map or mapbook?

How detailed should your map be?

Flexible facility typology or specific?

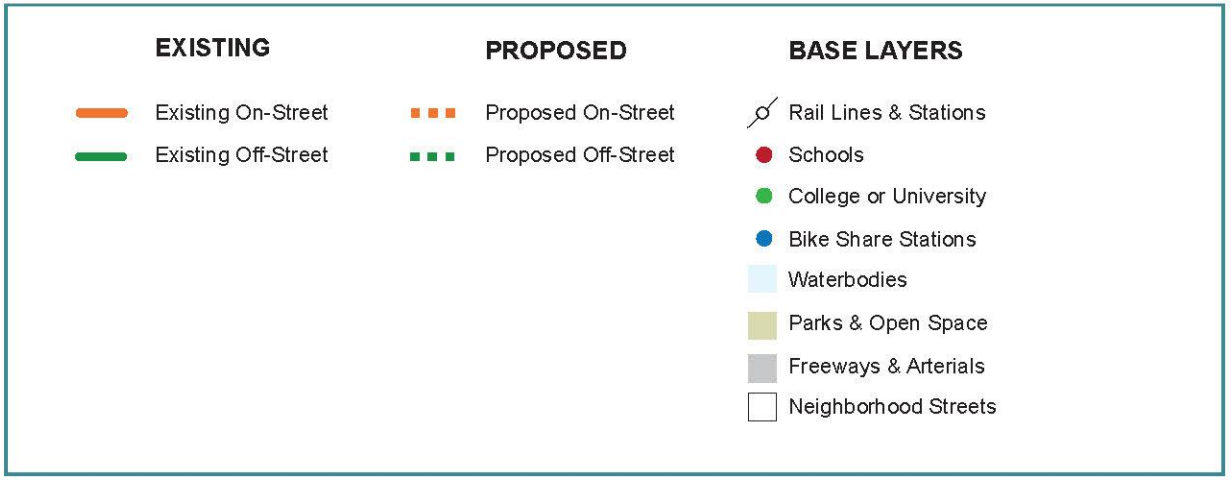


Alameda County Unincorporated Area Bicycle Plan. 2012.

SYMBOLOGY & LEGEND

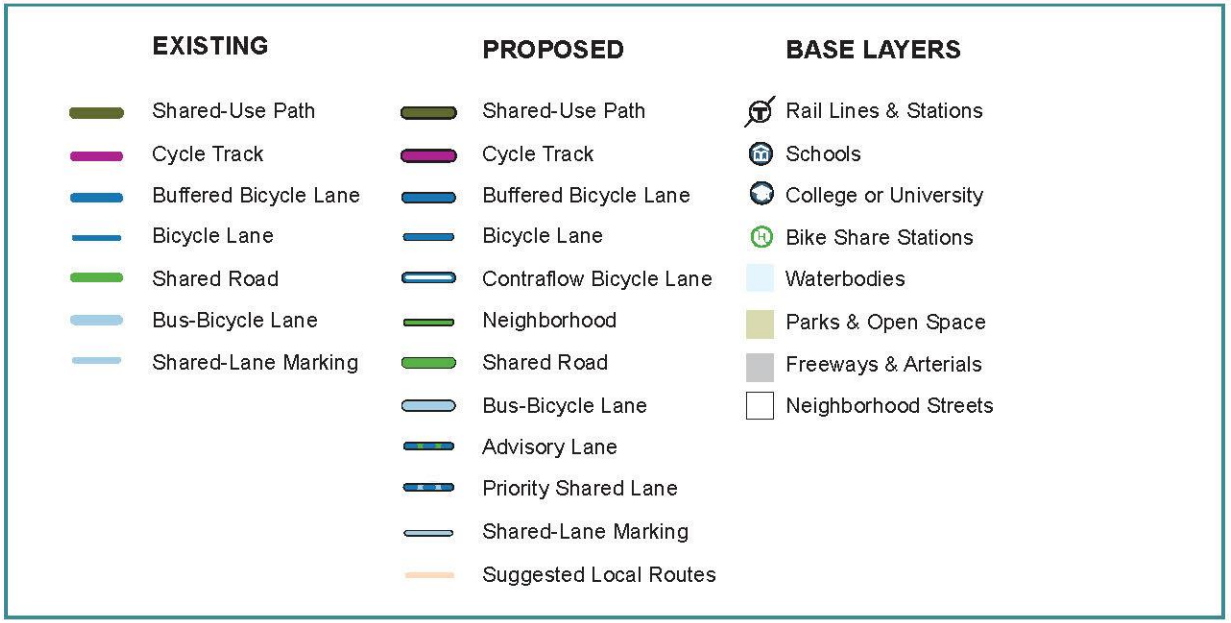
Flexible Network

Conveys a bicycle network without specific facility types



Complex Network

Conveys multiple facility types



CONTEXT

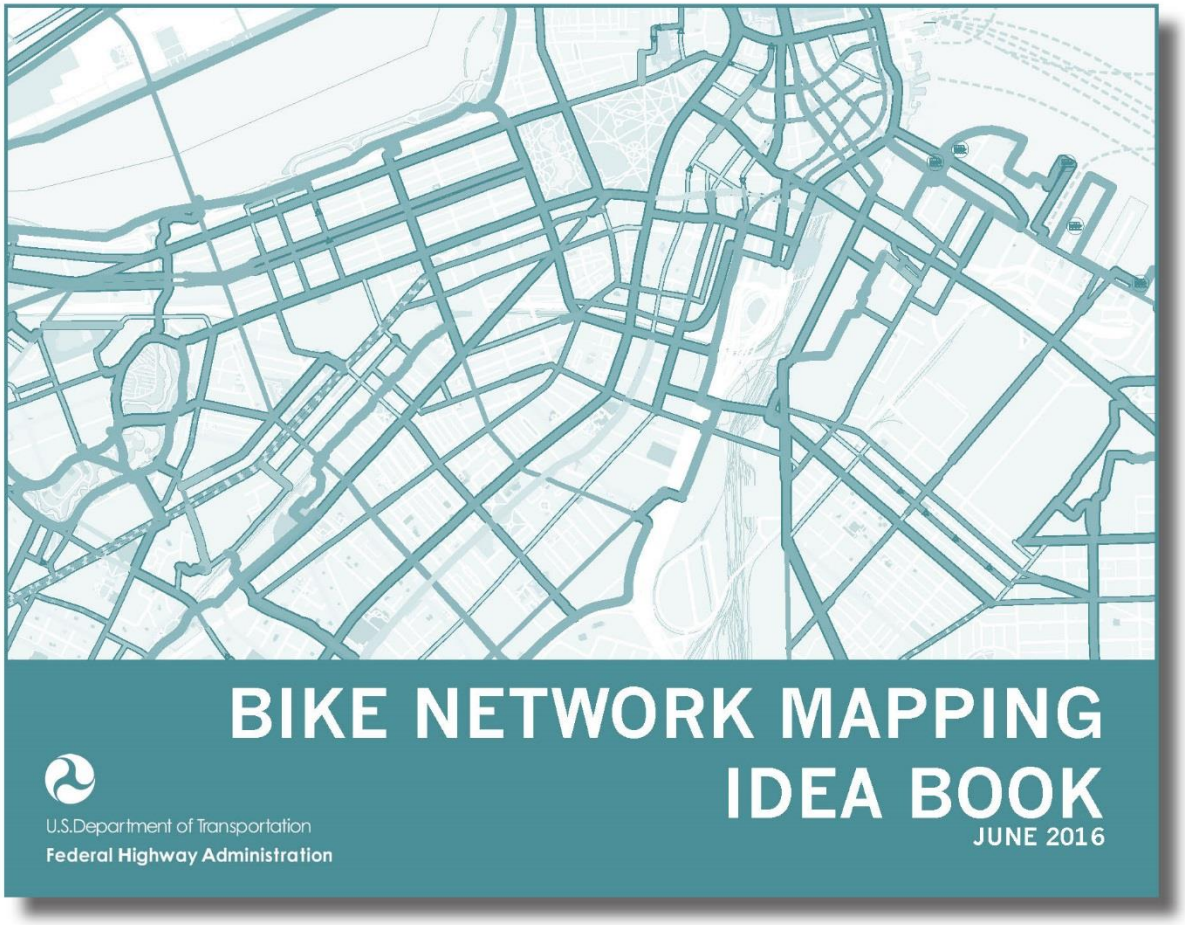
How can users orient themselves?

What information do you show?

NEXT STEPS

Visualize connected networks

Analyze connected networks



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Discussion

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- Archive at www.pedbikeinfo.org/webinars