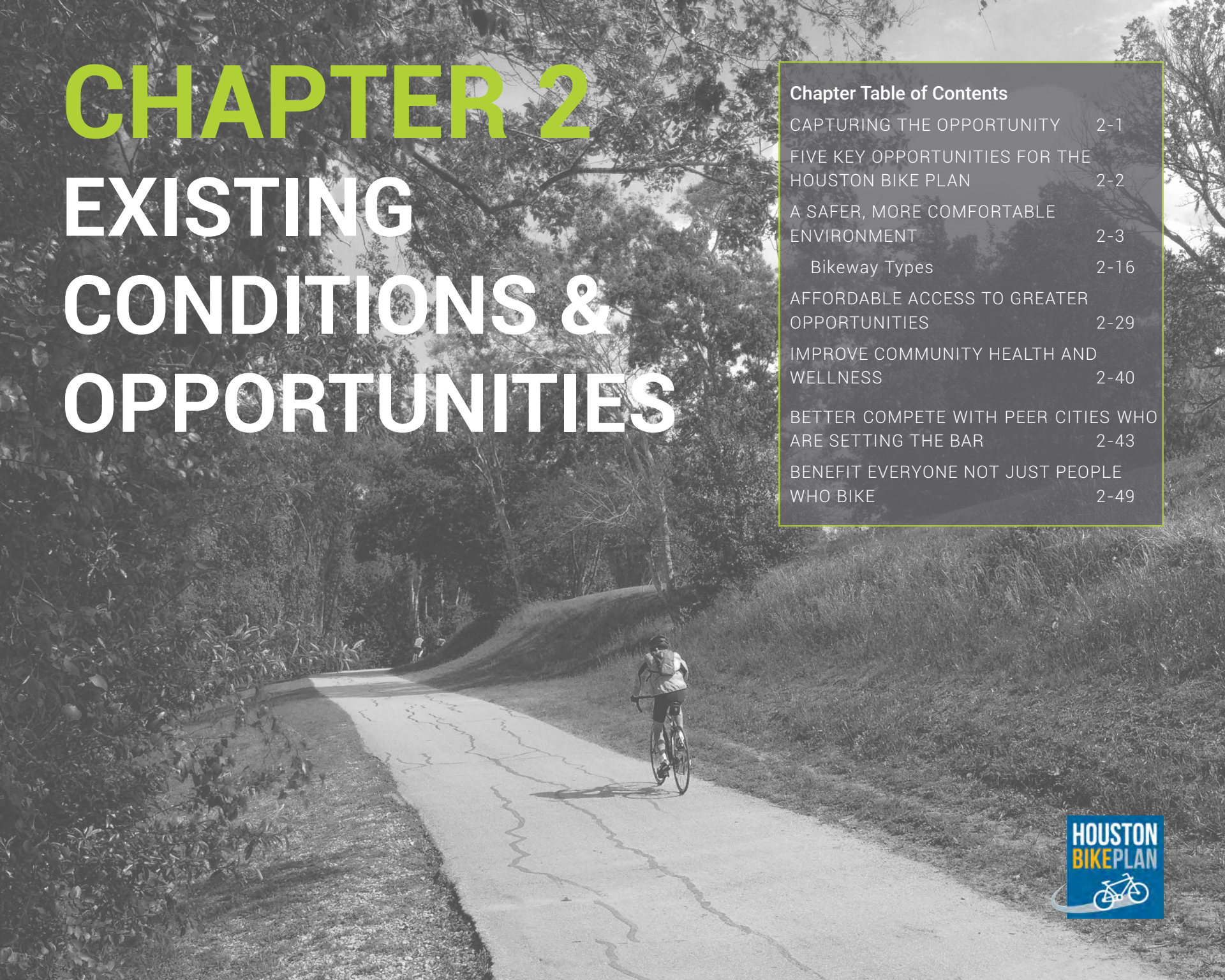
CHAPTER 2
EXISTING CONDITIONS & OPPORTUNITIES



Chapter Table of Contents

CAPTURING THE OPPORTUNITY 2-1

FIVE KEY OPPORTUNITIES FOR THE HOUSTON BIKE PLAN 2-2

A SAFER, MORE COMFORTABLE ENVIRONMENT 2-3

Bikeway Types 2-16

AFFORDABLE ACCESS TO GREATER OPPORTUNITIES 2-29

IMPROVE COMMUNITY HEALTH AND WELLNESS 2-40

BETTER COMPETE WITH PEER CITIES WHO ARE SETTING THE BAR 2-43

BENEFIT EVERYONE NOT JUST PEOPLE WHO BIKE 2-49

HOUSTON BIKEPLAN

02

EXISTING CONDITIONS & OPPORTUNITIES



CAPTURING THE OPPORTUNITY

The Houston Bike Plan comes at a critical time for bicycling in Houston. People bicycling are helping revitalize and transform cities worldwide, and many of the trends that support those transformations are also impacting Houston. Houston is becoming increasingly diverse, with people moving to Houston from all over the world. Demographic groups like Millennials, Baby Boomers, immigrant populations, and lower income and/or zero-car household populations are making decisions on where to live and work that influences the real estate and job markets and a company's ability to attract and maintain a talented workforce. Houston continues to work to help people live healthier lives and have access to more job and educational opportunities. At the same time, the roadways of the region continue to see significant levels of congestion. The plans, policies, and programs described in **Chapter 1** are making Houston into a place where more people want to ride a bicycle more often.

The Bike Plan represents an opportunity to create a framework and an action plan to address and capitalize on all of these trends. The development of Bayou Greenways and Complete Streets signals a change toward multimodal planning where people can have many transportation choices when they make their decision about where to live, where to work, and how to get around the city. This section details the current state of bicycling in Houston and the potential opportunities created by having a safe, accessible citywide bicycle network that is more comfortable for users of all abilities.

Why Develop the Houston Bike Plan?

Cities across the world have seen the benefits that come from improved bicycle infrastructure supported by complementary policies and programming. The Bike Plan represents a key step for the City of Houston in capturing these benefits. At the same time, many citizens of Houston are asking for more transportation options. The 2012 city bond election to support the build-out of Bayou Greenways on nine major bayous in the City of Houston passed with 68% of the votes. Two-thirds of respondents to the online 2014 Houston Parks and Recreation survey identified connecting their neighborhood to trails and revitalizing existing parks as their highest budgetary priority. In 2011, METRO surveyed over 1,000 people who bike about the biggest barrier to more bicycle use; 60% indicated it was a lack of better bicycle facilities.

Summarizing the many benefits and recognizing the opportunity that could come from addressing key challenges, the Bike Plan identifies key factors that support the case for action for the development of the Plan and how it is a transformative opportunity for Houston. These factors have been developed as a result of an in-depth assessment of existing bicycle conditions, feedback from the community, and the potential for increased ridership based on current trip patterns, demographic trends, and peer city performance.

FIVE KEY OPPORTUNITIES FOR THE HOUSTON BIKE PLAN

The Houston Bike Plan is a **transformative opportunity** to...

1. **Provide a safer, more comfortable environment for the growing number of people riding bicycles in Houston;**
2. **Provide affordable access to opportunities;**
3. **Improve community health and wellness;**
4. **Compete with peer cities who are setting the bar; and**
5. **Benefit everyone, not just people who bike.**

The following sections outline these factors in more detail and discusses the current conditions for biking in Houston as a foundation for the Bike Plan to build upon.



Bayou Greenway Trail
Brays Bayou

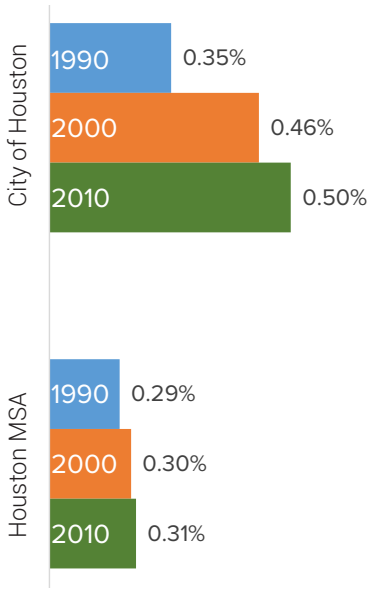
AN OPPORTUNITY TO...

PROVIDE A SAFER, MORE COMFORTABLE ENVIRONMENT FOR THE GROWING NUMBER OF PEOPLE RIDING BICYCLES IN HOUSTON

With the expanding amount of bicycle infrastructure in Houston, particularly trails along the city's bayous, the growth of the bike share network, the many programs offered, and the informal and organized rides that occur, it is difficult to travel through Houston without seeing people biking. Annual events such as the BP MS 150 attract over 13,000 people to ride from Houston to Austin every year as part of the nation's largest charitable ride of its kind. Participating in organized rides is often times a first step to riding more often for recreation and transportation.

While observations support the idea that many people are biking in Houston, the key challenge to assess the prevalence of bicycling in Houston is the limited data available, especially relating to trends over time. While significant data is collected annually on traffic volumes, limited data has been collected on people who bike. Where reliable data has been collected, however, it shows significant growth.

Figure 2.1: Work Commute Bike Mode Share



Existing Data

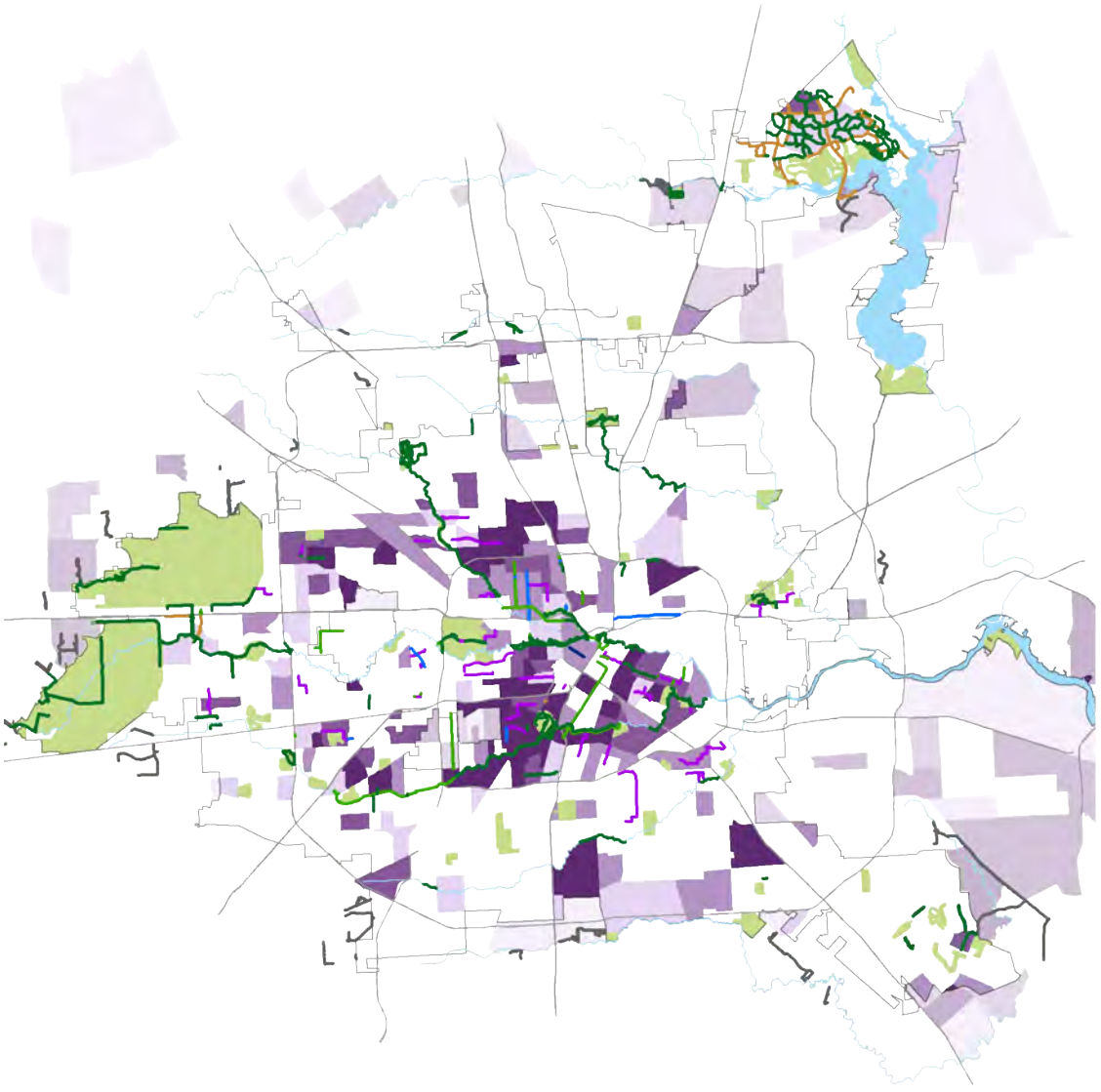
One fairly limited measure of people biking at a regional level is bicycle commute mode share utilizing Census data. As work commute trips make up less than 1 in 7 trips in the region, a large segment of the total number of people who bike is missed. This also only captures people who bike for the longest part of their commute on most days. This misses people who bike to work occasionally or chain trips between biking and transit. Even given those challenges, the Census data (Figure 2.1) shows that bicycle commute mode share has been growing in the Houston region, particularly in the City of Houston.

This data shows that during a twenty year period, while the number of commuters in the City of Houston grew 29%, the number of bicycle commuters grew 84%.

Figure 2.2 shows those places where there is an above average share of people commuting to work by bicycle, in many cases over 2%. These areas tend to be employment centers like Downtown or the Texas Medical Center where bicycles can be time competitive with driving and transit, or close to bike facilities like the Brays and White Oak Bayou Trails.

While no systematic bicycle count program currently exists for the City of Houston, two permanent counters have been installed on the MKT trail in the Heights and the White Oak Bayou trail near 34th Street. The counters have only been in place since 2013, too short a time period for conclusions about trends to be drawn, so they have experienced periods of unreliable data collection. Recently, three temporary pedestrian/bicycle counters have also been installed. Recent data from April 2015 is shown in Figure 2.3.

Figure 2.2: Work Commute Bike Mode Share



LEGEND

- City of Houston City Limit
- Parks

Bicycle Commute Mode Share

- 0.02% - 0.5%
- 0.51% - 1%
- 1.01% - 2%
- 2.01% +

Existing Bicycle Network

High Comfort Facilities

- High Comfort Walk/Bike Path
- Walk/Bike Path
- Separated Bike Lane
- Bike Lane
- Neighborhood Bikeway
- Shared Sidewalk
- Bike Facility Outside COH



Map Locater

0 2.25 4.5 9 Miles

Source: US Census Data (2013)

While it is just a snapshot of overall trail use and includes some pedestrian activity, the data does show the level of use along the trails is significant, even though many of the count locations are at the end of existing trails. This data will serve as a useful baseline as the bayou greenways system is expanded.

One place the growth in bicycling is well documented is in the number of people boarding METRO buses with their bicycles. In 2010, METRO completed the installation of fold-down bike racks on the front of its low-floor local bus fleet and the designation of bicycle compartments in the under-bus storage on its commuter fleet. Through the on-board data system, bus drivers record each time a passenger loads a bike onto the bus. (Note, data is not collected on the light rail system.)

The monthly boarding totals are shown in Figure 2.4. In the 12 months ending with March 2015, over 260,000 riders brought bikes on board METRO buses. This is more than twice the total in 2011, the first full year of the program. The data covers the broad spectrum of people traveling in the region including those that do not have ready access to a car and rely on transit and bicycles as their primary means of transport. This population is often difficult to reach through

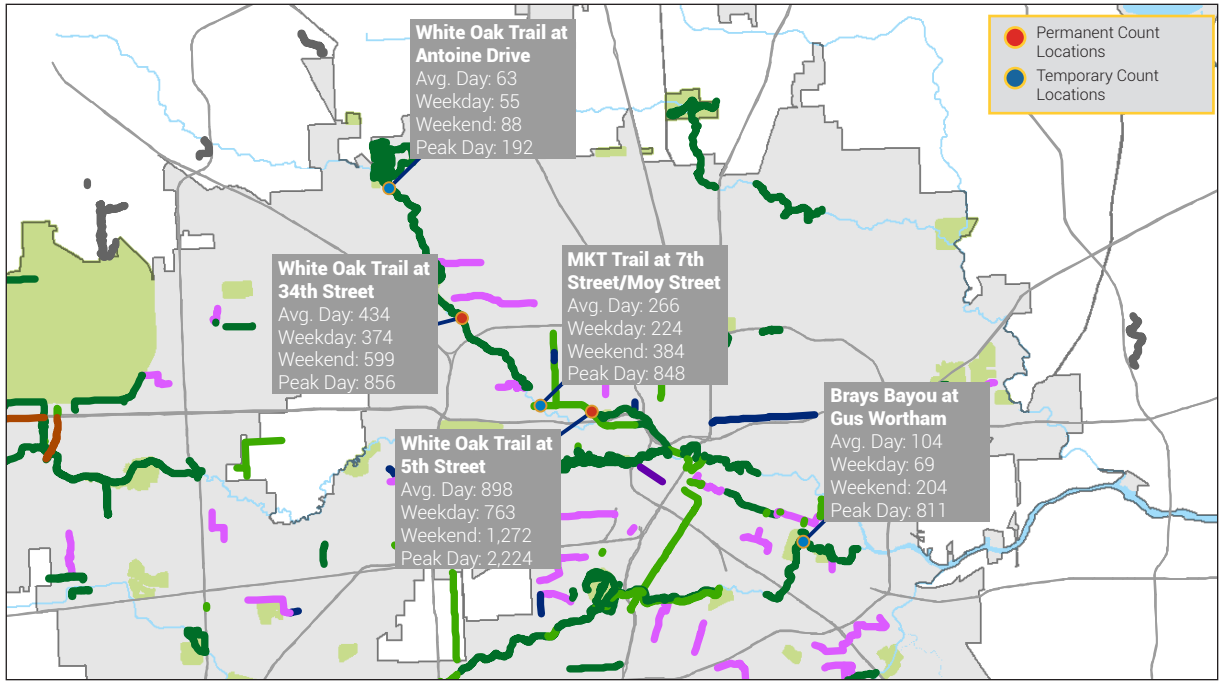


Figure 2.3: Trail Counter Data (April 2015)

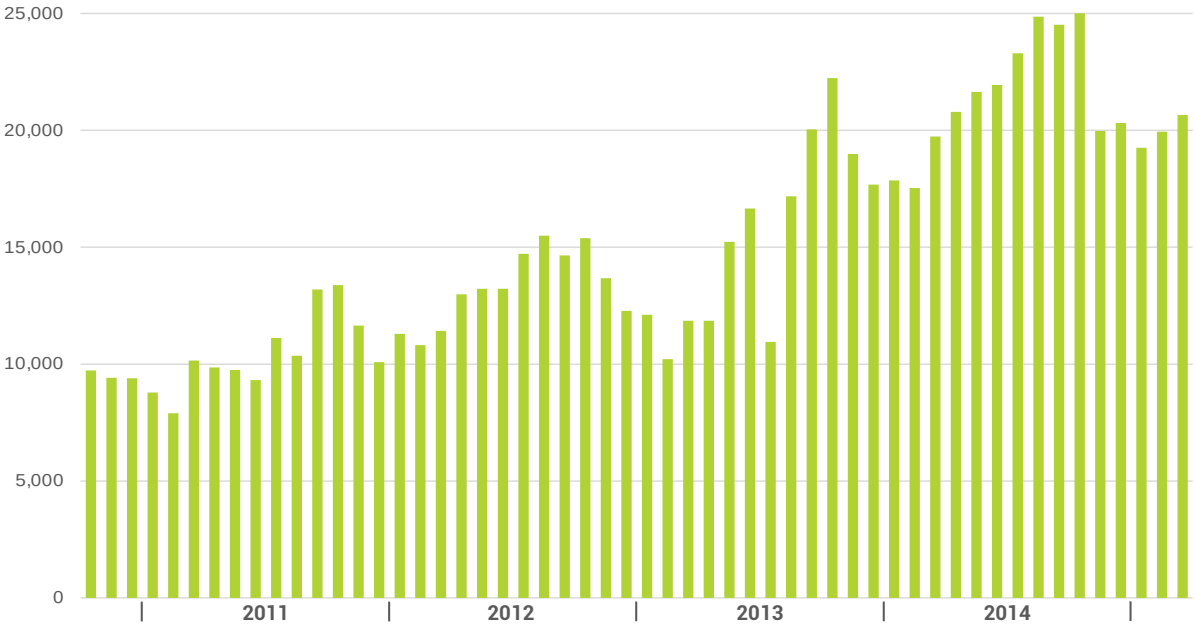


Figure 2.4: Bicycle Boardings on METRO Buses



Bike Boardings on METRO buses have more than doubled since 2011, the first full year of the

traditional planning outreach methods, but can especially benefit from an improved and safer network of bicycle facilities and programs. Over the same time period, METRO local bus ridership was stagnant overall, making the increase in bike boardings even more remarkable.

Another program showing continual growth in people biking is Houston's Bike Share, described in more detail on the following pages. In the first four months of 2015 over 28,000 trips were taken on the system, a 23% increase over the same period in 2014 despite no additions of stations or bikes. Usage continues to grow and the system regularly exceeds 2,000 checkouts per week. An all-time record of 3,250 trips was set during the last week of March 2015.

Participating in organized rides is often times a first step to riding more often for recreation and transportation. For those who do not own a bike, the bike share program allows them to participate in organized rides and other activities.



Sunday Streets

Source:
Go Healthy Houston
Office of Mayor Parker
Houston Bikeway Program

Existing Bike Programs & Events

Another way to assess the amount of people biking in Houston is to look at the existing involvement in bicycle programs and events. The City of Houston has been influential in promoting bicycling as a form of recreation, transportation, and a component of community health through various initiatives, programs, and events such as Sunday Streets and Bike to Work Day. Go Healthy Houston is an initiative that was launched by Mayor Annise Parker in 2012 to raise awareness of the health risks of obesity. In 2014, Go Healthy Houston. a task force of City departments and community leaders launched Sunday Streets, a pilot program that received corporate sponsorship by Cigna in 2015. During Cigna Sunday Streets, a segment of a major street in a neighborhood is closed off to automobile traffic for a four-hour period to create a family-friendly environment for people to walk, bike, play, and socialize. It has been an incredibly successful program with over 26,000 attendees estimated at some events. These events allow participants to enjoy the streets in a unique way, and diminish common safety concerns that are present with automobile traffic. According to Go Healthy Houston's website, this program has the potential to influence people's behavior as roughly half of participants say they are more likely to walk or bike to neighborhood destinations after attending.

National Bike to Work Day has a much different target audience than Sunday Streets, but a crucial one that encourages more people to commute by bike. 2015 marks the 15th year that the City of Houston has hosted a Bike to Work Day event, which traditionally begins with a celebratory bike ride near Downtown Houston, followed by festivities outside City Hall.

Management districts, bike shops, and community organizations have been influential in helping to coordinate these efforts, and their partnerships are essential

in reaching the general population in such an expansive city. For example, the Energy Corridor District hosts its own Bike to Work event, where designated "Bike Champions" lead groups on bike routes. The District has bike jerseys for purchase, receives sponsorships, and hosts Lunch & Learn events for area employers on bicycle instruction and safety. On a smaller scale, bike shops serve as meeting points for group rides in the City's celebratory Bike to Work Day ride, and can be a vital location for information dissemination for outreach and education.

Houston's bike share program, known as Houston B-cycle, improves bicycle access to the public by offering bike rentals at 29 locations throughout central Houston. B-cycle offers daily, weekly, and annual rates that allow for 60-minute trips between stations. The program launched in May 2012 with the introduction of three bike stations in Downtown Houston. Within three years, the program has increased to 29 stations and 200 bikes, and has a goal to expand to 1,000 bikes and 100 stations by the end of 2017. Each new station increases the program's usefulness while providing more connections and opportunities for more people and more destinations. Neighborhoods that now have access include Downtown, Midtown, Montrose, Third Ward, East End, and Memorial Heights.

The dynamic population of Houston riders is also influenced by the numerous organized, community, and social bike rides with



Figure 2.5: Houston B-cycle Station Map

differing purpose, culture, size, and location. These rides include BP MS 150, Critical Mass, Kidical Mass, Bayou Bikers, Karbach Brews Cruise, Crucial Matter, among many others. While some are highly organized rides, such as Tour de Houston and BP MS 150, community-based bike shops and social media have made it easy for communities to form social rides that are tailored to their needs, level of ability, and interests.



Houston Critical Mass

Sources:
Chip Gates
UWire, 7/29/2013

The Tour de Houston highlights a new route each year to showcase Houston neighborhoods. The 20, 40, and 60-mile ride is a BP MS 150 approved recommended ride. The ride has grown to more than 6,000 riders from the city and region.

The BP MS 150 is an example of a major organized ride as it is the largest charity ride in the U.S. This 160-180 mile, two-day bike ride (organized by the National MS Society South Central Region) starts in Houston and ends in Austin. An estimated 13,000 cyclists participated in the 2015 event, which was the 31st annual ride since it began in 1985. The annual event has been impactful by increasing bike ownership in Houston, creating a culture of cycling for sport, and raising awareness of bike safety and maintenance.

Critical Mass is a monthly cycling event that originated in San Francisco in 1992 to build support and awareness for people who bike, and has since spread to cities worldwide. The culture of these monthly bike rides varies across cities, and the Houston Critical Mass is typically a "casual, fun" event. There is no formal organization or membership, but it is estimated to attract 1,000 to 3,000 participants, who congregate in downtown Houston at Market Square on the last Friday of each month.

Due to the large number of participants, the ride may be slow paced and inclusive for a wide range of experience and comfort levels. Since 2014, Critical Mass leaders have been coordinating with the Houston Police Department to improve safety conditions of the ride. This social ride remains a symbol of the growing interest in streets where people on bikes are welcome.

Significant Potential For Growth

At the same time that cycling has grown significantly over the past decade, it remains a relatively small share of the mobility picture in Houston. There are many reasons to

believe that there is significant potential for growth. The Bike Plan is an opportunity to set a path to capture the latent demand among the large segment of the community who are interested in bicycling for more of their trips but currently do not.

National trends for bicycling in cities across the US and the world show rates increasing, with the ACS data for the 70 largest US cities seeing bicycle mode share increase an average of 85% from 2000 to 2012. The average mode share in these large cities is 1.1%, more than double the current mode share in Houston, which is 0.5% (See Fig 2.1).

As discussed earlier, home-to-work commuting is less than 15% of all trips made in Houston and the mode share calculations likely undercount the rate of people biking in Houston. Overall, a much larger percentage of people report biking for some of their trips, with 13% of people biking for one or more trips per week in the most recent 2009 National Household Travel Survey. Providing more people with safe, comfortable options to bike has the potential to significantly increase the level of usage in the City.

Houston is a rapidly growing and evolving city. Figure 2.7 on the following page shows how the population density in Houston has changed from 1990, approximately when the last Comprehensive Bikeway Plan was developed, to 2013. Over 430,000 people have moved to Houston over that time, a growth rate of 6% per year.

Density is simply a way of showing the amount of something (e.g., population, jobs) that exists in a defined area. By providing more things closer together, denser neighborhoods allow for shorter trip distances and support a broader range transportation options. Many of the current higher density areas did not have the same level of activity the last time the Bikeway Plan was updated.

The preference for higher density neighborhoods is partly driven by the high percentage of residents between the ages of 18 to 34 moving to urban areas. The percentage of residents in Houston within this age bracket, often called the Millennials, is 29%, which is higher than the national average of 23%. Millennials are the largest age cohort within the City. (Figure 2.6)

Baby Boomers, people ages 50-69, also represent a large cohort (19% of the population). They have shown some preference for the amenities available in more urban settings, particularly among people looking to downsize their homes as children have grown and moved away. A recent survey by the Urban Land Institute showed approximately half of these cohorts support more bicycle lanes in their communities (AMERICA IN 2015: A ULI Survey of Views on Housing, Transportation, and Community; Pg 17).



Bicycle maintenance and repair classes encourage safe riding

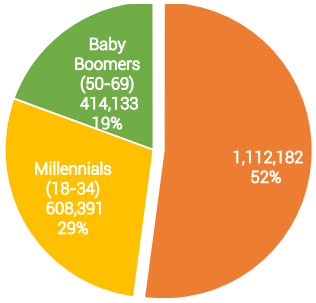
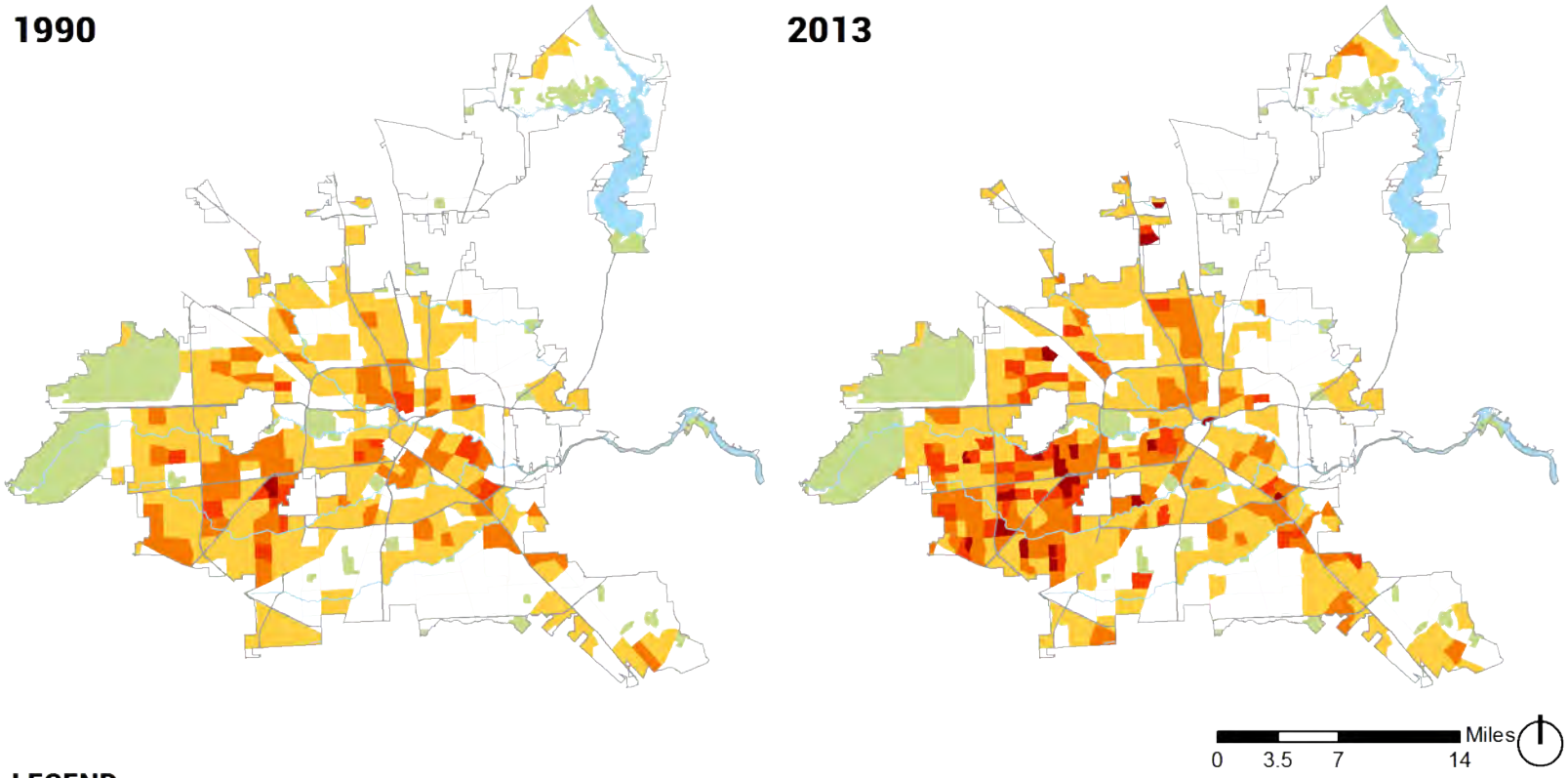


Figure 2.6 Houston's Largest Age Cohorts: Baby Boomers and Millennials

Figure 2.7: City of Houston Population Density: 1990 and 2013



Source: US Census Data, ACS (2013), US Census Data (2010)



Map Locater

Who Bikes in Houston?

To get an understanding of the potential to increase bicycle usage in Houston, it is important to understand demographic trends as well as the various types of people who may be looking to ride. In 2012, Portland State University and the Portland Bureau of Transportation developed a breakdown of people into "Four Types of Bicyclists". This was used to better understand the potential for bike usage in the city and has since been repeated in other cities like Austin, Texas.

These studies, including the data from Portland and Austin shown in Figure 2.8, have found that two to four percent of the population is made up of "**Strong & Fearless**" riders who will ride regardless of the extent and quality of existing bicycle facilities. 9%-16% percent of people are "**Enthused & Confident**" riders who will ride with basic bicycle facilities, such as bicycle lanes, but prefer to avoid sharing the road with traffic if possible.

Another 31%-44% percent of people, in the "**No Way, No How**" category, will not or cannot consider riding a bicycle under any circumstance. The fourth category represents the largest potential for growth of people bicycling. Between 39%-56% percent were classified as "**Interested but Concerned**" meaning that they would be willing to ride a bicycle, or ride more often, if conditions were improved and they felt more comfortable.

It is likely that people in the Strong & Fearless and Enthused & Confident categories make up the majority of frequent riders in Houston today, particularly people riding on city streets. People bicycling who are in the Interested but Concerned category are increasingly drawn to attractive trails segments along the bayous and other corridors. The lack of a well-connected network, as described in the next section of this report, limits the level of biking in Houston or leads people to load their bikes on their car to ride in comfortable locations.

It is worth noting that people who bike because other transportation options are limited might fall into any one or several of these categories. For instance, some riders might appear 'Strong & Fearless' and bicycle on streets with heavy vehicular traffic out of necessity, but they may also be 'concerned' about their safety and have limited transportation choices.

By defining a broader network that connects many of these comfortable bikeways with neighborhoods, activity centers, and each other, the Bike Plan can lay the groundwork for continued growth of bicycling in Houston and provide more transportation options for the broad and diverse set of people who are concerned about riding in Houston today.

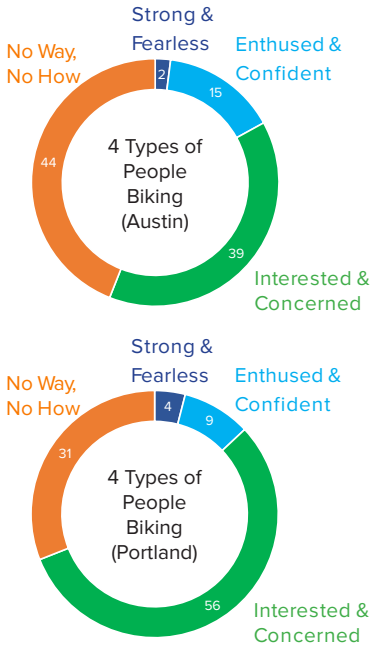


Figure 2.8: Population Breakdown of the Four Types of Bicyclist for Austin and Portland; Percent (%)

Women's Group Ride







Bike Routes on South Boulevard (top) and Griggs

The Existing Bikeway Network

This growth in people biking is happening on existing streets and bicycle facilities. As of Spring 2015, the existing Houston bikeway network is comprised of 498 miles of designated bicycle facilities and routes. This figure and the subsequent analyses include all designated facilities and routes within the City of Houston limits as well as any that pass outside the city but provide a link between Houston bikeways. An additional 50 miles of facilities located proximate to but outside the city limits are shown on the maps but are not included in the analysis.

The Houston Bikeway Program currently classifies facilities into one of six categories: shared-use trail, bike lane, signed bike route, signed shared roadway, cycle track, or other trail.

In the case of on-street facilities, the distinctions between these categories are drawn based upon the technical features of the facility type. Signed bike routes are designated by "bike route" signs only, while signed shared roadways also feature "sharrow" pavement markings. Bike lanes are separated from vehicle traffic by a white stripe while cycle tracks have a buffer and some physical feature to provide separation.

Rather than physical features, the difference between shared-use trails and other trails has to do with jurisdiction; other trails are maintained by entities other than the City of Houston.

While these categories provide a general idea of the type of provisions a person on a bike can expect along city roadways and bikeways, they have some limitations. Variation in condition and comfort within a category can result in vastly different experiences. For example, South Boulevard and Griggs Road, pictured at left, are both classified as bike routes. South Boulevard is a quiet, neighborhood street with low traffic volumes and speeds. Most bicyclists, including children, are likely to find this a comfortable and pleasant environment to ride. Griggs Road, meanwhile, is a four-lane, 40 mph thoroughfare. Only cyclists confident enough to ride in the vehicle lane alongside high-speed traffic will consider this a usable facility.

A person's decision of whether or not to bicycle on one of those streets wouldn't depend on the type of signage and markings provided, but rather the level of safety and comfort they felt using it. Concern about traffic is the most frequently cited factor that prevents people from bicycling, so it is important to understand which facilities provide a level of comfort that makes them appealing to most people who bike or are interested in biking.

Systems have been developed to objectively categorize facilities by level of traffic stress, or the inverse Level of Comfort (LoC). Some approaches utilize vast quantities of data to make these assessments. The

Figure 2.9: General Guideline for Level of Comfort Assessment of the Existing Bikeway Network



Minetta Transportation Institute developed the report "***Low-Stress Bicycling and Network Connectivity***" in 2015 utilizing a more balanced quantitative and qualitative approach that leveraged existing roadway data and information on the existing bicycle facilities to develop a rating from 1 (high LoC) to 4 (lower LoC) for each roadway or bicycle facility. This approach has been refined and utilized by the Houston Bike Plan study team to assess Houston's existing bikeway network. The general characteristics for bikeways for each LoC classification are shown in Figure 2.9. Quantitative site visits, safety data, and an assessment of surrounding land use context were used to classify existing bikeways. The 4 categories of Level of Comfort are described below:

LoC 1 facilities present very little stress and provide a relaxed riding experience. They are suitable for all people who bicycle including children who have been taught to cross intersections safely.

LoC 2 facilities require occasional interaction with calm, low-speed traffic and more attention than might be expected of children, but are still comfortable for nearly all adults who bike.

LoC 3 facilities involve more interaction with cars but still provide an exclusive riding zone when alongside multilane and/or moderate-speed traffic. These are still welcoming to many people who currently bicycle in the city.

LoC 4 facilities are all those beyond LoC 3. They require interacting with multilane and moderate to high-speed traffic and are unlikely to appeal to anyone but the strongest and most fearless cyclists or those that do not have alternatives to riding on these corridors. This can include people that do not have access to a personal vehicle and use their bicycle as their primary transportation mode, or out of necessity. This is an important consideration in developing a bikeway network that supports a diversity of transportation needs and choices.

Bikeway Types

In order to better associate bicycle facility types and map symbols with the type of bicycling experience they represent, the existing bikeway network was mapped by defining bikeways that incorporate both the facility type and the Level of Comfort. This analysis helps communicate to people interested in biking where they are most likely to find routes that are tailored to their desired riding experience. It also can show gaps in the existing network where people transition between bikeway segments of different comfort levels while traveling along a route.

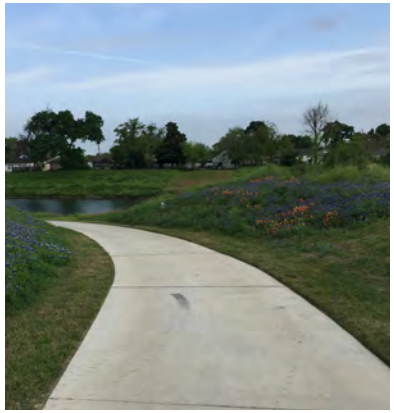
Figure 2.10 maps the existing bikeway network according to these bikeway categories. Consistent colors have been used for the three main categories of bikeways with darker shades aligned to higher levels of comfort. This allows simpler trip planning for people biking as they can select the routes that are most appropriate for their skills and experience. The bikeways are designated as shown in the following pages. There are also many local streets with low traffic volumes and speeds that have not been designated on the citywide bikeway network that are also comfortable places to bike. Some of these that serve as key connections in the citywide plan will be identified as part of the HPB. Neighborhood level planning should identify additional connections in the future. Bikeway types are discussed in more detail on the following pages and in **Chapter 4: Bicycle Toolbox**.

Bikeway Types

Off-Street

High Comfort Walk/Bike Path

Off-street facility shared by people biking and walking. Street crossings are few, and those that exist are safe and easy to cross.



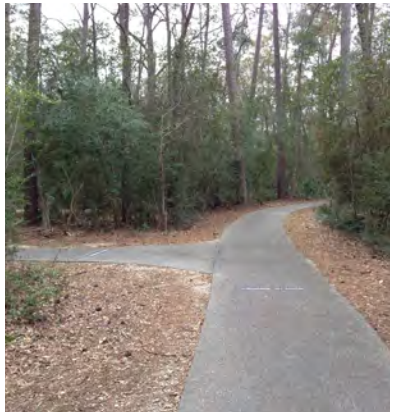
Shared-Use Walk/Bike Path

Off-street facility shared by people on bike and on foot. May include frequent driveway crossings and/or unprotected crossings of wide streets.



Shared Sidewalk

Sidewalk designated for bicycle use as well as foot traffic but too narrow to be considered a shared-use path (less than 8 feet wide).



On-Street Designated

Separated Bike Lane

Dedicated on-street space for bikes separated from traffic with a buffer and other physical delineation.



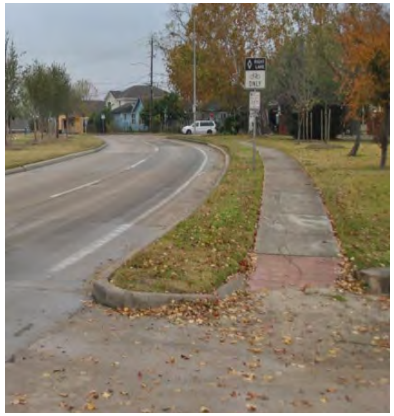
Bike Lane

Dedicated on-street space for bikes separated from traffic with painted markings.



Low-Comfort Bike Lane

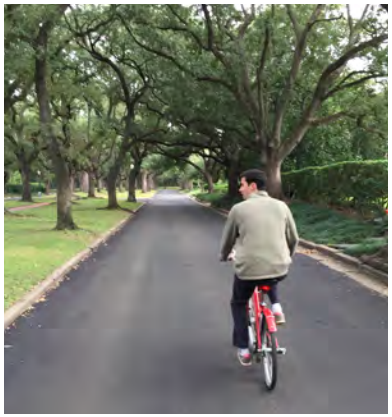
Dedicated on-street space for bikes separated with a white stripe. May be extremely narrow and/or located on a high speed, high volume street.



On-Street Shared Roadway

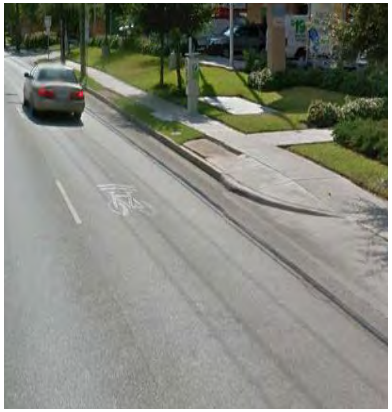
Neighborhood Bikeway

Low speed, low volume residential street shared by motor vehicles and bikes. Marked with "bike route" signs. These are a subset of Signed Bike Routes on the existing City map.



Shared Lane

Lane shared by motor vehicles and bikes. Marked with "share the road" signs and "sharrow" pavement markings.



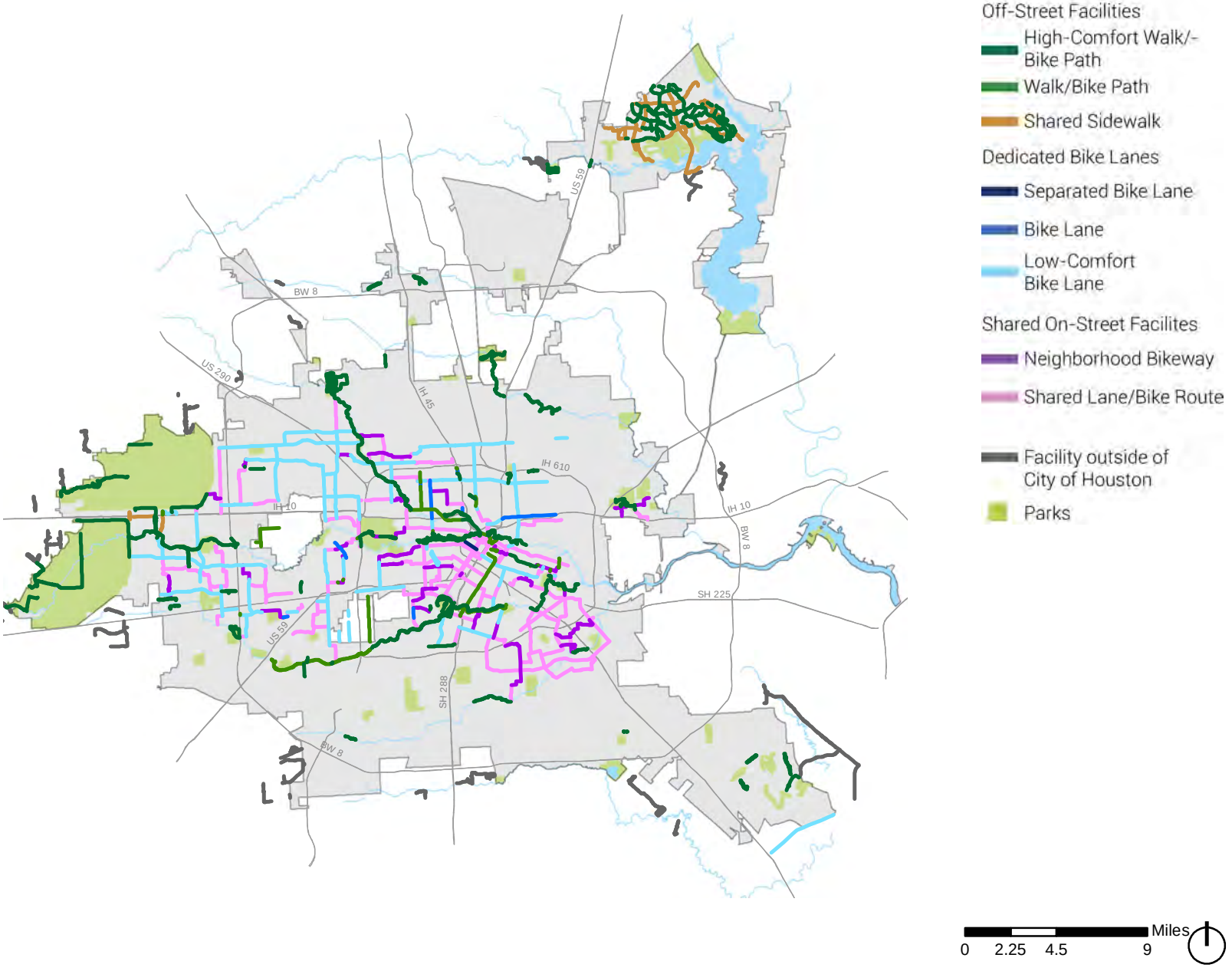
Signed Bike Route

Street shared by motor vehicles and bikes. Marked with "bike route" signs.



Shared lanes and signed bike routes are symbolized in the same color as the qualitative differences are not significant.

Figure 2.10: Existing Houston Bikeway Network



Source: Houston GIMS; Team Analysis & Site Visits

About 45% of the existing network is off-street and 33% is in lanes shared with cars.

Less than half of the existing network provides a level of comfort that would appeal to an average adult who bikes.

Figure 2.11 breaks down the total mileage of facilities in the network. Length is measured by centerline miles, i.e., a two-way street that is one mile long with a bike lane in each direction counts as one mile of bike lane.

Of the roughly 500 miles of total network, 45% consists of off-street bikeways, 22% is dedicated bike lanes, and the remaining 33% is shared roadways with motor vehicles in the form of bike routes and shared lanes. This data also shows that many of the existing bikeways are not higher comfort facilities, including the majority of existing bike lanes and signed bike routes. This limits the range of people who ride in the city. While the scope of the Bike Plan is focused on a citywide bikeway network, there are very comfortable facilities in each of these bikeway typologies which can serve as key neighborhood connections, in particular low volume neighborhood streets that link to regional bikeway corridors like the bayou trails.

Figure 2.12 shows the existing Houston bikeway network with the LoC 4 facilities removed. This represents the network that most "Enthused and Confident" cyclists but few "Interested but Concerned" cyclists would likely be most comfortable using.

Without the low-comfort facilities, most of the existing bike lanes and shared lanes disappear, as well as bike routes on multilane streets. The remaining network is fragmented and discontinuous, limiting people's ability to make many trips and likely the overall usage of the bikeway network. Continuity is particularly impacted in the outlying areas of the city where existing routes rely on narrow (less than four feet) bike lanes on fast, multi-lane streets. Even closer in, bikeways near the Uptown area become isolated and access to Downtown from the south is lost. Greenway Plaza is not connected at all.

Figure 2.11: Network Mileage and Level of Comfort

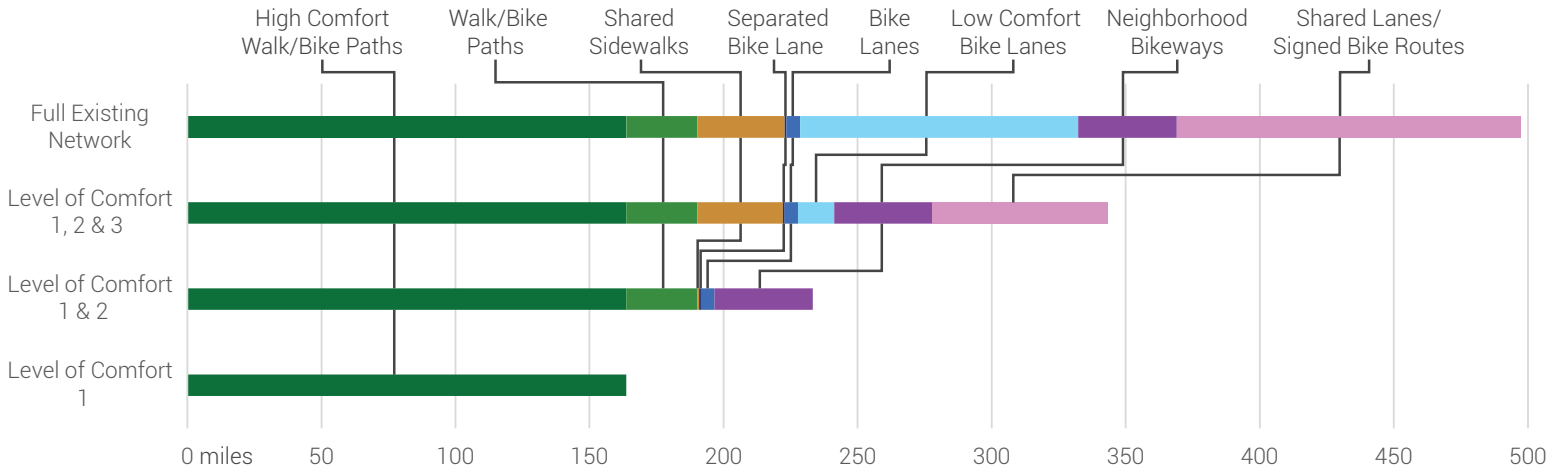
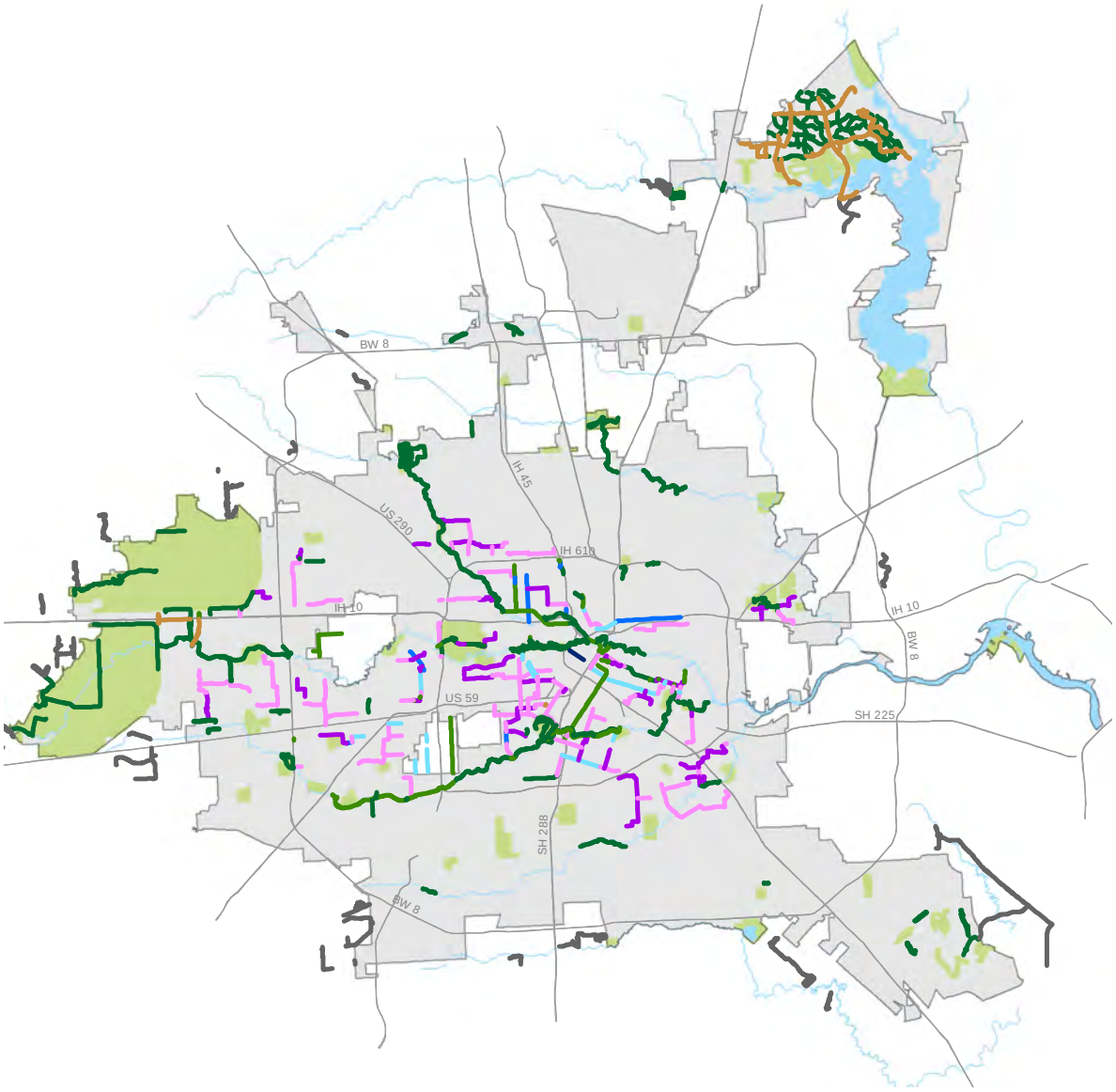


Figure 2.12: Existing Moderate to High Comfort Facilities (Level of Comfort 1, 2, 3)



LEGEND

Off-Street Facilities
- High-Comfort Walk/-Bike Path
- Walk/Bike Path
- Shared Sidewalk

Dedicated Bike Lanes
- Separated Bike Lane
- Bike Lane
- Low-Comfort Bike Lane

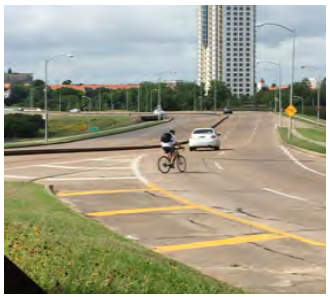
Shared On-Street Facilites
- Neighborhood Bikeway
- Shared Lane/Bike Route

- Facility outside of City of Houston
- Parks

0 2.25 4.5 9 Miles

Source: Houston GIMS; Team Analysis & Site Visits





Top: Buffalo Bayou near Tony Marron Park
Bottom: Waugh Street Overpass at Memorial Drive

Figure 2.13: Network Mileage and Dedicated Facilities

The middle bar of Figure 2.13 shows the two-thirds of the network not shared with cars. Among these dedicated bicycle (and bike/ped) facilities, many were not designed to current guidelines set by the National Association of City Transportation Officials (NACTO) and the City of Houston's current Infrastructure Design Manual (IDM). The NACTO Urban Bikeways Design Guide and IDM specify that bike lanes should be at least five feet wide and that shared-use paths should be a minimum of ten feet wide though wider is typically desirable.

Figure 2.13 shows the extent of facilities that meet these guidelines for width, less than half of the total dedicated facility mileage. A large share of bike lanes in Houston were retrofitted on boulevard thoroughfares with a 24-foot pavement width. Narrowing the vehicle lanes from 12 to 10 feet allowed the striping of a 4-foot bike lane, below current standards. The shared-use paths and shared sidewalks that don't meet AASHTO or NACTO standards are primarily located in Kingwood, a planned community that integrated trails into its design. These trails were largely designed to the standard for walking but have been designated as bicycle facilities on the City Bikeway maps.

Figure 2.14 shows the network with LoC 3 and LoC 4 facilities removed. This excludes all signed bike routes that aren't on quiet residential streets. What remains are the routes that would appeal to most people who bike. The expansion of these facilites to form more of a network is most likely to attract new people to ride.

The high-comfort bikeways currently do not function as a network since very few connect beyond a particular bayou corridor or neighborhood. For the majority of people who bicycle, or are interested in bicycling, opportunities to make useful trips are limited since most daily activities and destinations are not located directly on bayous. Some high-comfort facilities connect to the edge of activity centers like Downtown, Uptown, and the Texas Medical Center, but few actually serve the hearts of these areas.

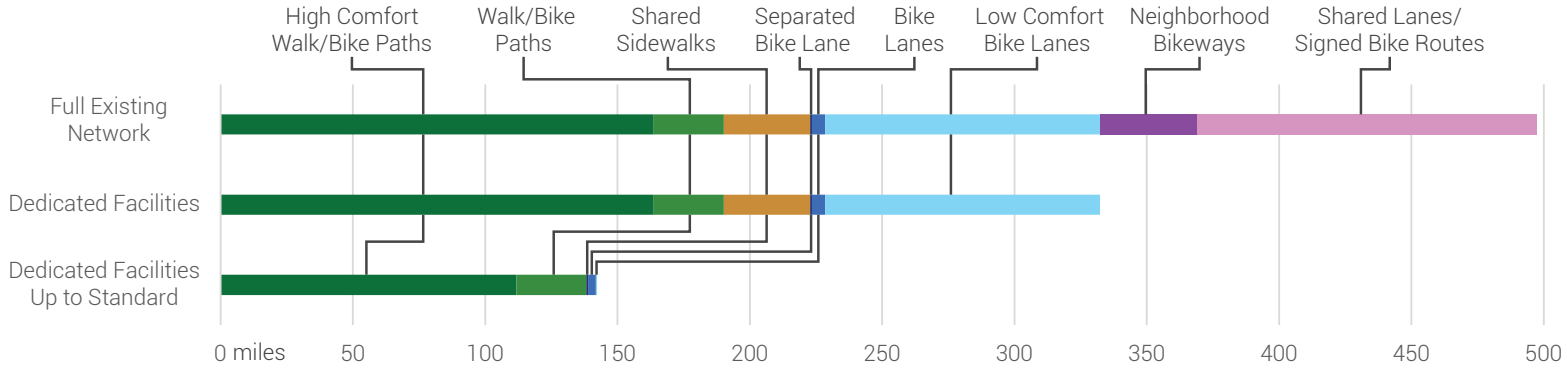
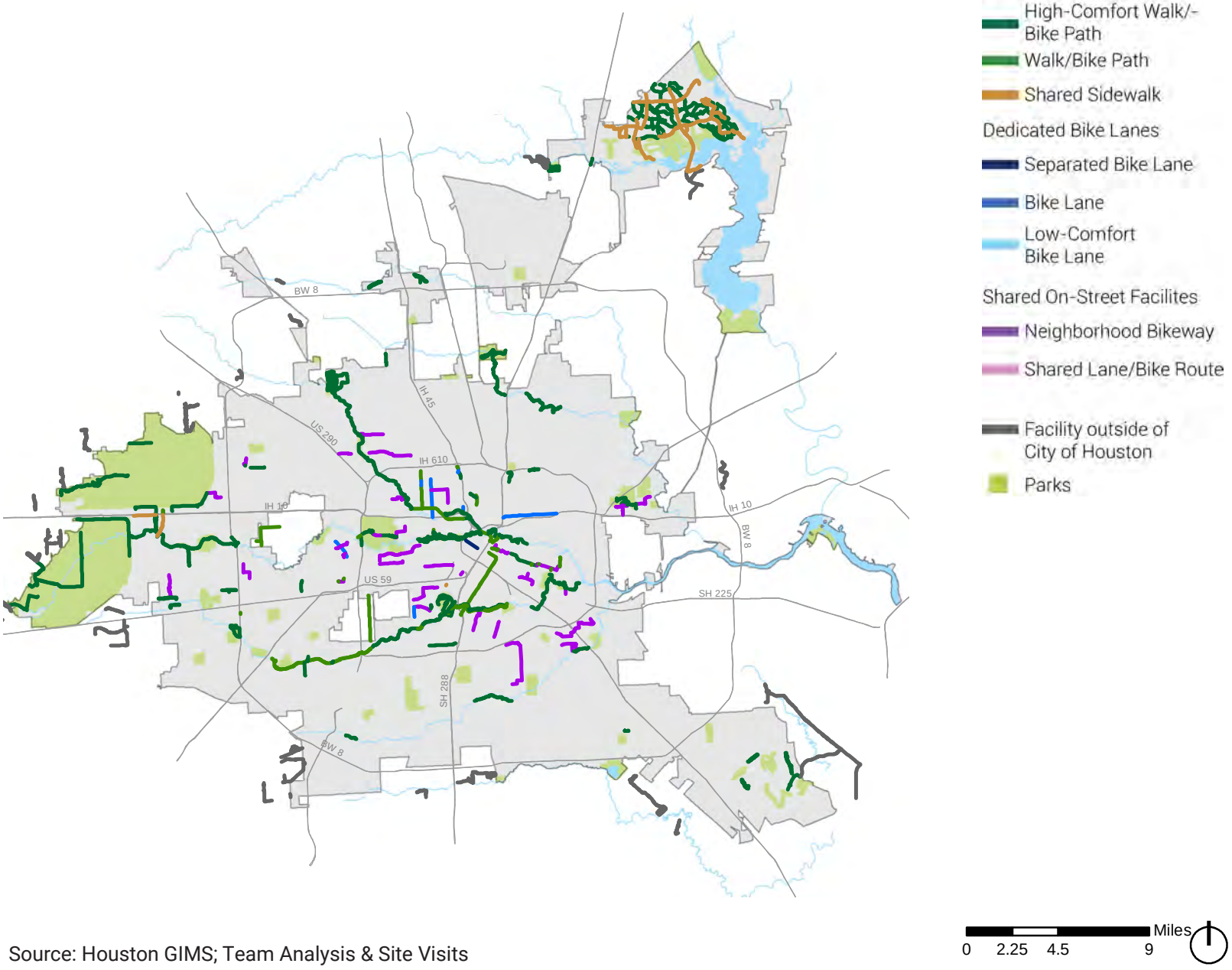


Figure 2.14: Existing High Comfort Facilities (Level of Comfort 1, 2)



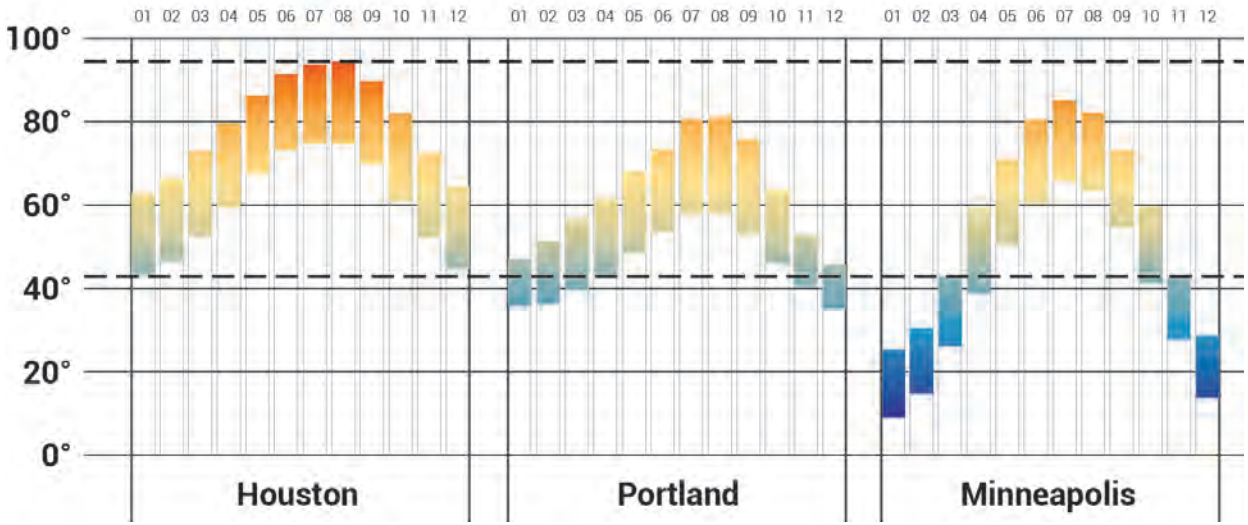
Source: Houston GIMS; Team Analysis & Site Visits

Climate and Geography

Houston benefits from a climate that makes bicycling possible throughout most of the year. Outside of the summer, approximately three months out of the year, Houston offers nine months of comfortable bicycling weather. Houston is ranked number 52 of U.S. cities with the highest percentage of bicycle commuting. Of the top five, Houston's climate is most comparable to Washington D.C. (ranked third), with temperatures that reach into the 90s (degrees Fahrenheit) in the summer (see graph below). But unlike Washington D.C., Houston's temperature rarely drops below 40 degrees in the winter. The lack of snow makes Houston winters very manageable for bike commuters. However, thermal comfort level may not be a primary deciding factor for people. Minneapolis, the U.S. city with the second highest percentage of bike commuters, maintains high ridership during extreme winter conditions with average temperatures below 20 degrees.

Regardless, Houston is well positioned to support bicycling based on its natural geography. In addition to Houston's bicycle friendly climate, the City's flat terrain makes most bicycling trips relatively easy. Looking again at a comparison between the top five bicycle commuting cities, Houston's elevation has the shortest range, from sea level to 83 feet. Portland and San Francisco's elevation ranges are close to 1,000 feet. Steep hills can present challenging conditions for bicyclists, and may discourage those who are less experienced. This is rarely a concern in Houston neighborhoods.

Monthly Climate Normal Temperatures (1981-2010): Houston and the Top Five U.S. Cities by Percentage of Bike Commuters



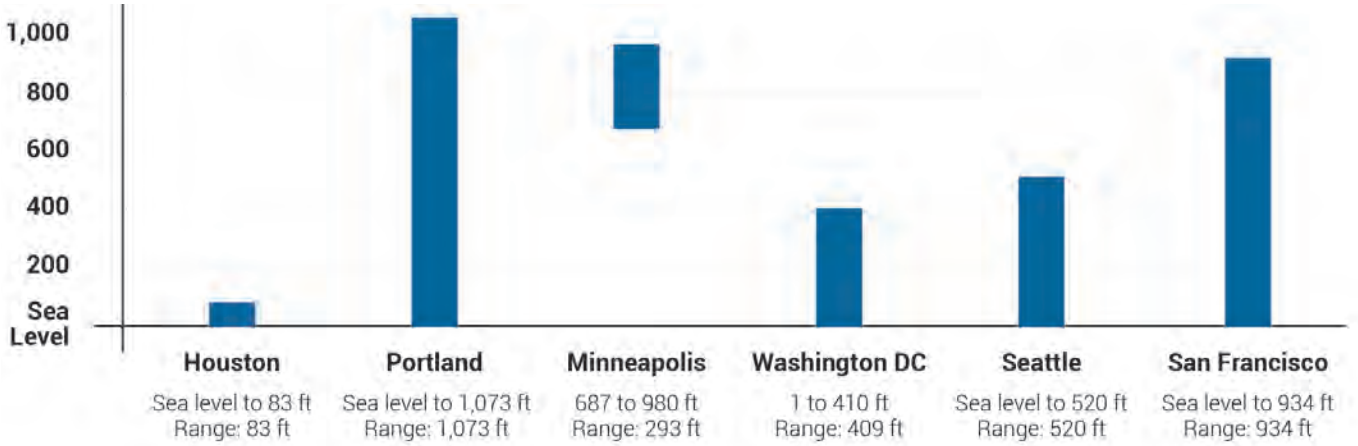
Sources:

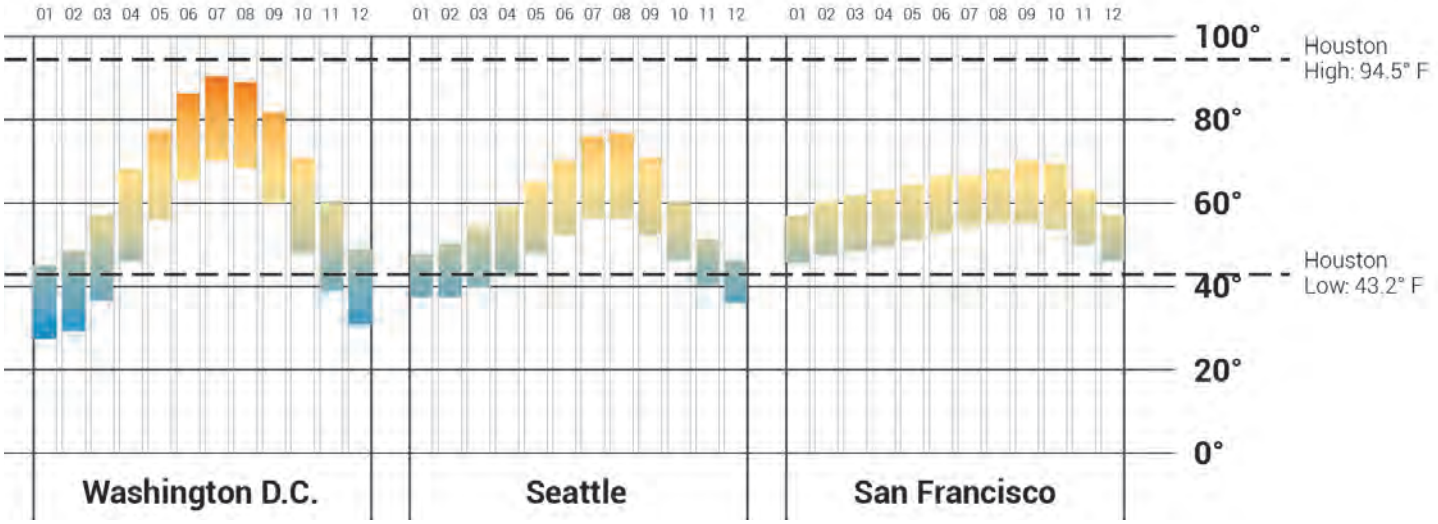
National Oceanic and Atmospheric Association, National Climatic Data Center / The 1981-2010 Climate Normals are NCDC's latest three-decade averages of climatological variables, including temperature and precipitation.

League of American Bicyclists, 2013 American Community Survey Data Report

U.S. Geological Survey

Elevation Range: Houston and the Top Five U.S. Cities by Percentage of Bike Commuters





In the 2014 Houston METRO Bike & Ride Study for over 1,100 people surveyed, the lack of safe bicycle facility and general safety were the top two barriers to people increasing their bicycle use.

Safety for All Road Users

Safety, or a perceived lack of safety, is typically cited as a top impediment to more people biking. The development of a safer citywide bicycle network is a critical outcome of the Bike Plan.

Data from the League of American Bicyclists gathered as part of Houston's designation as a Bronze-level Bike Friendly City indicates that Houston's bicyclist safety rate is below many national peers. This is measured by the number of fatalities over a three year period per 10,000 bicyclist commuters.

To assess more closely where bicycle related crashes have occurred in Houston, historical data was obtained for all recorded crashes within the City from 2010 through 2014, although there were likely more crashes that were never reported. Over that period, there were 1,509 documented crashes in the City of Houston, 0.6% of all documented crashes over that time. This rate is slightly higher than the bicycle commuter 0.5% mode share in the City. 67% of all crashes occurred at intersections where conflicts with vehicles are likely to be highest.

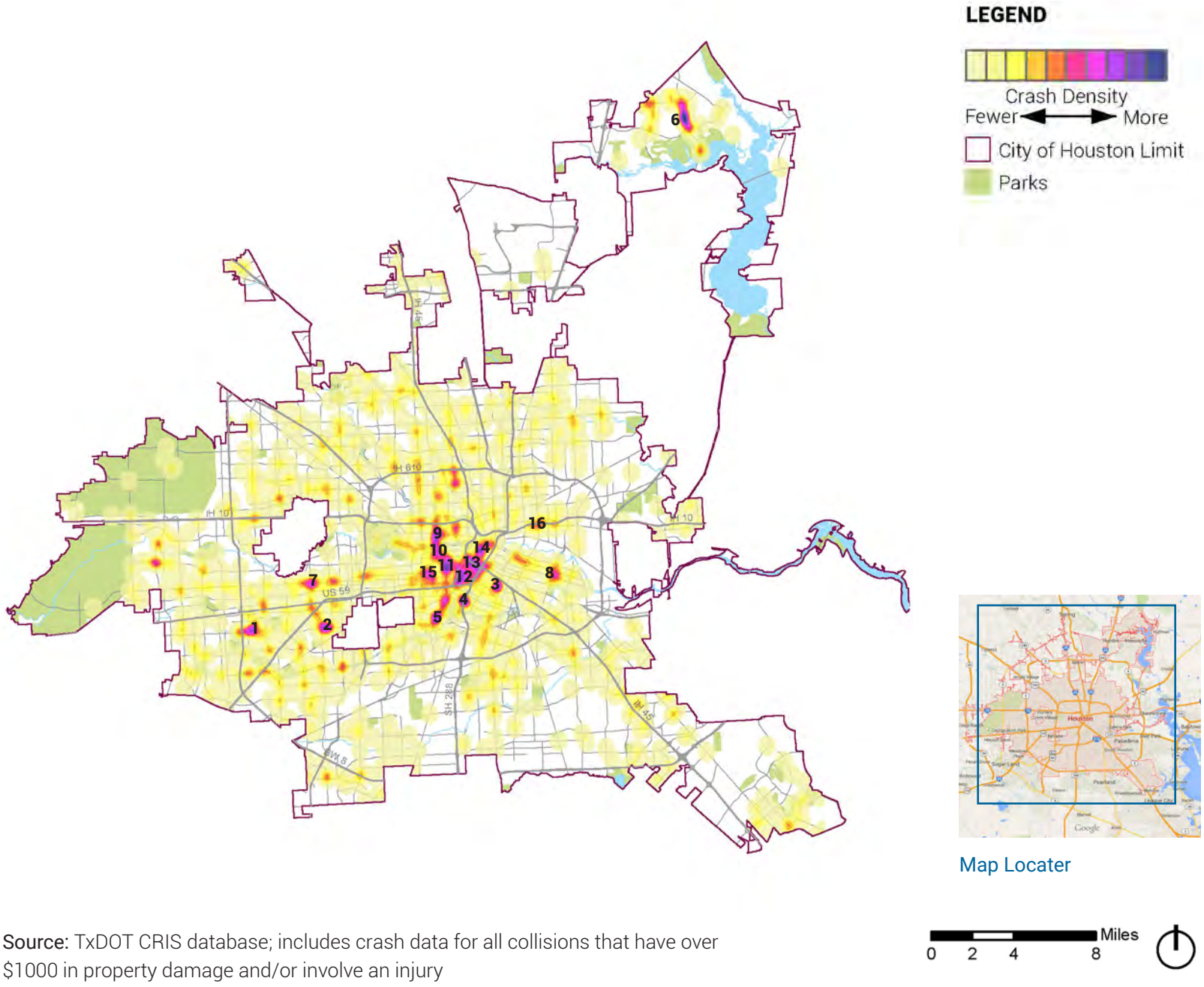
All bicycle crashes were mapped to identify clusters of crashes. Figure 2.15 includes the crash density of all crashes involving a bicycle within the city. Given the lack of systemic bicycle count data, the crash density does not normalize the number of crashes to the actual rate of bicycling at a local level. What the map can be used for is to assist with identifying the areas with a higher concentration of crashes that should be closely assessed as part of the development of the Bike Plan.

Sixteen higher crash regions were identified in the city. Each of the high crash regions included over 10 crashes within a ½ mile diameter area. These regions are depicted by the darker purple colors on the map which are primarily clustered in the areas near and west of downtown and other dense locations like Gulfton and Alief.

Areas with 10+ Crashes (2010-1014)

1. Bellaire and Corporate - Chinatown
2. Bellaire and Renwick – Gulfton/Sharpstown
3. Scott Street between 45 and Elgin
4. 3rd Ward – Riverside Terrace
5. Med Center
6. Kingwood – Kings Crossing – Along Lake Houston Parkway
7. Westheimer and Voss/Hillcroft
8. Wayside and Canal – Magnolia Park
9. Waugh – North of Buffalo Bayou
10. Waugh – South of Buffalo Bayou
11. East Montrose
12. Midtown
13. Downtown – Pierce Elevated
14. Downtown
15. Woodhead/Dunlavy – Lanier Middle School
16. Lockwood and IH10 – Denver Harbor/Port Houston

Figure 2.15: Bicyclist Crash Density Map (2010-2014)



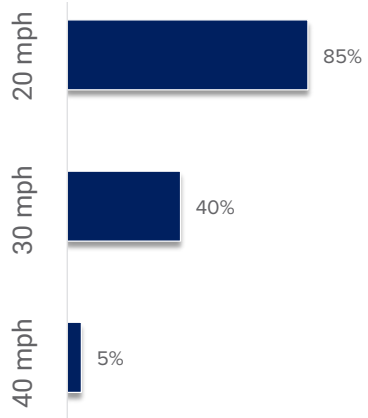
Source: TxDOT CRIS database; includes crash data for all collisions that have over $1000 in property damage and/or involve an injury

There have been a total of 25 bicycle fatalities in the 5 year analysis period. The location of these are shown in Figure 2.16. As shown in the map they are widely distributed across the city. While there is a range of specific causes for the crashes, all fatality crashes occurred when the speed of the vehicle was reported as 30 mph or over, and 84% of the fatalities resulted from a crash with a reported speed of 35 mph or over. Speed differential is one of the main factors in the severity of crashes.

In response to the terrible impact of these incidents, the City of Houston and BikeHouston partnered to launch the Goal Zero Campaign. The campaign works to educate both people who drive and those who bike about how to be safer when using and sharing the road. One of the key focal points of the Goal Zero campaign is the development of the Bike Plan to identify strategies and improve bicycle infrastructure to increase safety and eliminate bicycling fatalities. In addition, the Houston Police Department produced a Public Safety Announcement on Bicycle Safety, increased training levels, and conducted crime prevention operations.

The Bike Plan can develop plans, policies, and programs that build on the work of BikeHouston and the City to make traveling around the City safer for all users.

% Chance a Person Would Survive if Hit by a Car Traveling...



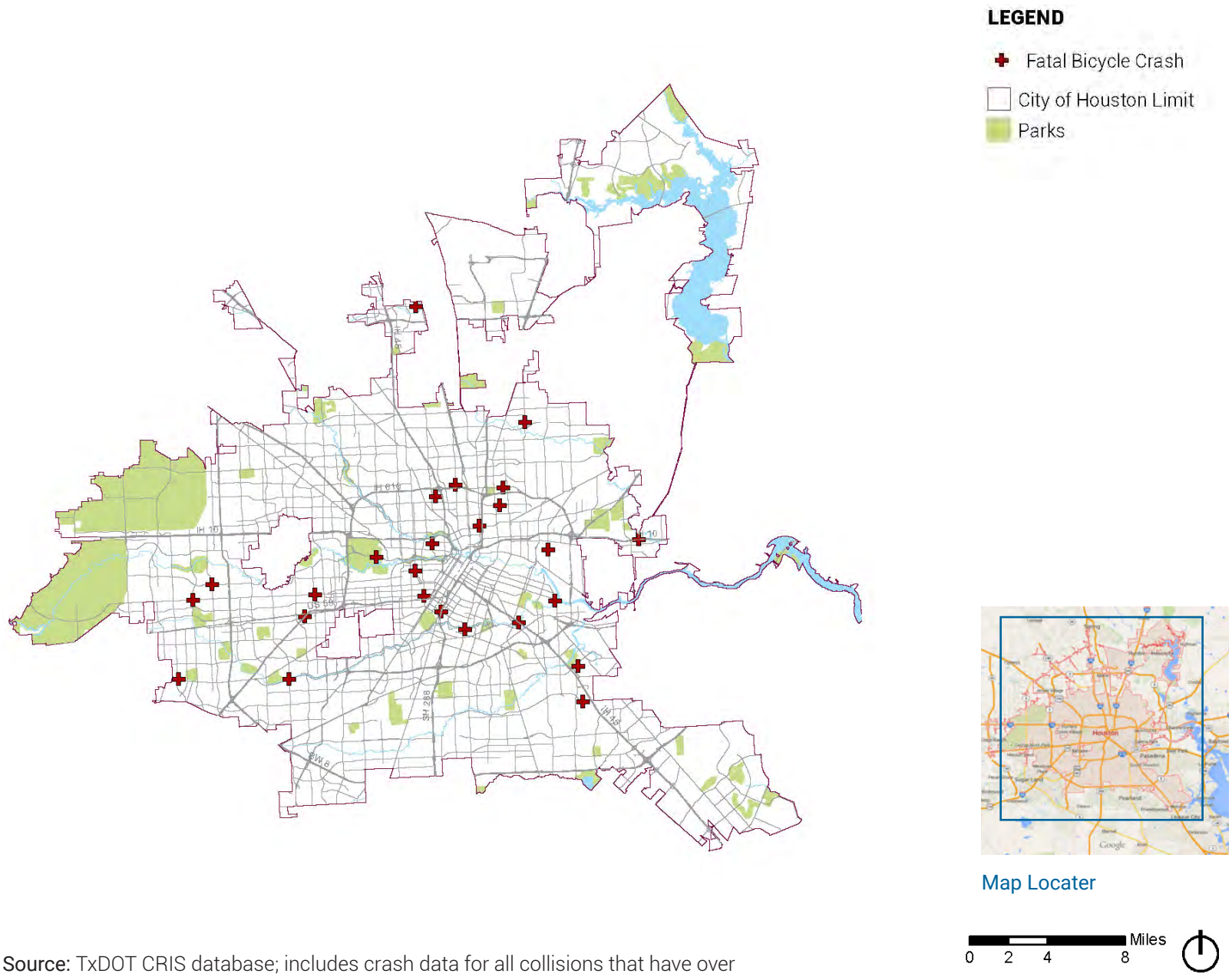
Goal Zero Lifesavers for drivers:

1. Follow the law. Speeding and driving under the influence puts lives at risk.
2. Motor on, cell phone off. No texting while driving. It can wait, Houston!
3. Give cyclists enough room. Houston law requires 3 feet or more.
4. Intersections require special attention. Always scan carefully before proceeding.
5. Never open a car door without looking for passing traffic.

Goal Zero Lifesavers for cyclists:

1. Follow the law. Cyclists have the same rights and duties as drivers. Always ride with traffic, in the right lane closest to the curb, unless needed to use the left lane for a left turn. Stop when required.
2. Be predictable. Make intentions clear to everyone on the road. Ride in a straight line and don't swerve between cars. Signal and check before changing lanes.
3. Be extremely visible. Use bright white lights on the front of the bicycle and bright red lights on the back, and reflectors. Bright, reflective clothing should be worn.
4. Think ahead. Plan your route carefully to avoid dangerous streets. Narrow, busy streets with fast speed limits are particularly dangerous. Watch for car doors being opened, road hazards, and drivers' next moves.
5. Be ready. Check that tires are properly inflated, brakes are working, the chain is running smoothly, and quick release levers are closed. Leave the earplugs and mobile phone off while cycling. Fewer distractions and the ability to listen will reduce risk substantially. Always wear a helmet.

Figure 2.16: Location of Bicycle Related Fatalities (2010-2014)



Source: TxDOT CRIS database; includes crash data for all collisions that have over $1000 in property damage and/or involve an injury

AN OPPORTUNITY TO...

PROVIDE AFFORDABLE ACCESS TO GREATER OPPORTUNITIES

A well-developed bicycle network can be liberating to people by providing a low-cost transportation choice to access key destinations that may be outside of an easy walking distance. Over 40% of all trips across all modes made in Houston are under three miles, the distance that most people on bicycles can comfortably cover in 15 minutes (12 miles per hour). Many of these short trips are home-to-work trips, but an even larger amount are to locations like schools, parks, libraries, shopping centers, transit, and other frequent destinations.

As shown in the previous section, the existing bikeway network has many gaps that make these connections difficult. Implementation of the Bike Plan can significantly increase the benefit for people biking, and increase the overall number of bicycle trips by developing an improved bicycle network that better serves more of these destinations.

Bicycling as a Low Cost Travel Option

Even with recent reductions in the cost of gasoline, operating a car for one year can be expensive for many people. In its annual assessment, motorist advocacy organization AAA estimates the cost to own and operate a typical sedan at $8,698 per year. This represents 19% of the City of Houston Median Household Income of $45,010.

The annual cost to own and operate a sedan represents 19% of the median household income in the City of Houston.

The ability to save money through the use of other modes such as walking, bicycling, or transit provides meaningful benefits to many households. This does not necessarily mean a household must go car free to capture the benefit, but improved transportation choices means they can reduce the number of cars they own.

Annual ownership and operation of a bicycle is estimated at approximately $310. An annual membership to Houston Bike Share is $60 (Figure 2.17). Cycling represent a significant savings versus car ownership and allows the members of a household to use these

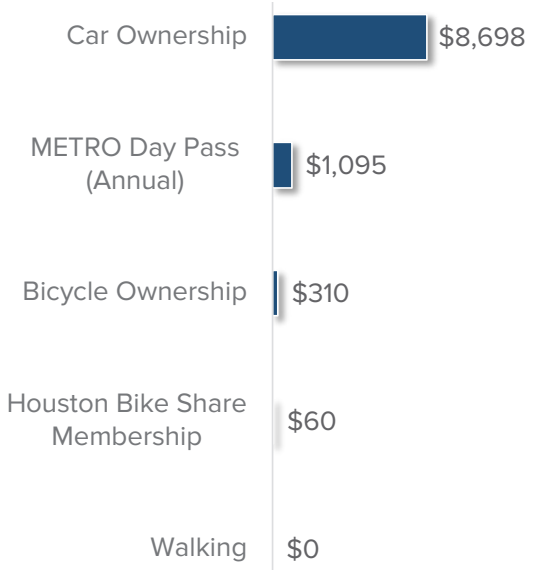


Figure 2.17. Annual Cost of Operations by Mode
Source: AAA; Litman 2012' Houston B-Cycle; METRO

resources on other items. These travel options combined with other lower cost travel options like walking and transit can save thousands of dollars that can be used for food, rent, a nicer house, a better vacation, more savings and investments, or other opportunities.

Connections to People and Jobs

The relationship between the existing bikeway network and the places people live and work is charted in Figure 2.18. The most recent aggregate population and job data from the Census are shown. Figures 2.19 and 2.20 show the high comfort bicycle network over population and job density, respectively. One half mile buffers were measured in direct line, or "as the crow flies," to asses general access in a consistent fashion across all design scenarios.

Out of the roughly two million residents in the City of Houston, 61% live within a half-mile of an existing bikeway. Only 38% of the population however, lives within a half-mile of a high-comfort facility that people who bike would be most likely to use.

Rates of bike facility access are slightly lower for populations of color and people living below the poverty line. Low-income individuals in particular can benefit from the low-cost access to jobs and services that a bicycle and safe bicycle facilities can provide.

Information regarding households without a vehicle is not available on as detailed a geographic level. However, the data does show slightly higher rates with 65% of households located within a half-mile of any facility and 40% within a half-mile of a high-comfort facility.



Tour de Hood bike ride

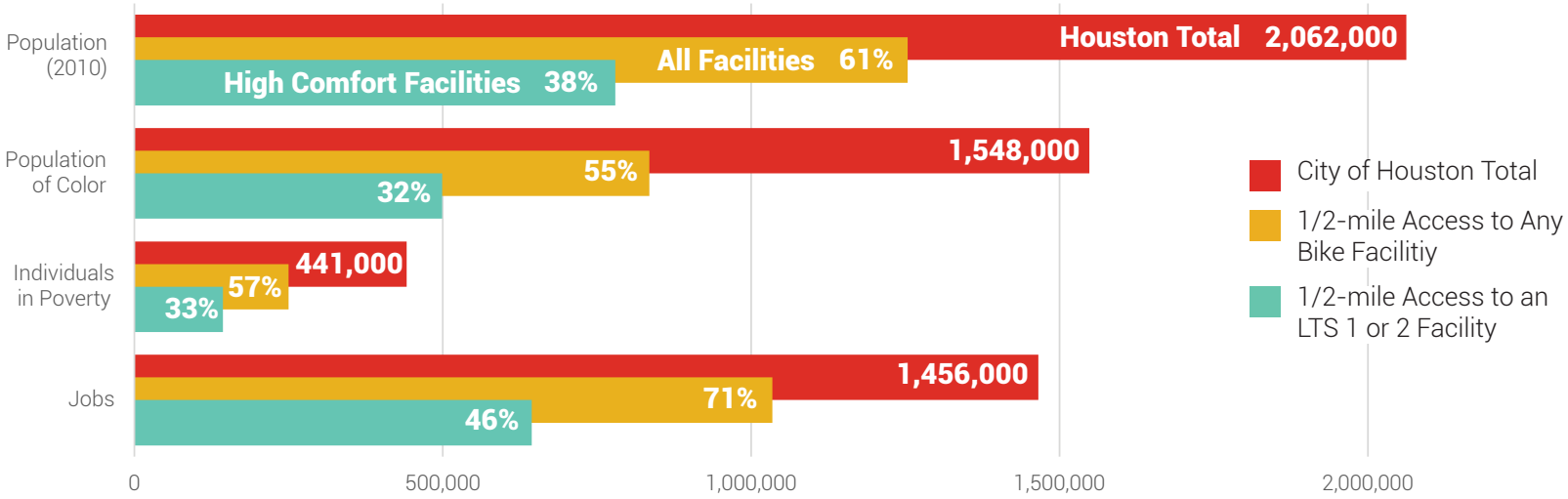
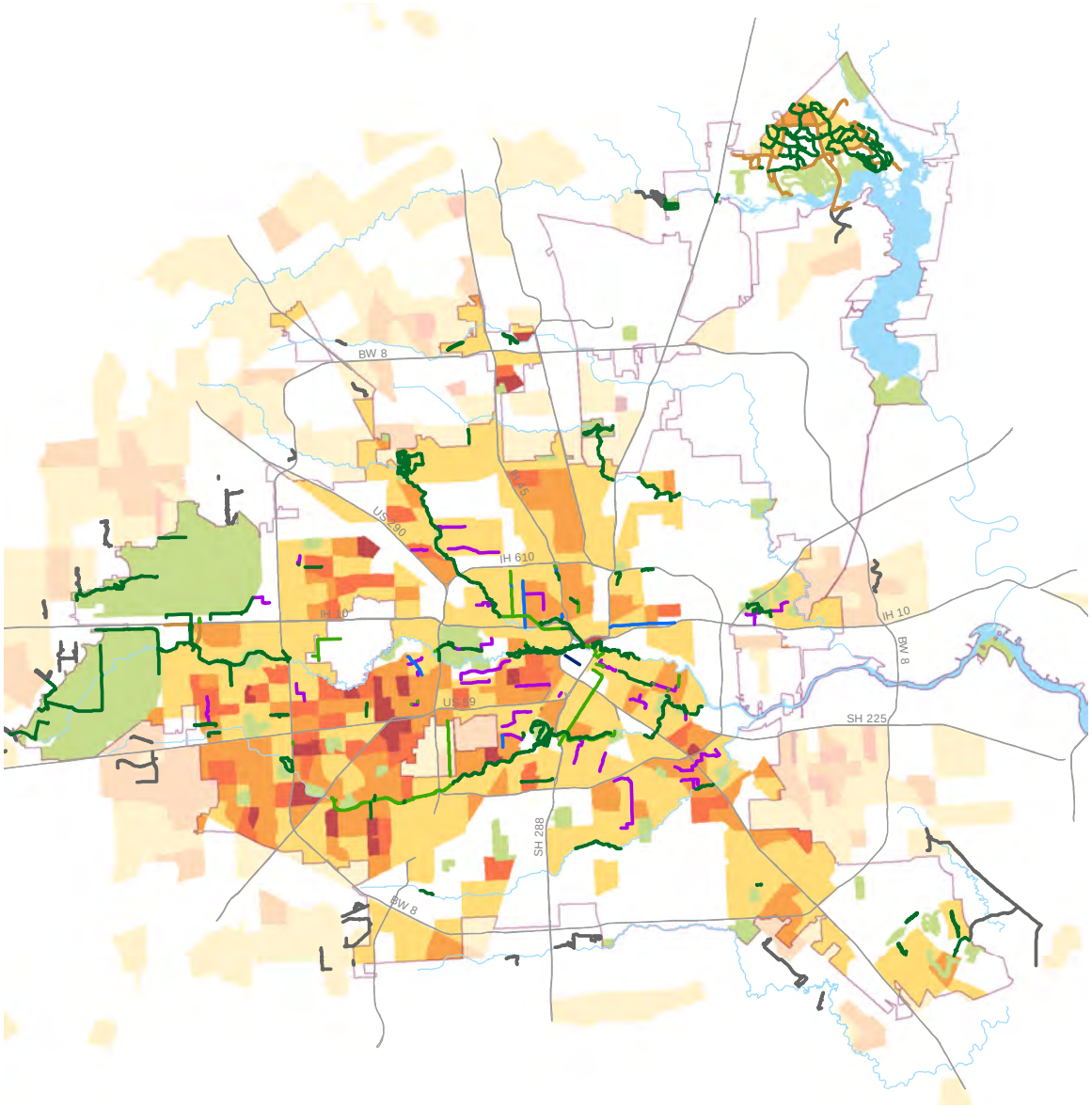


Figure 2.18: Half-Mile Access to Existing Bike Facilities
Source: US Census; American Community Survey; Team Analysis

Figure 2.19: Population Density and the High-Comfort Bicycle Network



LEGEND

Population Density
(Persons per square mile)
- 0 - 3,000
- 3,001 - 6,000
- 6,001 - 9,000
- 9,001 - 12,000
- 12,001 - 67,718

Existing Bicycle Network
High Comfort Facilities
- High Comfort Walk/Bike Path
- Walk/Bike Path
- Separated Bike Lane
- Bike Lane
- Neighborhood Bikeway
- Shared Sidewalk
- Bike Facility Outside COH
- City of Houston City Limit
- Parks

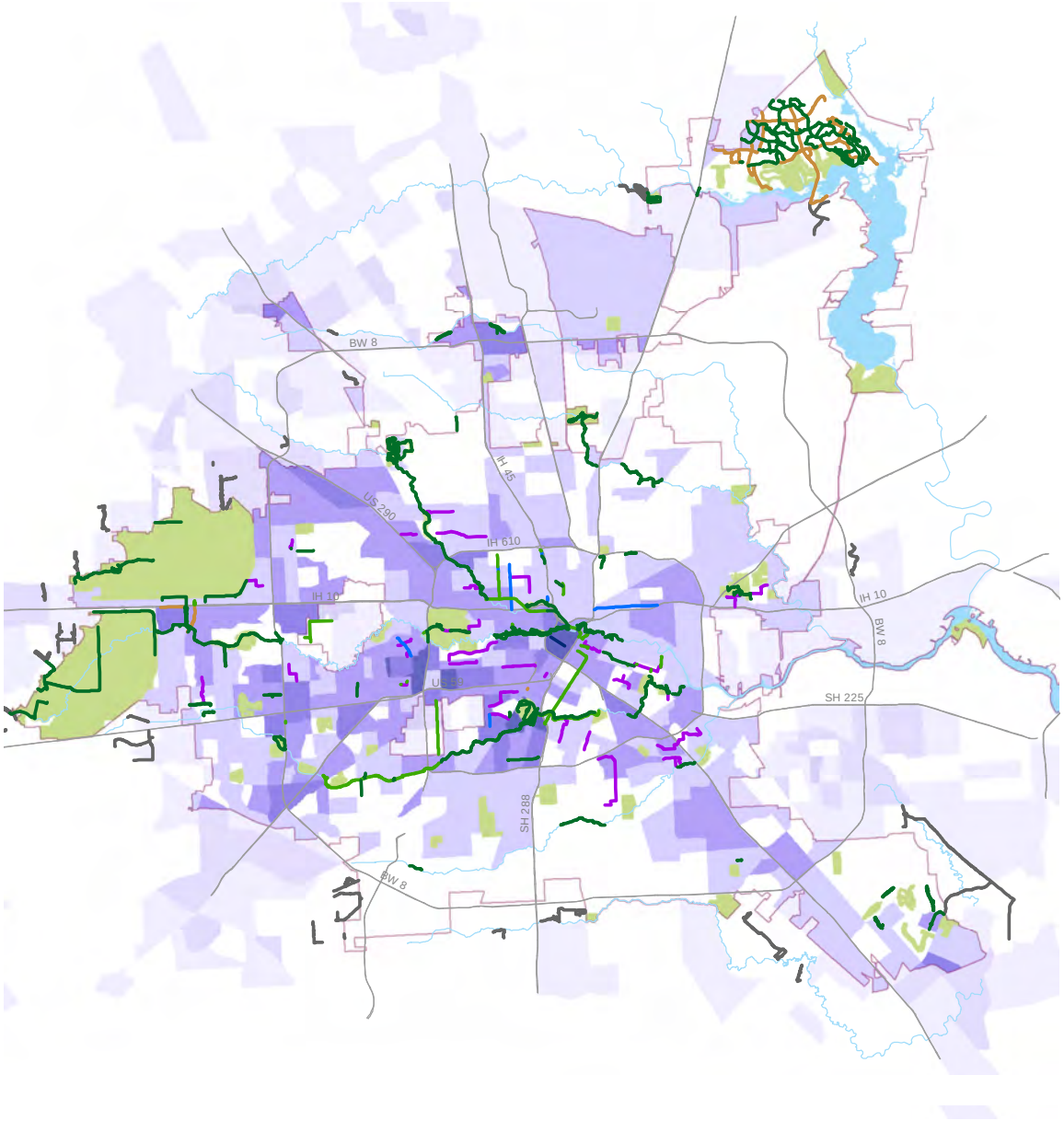


Map Locater

0 2.25 4.5 9 Miles

Source: US Census ACS (2013)

Figure 2.20: Employment Density and the High-Comfort Bicycle Network



LEGEND

Employment Density
(Persons per square mile)
- 0 - 500
- 501 - 2,000
- 2,001 - 8,000
- 8,001 - 40,000
- 40,001 - 97,309

Existing Bicycle Network
High Comfort Facilities
- High Comfort Walk/Bike Path
- Walk/Bike Path
- Separated Bike Lane
- Bike Lane
- Neighborhood Bikeway
- Shared Sidewalk
- Bike Facility Outside COH
- City of Houston City Limit
- Parks



Map Locater

0 2.25 4.5 9 Miles

Source: LEHD (2011)

Right page: The Texas Medical Center illustrates the "last mile" problem with employment centers: while bike networks connect in all directions, they all stop at the edge of the area of highest employment density.

Below left: The buildings of the TMC are tantalizingly close to the Braes Bayou trail system.

Below right: The Energy Corridor Management District has focused on building paths to connect regional bikeways to employment.

Job and Activity Center Access

Increased access to jobs means more access to job opportunities. Jobs in the region tend to be more concentrated in major employment centers so a higher share, about 71%, of the city's 1.5 million jobs are proximate to existing bikeways. As previously noted however, it's hard to comfortably get into Houston's major activity centers on a bicycle. Currently, bayou trails and existing bicycle infrastructure effectively penetrate only a relatively small share of major job centers and other key destinations. Increasing this access opens up new opportunities for people to find a better job, take classes to improve their skills, or connect to transit that further increases their access. The lack of these connections is in part responsible for Houston's 0.5% bicycle commute mode share.

Activity centers -- concentrations of employment, education, retail, culture, and entertainment -- are major destinations for all modes of transportation. These centers include a significant share of regional jobs: Downtown has 200,000 jobs, Uptown has 130,000, the Texas Medical Center has 127,000, and Greenway Plaza has 104,000. Together, these four centers account for 20% of the non-farm jobs in the Houston metropolitan region. The regional bikeway system provides useful routes to some of these centers. For example, Downtown is located near the Buffalo Bayou and White Oak Bayou greenway systems and several Rails to Trails, setting up connections to surrounding neighborhoods including Neartown, the Washington Avenue corridor, the Heights, the Near North Side, Fifth Ward, the East End, and the Third Ward. The Texas Medical Center is on the Braes Bayou trail, with connections to Braeswood and the Third Ward. Uptown is close to the Buffalo Bayou trails system.





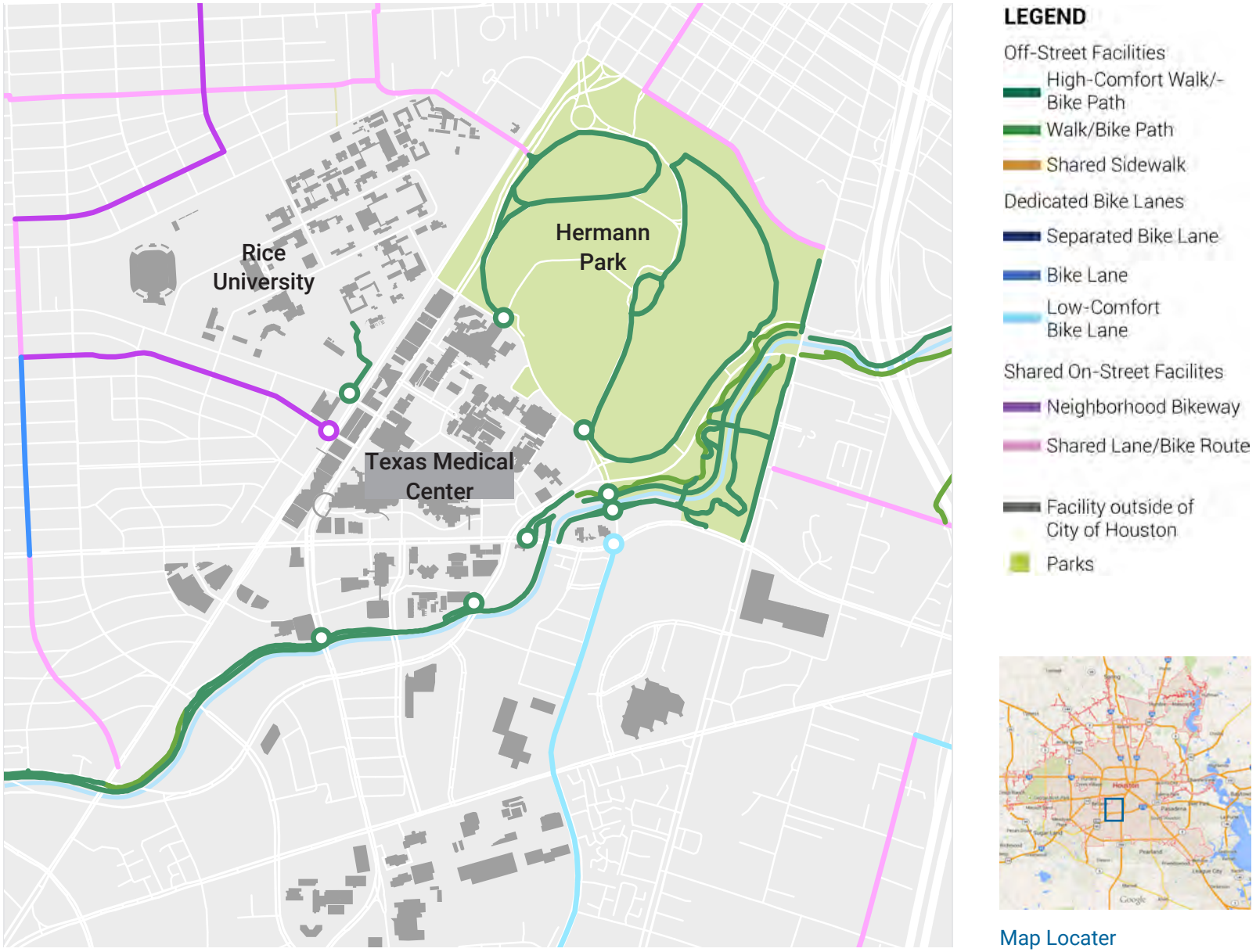


Figure 2.21: Texas Medical Center Bicycle Network

Right page: Rice Village, a bustling commercial area with dozens of businesses, has only a handful of bike racks. Generally, racks have been provided at new developments and for large buildings, but smaller and older buildings have none.

Below: Businesses that do provide places to store bicycles find that bike racks bring customers.

None of these centers, however, have good connections from the regional bikeway systems into the activity center itself. Trail systems end at the edge of the centers, requiring bicyclists to use congested, often dangerous streets to reach their place of work. Figure 2.21 highlights this challenge for the Texas Medical Center.

There have been some projects to improve bicycle connectivity. The Energy Corridor in particular has linked office buildings and corporate campuses to regional off-street trails. The new separated bike lane on Lamar Street in Downtown, once connected to trails at both ends, will extend the Bayou Greenway and Rail-to-Trail system into the heart of Downtown. Any strategy for increasing biking to work must focus on activity centers and, in particular, closing the "last mile" gap to link bike networks right to major destinations.

Bikeways are useless for transportation unless there is a place to securely park a bike at a destination, an area for which there is little current data.

Houstonians have come to expect convenient car parking; ironically, despite the fact that bike parking takes up a fraction of the space that car parking does, most Houston businesses have more car parking than bike parking. In Rice Village (Figure 2.22), for example, a busy retail area surrounded by bikable neighborhoods within an easy ride of the Rice University campus, the majority of businesses are more than 100 feet from the nearest bike rack. Thus, a bike ride can mean a long walk.

The uncertainty of finding bike parking is a further deterrent. In Houston, there's no assurance that there's a place to park your bike when your arrive, and that makes biking a much less appealing option.







Map Locater

400 ft

Figure 2.22: Map of Rice Village Bike Parking Coverage
Source: COH Bike Plan Team Site Visit August 2015

Other Major Destinations

Figure 2.24 shows the existing bicycle network compared to major destinations within the City. These include schools, multi-service and community centers, and libraries. These are representative of the types of locations that people travel to that are outside of a typical home-to-work trip and make up a significant portion of the total trips people make in the City of Houston

While some of these destinations are readily accessible by bicycle for certain locations, many are not. As shown in Figure 2.23, sixty percent of schools in the City of Houston are more than 1/4 mile away from an existing bikeway. The numbers for other destinations are comparable. For access from higher -comfort bikeways the connectivity is even lower. The lack of a well-connected network also limits the ability of people across the city from accessing those locations by bike.

Capturing More Short Trips

One of every three trips made by any travel mode in the City of Houston is estimated to be less than 3 miles, the distance most bicyclists can cover in less than 15 minutes. In many parts of Houston over half of all trips are under 3 miles. These short trips are typically those that can most readily be transitioned from driving to bicycles by providing bikeway infrastructure that is attractive to a broad range of people.

Figure 2.25 shows the share of trips that are less than 3 miles, based on the Houston Galveston Area Council's estimates from the regional travel demand model, compared with the locations that have high comfort bikeway facilities. The lack of bikeways in these areas shows the missed opportunities in the current bikeway network and suggests a significant potential to attract more people biking with a stronger bike network.

Figure 2.23: Access Statistics for Major City Destinations

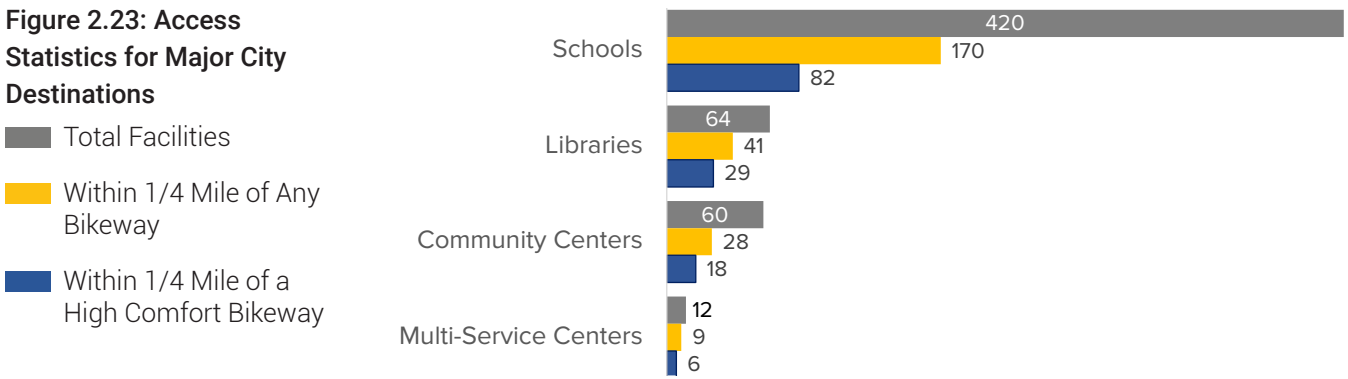
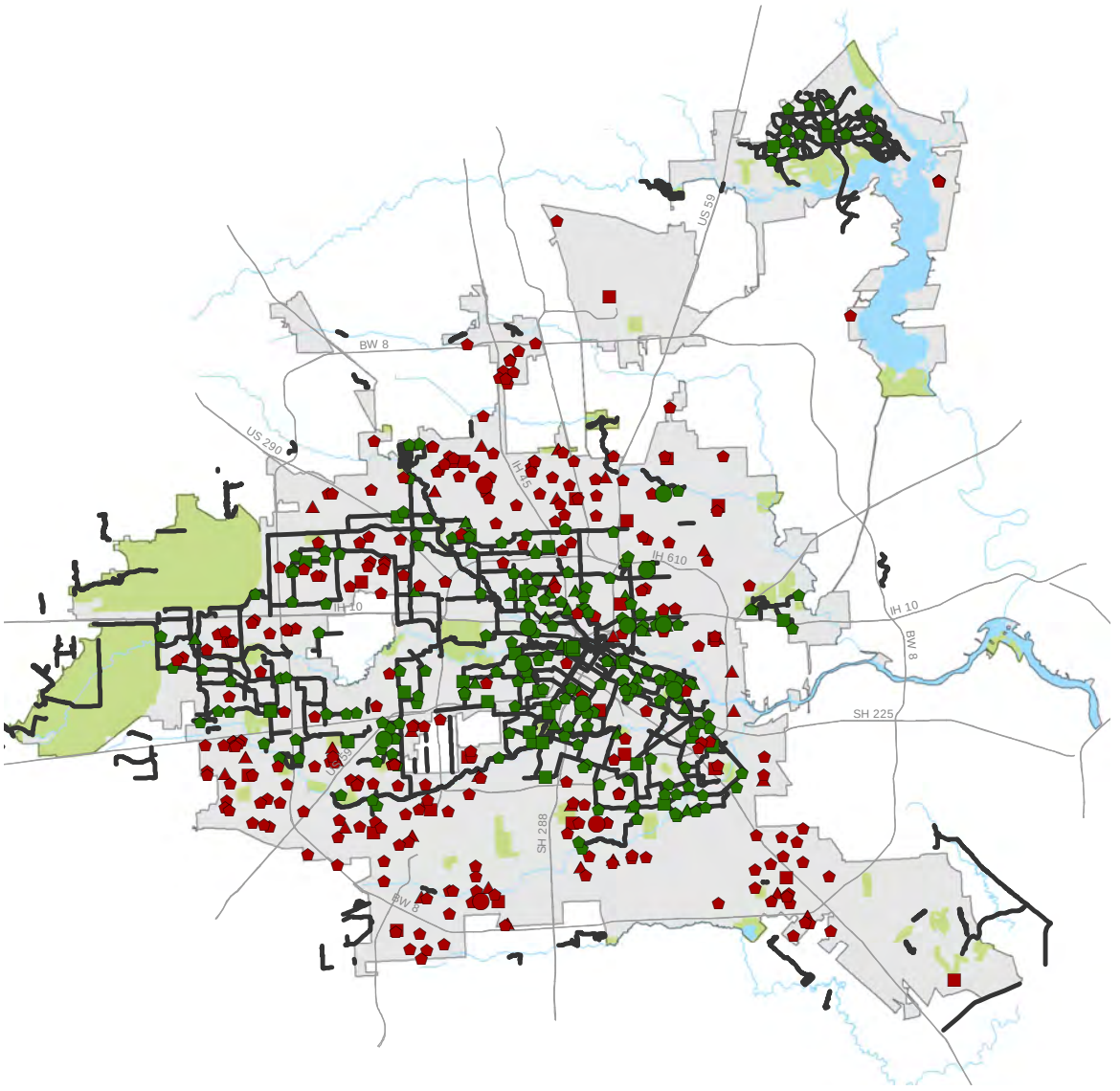


Figure 2.24: Existing Bikeways and Major Destination Access



Existing Bikeways

Community Destinations Within 1/4 mile of a Bike Facility
- Multi-Service Centers
- Schools
- Community Centers
- Libraries

Community Destinations Outside 1/4 mile of a Bike Facility
- Multi-Service Centers
- Schools
- Community Centers
- Libraries

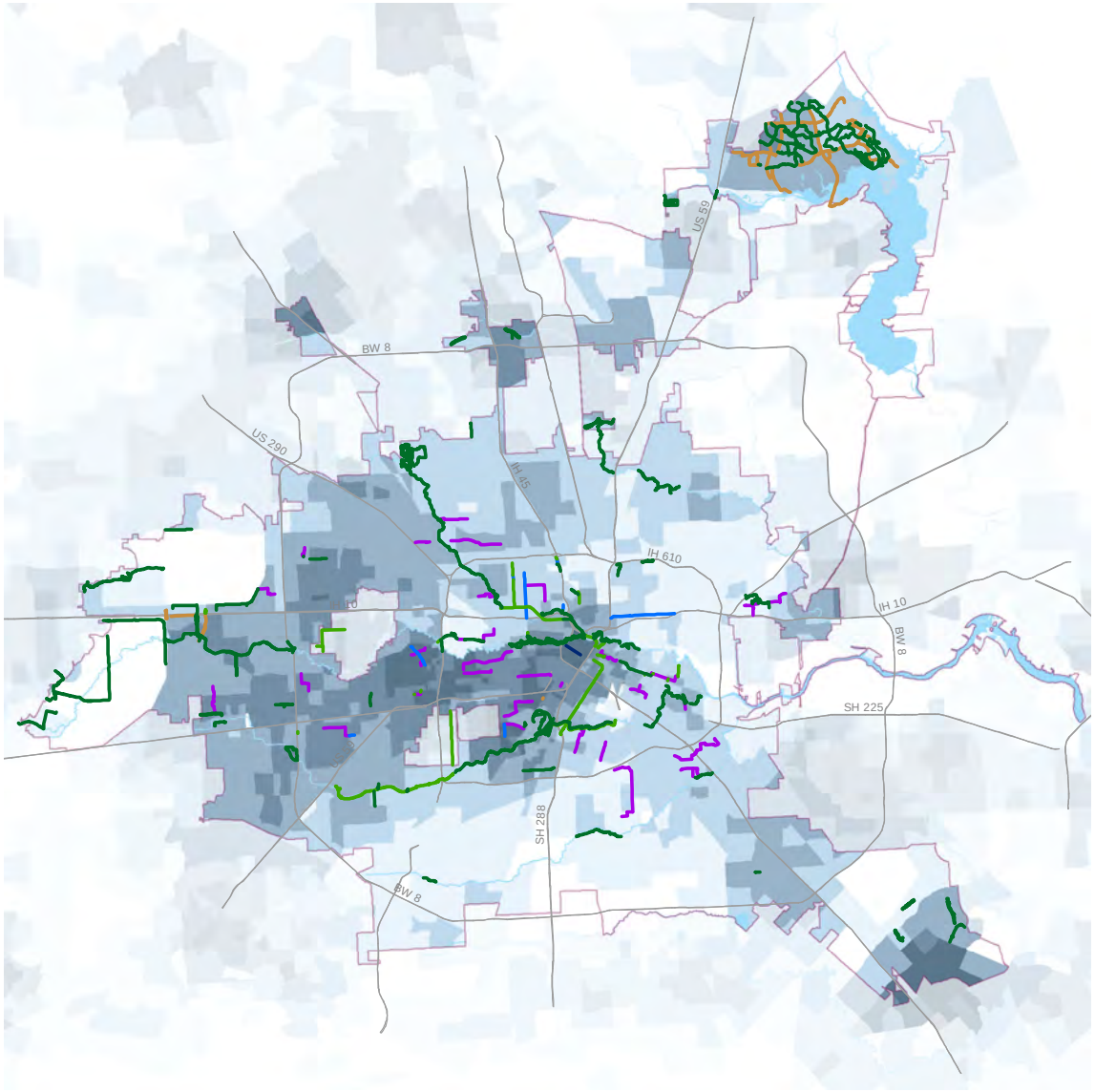


Map Locater

0 2 4 8 Miles

Source: City of Houston GIMS Data & Team Analysis

Figure 2.25: Existing High-Comfort Bikeways and Share of All Trips by All Modes that are Less Than 3 Miles



LEGEND

All Trips

Percentage of Trips 3 Miles or Less

- 1.1% - 10%
- 10.1% - 20%
- 20.1% - 30%
- 30.1% - 40%
- 40.1% - 50%
- 50.1% - 65%

Existing Bicycle Network

High Comfort Facilities

- High Comfort Walk/Bike Path
- Walk/Bike Path
- Separated Bike Lane
- Bike Lane
- Neighborhood Bikeway
- Shared Sidewalk
- City of Houston Limit



Map Locater

0 2.25 4.5 9 Miles

Source: City of Houston GIMS Data, H-GAC Travel Demand Model

AN OPPORTUNITY TO...

IMPROVE COMMUNITY HEALTH AND WELLNESS

Health is not merely the absence of illness or occurrence of doctor visits. It is determined by how we live, work, learn, play, and eat. A healthy community is one where the built environment allows making healthy choices easier for individuals. In many places in Houston, incorporating physical activity into a person's daily routine is very difficult. Our transportation system is a major part of the built environment, and in many ways it poses barriers to better health outcomes. By providing a plan for safe, accessible bicycle infrastructure, the Bike Plan can support more physical activity in people's daily life.

The medical profession is recognizing this challenge. According to the American Heart Association (AHA), increasing one's level of physical activity reduces the risk and impact of cardiovascular disease, diabetes, and some cancers, as well as helps to control weight and improve mood. The AHA advocates changes to the built environment, street level design, and community development that promotes opportunities for physical activity. Specific strategies recommended include complete streets, smart growth design, and implementing Transportation Alternatives as identified under MAP-21. Studies have also found that building bike/pedestrian trails reduces health care costs associated with physical inactivity. For every $1 invested in these facilities, nearly $3 in medical cost savings can be achieved.

The Centers for Disease Control and Prevention (CDC) states that the nation is in the midst of an obesity epidemic with more than one-third of American adults identified as obese. Additionally, obesity related conditions, including high blood pressure and diabetes, are occurring in 32% and 9% of the national population respectively. These health indicators are closely related to the level of regular aerobic activity. According to the Alliance for Walking and Biking's 2014 Benchmarking Report, there is a strong inverse correlation between bicycling and walking commuter rates and levels of obesity, high blood pressure, and diabetes. Public health officials recommend a minimum of 150 minutes of physical activity a week. In Houston, only 51.1% of the adult population gets the recommended amount of weekly aerobic physical activity. Low activity levels contribute to an adult population that is 28.7% obese, 8.5 % diabetic, and 29.8% having high blood pressure.

At 32%, the prevalence of obesity and other health complications in children in Houston is also higher than the national average. Obesity in children not only causes risks for other health complications such as metabolic syndrome, joint problems, and sleep apnea, but it increases the likelihood of chronic health problems as an adult and a higher risk of obesity throughout life. Childhood obesity also increases the financial burden on families and individuals, as children who are obese spend more time at doctor's offices

and in hospitals. In 2005, a study concluded that a 1% drop in obesity among 12-year-olds would lead to over $260 million in medical cost avoidance nationally over their lifetimes.

Physical Activity

One of the reasons cited for the obesity epidemic is an increasingly sedentary lifestyle and changes in modes of transportation. Children living in densely-populated urban areas often lack access to safe, open spaces and parks in which to play. It is estimated that 56% of children in Houston do not live within half a mile of public green space.

Figure 2.26 shows the existing park system in Houston, including SPARK parks which are school sites with park and playgrounds areas open to the public. The figure shows limited access to high comfort bikeways in areas with higher obesity levels. Access to park space for children is also limited by few connections to comfortable, safe bikeways suitable for children. The Bayou Greenways Initiative addresses some of these proximate access challenges. Connecting households to these corridors and connecting major bikeways to parks can expand rates of physical activity.

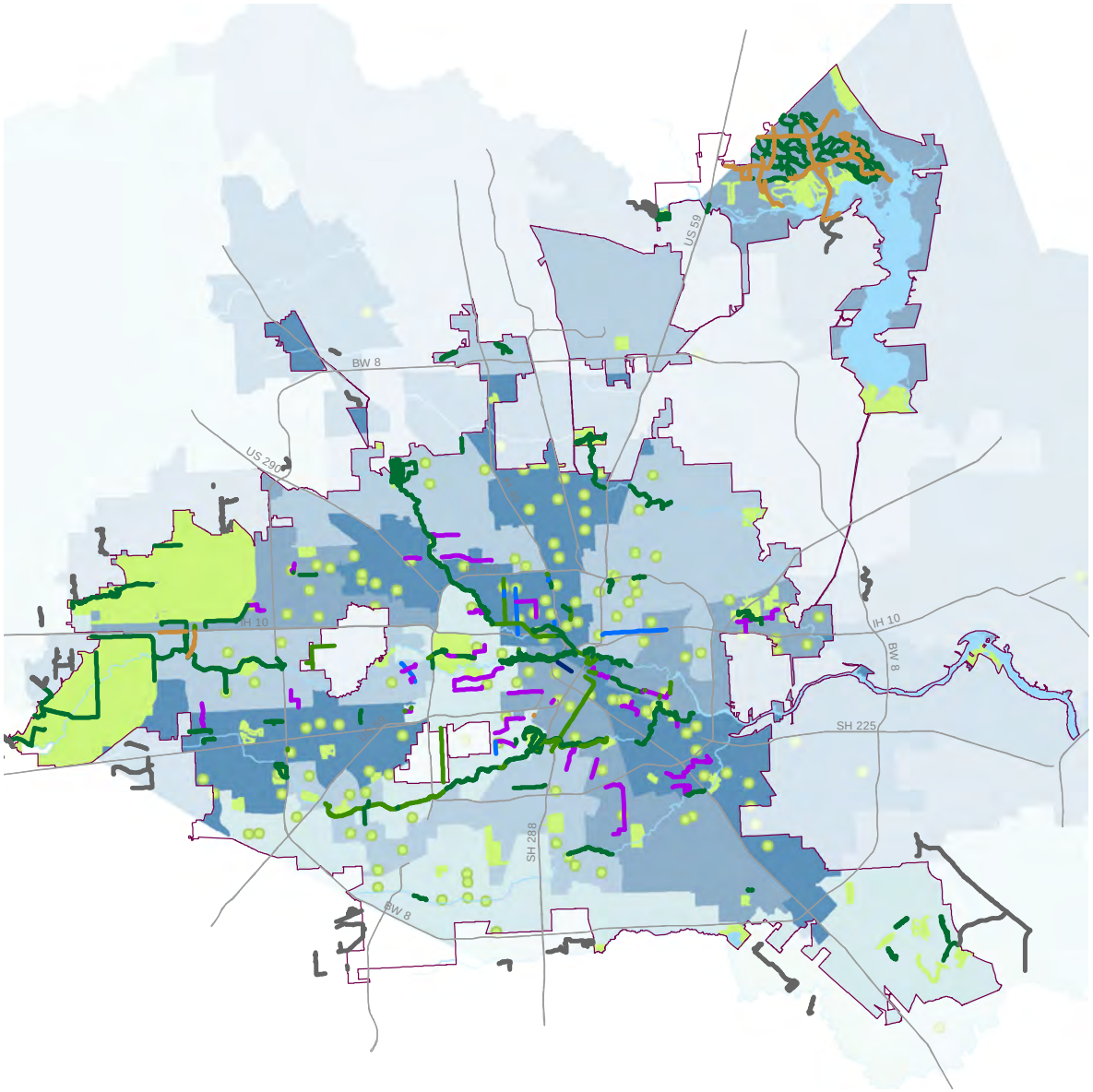
The lack of access keeps children indoors and prompts them to pursue less active activities. Providing access to safe bicycle facilities that connect parks and open spaces, schools, and community facilities to neighborhoods could have a significant impact on reducing obesity in Houston, especially among the younger population.

Air Quality

Public health impacts of the transportation system extend beyond physical inactivity and chronic disease. Walking and bicycling, even for short trips, reduces automobile emissions and improves air quality. Cleaner air improves conditions for those suffering from asthma and other chronic respiratory conditions. Health professionals and advocates have become new partners in promoting and planning for active transportation. After carefully considering the best science and converging evidence, public health authorities, including the Centers for Disease Control and Prevention and the American Medical Association, have recommended road improvements, connectivity, land use policies, active transportation to schools, and programs to advance walking and bicycling.

According to the US Department of Transportation, at a national level, nearly half of all trips in metropolitan areas are three miles or less and 28 percent are one mile or less – distances easily covered by foot or bicycle. Yet 60 percent of trips under one mile are made by automobile, in large part because incomplete streets make it dangerous or unpleasant to walk, bicycle, or take public transportation. This data identifies a great opportunity for increasing bicycle mode share and trips. With safe facilities and connections to locations of interest, the City of Houston could see a significant improvement in the community's use of bicycling as an option for short trips, which could have a positive impact on community health.

Figure 2.26: Existing High-Comfort Bikeways and Childhood Obesity Rates



LEGEND

Percentage of Obese Children

- *17%*
- *27%*
- *37%*
- Park
- FreewayTollway
- SPARK Park
- High Comfort Shared-Use Path
- Shared-Use Path
- Protected Bike Lane
- Bike Lane
- Neighborhood Bikeway
- Shared Sidewalk
- Outside COH
- City of Houston



Map Locater

0 2.25 4.5 9 Miles

Source: 2010 Health of Houston Survey and City of Houston Health Department data

AN OPPORTUNITY TO...

BETTER COMPETE WITH PEER CITIES WHO ARE SETTING THE BAR

While Houston has made significant strides in improving its bikeway network, to truly understand the context of Houston's existing conditions, comparisons identifying similarities and differences between peer cities is important. Peer cities are competing with Houston for talented workers that can choose to live many places. Investment from employers that have choices about where they locate their business is increasingly competitive. A peer cities review provides valuable insights for what can be achieved through a focused effort of bikeway programs, policies, and projects, and helps identify realistic but aspirational targets for Houston as it works to be a more bicycle-friendly city.

As biking has gained significant momentum and validity nationally as a transportation option in the last several years, there are many cities that provide valuable data and insight for Houston. Fifteen peer cities have been chosen for this report based on several factors, which range from their similarity to Houston in environment (demographic, geographic, and political), such as Dallas and Atlanta, to their successes in increasing mode share, safety, and health outcomes such as Minneapolis or Denver. Many have used creative approaches to develop multiple infrastructure and implementation strategies. The peer city data and analysis is largely based on the Alliance for Biking & Walking's 2014 Benchmarking Report for Bicycling and Walking in the United States (http://www.bikewalkalliance.org/). The 2014 Benchmarking Report utilizes the most up-to-date data from various sources including self reported data from the individual cities in order to develop a comprehensive look at the state of walking and bicycling.

City Size and Density

Compared to the selected peer group the City of Houston is characterized by a larger population spread out over a larger city footprint area. Utilizing 2010 census data, the City of Houston had about twice the population of the peer cities average (2.11 million versus 1.03 million), and is about 2.5 times as large in area. As density measures the proximity of people to one another it can impact the level of biking.

Higher density means that more destinations are likely to be within a comfortable biking distance. Given its larger footprint, Houston's population density is lower than the average peer city (3,522.7 persons/sq. mi. versus 6,192.2 persons/sq. mi.), though using average density obscures the fact that there are many higher density places in Houston with many people, jobs, and other destinations in close proximity to one another that facilitate higher bicycling usage.

Bicycle Commuting Mode Share

The mode share for bicyclists represents the percentage of people who use their bike for commuting purposes. While it is the

Figure 2.27: Peer City Analysis on Key Bike-Friendly Performance Factors

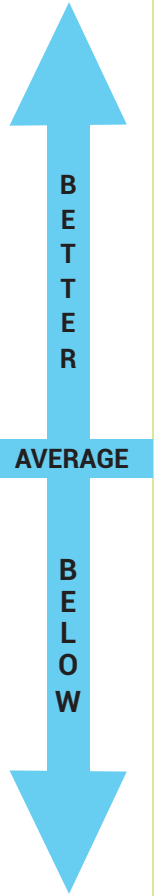
% of Bicycle Commuter Mode Share	
6.1	Portland, OR
3.6	Minneapolis, MN
3.4	Seattle, WA
3.3	San Francisco, CA
2.9	Washington, D.C.
2.2	Denver, CO
1.8	Average
1.3	Austin, TX
1.3	Chicago, IL
1.1	Atlanta, GA
1.0	Los Angeles, CA
0.7	Miami, FL
0.7	Phoenix, AZ
0.5	Houston, TX
0.2	Dallas, TX
0.2	San Antonio, TX
0.1	Fort Worth, TX

Total Existing Miles of Bicycle Facilities / Sq Mile	
7.8	San Francisco, CA
4.6	Austin, TX
3.9	Seattle, WA
3.9	Minneapolis, MN
3.8	Washington, D.C.
3.1	Denver, CO
3.0	Portland, OR
2.7	Average
2.6	Chicago, IL
2.5	Dallas, TX
1.5	Phoenix, AZ
1.3	Los Angeles, CA
1.3	Miami, FL
1.1	Houston, TX
1.1	San Antonio, TX
0.7	Atlanta, GA
0.5	Fort Worth, TX

Miles of Planned Bicycle Facilities	
1741	San Antonio, TX
1680	Los Angeles, CA
1296	Dallas, TX
1100	Austin, TX
1000	Fort Worth, TX
962	Portland, OR
640	Chicago, IL
632	Average
523	Seattle, WA
311	Denver, CO
277	Miami, FL
275	Minneapolis, MN
125	Washington, D.C.
98	Houston, TX
60	Atlanta, GA
19	San Francisco, CA
5	Phoenix, AZ

% Adults Meeting Recommended Minimum Weekly Aerobic Physical Activity*	
62.4	San Francisco, CA
61.5	Denver, CO
60.6	Miami, FL
60.3	Portland, OR
56.0	Los Angeles, CA
55.9	Austin, TX
55.5	Minneapolis, MN
55.3	Average
54.9	Washington, D.C.
54.5	Seattle, WA
52.9	Phoenix, AZ
52.3	Chicago, IL
52.1	Atlanta, GA
51.1	Houston, TX
50.3	San Antonio, TX
48.8	Dallas, TX

Bicyclist Fatalities per 10k Bicycling Commuters	
0.9	San Francisco, CA
1.1	Portland, OR
1.1	Washington, D.C.
1.5	Denver, CO
1.6	Atlanta, GA
1.7	Seattle, WA
2.3	Minneapolis, MN
2.4	Austin, TX
3.9	Chicago, IL
4.3	Los Angeles, CA
5.4	San Antonio, TX
7.8	Average
7.9	Miami, FL
11.2	Houston, TX
17.6	Dallas, TX
19.3	Phoenix, AZ
41.9	Fort Worth, TX



*Data was unavailable for Fort Worth, TX

Source: Alliance for Biking & Walking's 2014 Benchmarking Report for Bicycling and Walking in the United States



Washington DC Bike Repair Station

most reliable data that is regularly available for estimating bike use at a city-wide level, commuting mode share represents less than one in seven trips made in the Houston region. The peer city average for bicycle mode share is 1.8%, with Houston's bicycle mode share at 0.5%. The range fluctuates from 6.1% in Portland to 0.1% in Fort Worth. Mode share in cities like Atlanta (1.1%) and Los Angeles (1.0%) supports the potential that Houston can at least double commuting mode share.

Existing & Planned Bicycle Facilities

The existing miles of bicycle facilities per square mile of a city indicates how dense or accessible the bike network is. The average miles of bicycle facilities per square mile for a city is 2.7. San Francisco has the highest with 7.8 miles of bicycle facilities per square mile with Austin in second at 4.6 miles per square mile. Houston is near the lower end of the spectrum with 1.1 miles per square mile and Fort Worth has the lowest at 0.5. This is not surprising based on a review of Houston's existing Bikeways Map, as significant focus has not been placed on large sections of the City leaving areas without bikeways.

The number of miles of planned bicycle facilities among the peer cities varies greatly. Looking forward, San Antonio is the highest with 1,741 miles of bicycle facilities planned and Phoenix is the lowest with only 5 miles planned. The peer average is 632 miles. Houston was near the bottom with a reported 98 miles of bike facilities planned. The development of the Bike Plan should go a long way toward addressing this though the critical aspect will be how to move from planned bikeways to implementations.

Safety (Fatalities)

In order to understand safety, the data must be looked at in context with the level of bicycling in a city to determine the risk. For this measure, annual bicycle fatalities (an average over 3 years) were divided by the number of bicycling commuters over that same three year period for each peer city. Across the peer cities, there were 7.8 bicyclists killed per year per 10,000 bicycle commuters with Houston observing 11.2 bicyclist fatalities per year per 10,000 bicycle commuters. San Francisco had the best peer rating with 0.9 fatalities and Fort Worth had the worst at 41.9 fatalities per year per 10,000 bicycle commuters.

Active Community

Community health measures typically encompass the percentage of adults with obesity, high blood pressure, and diabetes. There is a link to those factors with the amount of regular exercise. The peer cities average of 55.3% of adults meeting the recommended minimum weekly aerobic physical activity level is higher than in Houston with 51.1%. Peer cities range from a high of 62.4% in San Francisco to a low of 48.8% in Dallas.

Use of Infrastructure Strategies

Not all infrastructure types and treatments will be appropriate in all situations. Peer cities that utilize a wide variety of strategies to encourage bicycling in various contexts have achieved greater mode share. This is particularly true in areas where infrastructure has been developed to serve cyclists of all age ranges and abilities as this opens up bicycling to the broadest possible set of people. These strategies range from the use of bike share and bicycle corrals, to the implementation of bicycle boulevards, bicycle signals, separated bike lanes, bike boxes, and other items that are addressed as part of the Bicycle Toolbox.

Transit Connectivity

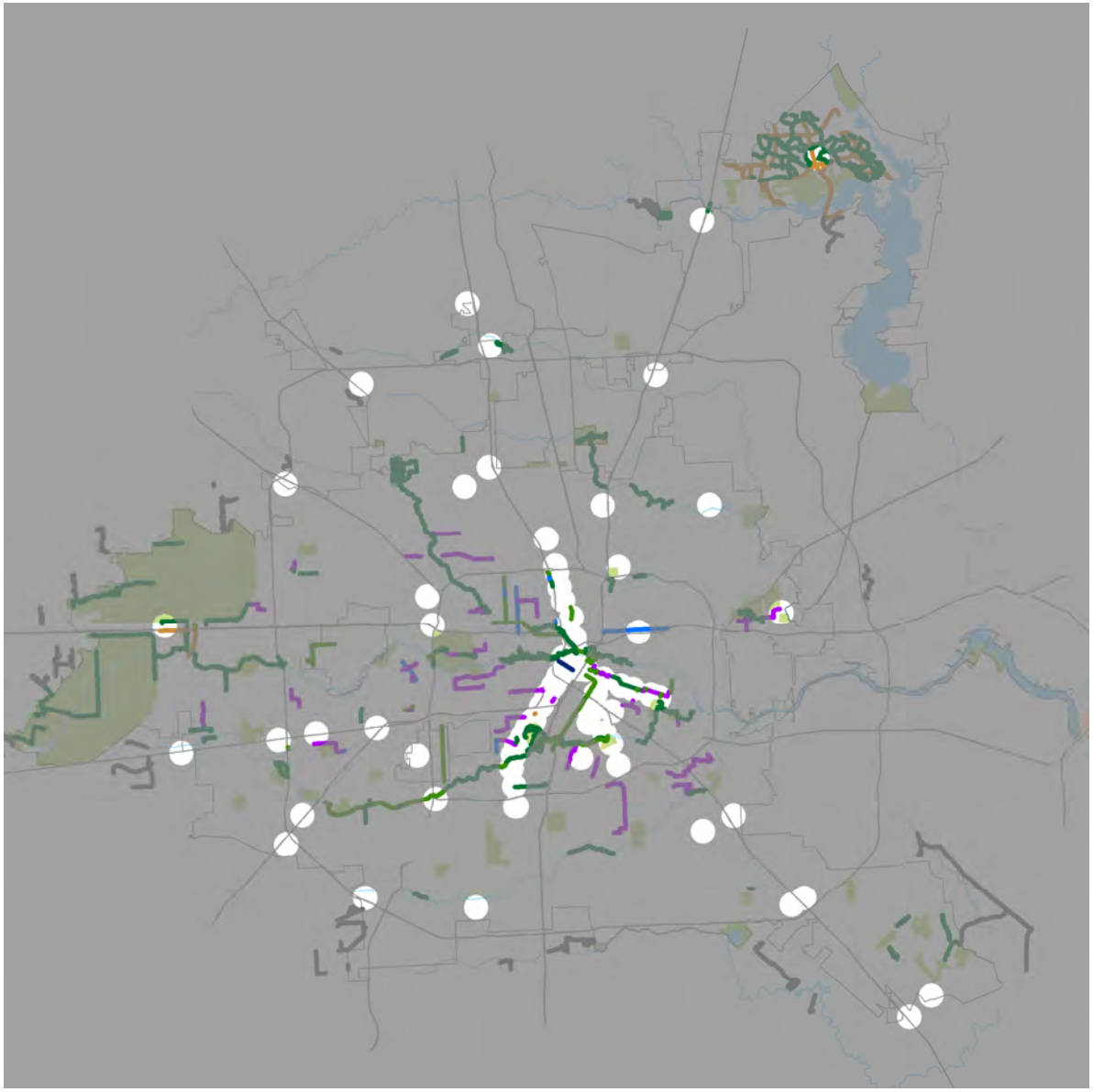
Combining bicycling with transit improves mobility options and expands the catchment area for transit. Bicycles can be a key factor in helping transit users complete the first/last mile gap between their origin/destination and transit stop. Improving and increasing bicycle connections to transit facilities and high frequency routes can have a positive impact on mode share both for bicycling and transit. Thinking through the challenges of where to provide bike parking and integrate bike share can make these networks work together more seamlessly. Peer regions that have high quantity and quality transit connections for bicyclists tend to achieve higher mode share. Figure 2.23 shows the catchment areas around transit stations and other nodes, such as transit centers, compared to the existing high comfort bikeways.

Funding and Maintenance of Facilities

Funding for new bicycle facilities and maintenance of existing facilities is essential to consider in the evaluation and development of bike systems. Funding for bicycling and walking facilities is inconsistent among peer cities with some having dedicated city funding, annual spending targets, and utilized federal funds to increase the amounts obligated per capita beyond "normal" levels.

Cities that have dedicated city budget funds and an annual spending target for bicycling and walking are making greater strides for improving bicycling and walking opportunities. Austin has an identified funding amount of $8 million of the city's budget for bicycling and walking facilities. Austin also has a dedicated city budget of $19 million and was able to obligate 4.8% of federal funds to bicycling and walking. Minneapolis, without an annual spending target, does have a dedicated city budget of over $15 million and has prioritized using federal funding with 24.4% of those funds for bicycle and walking facilities.

Houston does not have an annual spending target and obligated only 3.3% of federal funds to bicycle and pedestrian facilities. However, in 2012, Houston did top the peer cities with a dedicated city budget of over $46 million largely through new Bayou trail projects. Utilizing multiple funding mechanisms to leverage federal funds and setting local annual targets will be key for Houston to expand and maintain its system.



Areas in White Represent 1/2 Mile Distance from Existing METRO Transit Nodes

LEGEND

Off-Street Facilities
- High-Comfort Walk/-Bike Path
- Walk/Bike Path
- Shared Sidewalk

Dedicated Bike Lanes
- Separated Bike Lane
- Bike Lane
- Low-Comfort Bike Lane

Shared On-Street Facilites
- Neighborhood Bikeway
- Shared Lane/Bike Route



Map Locater

0 2 4 8 Miles

Figure 2.23:Transit Nodes (Transit Centers, Park & Rides, and Rail Stations) Miles and High-Comfort Bikeways

Bicycle Friendly Designation

The League of American Bicyclists has identified five broad areas of bicycling activities that comprise the core of what is "bicycle friendly." This is commonly referred to as the 5 E's: Engineering, Education, Encouragement, Enforcement, and Evaluation. By evaluating factors that fall into each of the 5E's, the "bicycle friendly" level of a community, business, or university can be identified and if so, to what level (Bronze, Silver, Gold, Platinum and Diamond). Houston was awarded designation as a Bronze-level bicycle friendly community in 2013. While the designation is an accomplishment to be proud of, much work needs to be done in order to move up to Gold or higher levels.

As shown in Figure 2.28, cities with higher mode share and Bike Friendly designations tend to do well on at least four of these comparison areas. Many of these cities started in a very similar place to Houston in terms of existing infrastructure and mode share and have been able to steadily improve.

Since 2013, Houston has made additional improvements, such as the Sunday Streets initiative and completion of the first Separated Bike Lane in Downtown Houston. The Bayou Greenway Initiative and more trails on utility easements offer immense opportunities to further improve Houston's level.

Just meeting the average mode share across this 15 city peer group would represent over a 300% increase in biking in Houston.

Figure 2.28 Peer Region Best Practice Areas

Peer Region Factors	Atlanta, GA	Austin, TX	Chicago, IL	Dallas, TX	Denver, CO	Fort Worth, TX	Los Angeles, CA	Miami, FL	Minneapolis, MN	Phoenix, AZ	Portland, OR	San Antonio, TX	San Francisco, CA	Seattle, WA	Washington, D.C.
Mode Share					●				●		●		●	●	●
Existing Infrastructure Levels		●			●				●		●		●	●	
Planned Facilities		●		●		●	●				●	●			
Safety Levels	●				●						●		●	●	●
Healthy Communities					●			●			●		●		
Infrastructure Strategies		●	●						●		●		●	●	●
Funding Levels		●						●	●	●	●				●
Transit Connectivity			●		●						●			●	
Bike Friendly Designation		S	S		S		B	B	G	B	P	B	G	G	S

B=Bronze
S=Silver
G=Gold
P=Platinum

AN OPPORTUNITY TO...

BENEFIT EVERYONE NOT JUST PEOPLE WHO BIKE

The Bike Plan has the potential to provide significant benefits to people who bike through development of a well-connected bikeway network that serves a broader range of people all over the city. Importantly, development and implementation of the plan also has significant benefits including health outcomes, mobility, and overall quality of life for all of Houston, including those who don't bike.

Fewer Cars on the Road

Every person biking reduces the number of potential cars on the road. Growth in Houston has put stresses on the City's transportation networks and efficient utilization of space is critical. In both travel lanes and parking areas, bicycles are much more space efficient than cars so the same number of trips take up less space. This means more can be allocated to other travel modes, better sidewalks and pedestrian realms, more green space or more development opportunities.

By providing the projects, policies, and programs that increase the rate of people biking, the City can remove the marginal drivers who compound congestion levels, particularly at peak travel times.

Less Conflicts with People Biking

Heavily traveled shared routes and narrow bike lanes frustrate both people biking, people driving, and transit vehicles. Bicycles in mixed traffic on arterials present a conflict for motorists who are traveling at a faster speed and must find a safe opportunity to pass. Buses stopping on shared routes or in bike lanes create conflicts with passing bicyclists. This adds stress to the cyclist who is vulnerable on the street and to the car and bus drivers who are navigating the corridor. A recent University of California-Berkley study found that over 80% of motorists feel comfortable driving next to a person cycling in a separated bike lane. That number drops to roughly half for motorists who feel comfortable driving in a shared lane with cyclists. Some level of discomfort is good for both people on bikes and people in cars because it increases their level of awareness and caution. Too much frustration can be a detriment to bicycling levels and lead to frustration between drivers and cyclists that underscores many debates about the growth of bicycling in urban areas.

Right:

Cyclehoop Bike Parking:
1 car - 10 bikes
www.cyclehoop.com



The design gaps in the current bikeway network lead to many situations where bicyclist go from a comfortable separated facility to one where cars, buses, pedestrians, and people biking are all mixing. New York City has studied the impact of the installation of separated bike lanes and found that they have improved safety for all users of the corridor, not just people biking. This often includes a reduction in the rate of speeding which is a key factor in the severity of crashes when they do occur. Making multimodal conflict points more predictable, easier to navigate, and where possible less frequent, is a benefit to all roadway users.

Economic Development and Quality of Life

Many recent studies support the implementation of bicycle facilities as economic development tools. For retail, people biking have been shown to spend more overall than other customers because, while they spend less in a typical trip, they frequent stores more often. New York has seen lower commercial vacancy rates, and higher retail sales in corridors where they have made investments in improved bicycle infrastructure.

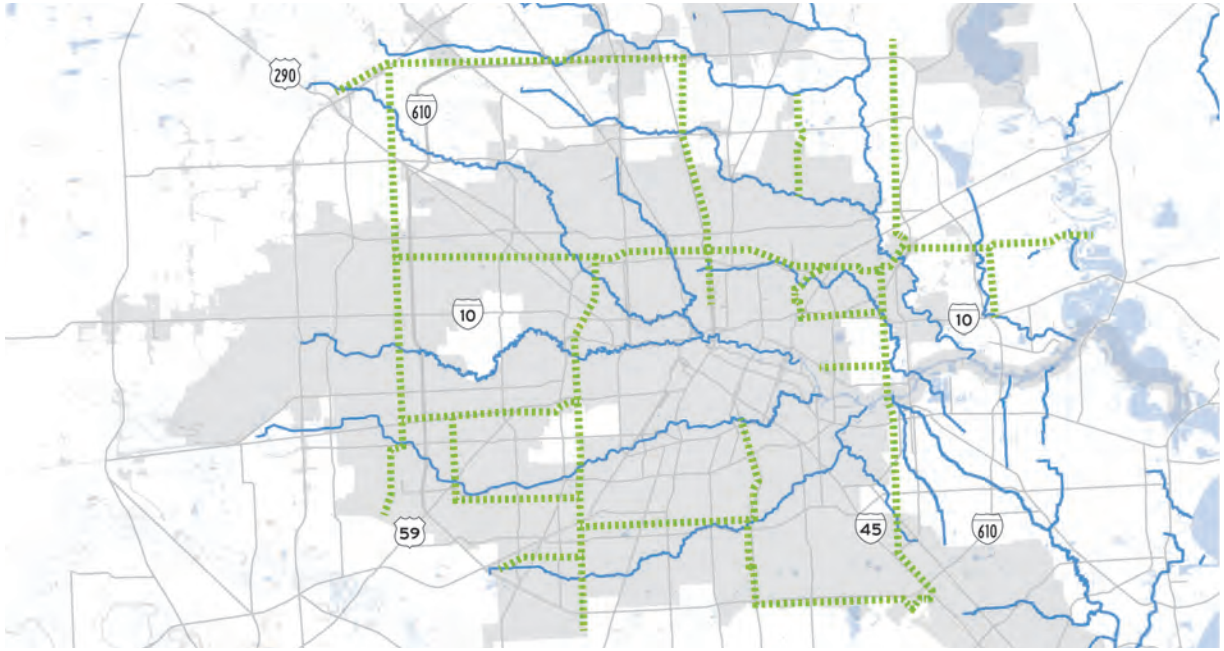
New York is not alone in these findings, other studies around the US and the world have found similar outcomes. Many cities are including the improvement of bicycle networks and related programs and policies as key pillars in their value proposition to attract major employers and corporate investments. Employers see the benefit of locating in bike accessible places to attract young professionals who have shown a stronger preference for more transportation choices than previous generations. The economic and quality of life benefits have been realized by the philanthropic community in Houston leading to recent major investment in bayou trails and green space from leading foundations such as the Kinder Foundation, the Hildebrand Foundation, and the Houston Endowment.

Environment and Health

People biking can provide benefits to their own personal health, but the benefits also translate to regional benefits as well. More people biking reduces the impacts from green house gas (GHG) and other emissions from automobile trips, particularly as it occurs during congested peak hours. It increases community resilience by providing more transportation options and a redundancy the City's transportations networks.

More people biking also improves the overall health of a community which can lead to meaningful reduction in health care costs. This indirect benefit can translate to lower insurance rates and taxes that support treatment of the large number of chronic diseases related to obesity, heart disease, and other outcomes from low levels of physical activity.

Figure 2.29: Major Bayou and Utility Corridors



Maximizing Investments

Successful implementation of the Bike Plan can enhance the investments being made in new trails and transit connections by making them more accessible and useful to more potential users.

Bayous and Utility Corridors: In 2012, Houston voters overwhelmingly approved a city bond program to support the construction of new shared-use trails and parkland along nine major bayou corridors in the City of Houston. These corridors would be developed in partnership with local philanthropic donors to provide over $200 million in new park and bicycle infrastructure known as the Bayou Greenway Initiative

In 2013, the Texas Legislature also passed regulation that would support the development of new shared use trails along major utility corridors in the Houston region, including the many utilized by Centerpoint for electric power distribution. Figure 2.29 shows a high level view of the bayou and utility corridors that have the potential to be the backbone of a well connected bicycle network in Houston. Many of these corridors have existing high quality trails and many more will in the next 7-10 years.

Developing better bicycle access from neighborhood and activity centers to these major corridor investments will allow more people to use them more often. In discussions with many people in the community, they love

riding on these trails and can't wait to see more of them constructed. They feel the biggest challenge is accessing these corridors from where they live or work, leading many people to feel the need to drive to the bayous to then ride their bikes.

Instead of having to devote parkland to expanded parking lots, by creating opportunities for more people to access the bayous by bicycle, these resources can go toward the improvement and maintenance of these amazing linear parks, and improve their ability to be major bicycle arterials across the city. Safer, more abundant access to the major investment in these corridors that are being supported regionally will maximize the return on the significant community investment in many ways.

Transit Connections

Bicycle access greatly increases the catchment area that is readily served by transit. While walksheds, the area easily walked to around a transit stops, are typically assumed to be 0.25 to 0.5 miles, bikesheds for transit can be one to three miles. As shown in Figure 2.30, the Houston region is investing in new transit service in the form of three new light rail corridors, which have opened in the past 18 months, bringing the total miles of active light rail to 22. In August 2015, METRO implemented its New Bus Network that redesigned how the local bus network can better serve the Houston region. Importantly for people biking, a growing segment of METRO's ridership, the New Bus Network provides a significant increase in the places reached by frequent transit, meaning transit coming every 15 minutes for most of the day (Figure 2.30). The frequency of transit service is a critical element for all users but is particularly important to people biking. When a person with a bike waits for transit, the alternative distance they could travel on their bike during that wait time is significant.

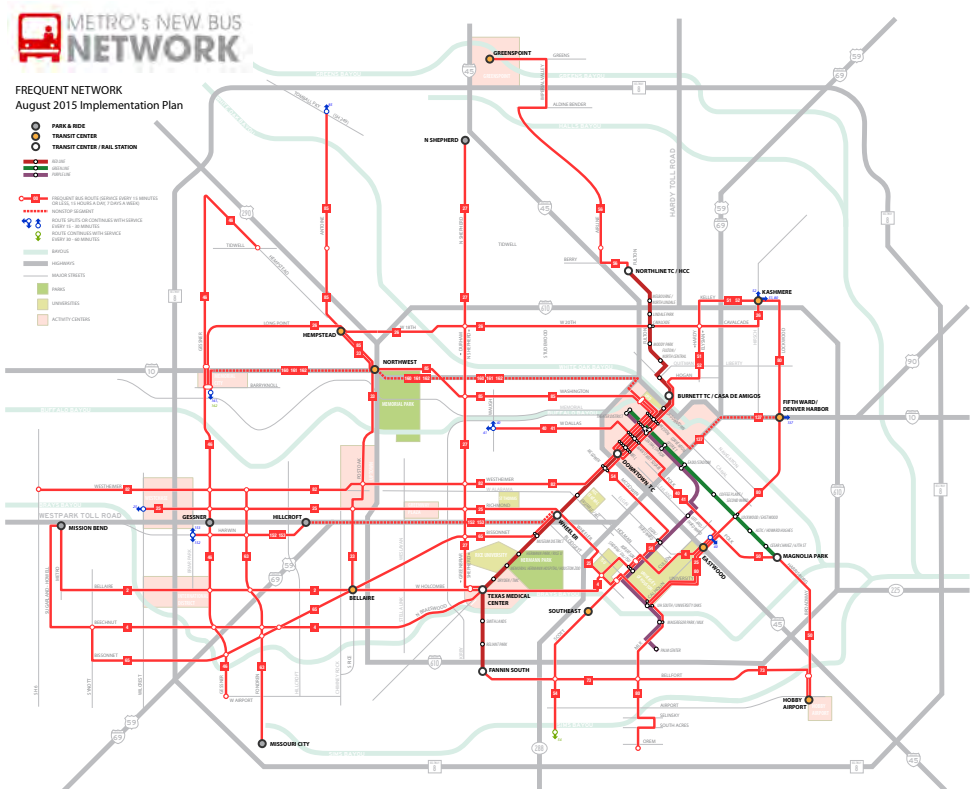


Figure 2.30: Houston METRO High Frequency All-Day Transit Service (August 2015)

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