Choices Report

MCTS Forward

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prepared by:

JARRETT WALKER + ASSOCIATES

ATHENA COMMUNICATIONS

BRC
BAY RIDGE CONSULTING

SRF

MILWAUKEE COUNTY

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1 Introduction

What is MCTS Forward?

MCTS Forward is a collaborative effort to think about the future of public transit in Milwaukee County. Amidst the current budget deficit, this initiative will be a transparent, conversation with the public, stakeholders, and the County Supervisors about what MCTS's bus network could look like within a set budget.

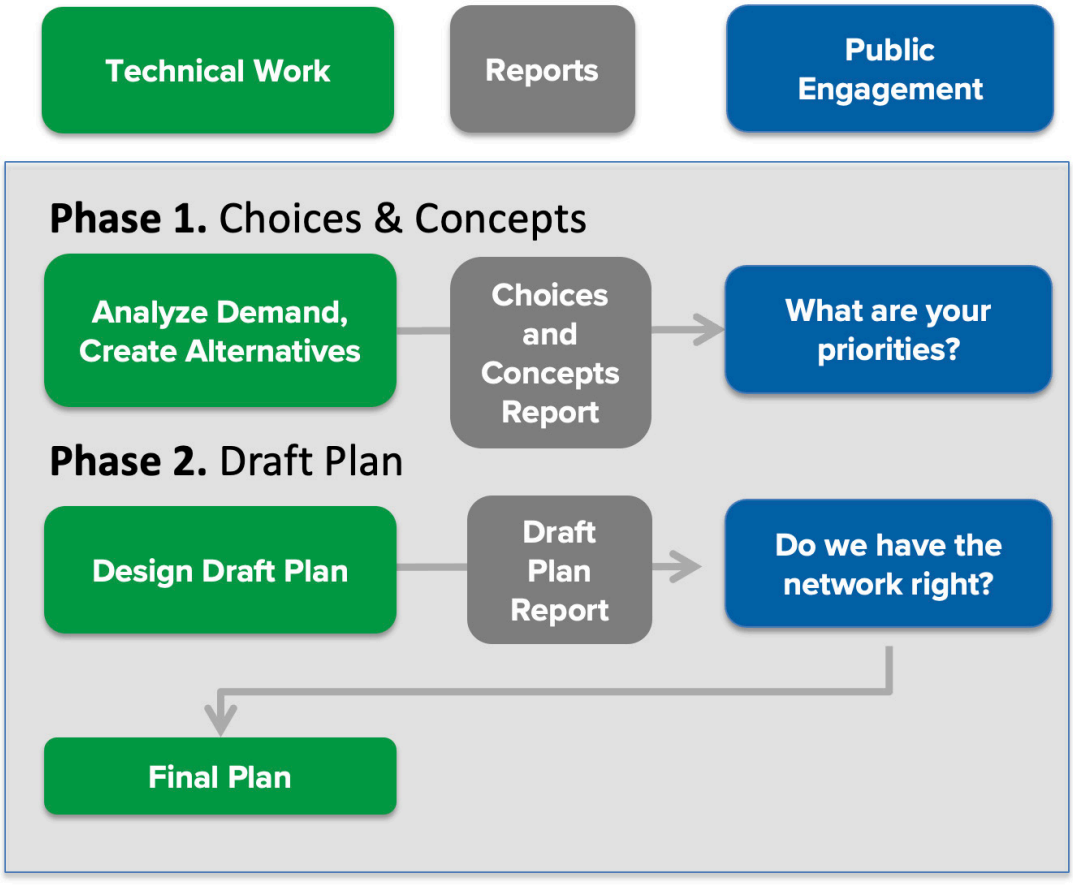
This project will chart a fresh course for how MCTS can strengthen and connect communities within the county by having a clear conversation about the community's goals for transit and designing a new transit network based on those goals.

Reasonable people can disagree about the purpose of transit in their own community. Transit can deliver many different outcomes, but some of these outcomes trade-off against others.

Learning how the community values different outcomes is an essential step in deciding where to run service, what kind of service to run, and how to define success. This report explains some of those trade-offs and helps the reader identify which choices are most consistent with their own values for transit.

What is the purpose of this report?

This Choices Report is the first step in **MCTS Forward.** It is meant to spark a conversation about transit needs and goals in Milwaukee County. The Choices Report helps lay out relevant facts about transit and land use in the county, and draws the reader's attention to major choices that these facts force us to consider.



High Ridership is Not the Only Goal

If MCTS wanted to maximize transit ridership, it would focus its network around the busiest places where the greatest numbers of people live and work. If MCTS did this, it would be acting more like a business: delivering the best service in places with the most potential customers.

McDonald's is not obliged to provide a restaurant within 1/2 mile of everyone in Milwaukee County. If it were, then the company would have to add many additional locations. Some locations would serve just a handful of homes, and most would operate at a loss because there are so few customers nearby.

People understand that less-inhabited areas will naturally have fewer McDonald's restaurants than more-inhabited areas. We don't describe this as McDonald's being unfair to places where few people live; they are just acting like a private business. McDonald's has no obligation to serve areas of low demand.

Transit agencies are not private businesses. Most transit agencies decide that they do have some obligation to cover places with fewer people in them even when this would not be a good business decision.

The officials who ultimately make public transit decisions hear their constituents say things like "We pay taxes too". In response they may decide that "If you cut this bus line, I will be stranded" and they decide that coverage, even in low-ridership places, is an important transit outcome.

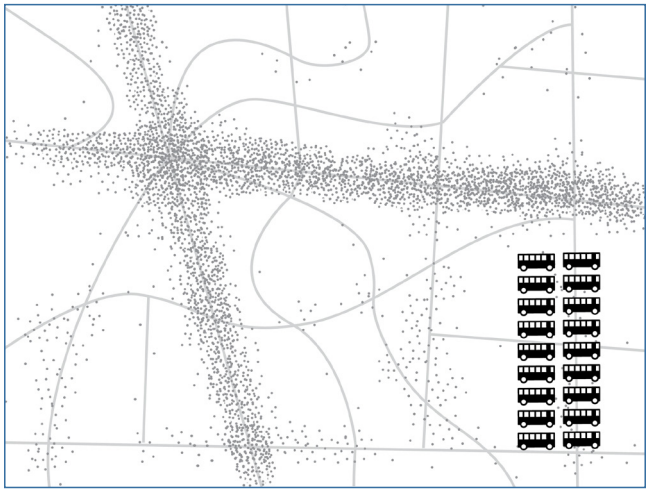
Transit agencies are often accused of failing to maximize ridership, as if that were their only goal. In fact, most agencies are intentionally operating some coverage services that are not expected to generate high ridership.

Do buses need to be full for transit to be "successful"? That depends on transit's purpose in the community.

Conflicting Goals

All transit agencies must balance the competing goals of high ridership and high coverage. Within a limited budget, if an agency wants to do more of one, it must do less of the other. This problem arises from the fact that the two goals produce opposite kinds of design. We explain this trade-off in the image below.

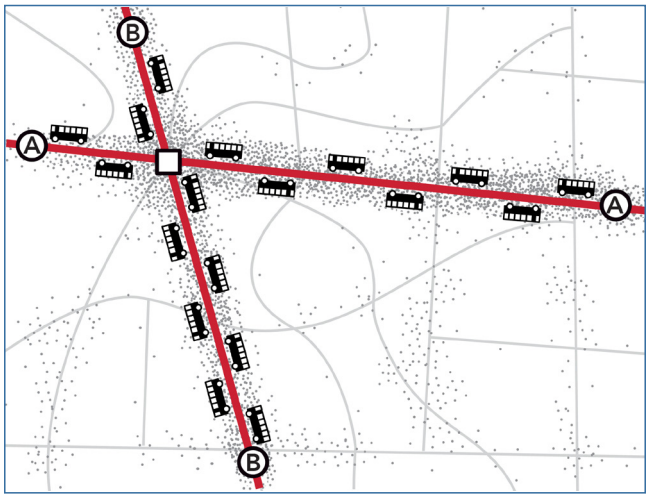
The "right" balance of ridership and coverage goals is different in every community.

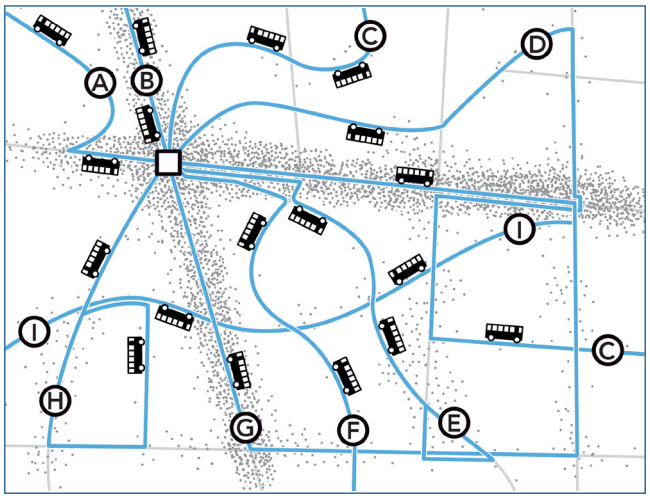


Imagine you are the transit planner for this fictional town. The dots are people and jobs—most are concentrated around two roads, as in many towns.

You have 18 buses to design a transit network.

Before you can plan transit routes, you must first decide: What is the purpose of your transit system?





High Ridership Goal

All 18 buses are focused on the busiest streets, so buses come frequently (maybe every 15 minutes). Waits are short but walks to service are longer for people in less populated areas. Frequency and ridership are high but some places have no service.

High Coverage Goal

The 18 buses are spread around so that there is a route on every street. Everyone lives near a stop, but buses come infrequently (maybe every 60 minutes). Only a few people can bear to wait so long, so ridership is low.

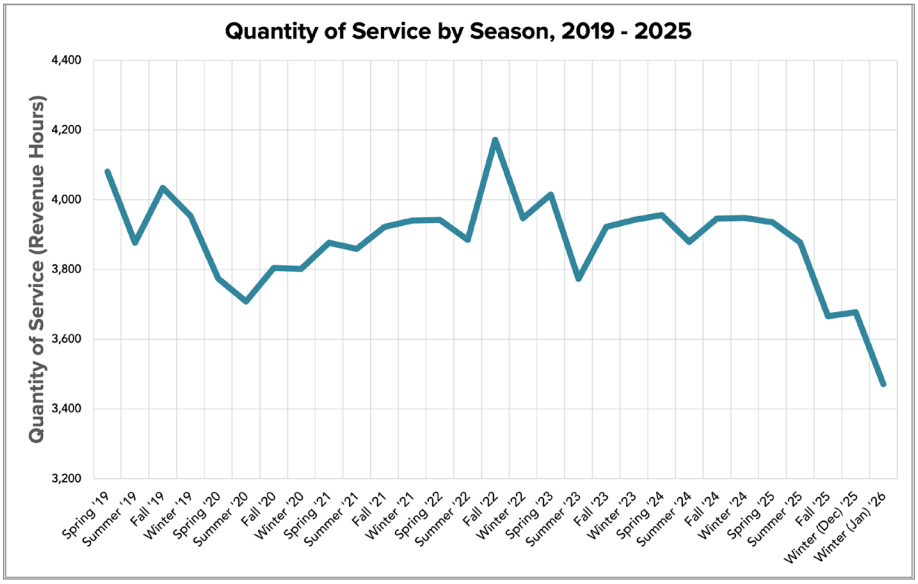
Recent Trends for MCTS

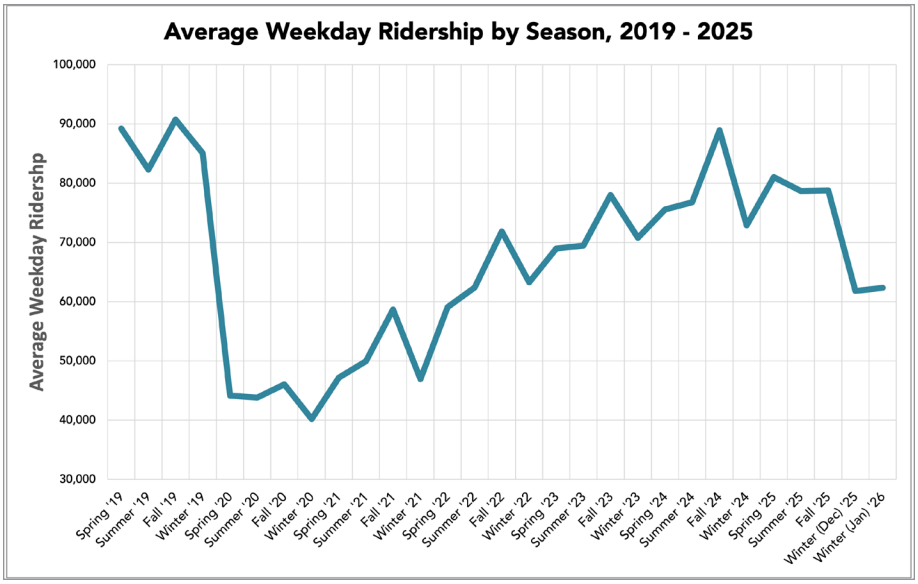
The charts to the right show MCTS quantity of service and ridership since 2019 (the year before Covid-19).

A key driver of ridership is total service. More service means that more transit is available for people to ride. For MCTS, the general trend has been that when quantity of service changes, ridership changes in response.

Quantity of service and ridership declined significantly in 2020, in large part due to the economic and social challenges around Covid-19. Since then, MCTS restored most service and ridership increased. In Fall 2024, Ridership peaked to 89,000 rides per day, almost reaching 2019 ridership.

However, since Fall 2024, MCTS started to make service reductions and ridership has been decreasing. Since then, the quantity of service has decreased by 14% and ridership has decreased by 27%. These recent trends suggest that it's time to take a holistic look at the MCTS bus network.





What else is in this report?

Geometry of Transit

In Chapter 2, we summarize the basic principles of transit geometry, how they affect the access and opportunities that transit can provide to residents, workers, and visitors, and how the underlying geometry forces every community to grapple with some key value trade-offs in the design of its transit system.

Markets and Needs

In Chapter 3, we assess the markets for transit in Milwaukee County, the potential for high ridership, and the areas where the need for transit is high but the density of demand is not.

By "market" we are referring specifically to the demands for transit that result in high ridership relative to cost. This way of thinking about a transit market is similar to the way a private business thinks about its market for sales – how many potential customers there are, how useful they will find the product, and how well the product competes for their business.

Existing Transit Network

In Chapter 4, we analyze the existing transit network's performance, including the frequency, spans, ridership, productivity, and specific observations about the structure of the network.

Key Questions & Next Steps

In Chapter 5, we summarize key value choices that only the community and its leaders can make about how transit should serve Milwaukee County. These value choices cannot be answered by technical experts because they are questions about what goals and values the community prioritizes. There is not a technically correct answer to these value questions.

2 Geometry of Transit

What is the product of transit?

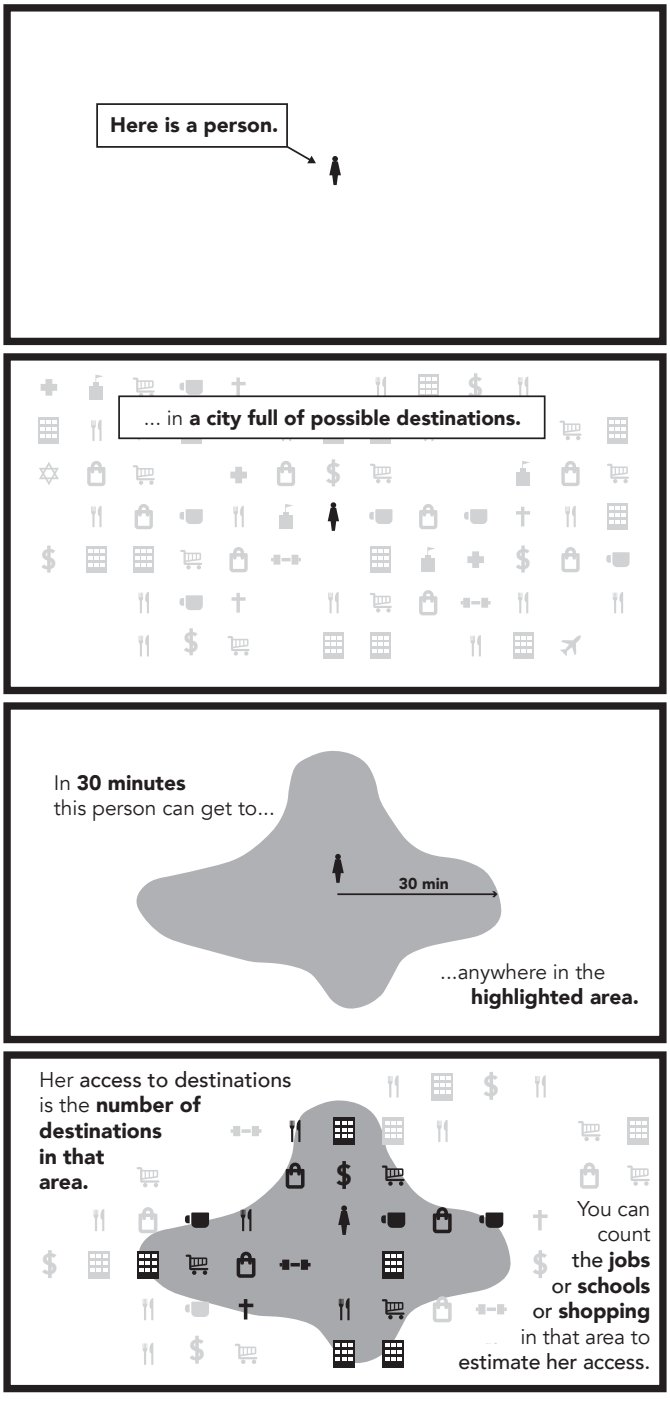
Public transit can achieve many goals, but a commonly held goal for transit is to help people access opportunities: work, shopping, medical needs, education, and all the economic, social, cultural, and natural riches that a community has. Everyone has a limited amount of time in their day and, therefore, can only spend so much time traveling to meet their needs. Maximizing the destinations that people can reach in a limited amount of time is something we can calculate in assessing how well transit is meeting this goal. The figure below shows how we calculate this.

What Access Achieves

When we expand access for as many people as possible, we achieve many important things:

- We **make service more useful** for the trips people are already making and for other trips people might want to make by transit.
- We **increase ridership potential**, as a result of service being more useful. When transit is more useful, more people use it.
- We increase transit's potential to help with **pollution and congestion**. Ridership is the key to how transit achieves these things, and improving access is the path to ridership.
- We **expand access to opportunity** (jobs, education, shopping, services) for people who need transit for that purpose.
- We **increase the economic attractiveness** of the urban area. Connecting people with opportunities is the whole point of cities, so improving those connections makes any community more effective.

WHAT IS ACCESS?



Access & Freedom

Wherever you are, there is a limited number of places you could reach in a given amount of time. These places can be viewed on a map as a bubble around your location.

Think of this bubble as "the wall around your life." Beyond these walls are jobs you cannot hold, places you cannot shop, and a whole range of things you cannot do because it simply takes too long to get there.

The technical term for this is access, but it's also fair to call it freedom, in the physical sense of that word. The extent of this bubble determines what your options are in life: for employment, school, shopping, or whatever places you want to reach.

If you have a bigger access bubble, you have more choices, so in an important sense, you are more free. That increase in freedom is also closely related to transit ridership.

Access Is a Matter of Geometry

The way these factors combine and determine access is geometry because freedom (and access) is about what you *could* do, not predictions of what you *will* do.

Access is a basic driver of ridership, but it can also be considered a worthy goal in itself. Access from a particular location is something that gives that a location value. Real estate firms routinely study where you can get to by car from a particular development, and we can do a similar analysis using transit. If you are deciding where to live based on whether you can get to your job, school, or relatives, you are asking about access.

How Transit Expands Access

When using transit, the extent of access is determined by:

- **The transit network.** This includes the frequency, speed, and spans of service. These features determine how long it takes to get from any point to any other point.
- **The layout of the community.** For each transit stop on the network, this determines how many useful destinations are near the stop or within easy walking distance.

Frequency is Freedom

Frequency refers to how often a bus comes, which determines maximum waiting time. Frequent service provides several related benefits for customers.

- **Short Waits.**
- **Fast Connections.** Transferring lets a rider reach many places along more than just one route. Frequency makes connections easy because the next bus is always coming soon.
- **Improves Reliability.** If a bus breaks down, the next bus is coming soon.
- **Spontaneity.** Rather than living around a bus schedule, customers can show up at the stop and go.

The payoffs of frequency are non-linear, with the highest ridership benefit usually being found in 5 to 15-minute frequencies.

This chart plots the frequency and productivity of routes operated by 45 US urban transit agencies.

- The horizontal axis shows frequency (better, more useful frequency means a lower wait time, so more frequent service is to the left).
- The vertical axis shows productivity—ridership compared to the quantity of service.
- A dark hexagon means that lots of transit routes share that combination of frequency and productivity.
- A light hexagon means less route examples share that frequency and productivity combination.

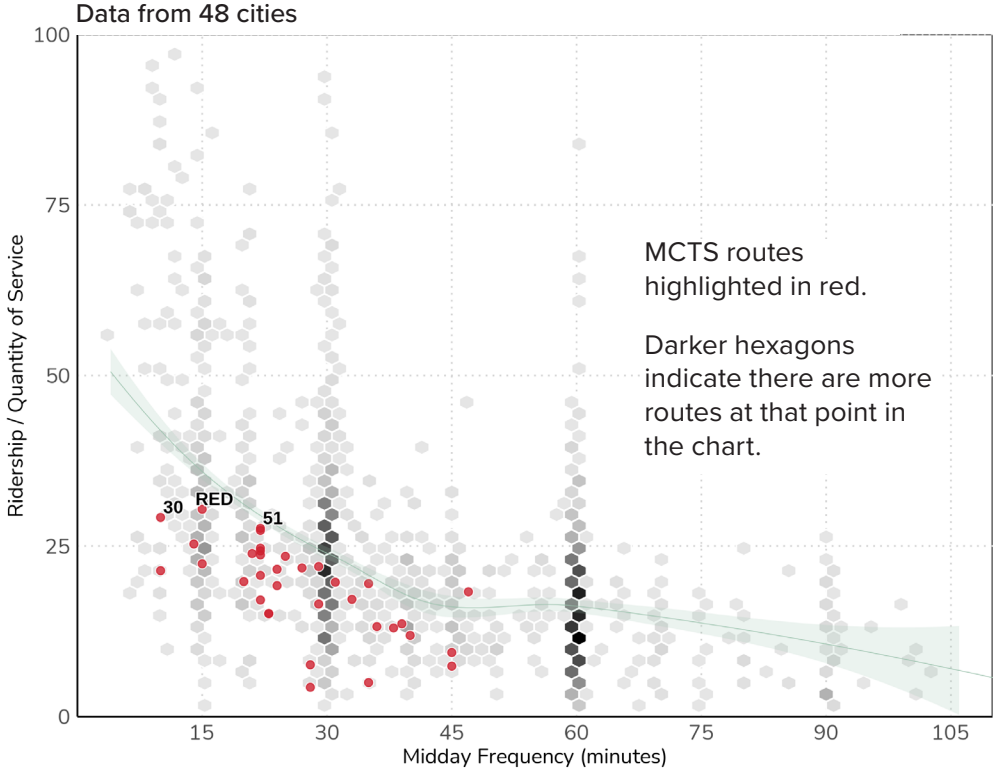
Following the hexagons, particularly the darker ones, we see that productivity increases with frequency even though better frequency costs more. The cost of frequency is part of Quantity of Service, so it should pull the productivity ratio down, but instead it goes up.

How much frequency is enough? Two points should be noted:

- **15 minutes or better has the best chance of being useful.** Here, the non-linear payoff begins to appear.
- Trip length matters because **it doesn't make sense to wait a long time to travel a short distance.** Very short routes usually don't make sense unless they can be run at frequencies well under 10 minutes.

Route Productivity by Frequency of Service

Data from 48 cities



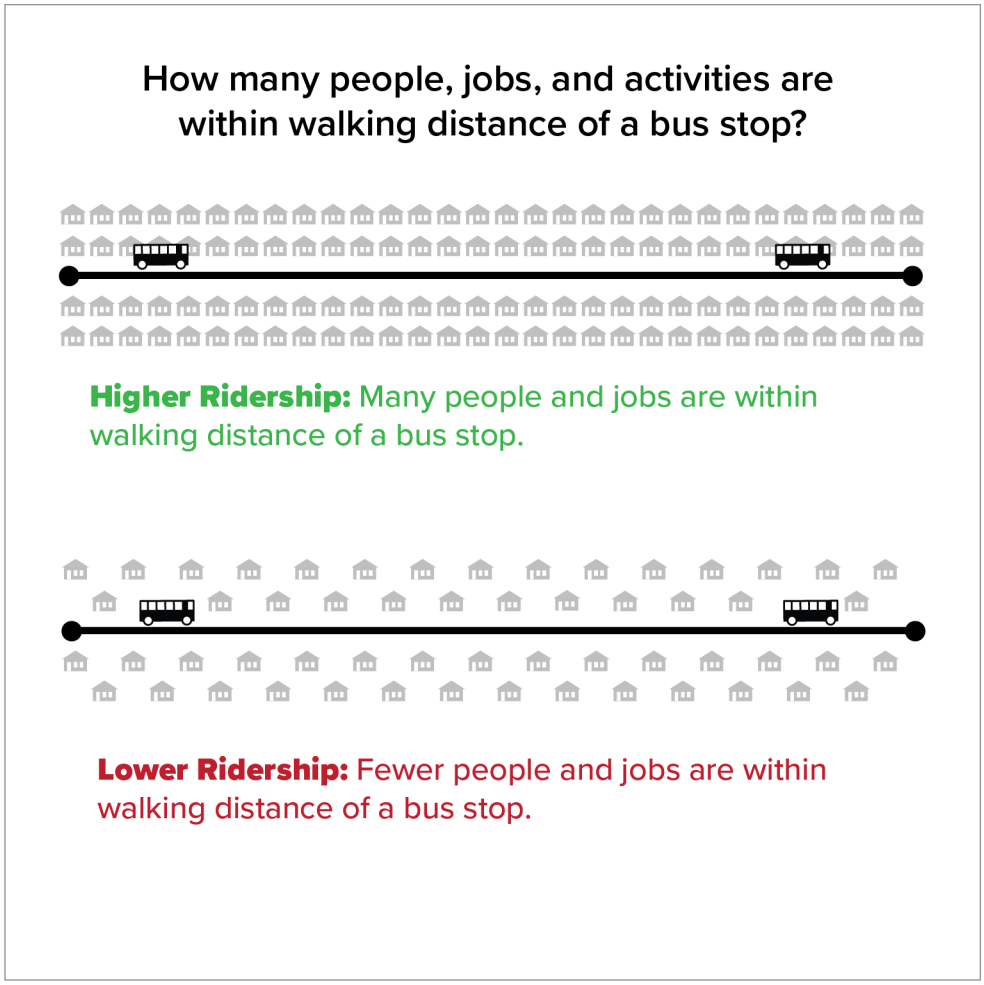
Why do development patterns matter?

The layout of a community has an enormous impact on transit's ability to succeed there. These are purely geometric facts about a community's layout. In describing them, we are not saying anything about the people who live there. Four major features of a community determine transit potential. They are Density, Walkability, Linearity, and Continuity.

The graphic below shows two identical bus routes. The route on the top is traveling in an area that has twice as many houses as the route on the bottom. All else being equal, places in Milwaukee County that have higher density are likely to get higher transit ridership than places that are less dense, regardless of who lives there.

Density

Density is the number of residents or activity destinations in a fixed land area. For transit, what matters is the fixed land area round each transit stop.



Why do development patterns matter?

Walkability

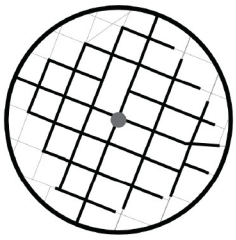
To use transit, people need to be able to walk to the bus stop. The street design around a bus stop determines if people can reach the stop by walking.

The graphic below shows two bus stops with a 1/4 mile circle around each one. The black lines show the parts of the street network that are within 1/4 mile walk of the stop. Not all of the 1/4 mile circle is in a 1/4 mile walk.

The street network in the top example is a simple grid that allows many people to easily walk to the bus stop. The bottom example shows a disconnected street network where fewer places are within a 1/4 mile walk of the bus stop. Even though many people may live near this bus stop, some people have to walk a long distance to get there. To a transit planner who is trying to maximize ridership, the effect is the same as if the density were lower: fewer people who can benefit from the service.

It is also important that people be able to cross the street to reach the bus stop. If a road is too dangerous to cross, people won't be able to ride transit in both directions. When they are dropped off on the opposite side of the street, they will be stuck.

Is the walk to the bus stop direct and comfortable?



Higher Ridership: In a connected street network, most nearby places are a short distance away on foot.

Lower Ridership: In a disconnected street network, walks to nearby places are long and circuitous.

Higher Ridership: For people to use a bus in both directions, it must be safe to cross the street near the stop.

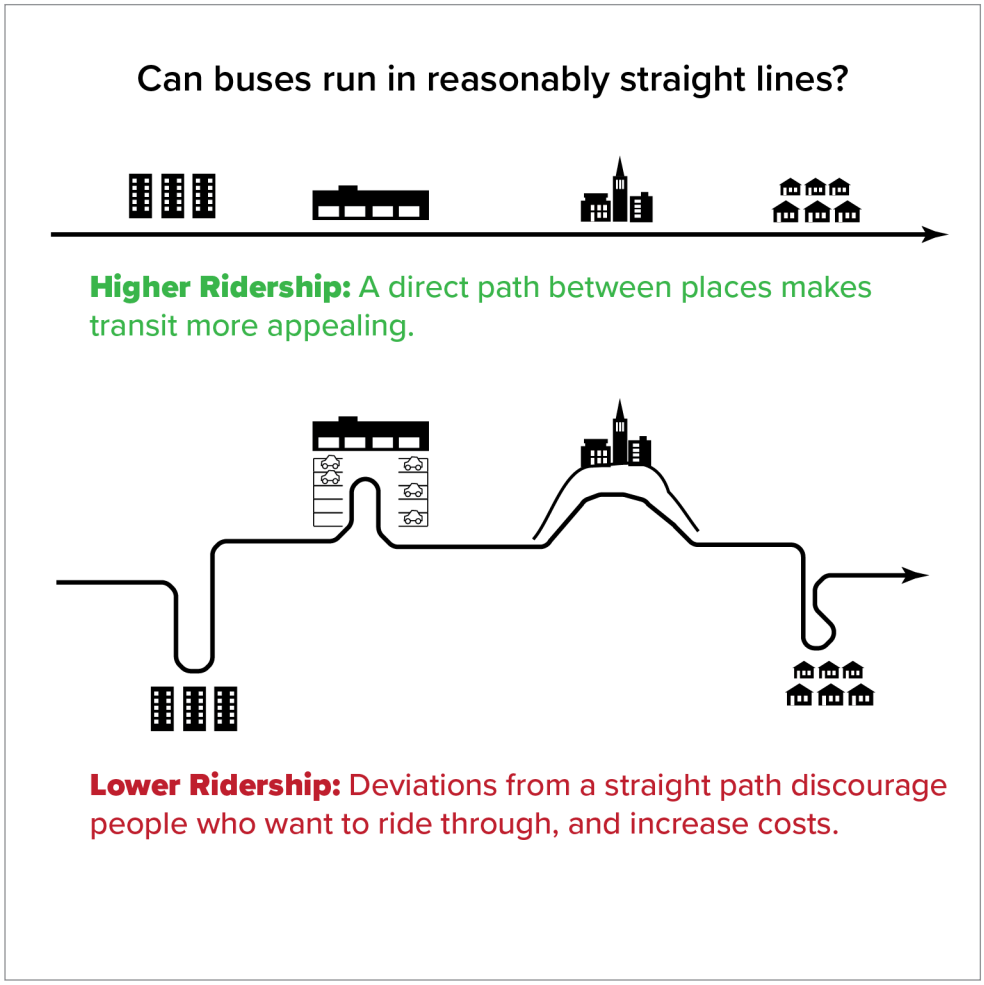
Why do development patterns matter?

Linearity

The upper graphic below shows four destinations aligned in different ways. In the town on the top, all destinations are located along the main road. Transit can serve all destinations with a line that everyone will experience as direct. People riding from one end to the other will find this service useful because they are always traveling towards their destination.

The town on the bottom has the same four destinations located far from the main road. To serve these places, a bus needs to deviate from the main road and then drive back to the main road. If this is your destination, this is great for you. But if you are traveling between any other two points, you are traveling out of the way before getting where you want to go.

Also, the route on the bottom example is much longer, which means it's more expensive to operate for the transit agency. Having long or circuitous routes like this one means that MCTS can't provide as much frequency, so people will have to wait longer for the bus.



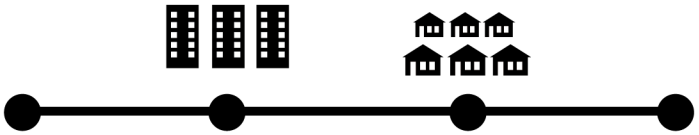
Why do development patterns matter?

Continuity

In transit, distance is a major contributor to the cost of service. Connecting places that are far away, with long gaps, is more expensive than places that are close to each other.

Within a fixed budget, a more expensive route means that a bus can't come as frequently, so people have to wait longer. If waits are longer, less people are likely to find the service useful.

Do buses have to traverse large areas with little demand?

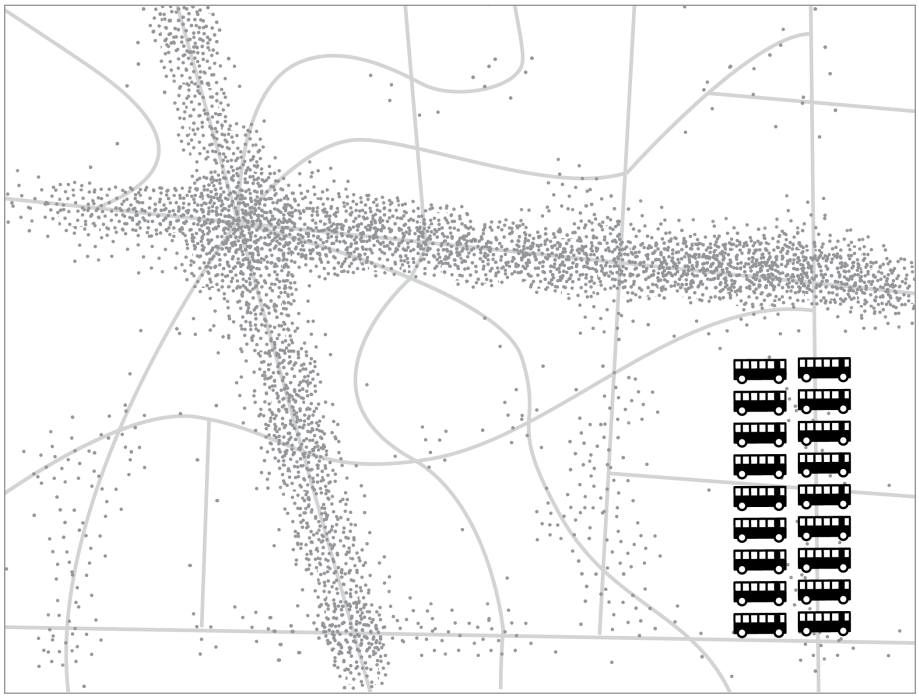


Higher Ridership: Short distances between many destinations are faster and cheaper to serve.

Lower Ridership: Long distances between destinations means a higher cost per passenger.

Goals of Transit

The previous pages describe how you would design a transit network **IF** your goal was high ridership—you would put frequent service in favorable development patterns. But at no point are we saying that you should want high ridership. Within any fixed budget, there is a decision to be made between providing service with the goal of getting high ridership vs. providing wide geographic coverage.



Ridership-Coverage Trade-off

Imagine you are the transit planner for this fictional town. On the map below, the lines indicate roads and the dots indicate people and jobs. Most people and jobs are concentrated along two main roads, as in many towns. So, these are places that more people want to travel to and from.

You have 18 buses to design a transit network. Before you can plan transit routes, you must first decide: What is the purpose of your transit system?

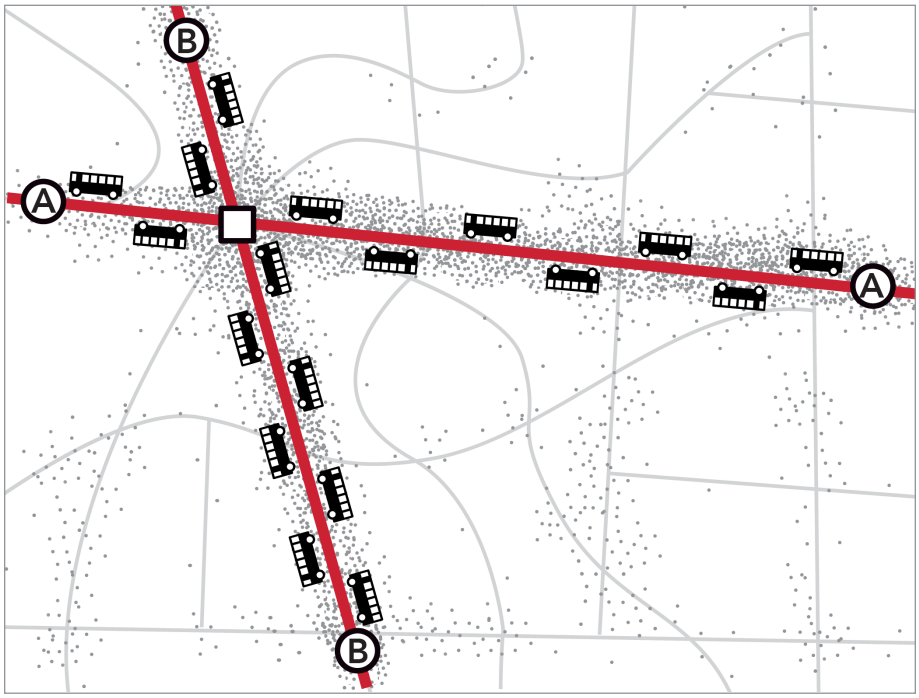
Goals of Transit: Ridership

If the goal is high ridership, you would concentrate all 18 buses on the busiest areas. You would only have two routes but waits for service are short.

Since the service is direct and frequent, many people would find the service useful, so many would use transit.

Frequent service is available in places with the greatest travel demand, but some places have no service.

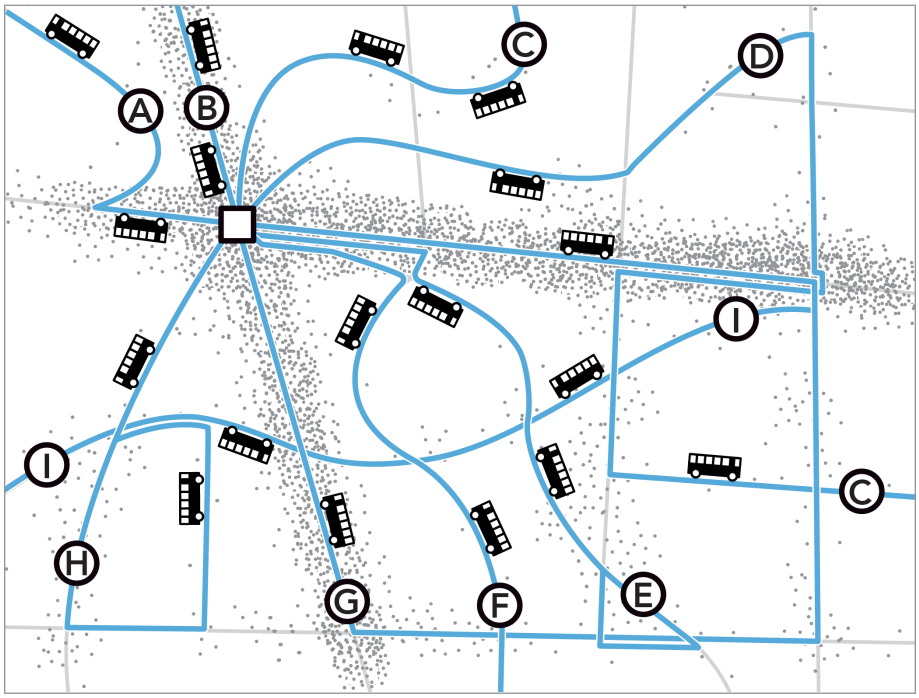
Performance Measure: ***Productivity***
Ridership relative to cost



Goals of Transit: Coverage

If the goal is high coverage, you would spread out the 18 buses so that every street has a route. Everyone lives near a bus stop, but every route is infrequent, so waits for service are long. Routes are looping and circuitous, so people spend a lot of time on the bus even when going a short distance. Only a few people can bear to wait or ride for so long, so ridership is low.

Performance Measure: ***Coverage***
Percentage of people near service



Conflicting Goals

All transit agencies must balance the competing goals of high ridership and high coverage. Within a limited budget, if an agency wants to do more of one, it must do less of the other. Ridership and coverage goals conflict with one another due to geometry and geography.

On a fixed budget, each bus that the transit agency runs down a main road, to provide more frequent and competitive service in that market, is not running on the neighborhood streets, providing coverage.

While an agency can pursue ridership and provide coverage within the same budget, it cannot do both with the same dollar. The more it does of one, the less it does of the other.

A particularly clear way for transit agencies to set a policy balancing ridership and coverage is to decide what percentage of their service budget should be spent in pursuit of each. The "right" balance of ridership and coverage goals is different in every community.

Ridership Goal

If the goal is to get **high ridership**, you would put most routes in places that are dense, walkable, linear, and continuous as described by the indicators of high ridership on pages 13-16.

In a network designed for ridership, dense areas get very good service, with the next bus always coming soon. But when an agency focuses on making the high-ridership routes as useful as possible, it means it can't afford to run to a lot of other places.

Reasons to pursue a ridership goal include:

- Getting more riders
- Reduced car trips
- Reduced emissions
- Less subsidy per passenger

Coverage Goal

If the goal is **high coverage**, you would spread service out so that there's some service everywhere. But spreading it out means spreading it thin. Since there is such a huge area to serve, none of the buses can come very often, which means that fewer people find them useful. Some people who do use coverage services really need them, and will defend them. Other people may value having service available "just in case", even though they don't use it most of the time.

Reasons to pursue a coverage goal include:

- "Access for all."
- Service for people with severe needs for transit, no matter where they live.
- Service to every city or district.

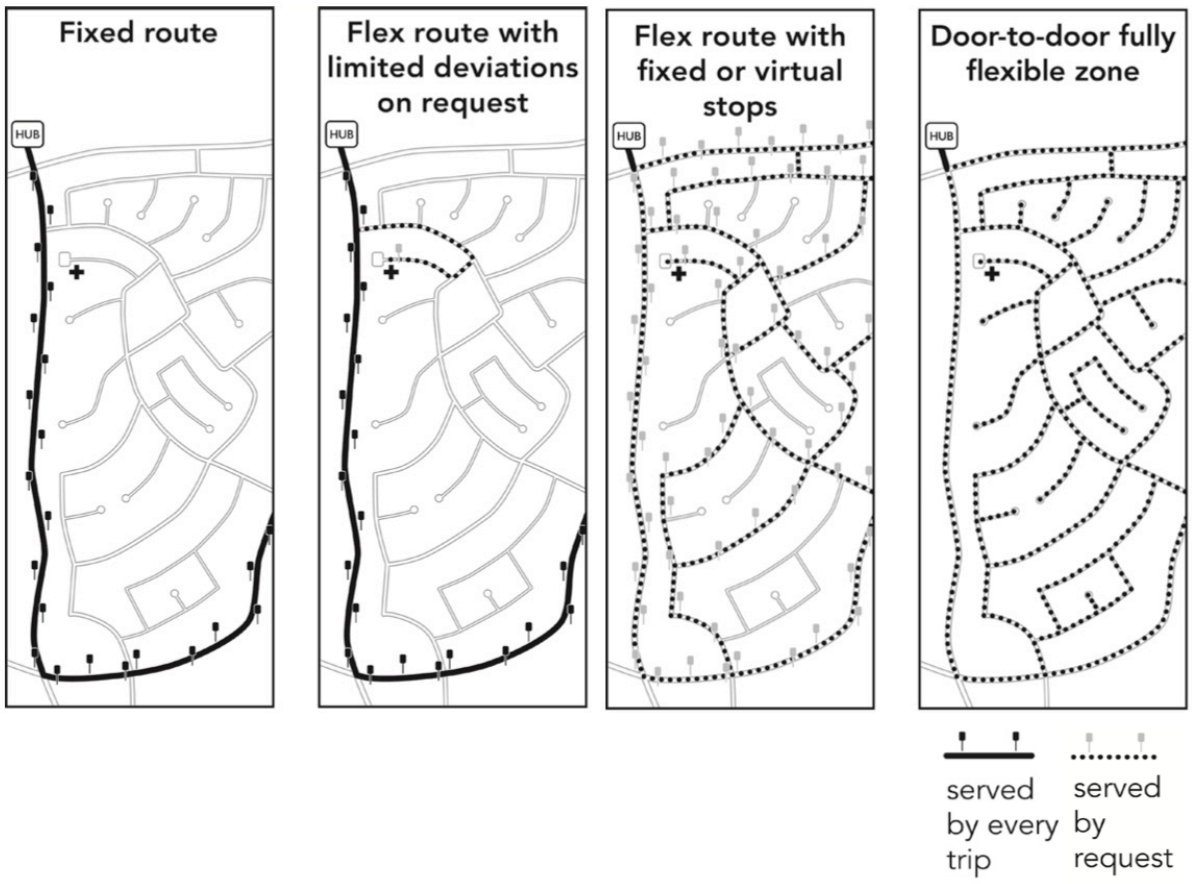
What about on demand transit?

You may have heard about taxi-like services that pick you up when and where you request them, rather than running fixed routes. This is often referred to as "microtransit," "dial-a-ride," “flex-route,” "on demand," or "demand-response." In this report, we’ll refer to those services as “on demand.”

These graphics show how on demand differs from fixed route transit. In fixed-route transit, people walk to bus stops and buses arrive based on a predetermined schedule. On demand service can pick up riders where and when they request it. On demand service can vary from a route that can provide some limited deviations on request, to an area with several fixed or virtual stops, to door-to-door service anywhere within a zone. These parameters can determine the service’s attractiveness and cost.

On demand service is generally convenient for riders because it doesn’t ask them to walk to a bus stop, and it often lets them travel at the time they prefer. But these features don’t come free.

On demand service following meandering paths puts more driver effort into serving each passenger, so in most places, it tends to be less efficient than fixed routes.



Limitations of On Demand

On demand trips can be more expensive, sometimes vastly more expensive, to provide than fixed route trips. This is why transit agencies are careful and thoughtful about where they offer on demand service and how they control its costs.

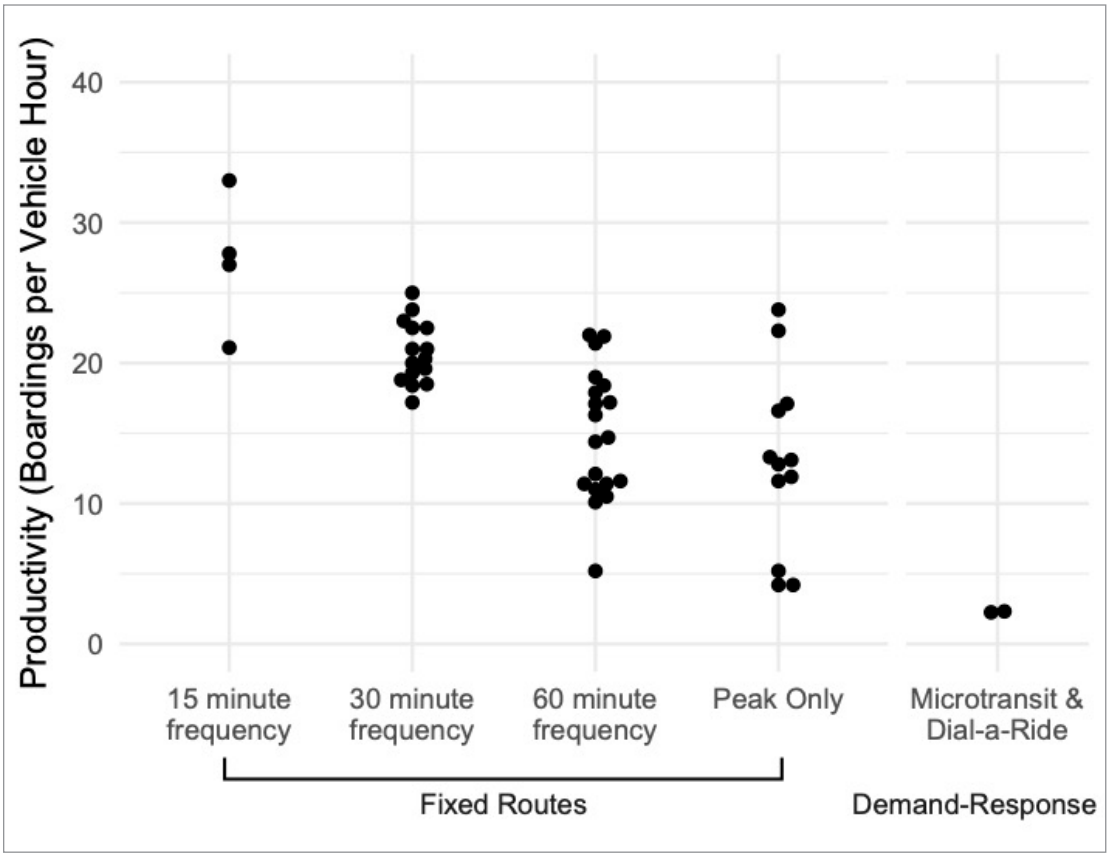
The cost of a fixed route is steady over time. It does not go up immediately when more people ride it. As a result, when more people ride, it becomes less expensive to provide each ride.

In contrast, the costs of on demand service can rise quickly as more people request trips. There is a low ceiling on how many rides per hour an on demand vehicle can serve before an additional vehicle and driver need to be deployed. **Almost no on demand services are able to average more than 5 boardings per vehicle, per hour.** If you think about what the vehicle has to do – driving around to each person's requested pick-up spot, then their requested drop-off spot – then it's clear why it would be so hard to do this very many times in an hour.

The scatterplot below shows data for each route at a real mid-sized transit agency. Each dot is a route, and its height on the graph shows its average number of boardings per hour, per vehicle. On demand service (all the way to the right) handles many fewer rides per hour than even the lowest-ridership fixed routes.

This difference in potential ridership per vehicle, when comparing fixed routes to on demand, is quite typical, because of the basic math of how the two types of services work. This means that on demand service can be a useful tool to provide coverage in a place where you would not expect to get high ridership, such as a low density area that is hard to serve by fixed route.

Route Productivity by Frequency and Type of Service



On demand services rarely get more than 5 boardings per vehicle, per hour.

3 Market & Needs

Market & Needs Assessment

In this chapter, we present and discuss data that inform two different types of considerations in transit planning:

- Where are the strongest markets for transit, where ridership is likely to be high relative to cost?
- Where are there moderate or severe needs for transit, regardless of potential ridership and cost?

The first of these helps us plan for high ridership. The second helps us deploy coverage services to best meet the needs.

Market Assessment

The transit market is mostly defined by **WHERE** people are, and **HOW MANY** of them are there, rather than by **WHO** they are.

On the following pages, these maps help us visualize the transit market:

- Residential density
- Job density
- Activity density (the sum of residents and jobs)
- Travel patterns
- Density of low-income residents

All else being equal, density matters more than income and age if you are trying to predict where transit will get high ridership.

This is not to say that who people are is not important. It is extremely important, especially when designing transit services to achieve a coverage goal.

Need Assessment

We learn about transit needs by examining **WHO** people are and what life situation they are in.

On the following pages, these maps help us visualize transit needs:

- Density of low-income residents
- Density of zero-vehicle households
- Density of seniors
- Density of youths

These measures cannot by themselves tell us that a person has a severe need for transit. For example, some people in a zero-vehicle household can afford to use Uber/Lyft. We must consider these measures to understand where people's needs for transit are likely to be severe.

Civil Rights

Another important map in this chapter is not strictly related to need but rather to civil rights. This map shows **where people of color live**.

Unequal treatment on the basis of race, ethnicity, or national origin is prohibited by the Civil Rights Act of 1964. Regulations by the Federal Transit Administration require that MCTS considers the benefits and burdens that people of color and people in poverty experience from transit service and in the process of planning for transit and transportation projects.

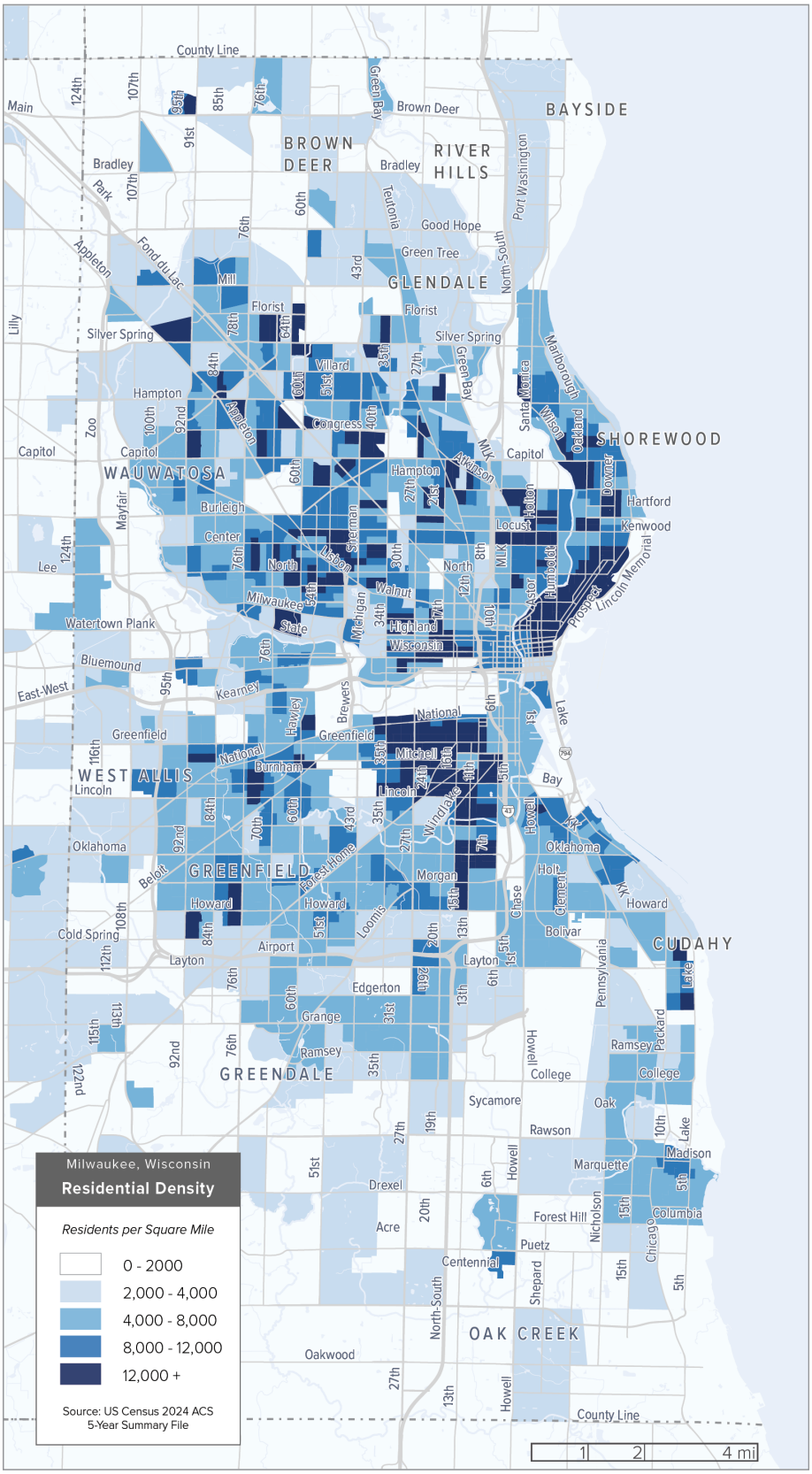
Market: Residential Density

Most trips start or end at home. Further, places with many households are also destinations for other people, whether for visiting, worship, caring for family or home-based work.

This map shows the distribution of residential density in Milwaukee County. The areas with the highest residential density are:

- Downtown Milwaukee
- northeast of Downtown along the lake
- Near South Side
- Near Marquette
- several areas 2-5 miles northwest of Downtown

There are also relatively dense areas scattered throughout the county, including Cudahy and some parts of Greenfield.



Market: Job Density

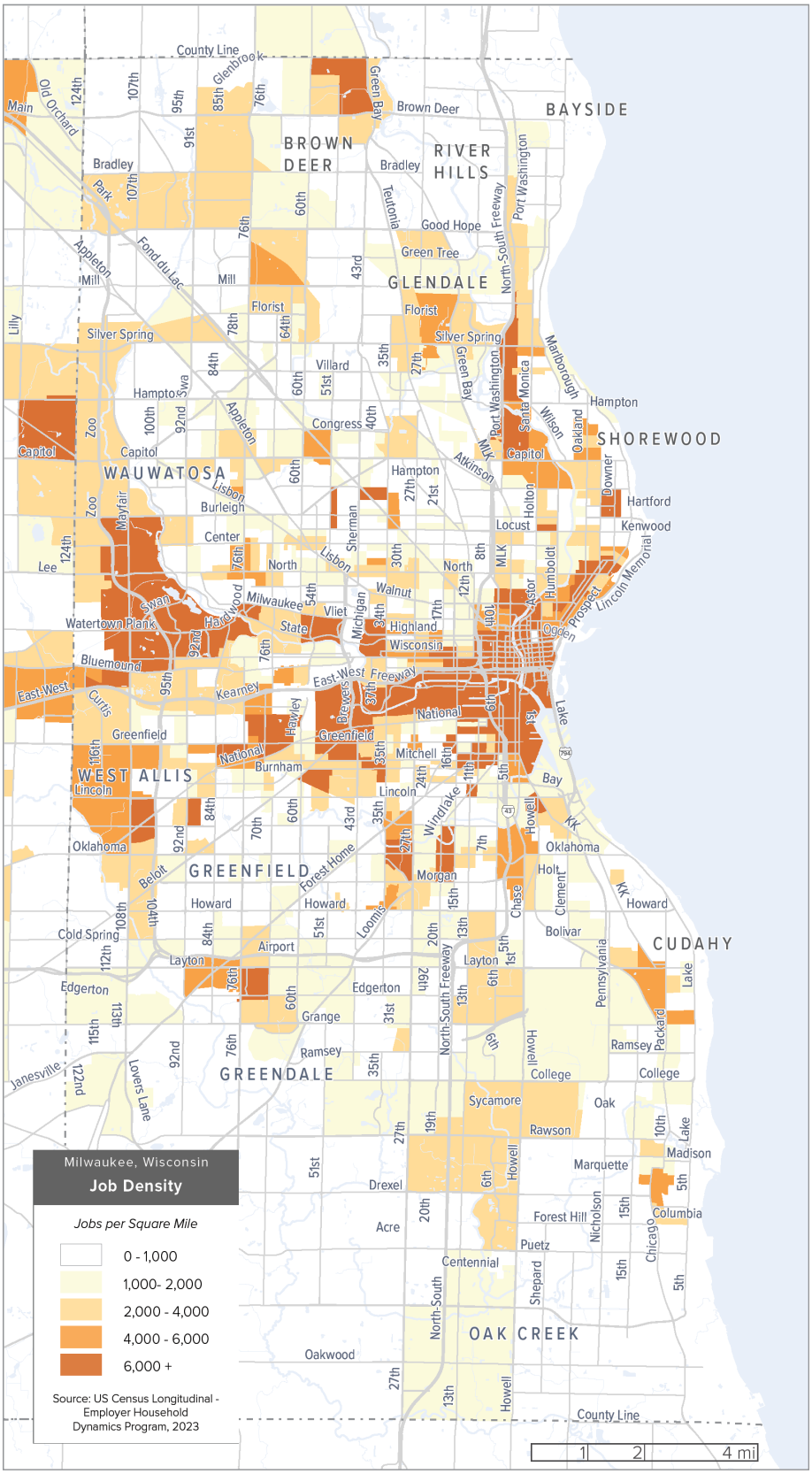
A map of job density shows us not only the places people travel for work, but also places people go for services, shopping, community, health care, and more. A person's workplace may be, throughout the day, a destination for dozens or even hundreds of people. For this reason, job density is typically an even better predictor of transit ridership than residential density.

This map shows the distribution of job density in Milwaukee County. The area with the highest concentration of jobs is in and near **Downtown Milwaukee**.

Additionally, there are a lot of jobs in other places, including,

- the Menomonee River Valley
- the Milwaukee Regional Medical Center and nearby areas
- northeast of Downtown along the lake
- along North Port Washington Road

Other dense job areas include Maquette University, West State Street, West Allis, Ascension, St. Francis Hospital, and South 27th Street.

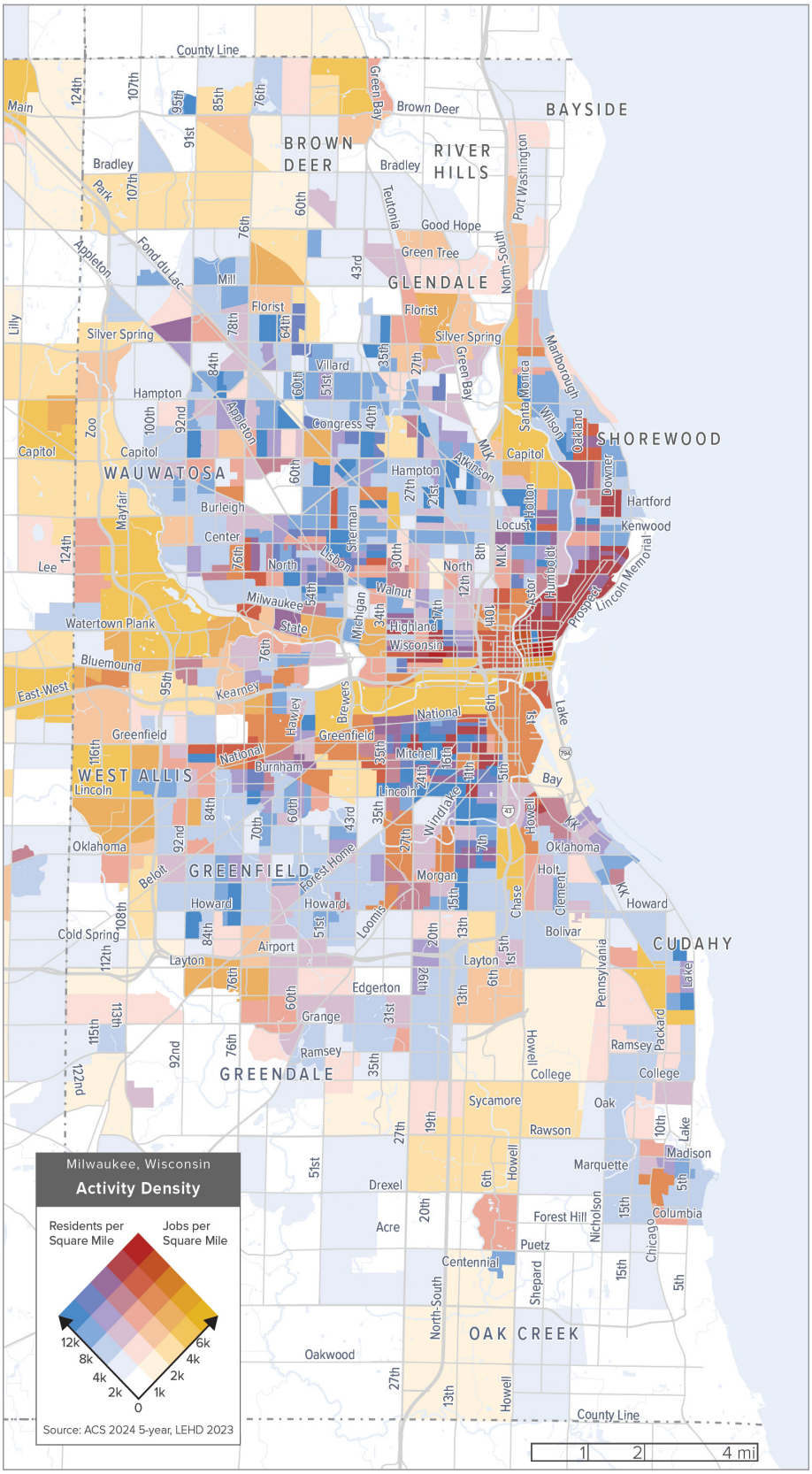


Market: Activity Density

Resident and jobs density are both critical measures of a place's potential transit market relative to other parts of the service area. Those two measures can be combined in a single map that shows the activity density—the density of both jobs and residents. Activity density helps visualize the overall potential transit market of an area. The map below shows activity density in Milwaukee County.

Places with more residential density are shown in increasingly brighter shades of blue; areas of high employment density in brighter shades of yellow. The areas shown with shades of red (also purple and orange) are places where there are high densities of both jobs and residents, and where there is likely to be a strong market for travel for most or all of the day.

This is because an area with a mix of housing, retail, services and jobs tends to generate more even demand for transit in both directions, throughout the day. Transit serving purely residential neighborhoods tends to be used in mostly one direction as residents leave in the morning, and return in the evening.



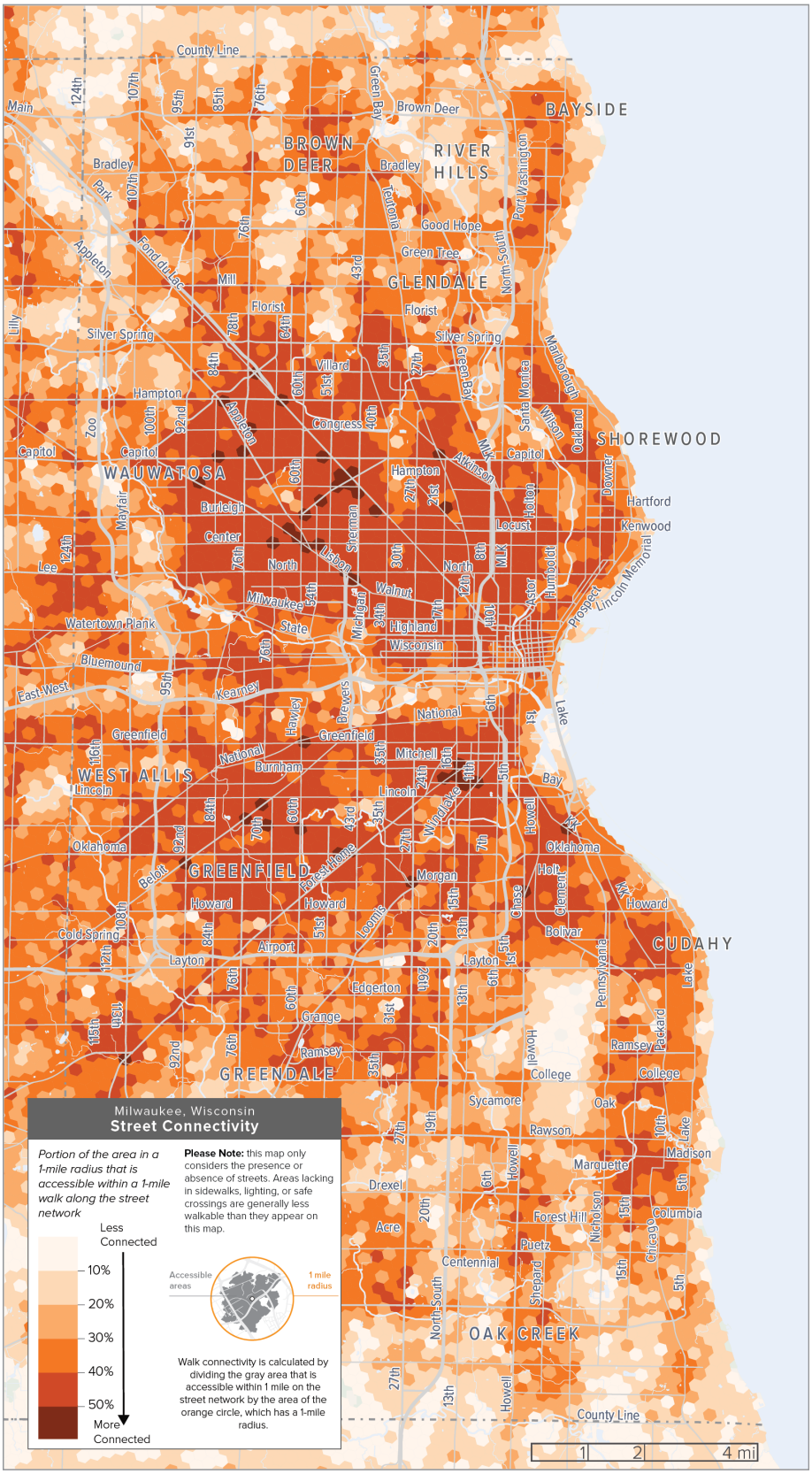
Market: Walkability

In most cases, transit trips begin and end by walking. Therefore, the ability to walk to transit is very important. The street pattern determines how much of the area around a stop is truly within a short walking distance.

Areas with highly-connected street patterns provide short and direct paths between any two locations. Areas with poorly-connected street patterns force long and circuitous paths and discourage walking. A lack of sidewalks and safe crossings can also mean that fewer people and jobs are within a short walk of transit because people may have to walk farther to cross the street to reach a bus stop.

The map to the right asks “how directly is it possible to walk? Here, we show the percentage of the area in a one-mile radius that can actually be reached in a one-mile walk. A continuous street grid typically score over 60% but areas with many barriers to walking score much lower. Darker areas correspond to contiguous grid-like layouts, while lighter areas represent barriers to walkability, including restrictive street patterns. In some cases, the lack of street connectivity and limited walkability is a combination of both development pattern and natural topography that limits the ability to create more connected street networks.

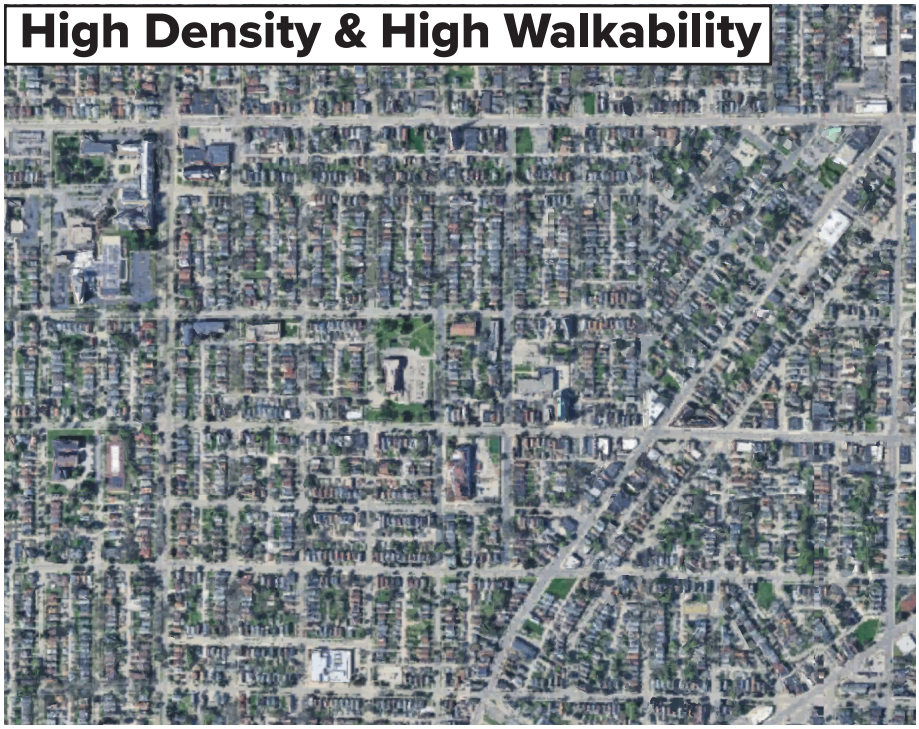
The street network is quite walkable throughout the inner parts of the County, except where the freeways interrupt the street grid. About 6 miles from Downtown, the grid starts to fall apart and less connected cul-de-sacs start to emerge.



Examples of Density & Walkability (1)

High Density & High Walkability

The Near South Side is among the densest parts in the county. It features both many jobs and many residents. It features a traditional street grid, many street crossings, and sidewalks on most streets, making it one of the most walkable areas of the county.



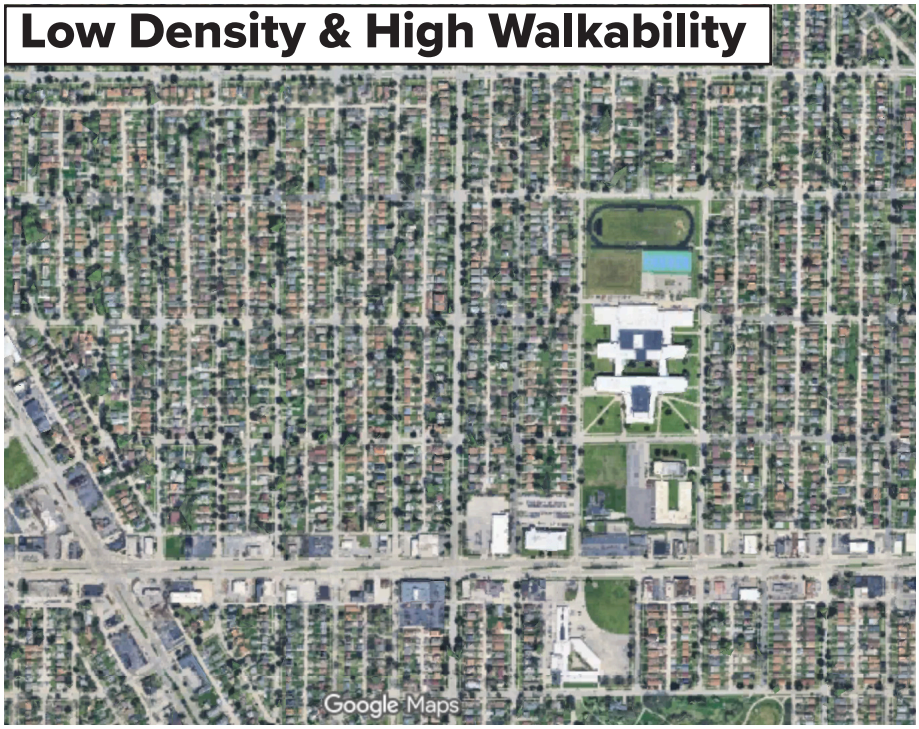
High Density & Low Walkability

The area around the Milwaukee Regional Medical Center has a high concentration of jobs, including several office parks. Most buildings are surrounded by a sea of parking lots making it very uncomfortable to walk. The main streets have sidewalks, but walks are long and you often have to cross parking lots to reach the buildings. Additionally, I-84 crosses through the middle, so you can't walk from the office parks in the west to the Medical Center in the east.

Examples of Density & Walkability (2)

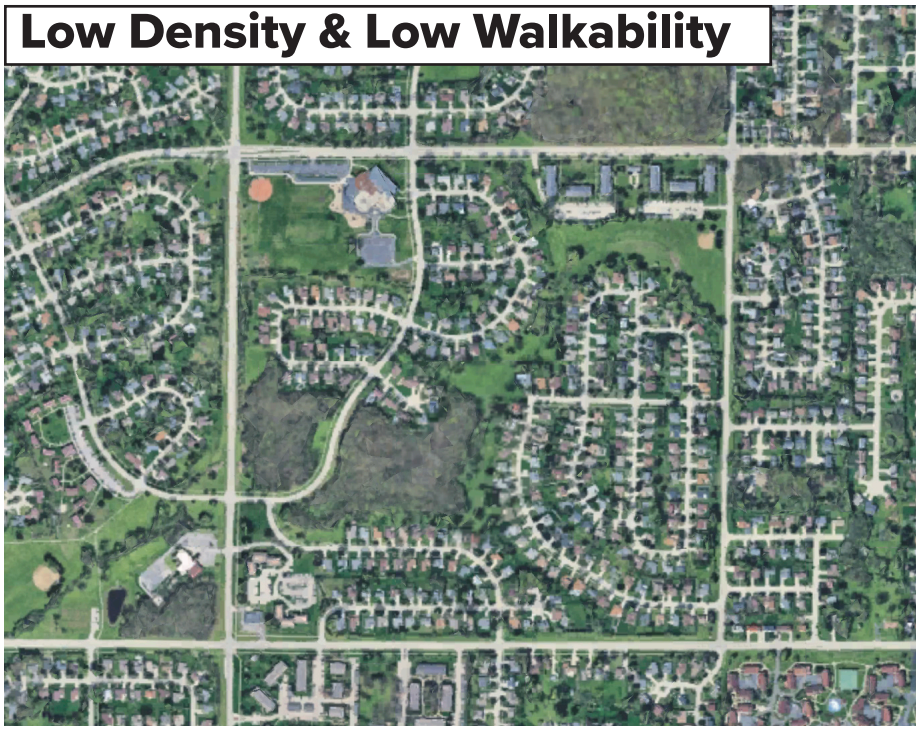
Low Density & High Walkability

Many neighborhoods farther from Downtown, like Capitol Heights and Columbus Park, are very walkable neighborhoods with a gridded street network up to about 6 miles from Downtown Milwaukee. Due to being primarily single family housing with few businesses, it has a much lower density, and therefore lower ridership potential, compared to a place like The Near South Side. Nevertheless, the highly walkable layout means it can more easily become a transit-oriented place than the office parks west of I-84.



Low Density & Low Walkability

Neighborhoods near the edges of the county were built with large lots with the presumption that most people would drive. Greendale and Brown Deer are examples of typical auto-oriented, single family residential area with low street connectivity. The meandering streets and neighborhoods with only one or two outlets make these places quite unwalkable and therefore have very low transit ridership potential.



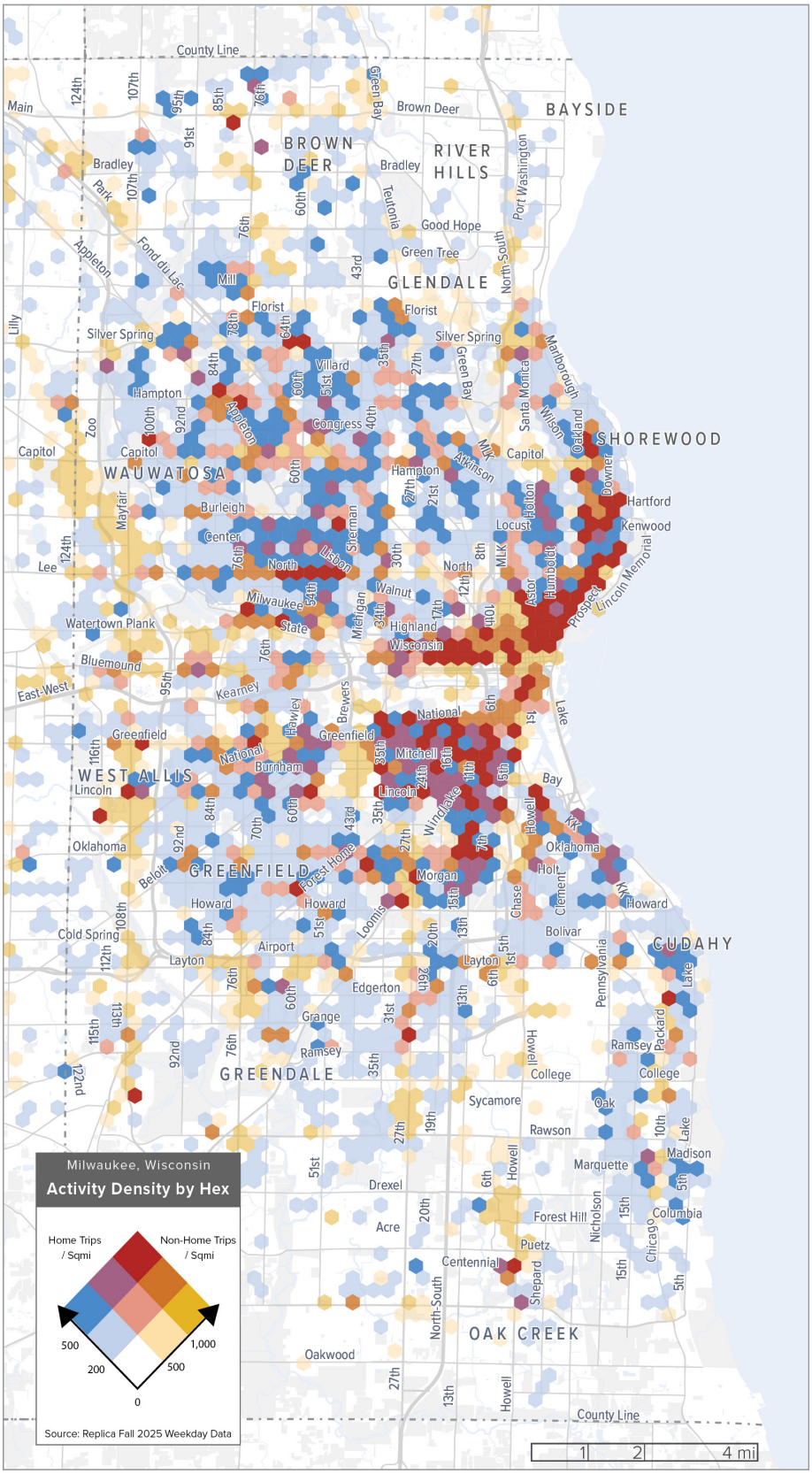
Market: Trip Density

Looking at how people are traveling today can tell us a lot about demand. The map below shows the number of people traveling today to every census block using any mode. The source for this map is Replica.

Replica uses cell phone location data to feed its model and determine travel patterns. Replica only uses de-identified mobile location data.

This map shows the density of trips during a weekday. Similar to the previous activity density map, places with more people going home are shown in increasingly darker shades of blue and areas with other trips are shown in increasingly darker shades of yellow. The areas shown with shades of red (also purple and orange) are places where there are high densities of all kinds of trips, and where there is likely to be a strong market for travel for most or all of the day.

The biggest destinations for all trips are in and near Downtown Milwaukee, Near South Side, Marquette, and along the lake, northeast of Downtown. There are also a lot of trips along West Oklahoma Avenue and West North Avenue.



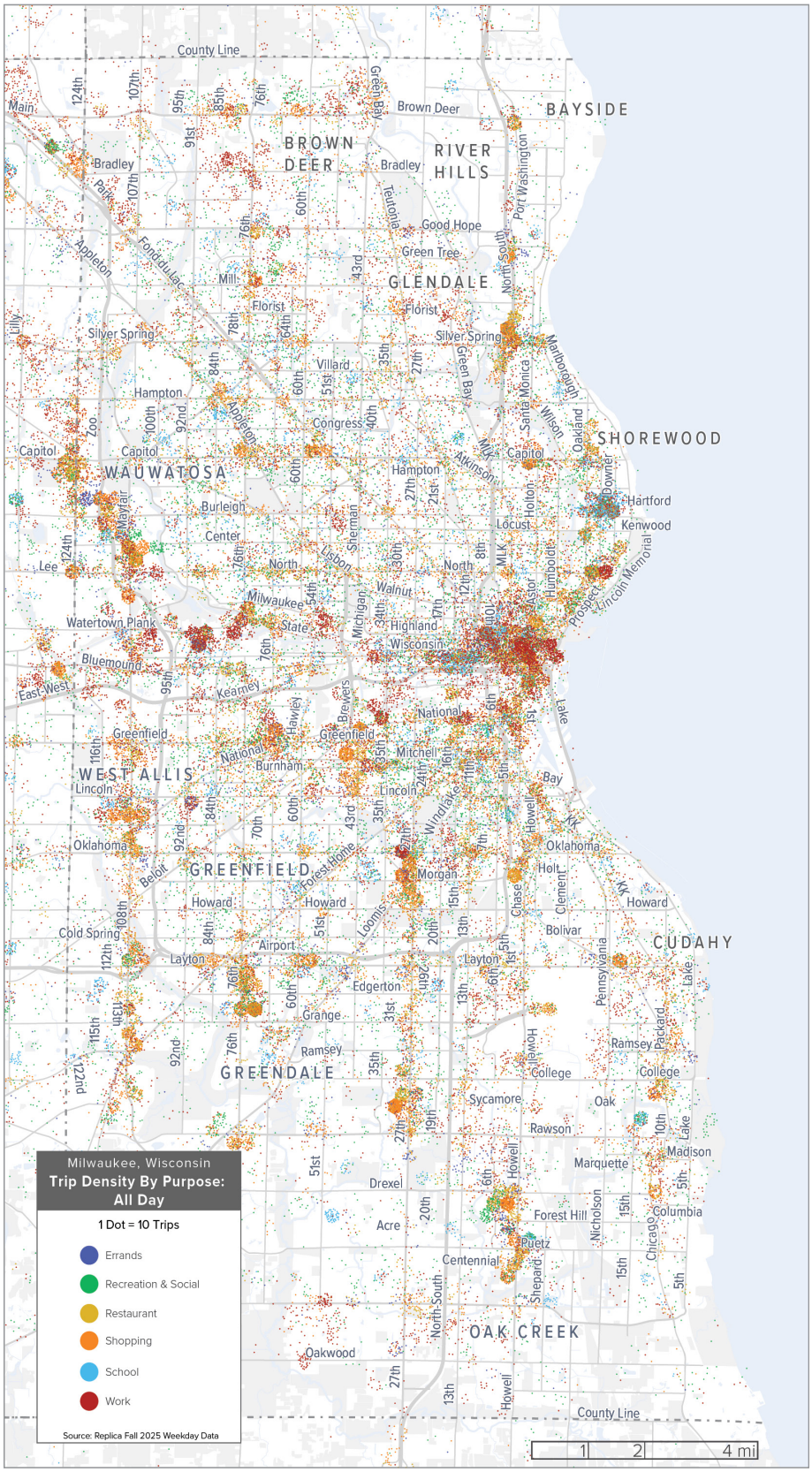
Market: Trip Density by Purpose

In addition to mapping home trips, we can map all kinds of trip destinations together. On the map to the right, every dot represents 10 trips and the color of the dot is the purpose of those trips. Where there are more dots together, there is higher trip activity.

In red, we can see that work trips follow a similar pattern as the job density map with the largest concentration in Downtown Milwaukee, South 27th Street, northeast of Downtown and the Medical Center.

Orange and yellow represent shopping and restaurants, respectively. They highlight several main corridors throughout the county, including North Port Washington Road, South 108th Street, South 76th Street, and South Howell Avenue. Many of these places have shopping malls of big box stores.

In light blue, we can see trips going to school. Naturally, there is a large concentration of school trips at Marquette University and the University of Wisconsin-Milwaukee.

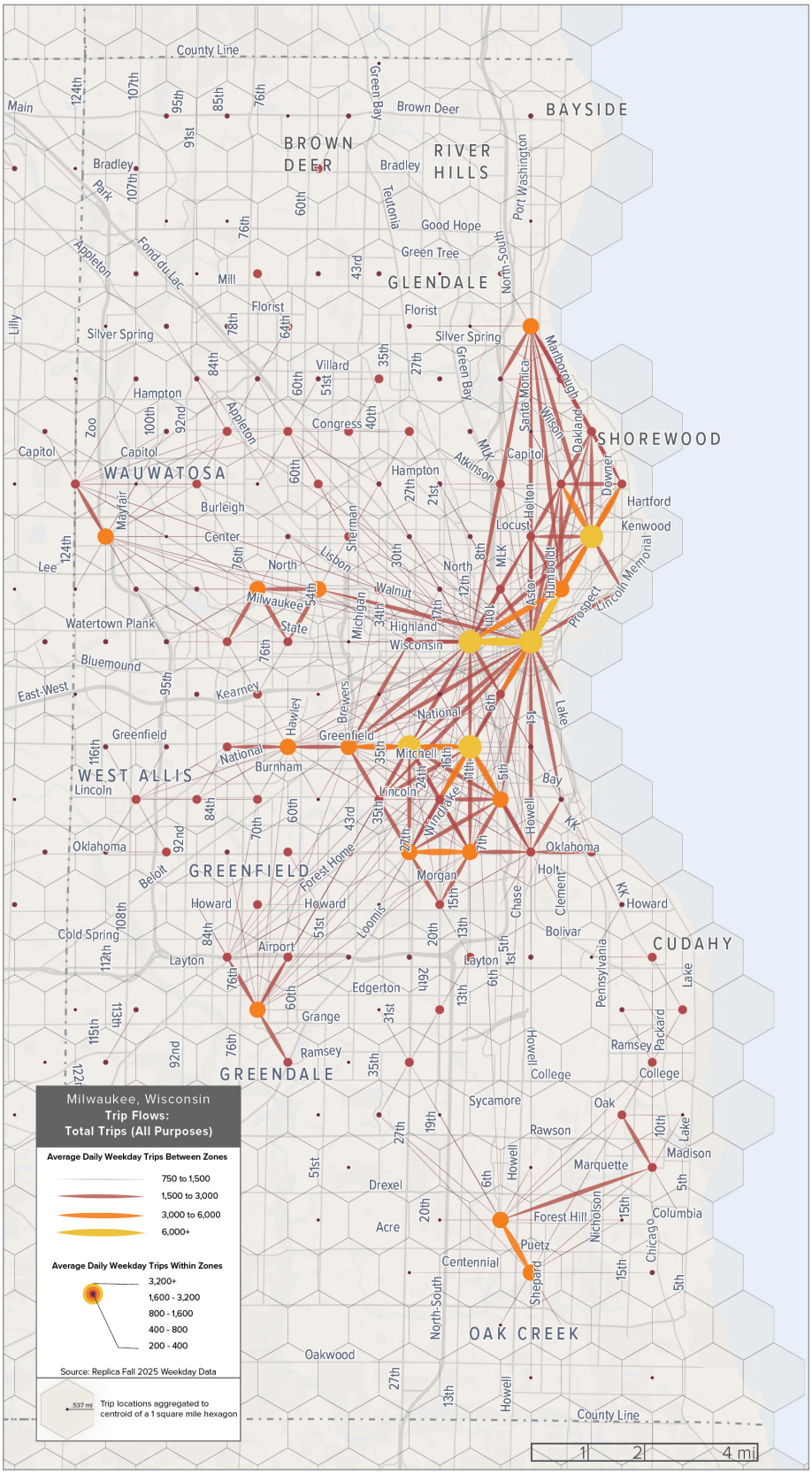


Market: Travel Patterns

By using the same Replica dataset, we can explore travel flows. On this map,

- Dots represent trips that start and end within a specific hexagon.
- Larger dots mean more trips within that hexagon.
- Lines represent trips between two hexagons.
- Wider, more yellow lines mean more trips between those two hexagons.

The yellow and orange lines on this map are short, which tells us that, even thought people travel everywhere throughout the county, most people are traveling short distances. The largest dots are in Downtown, the northeast, and The Near South Side, which further highlights short trips.

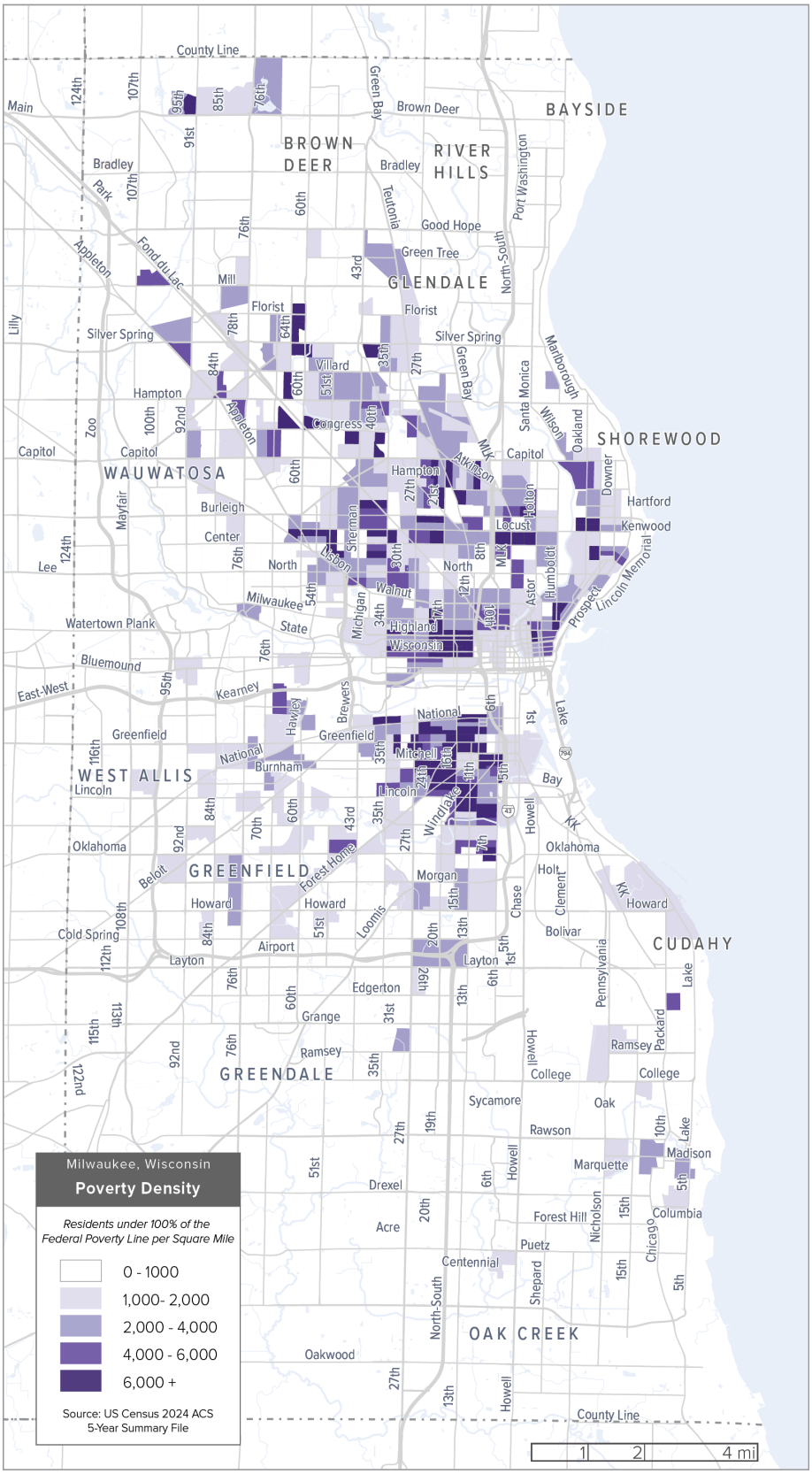


Market & Need: Low-Income Residents

This map shows the density of residents with family incomes below the federal poverty level. A frequently-cited goal for transit service is to provide affordable transportation for lower-income people.

Areas with medium to high low-income density, in walkable neighborhoods, can produce high ridership. However, if transit doesn't allow people to make the trips they need in a reasonable amount of time, even lower-income people won't use it. They'll seek other options like buying a used car or getting a ride from a friend.

The Near South Side and the areas northwest of Downtown stand out as having the highest concentration of low-income residents. Areas near the two universities likely include many students, and students often report low incomes to the census while studying.

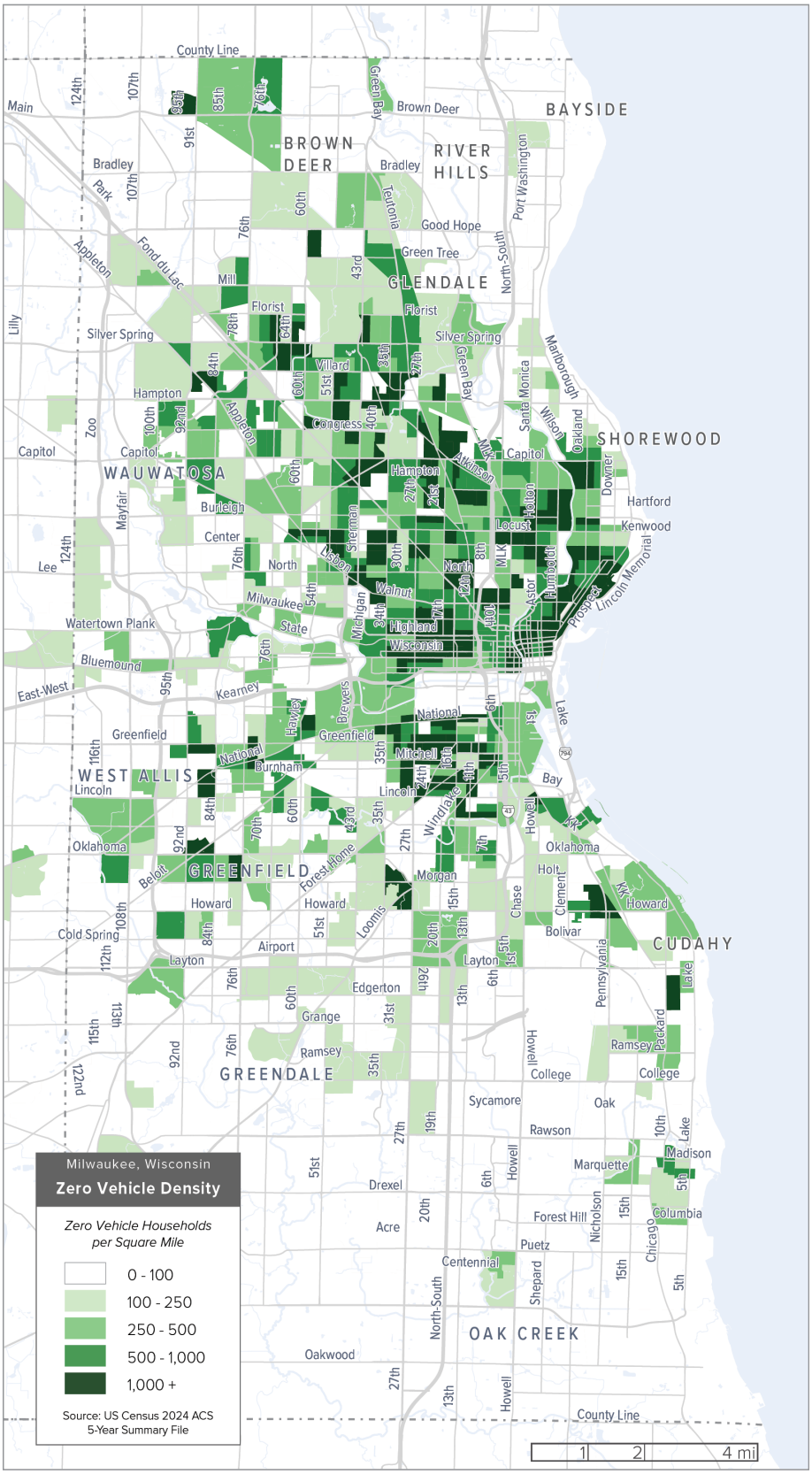


Market & Need: Households Without Cars

Another factor affecting transit's competitiveness and need is the availability of personal cars. People in households without vehicles have a greater inclination toward transit use because they don't have a car always ready to go. So if transit is useful, reasonably fast, reliable, and available when needed, it can be a compelling option.

If transit does not present a realistic travel option, then people without cars will find other ways to reach the places they need to go by getting rides from friends, cycling, walking, or using taxis. Some people may also just not travel, thereby limiting their access to the economic, social, and other opportunities in the county.

This map shows the density of households without cars. Note that this map shows households, not individual residents like the previous demographic maps. There are households without cars throughout the county, but the areas that stand out the most are the Near South Side, northeast of Downtown, the northwest in general. This corresponds closely to people in poverty.



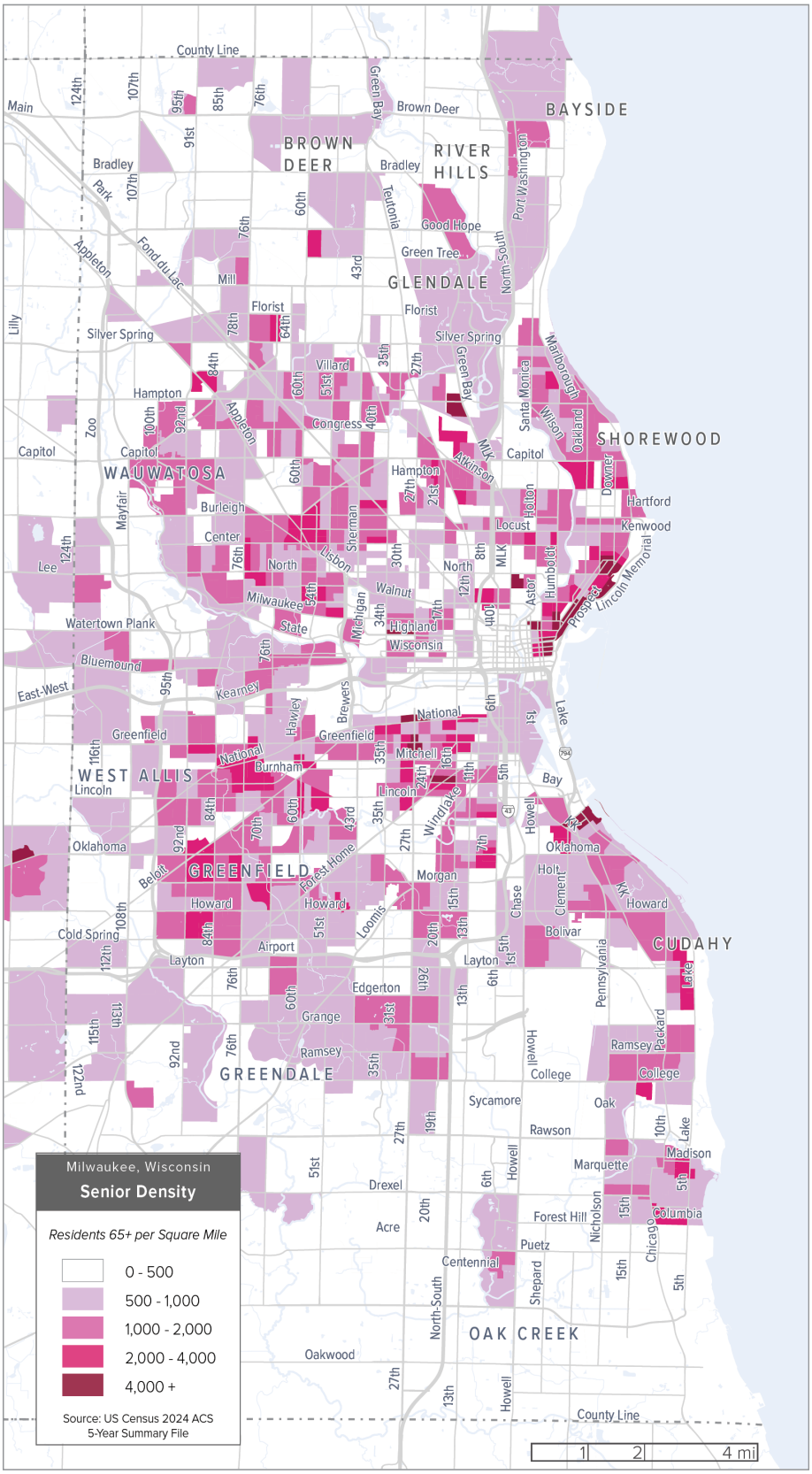
Need: Seniors

Seniors (65 and older) are an important constituency for transit because a major value of transit coverage is providing service for people who cannot drive, no matter where they live. Some seniors cannot drive and may be more likely to use transit. And as a group, senior-headed households are less likely to own cars than the general population.

Seniors tend to have different preferences for transit than younger people. On average, seniors are more sensitive to walking distance but less sensitive to long waits because many are retired and have flexible schedules. As a result, seniors often advocate infrequent, circuitous services that are not of much use to younger riders who have less free time.

For this reason, transit service specialized around the needs of seniors rarely attracts high ridership relative to cost. Thus, the focus that transit agencies place on meeting the needs of seniors should be carefully balanced with the needs and desires of the rest of the community.

This map shows the density of senior residents. Compared to all residents, seniors are generally scattered throughout the county, but there are less near Downtown, except right by the lake. Most seniors are between two and six miles from Downtown.



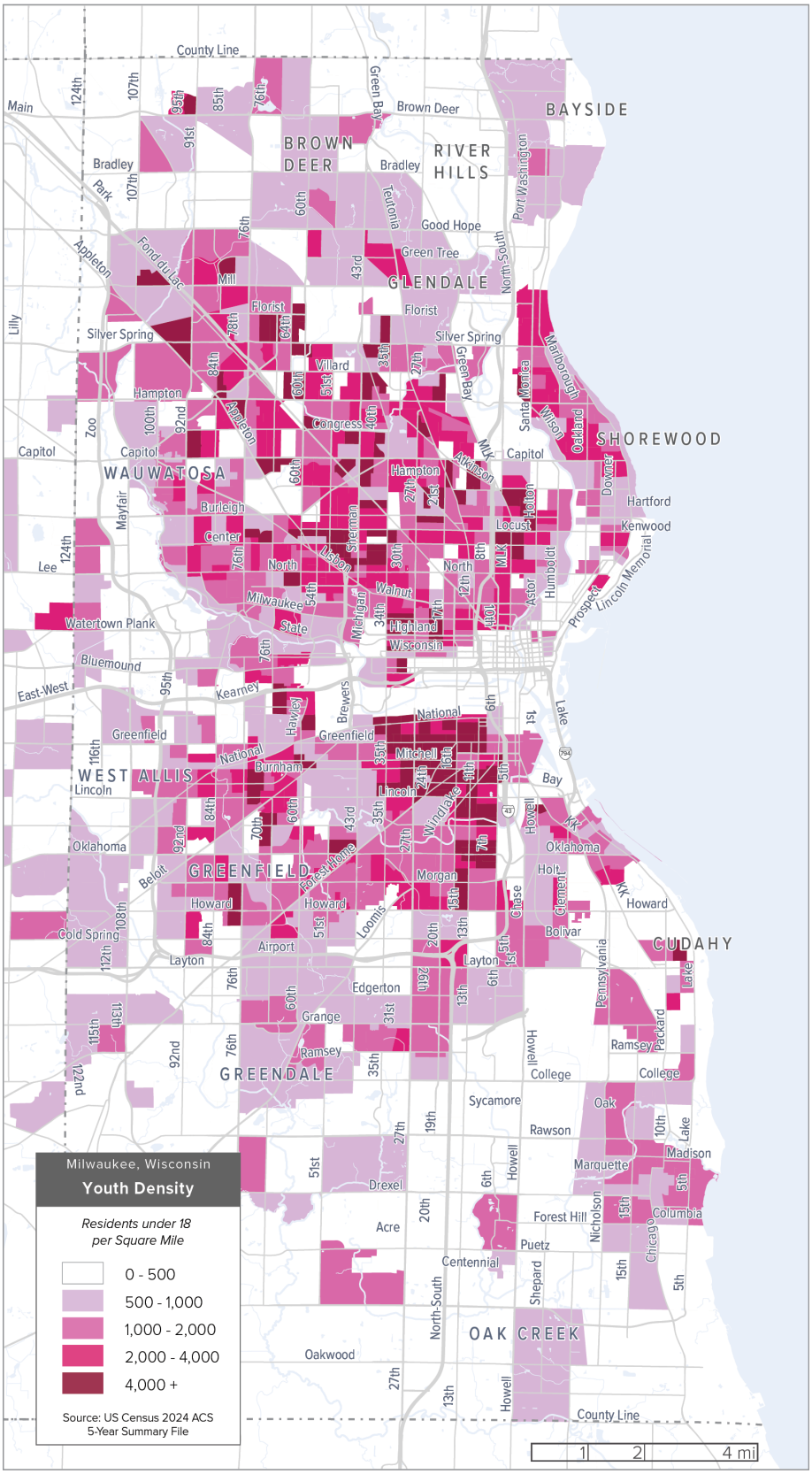
Need: Youth

Just as transit coverage can meet the needs of seniors who cannot or choose not to drive, transit coverage can also meet the needs of children and teenagers who are too young to drive.

The map below shows the density of residents under the age of 18. Young residents follow a very similar distribution to all residents, except that there are less in Downtown and northeast of Downtown.

Young people are like seniors in that they often live on a tighter budget than people of working age. For this reason, both are very sensitive to transit fares, and parents are sensitive to paying a fare for each child.

However, young people and seniors are very different in their ability and willingness to walk to transit service. Most young people can and will walk farther to reach service than seniors. Whatever effect an increase in price has on ridership among working age people, it will have an even stronger effect on ridership among young and old people. This is why many transit agencies, along with movie theaters and other for-profit businesses, offer a discounted price for seniors and children.

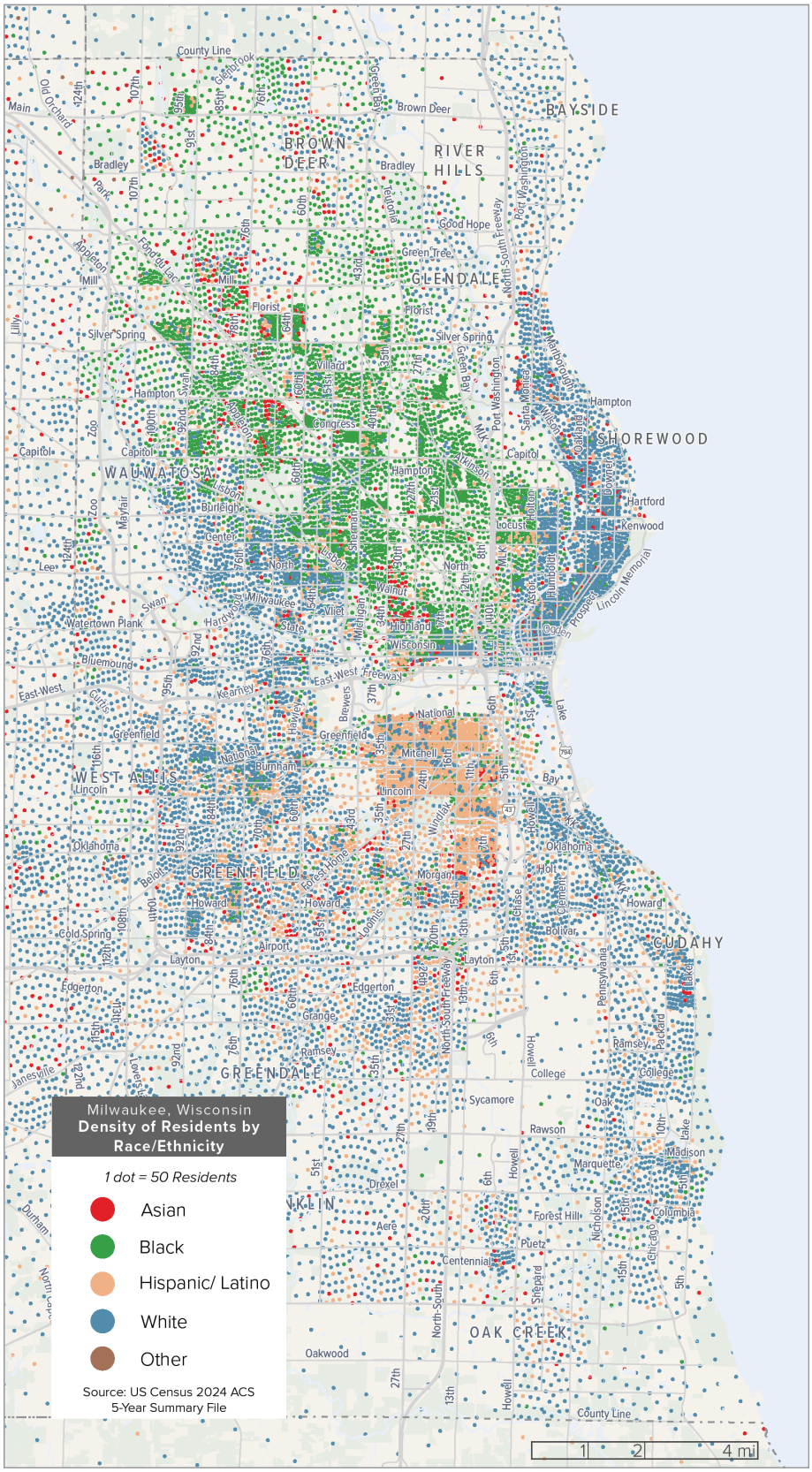


Civil Rights: People of Color

Data about ethnicity or race do not alone tell us how likely someone is to use transit. However, avoiding placing disproportionate burdens on people of color is essential to the transit planning process. Transit agencies are also required by Title VI of the Civil Rights Act of 1964 to ensure that services they provide do not discriminate on the basis of race, color or national origin.

This map shows the distribution of people by race and ethnicity. Each dot represents 50 residents. Where dots are close together, the overall density of residents is higher. Where dots of a single color predominate, people of a particular race or ethnicity make up most of that area's residents.

Milwaukee County has a high degree of racial segregation. The Near South Side is predominately Hispanic, residents in the northwest are mostly African Americans, and the northeast is mostly White. Some areas are more mixed, including southwest of The Near South Side and west of Marquette University.



4 Existing Transit Network

Where is service available?

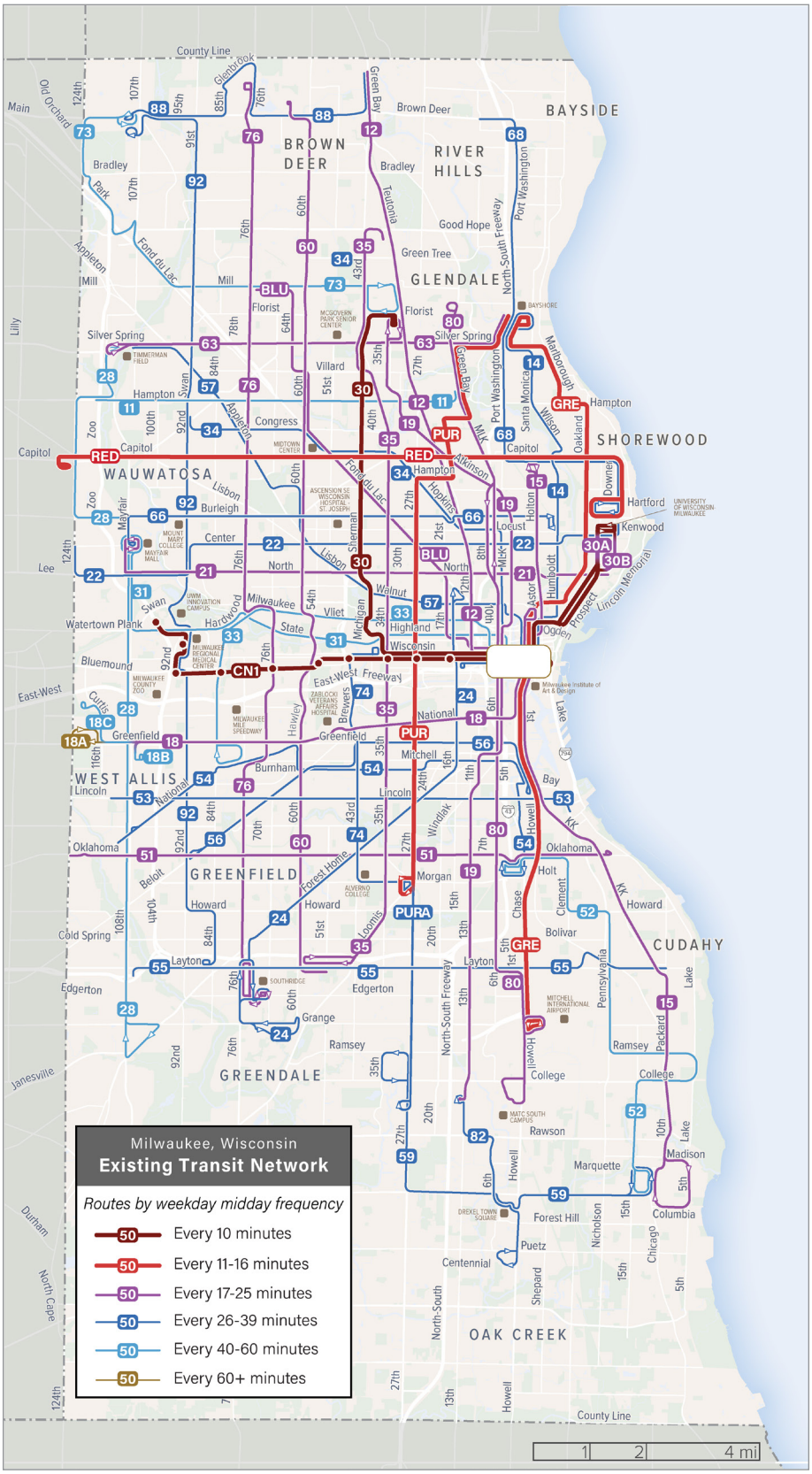
Many conversations about transit focus on where services are provided, but often not enough attention is paid to when transit is coming. Waiting time is such an important component of any transit trip that it is essential to think about frequency when looking at a bus network. The routes in this maps are colored by their frequency during midday on a regular weekday.

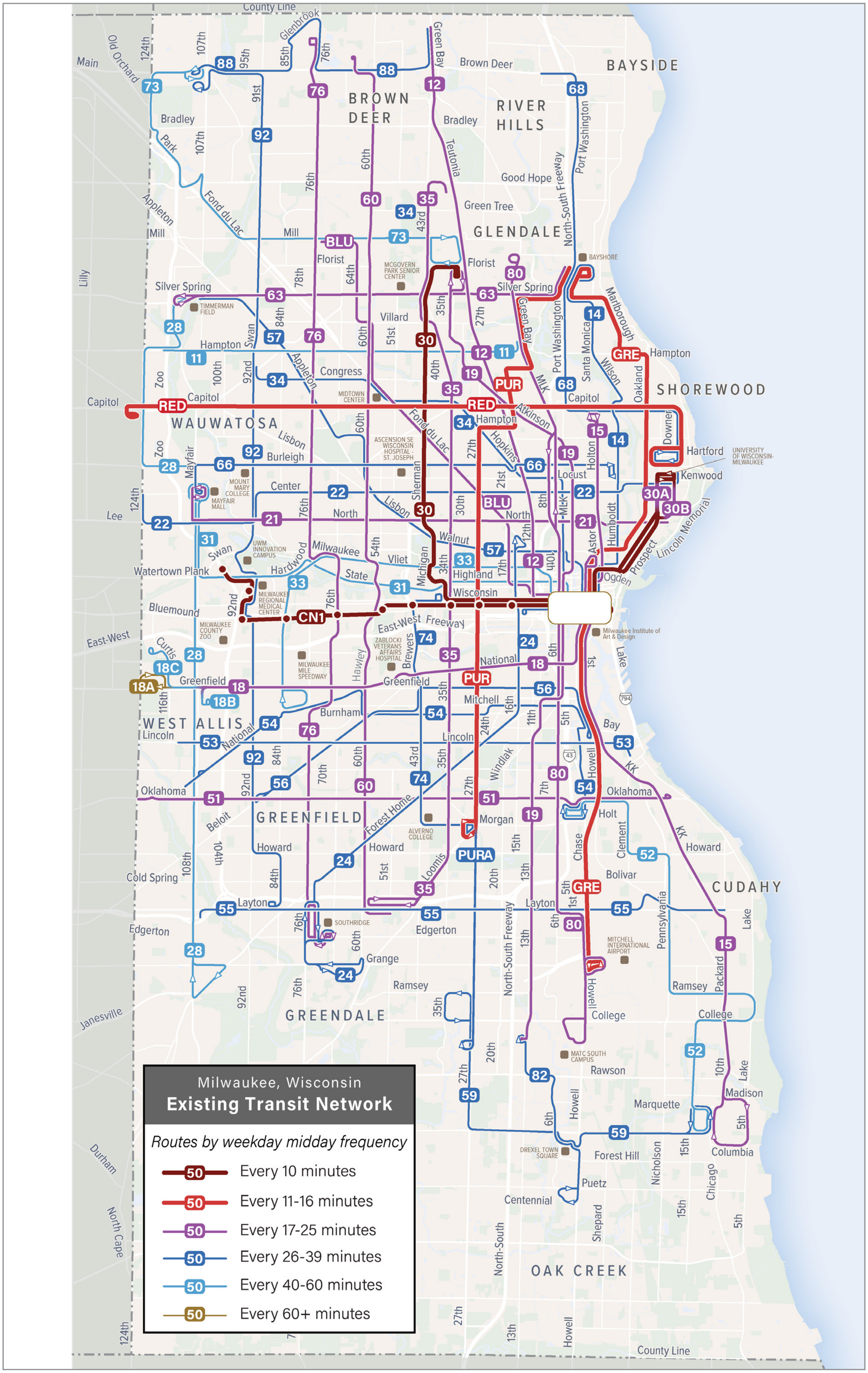
- **Dark red lines** are routes that run every 10 minutes,
- **Bright red lines** run every 11-16 minutes,
- **Purple lines** run every 17-25 minutes,
- **Dark blue lines** every 26-39 minutes,
- **Light blue lines** every of 40-60 minutes, and
- **Brown lines** are routes that run only during peak periods.

Sometimes, a route splits to provide service to more places but at a lower frequency. Route 30 runs every 10 minutes, so it is colored as dark red. When it approaches the University of Wisconsin-Milwaukee, it branches to provide service on North Maryland Avenue and North Downer Avenue every 20 minutes on each. Thus, Route 30A and 30B area colored as purple.

CONNECT 1, the county's bus rapid transit route (BRT) is colored as dark red because it runs every 10 minutes in the midday. It's stations are also marked on the map for clarity.

The next page has a larger version of this map to show details more clearly.




Milwaukee, Wisconsin
Existing Transit Network
Routes by weekday midday frequency
Every 10 minutes
Every 11-16 minutes
Every 17-25 minutes
Every 26-39 minutes
Every 40-60 minutes
Every 60+ minutes
BAYSIDE
BROWN DEER
RIVER HILLS
GLENDALE
SHOREWOOD
WAUWATOSA
WEST ALLIS
GREENFIELD
GREENDALE
CUDAHY
OAK CREEK
County Line

When is service available?

The chart below summarizes the frequency throughout a weekday for several routes. Every row represents a route and every column is an hour of the day. The color of each single block is the frequency of that route at that hour.

Many routes have higher frequencies during peak hours and often lower frequencies in the evenings. The Blue Line and Routes 15, 18, 19, and 21 provide roughly 15-minute frequency during the peaks, 20 minute frequency in the middle of the day and 30-minute frequency in the evenings.

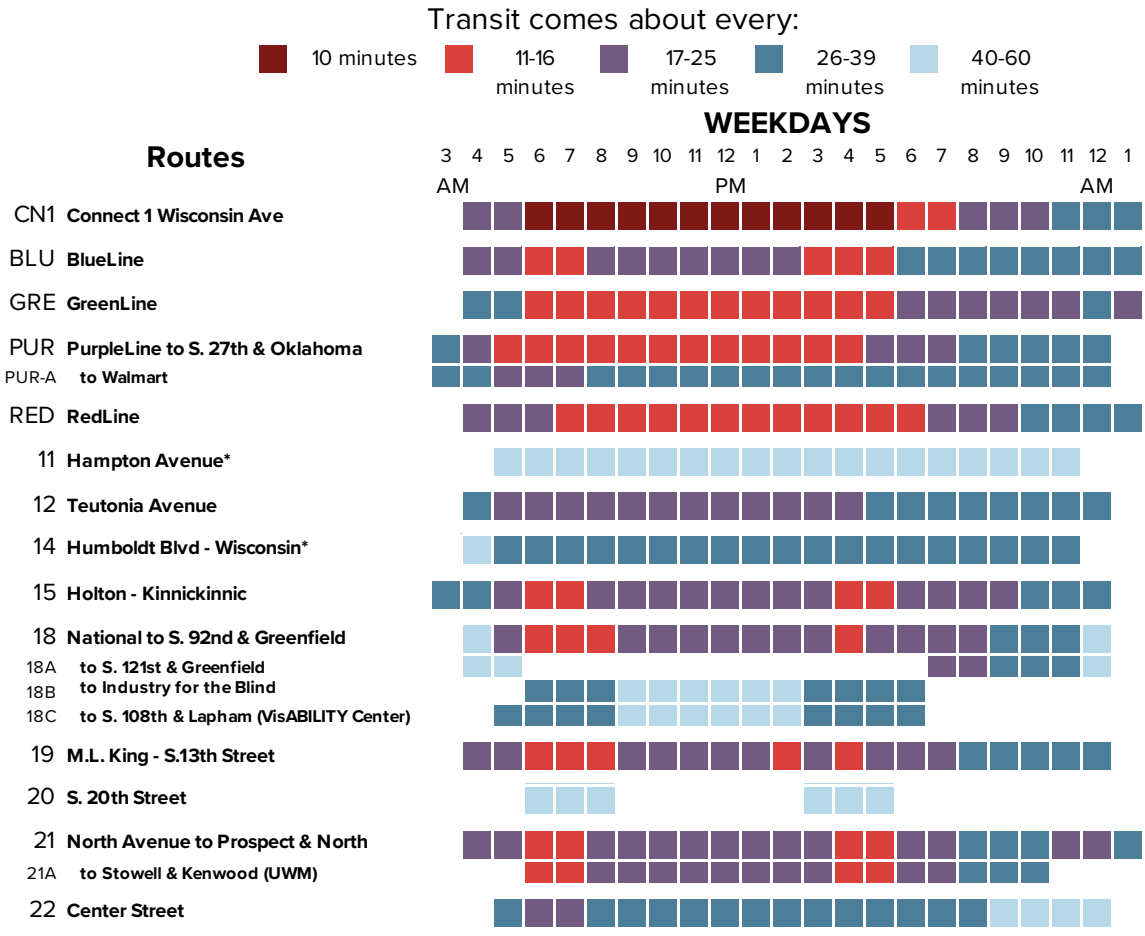
The Purple Line (PUR) runs every 15 minutes to South 27th & Oklahoma Avenue in the midday, so it is colored as red on this chart. It also runs farther south, to the Walmart, every 30 minutes, so the row for the Purple-A (PUR-A) is colored as blue.

Most routes start service around 4am and end around midnight, which is good for making the transit useful for many kinds of trips. High ridership tends to arise from all-day, all-week service. Many people that work in retail of service jobs have shifts that are not Monday to Friday, 9 to 5. If a person has to be at work before or after transit service is provided, they are not likely to find transit useful. Additionally, people who work during the week value having a chance to do their shopping or visiting by transit on weekends.

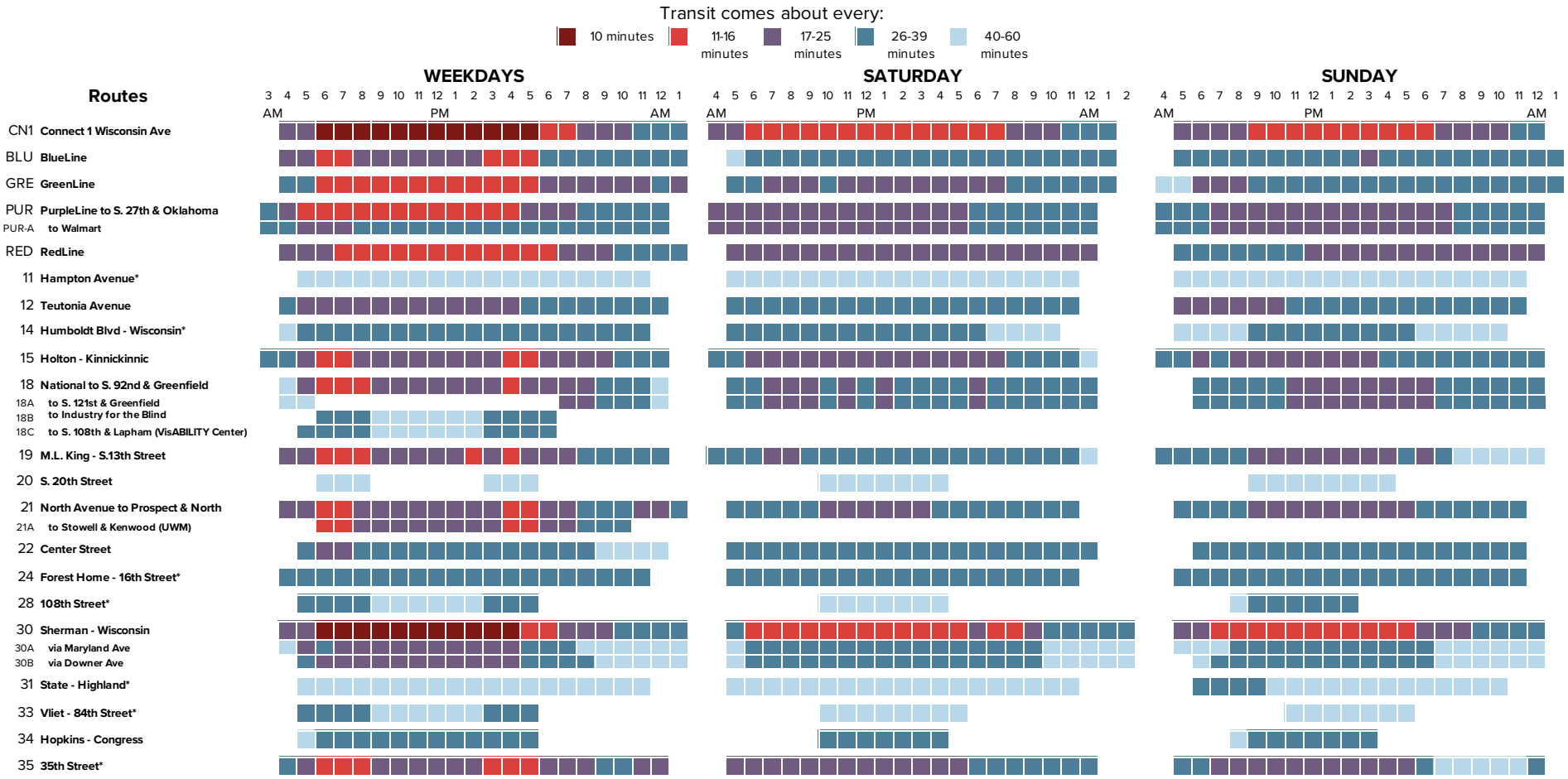
Even though, many people might not use the late night service, its availability allows people to use transit in the evenings.

The next two pages show the frequency for all routes throughout the day for weekdays, Saturdays, and Sundays.

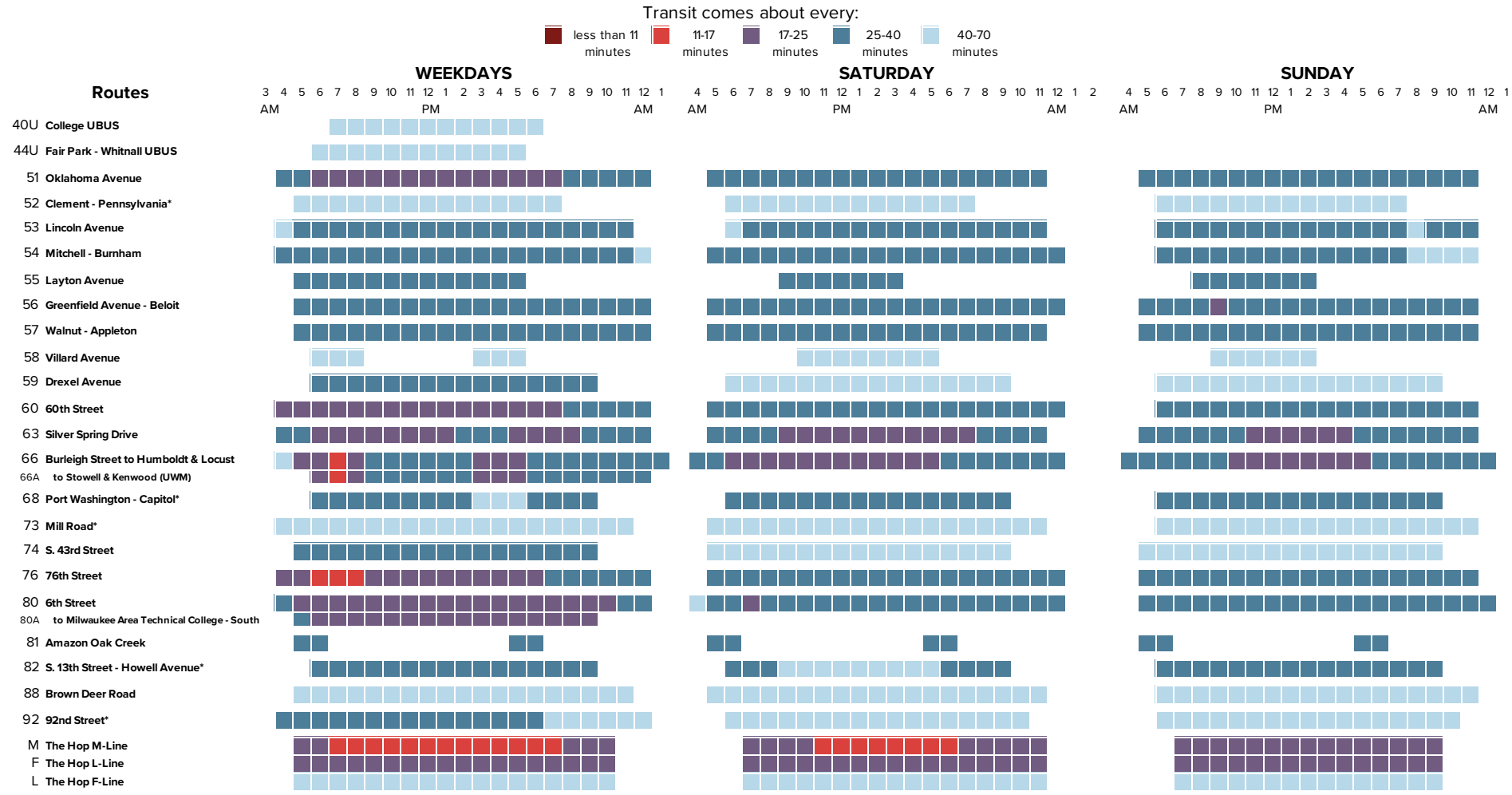
MCTS Spring 2026 Network



MCTS June 2026 Network



MCTS June 2026 Network



Evening and Weekend Service

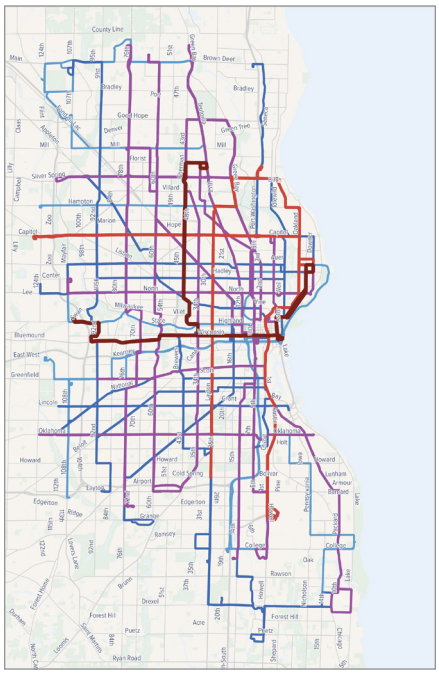
The maps to the right show the service provided during weekday midday, peak hours, Saturdays, and Sundays in Spring 2026—using the same color scheme as before.

The weekday midday map is very similar to the main map on page 40, but it doesn't include the peak services. CONNECT 1 and Route 30 run every 10 minutes, and there are three other routes that run every 15 minutes, Green, Purple, and Red.

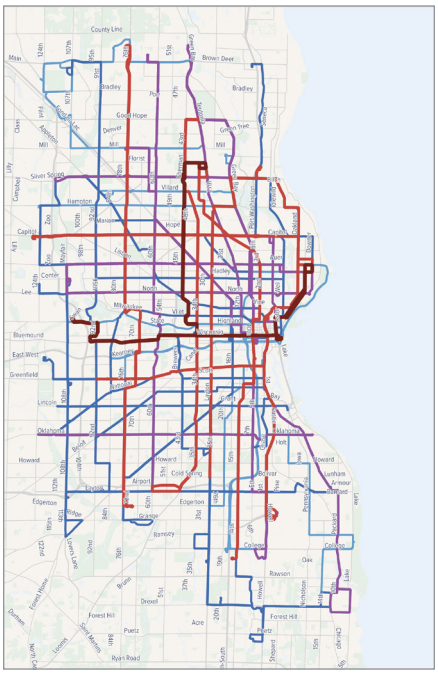
The map for peak hours (Weekday 8am) features many more frequent services, shown in red.

The maps for Saturdays and Sundays are quite similar to each other. The only frequent services are the CONNECT 1 and Route 30, which run every 15 minutes. Everything else run less frequently on weekends

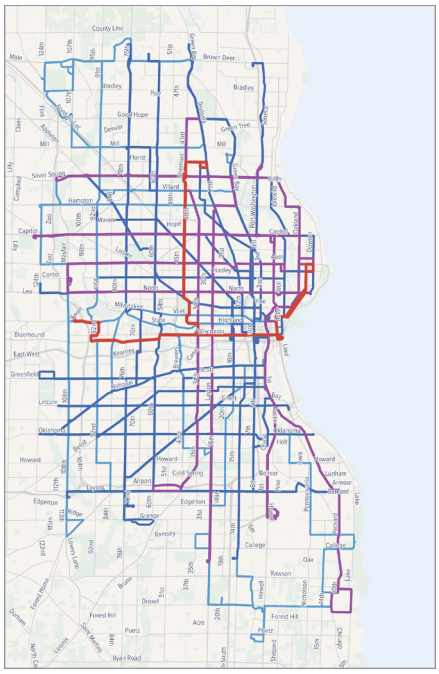
Weekday 12pm



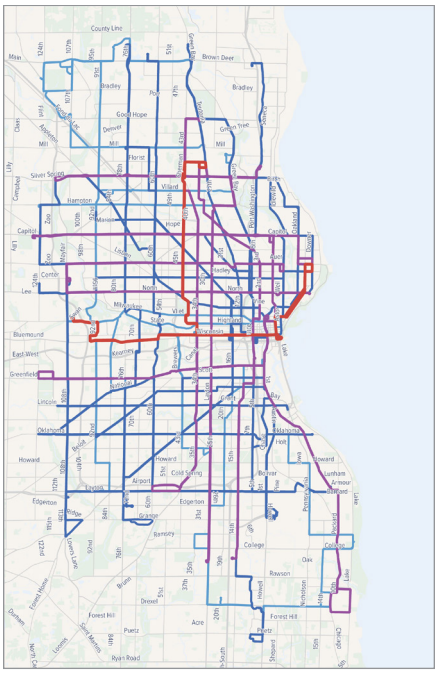
Weekday 8am



Saturday 12pm



Sunday 12pm

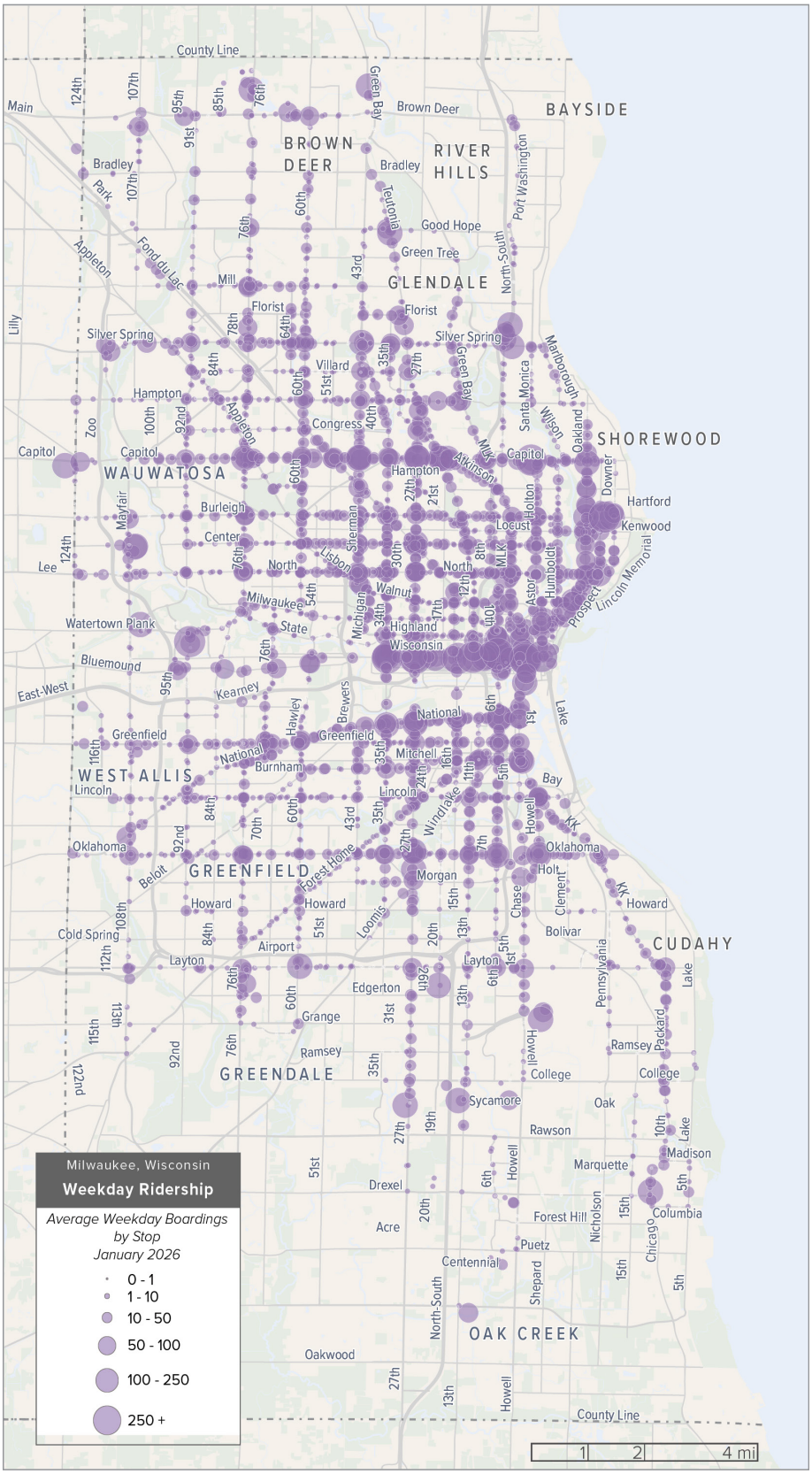


Where are people riding transit?

One measure of transit performance is the sheer amount of ridership it attracts. This can be made visible with a map of boardings at each transit stop, as shown on this map.

High ridership routes and areas can appear in two ways on this map: either as large dots or as multiple medium-sized dots that are very closely spaced. Looking for those patterns we can observe that the highest boardings occur:

- in and near Downtown
- northeast of Downtown along the Green Line and Route 30
- along the Red Line on Capitol Drive
- west of Downtown along the CONNECT 1 on Wisconsin Avenue
- southwest of Downtown along South 1st Street and National Avenue



Where are people riding transit?

Boardings heat map

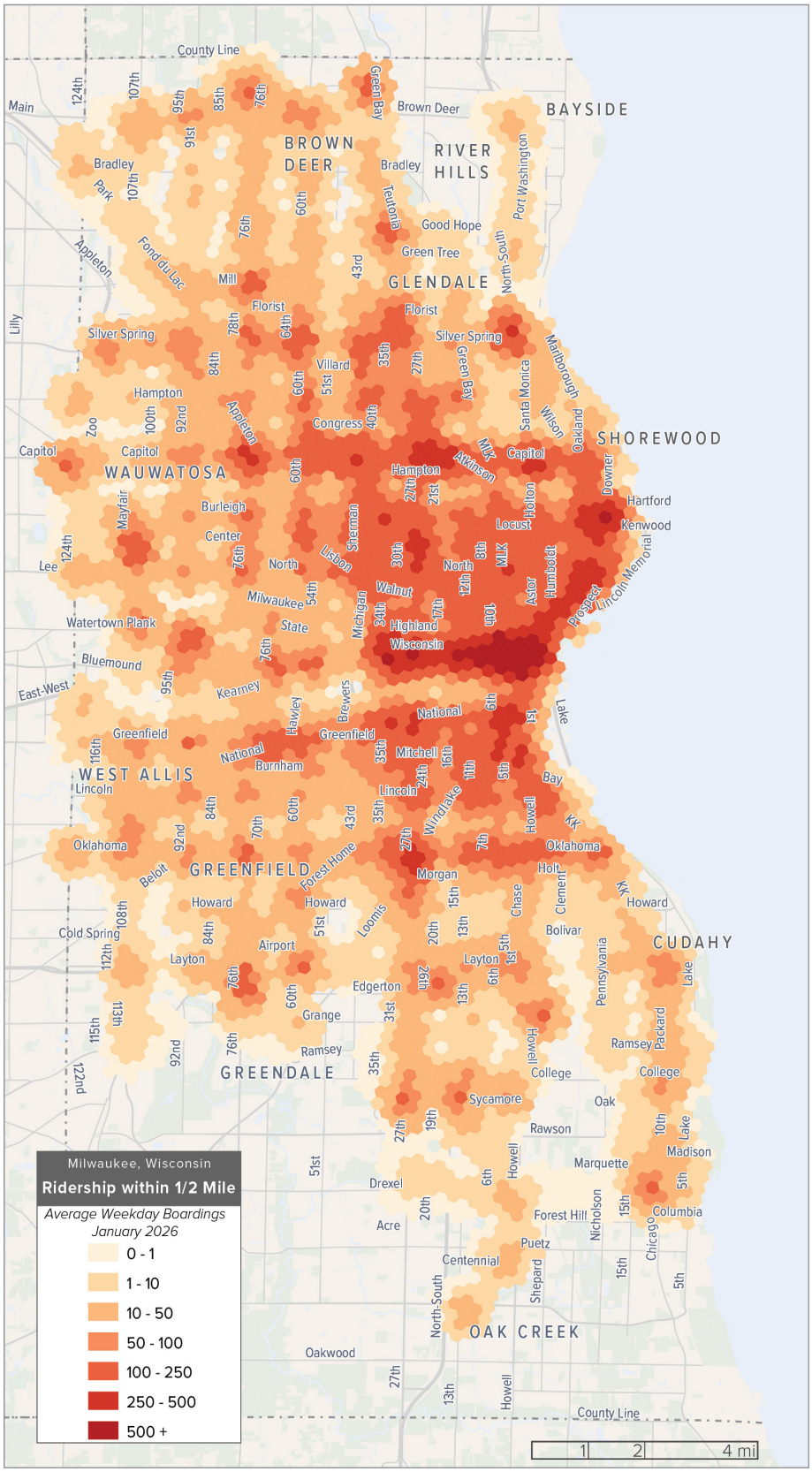
The map of boardings on the previous page has two problems: big dots sometimes obscure one another, and the dots are scaled based on categories, not the pure number of boardings at each stop, which exist in a continuum.

The map at right solves both of these problems, offering a continuous scale that represents the number of weekday boardings at each stop on the MCTS network.

This map clearly highlights the same busy areas as the previous map, but it also reveals that there is generally higher ridership in the north than the south. It also helps identify other corridors with relatively higher ridership such as 27th Street (north and south).

Looking at this map and the one on the previous page, however, we must keep in mind that *not every stop is offering the same level of service*. Some of these stops are served just a few times per day. Some are served four times per hour. A small dot on a very low-frequency route may simply be a reflection of the low quality of service. A small dot on a frequent route, on the other hand, suggests other problems.

Conversely, a large dot on an infrequent route means that ridership is high *despite a low level of service,* which suggests that underlying transit demand may be high. Ridership alone, then, cannot tell us everything about ridership *potential.* To learn something about future ridership potential, from existing ridership data, we must compare it to the existing level of service. This measure is called productivity.



Productivity & Frequency

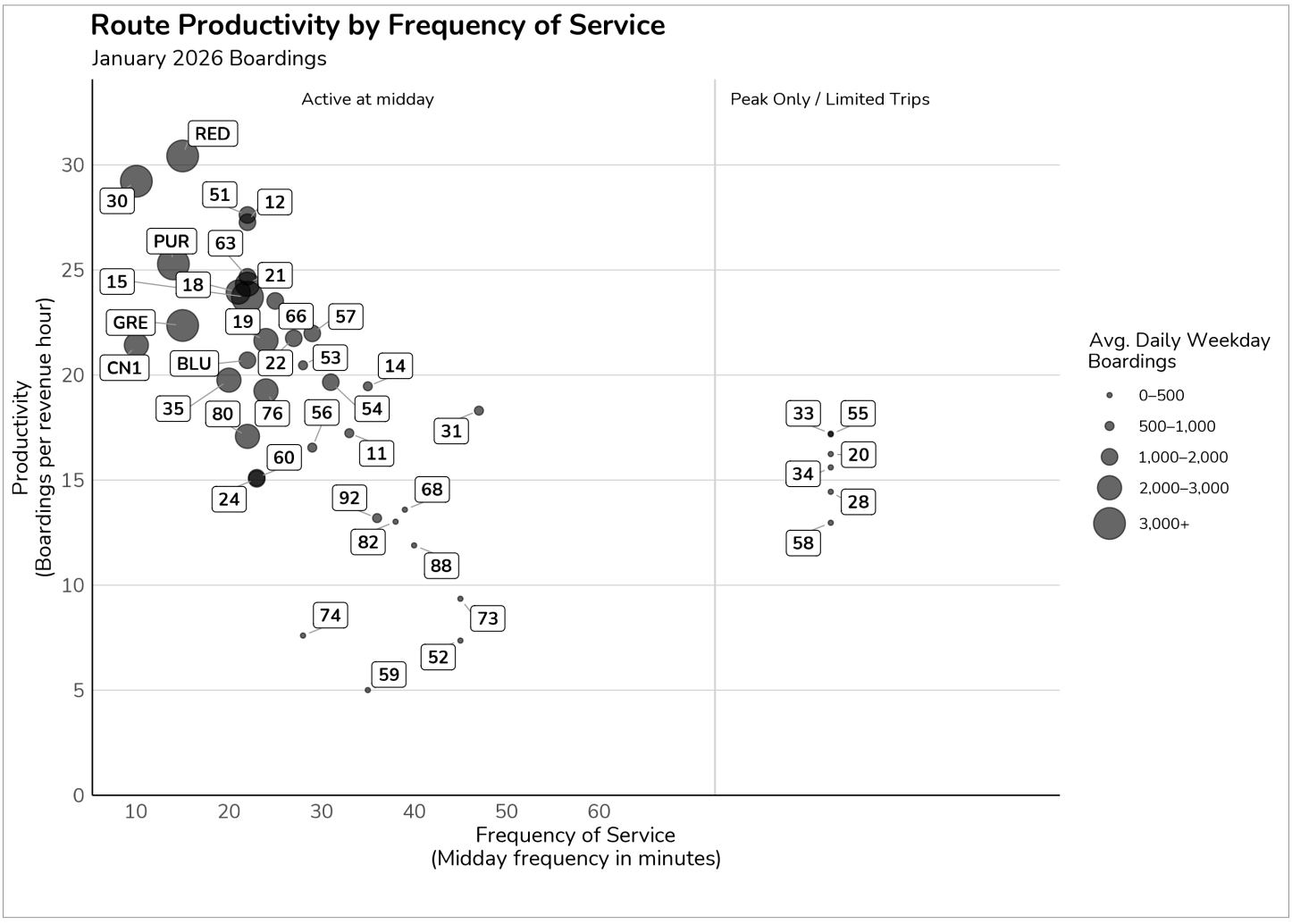
In addition to sheer ridership, we can look at **ridership relative to cost.** Ridership relative to cost is called "productivity," and it's measured as boardings per revenue hour. A revenue hour—one bus operating for one hour—is a good measure for cost because transit operating costs are dominated by driver labor.

$$\textit{Productivity} = \frac{\textit{Ridership}}{\textit{Cost}} = \frac{\textit{Boardings}}{\textit{Revenue Hours}}$$

The chart below shows the productivity (Y axis) of individual MCTS routes plotted against their "baseline" weekday midday frequency (X axis).

The chart shows that, on average, 10-20-minute routes are more productive than 25-35-minute routes, which are more productive than most 40-50-minute routes.

This is a common trend across agencies (as shown on page 12). Higher frequency services often tend to have not just higher overall ridership, but also, higher overall productivity.



Service and Productivity by Time of Day

MCTS operates some peak-only routes and increases frequencies during the peaks on several other all-day routes. Peak-hour service tends to focus on the commuting needs of full-time office workers, but there are many other reasons to ride transit and many other types of potential riders.

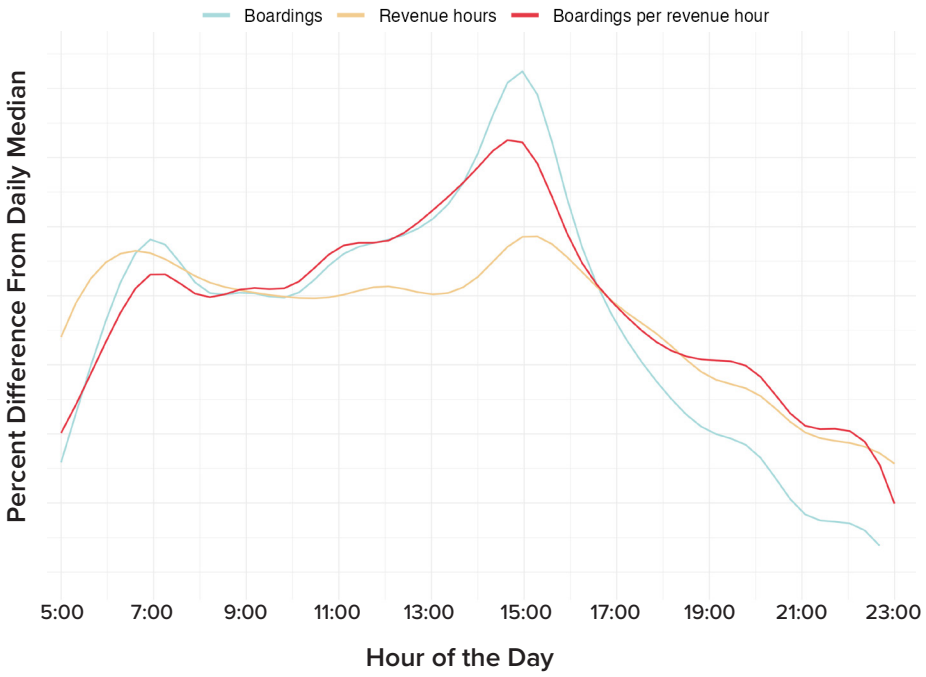
The chart to the right shows boardings and quantity of service per hours of the day.

- The blue line shows boardings
- The yellow line shows quantity of service (revenue hours)
- The red line shows productivity (boardings per revenue hour)

The morning peak is not very pronounced. The afternoon peak has more riders, but it happens earlier than the peak of transit service provided and quickly drops afterwards. This peak of riders around 3pm is coming from schools.

Given that the peak ridership is not a capacity concern, the community may want to ask itself whether MCTS is a peak-transit-agency that runs some service at other times, or an all-day-transit-agency that supplements certain services during periods of very high demand. (Periods that may or may not line up with the traditional morning and evening traffic peaks.)

Boardings and Quantity of Service by Hour



The Network Grid

Milwaukee County's regular street grid naturally encourages bus lines to be organized as a grid of long and straight lines, spaced every 0.5 to 1 mile.

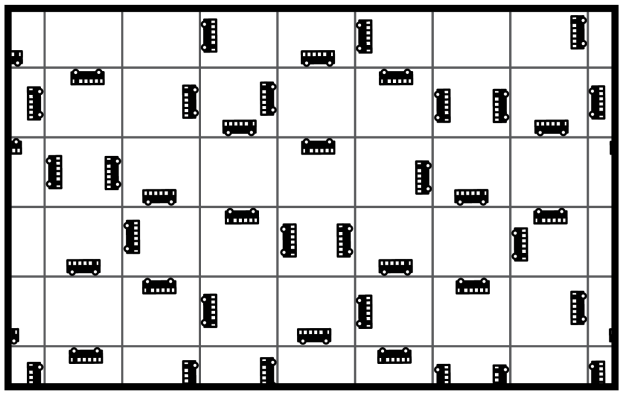
Some lines operate east-to-west, others north-to-south, and each bus line crosses many others. This allows riders to go from anywhere to anywhere else with a single transfer.

However, grids work best when the services are frequent. A gridded network relies on passengers' willingness to transfer from one bus to another. This means it's essential to minimize the amount of time passengers spend waiting for both buses.

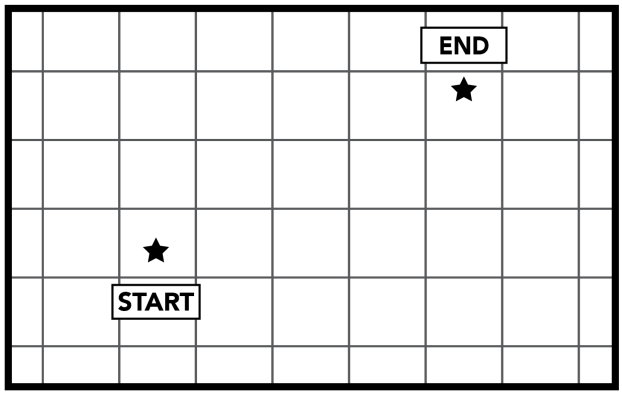
Making a grid network convenient requires very frequent service on as many lines as possible, so no matter where you are, the next bus is always coming soon. MCTS's bus network features some relatively frequent service, particularly during peak hours. To truly make the network the most useful, major routes should run frequently (every 15 minutes) all-day.

HOW FREQUENT GRIDS WORK

A frequent grid consists of perpendicular lines all running **FREQUENTLY.**

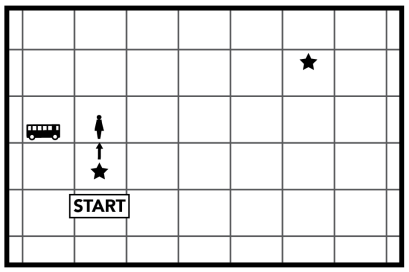


A grid serves trips from **ANYWHERE** to **ANYWHERE.**
For example:

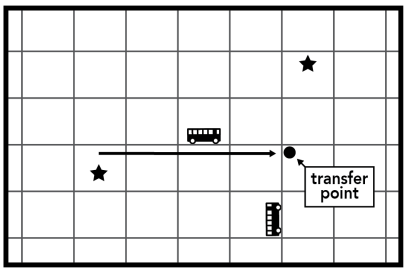


For ANY trip...

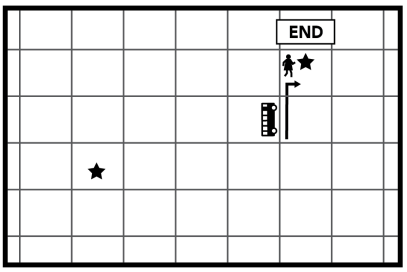
1. WALK and **WAIT*** for the first bus.
*The wait is **SHORT** because service is **FREQUENT.**



2. RIDE and **WAIT*** for the second bus.
*The wait is **SHORT** because service is **FREQUENT.**



3. RIDE and **WALK** to the destination.
You've arrived!



THE HIGH FREQUENCY IS CRITICAL.
It makes the **transfer fast**, so that the **whole travel time is reasonable.**

Clockface Frequencies

Many transit agencies deliberately design routes, and write schedules, so that the schedule repeats each hour, a practice called “clockface frequencies.” For example, clockface frequencies include 10, 15, 20, 30, or 60 minutes but not 25 or 35. This pattern makes it easy to remember the schedule, and also ensures that connecting routes always connect with the same amount of waiting time.

On an hourly route, for example, the schedule becomes vastly easier understand and remember if the bus leaves at the same time in each consecutive hour. If you know that the bus leaves at :15 after each hour, and you know when service begins and ends each day, then with just these three facts you know the entire day’s timetable.

Clockface frequencies are especially important at low frequencies, such as hourly or half-hourly. At these frequencies, the trip must be planned around the limitations of the timetable, so a timetable that can be remembered makes it easier to plan those trips spontaneously. For this reason, non-clockface frequencies (such as 39 or 47) should be questioned; at these low service levels, the usefulness to the customer may be improved if the frequency is changed to a memorable 60-minute pattern, even though this represents somewhat less service.

Ease of memorization directly contributes to the user’s sensation of freedom. Low frequencies are not very liberating, but at least with clockface low frequencies the user can remember the schedule. This makes it apparent what the options are at any time of day.

MCTS Midday Frequencies

Route	Midday Frequency
30	10
CN1	10
PUR	14
GRE	15
RED	15
18	19
21	20
35	20
15	22
80	22
BLU	22
12	23
19	23
51	23
60	23
63	23
76	24
24	26
66	26
53	28

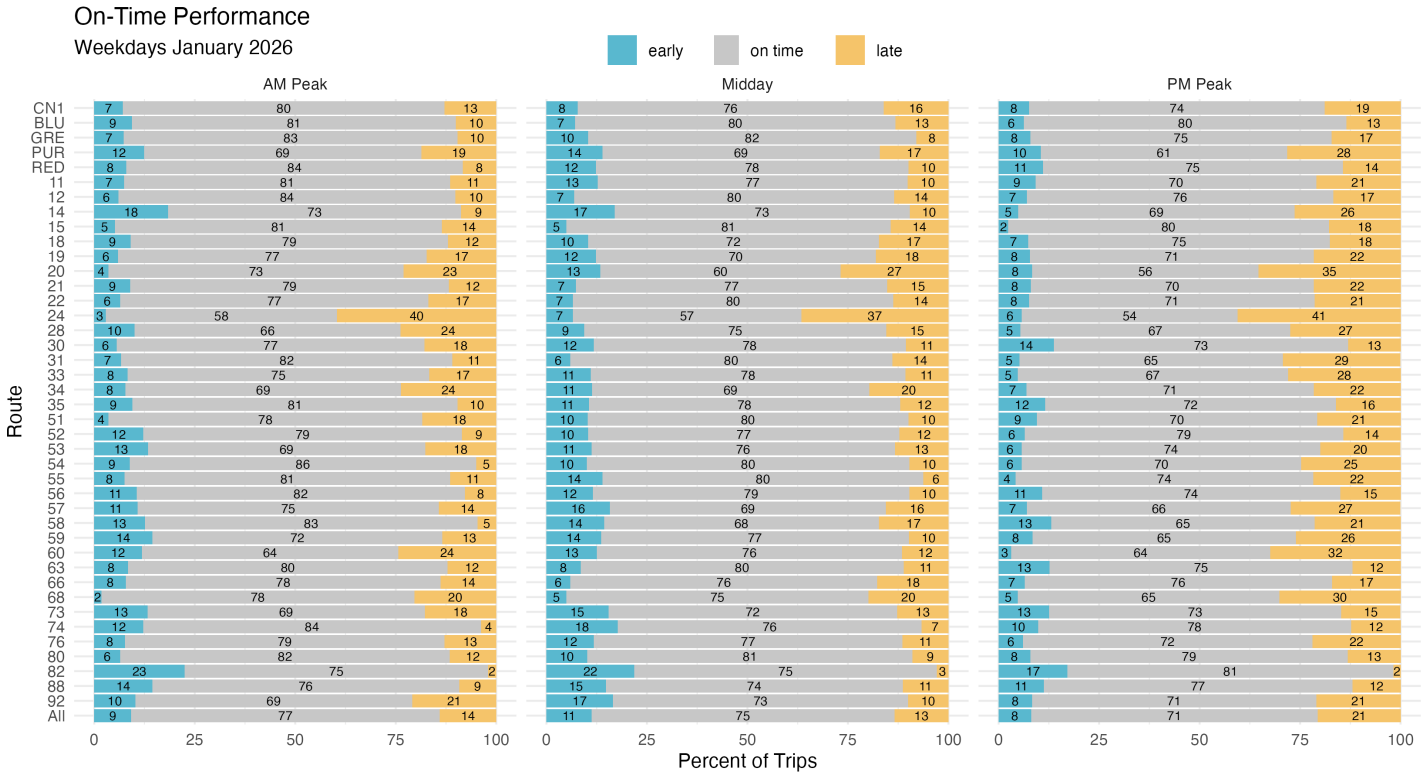
Route	Midday Frequency
56	28
74	28
57	29
55	30
54	31
34	32
22	33
59	33
14	35
82	38
68	39
92	39
28	41
31	45
33	45
73	45
52	46
11	51
88	60

On-Time Performance

On-time performance is a measure of how reliably buses depart when customers expect them to depart. Reliability is particularly important when a transit network is built of infrequent routes. If another bus is not coming soon, the timeliness of each bus is extremely important.

On an infrequent route, an early departure can be much worse than a late one. If a route that comes every 60-minutes is 5 minutes late, someone might be 5 minutes late to work, and that is bad. But if it is 5 minutes early, they probably weren't at the bus stop in time, and they may now have to catch the next bus—so they are now 60 minutes late to work.

Generally, a bus is considered "on-time" if it departs at a timepoint at most 1 minutes before or 5 minutes after the scheduled time and departs at most 5 minutes after the scheduled time. The chart below shows the percentage of times each route was observed to be on time on Weekdays during the AM peak, the midday, and the PM peak in January 2026. MCTS has a systemwide on-time performance of 75% during the midday, with 11% of trips departing early and 13% departing late.



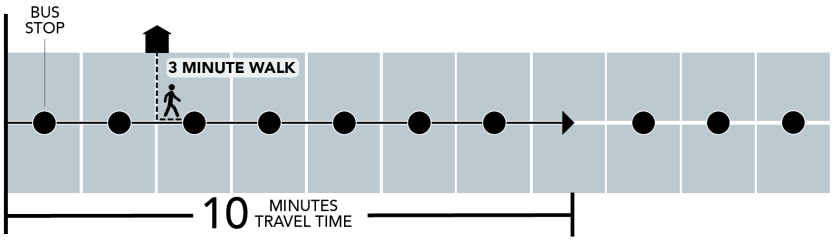
Stop Spacing

There is a geometric trade-off between closer stop spacing and faster bus speeds. As stops are placed farther apart, buses can travel faster and cover more distance in the same time. Much of the time lost when stopping for passengers is the time to slow down, open the door, and pull back out into traffic. That time is about the same for 1 passenger or 50.

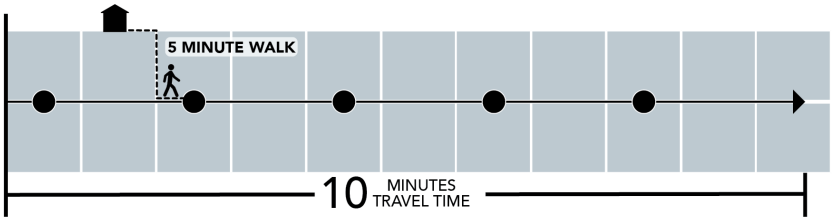
On average for MCTS, bus stops are about every 0.18 miles (950 feet) apart. For many people along a route, it is easy to walk to any of several stops on a route. Several stops are not necessarily better. The chart to the bottom-right shows the distribution of stops in the MCTS bus network.

When there are many stops, passengers spread themselves out among them, so the bus stops more for the same number of people. When passengers gather at fewer stops, stopping time is used more efficiently, resulting in faster operations.

Closer stop spacing: Shorter walk, slower bus

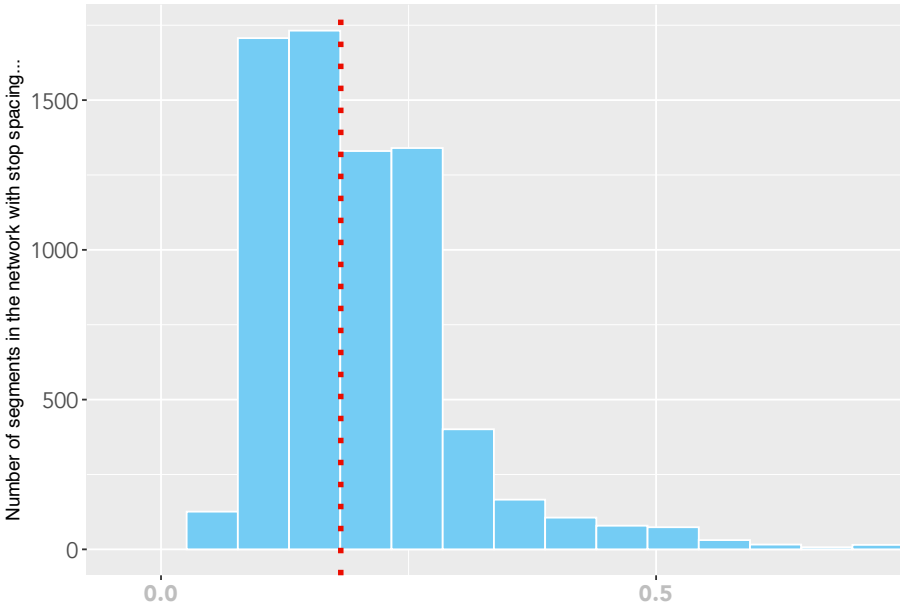


Wider stop spacing: Longer walk, faster bus



MCTS network: Stop spacing

Median stop spacing (dotted line): 0.18 miles.



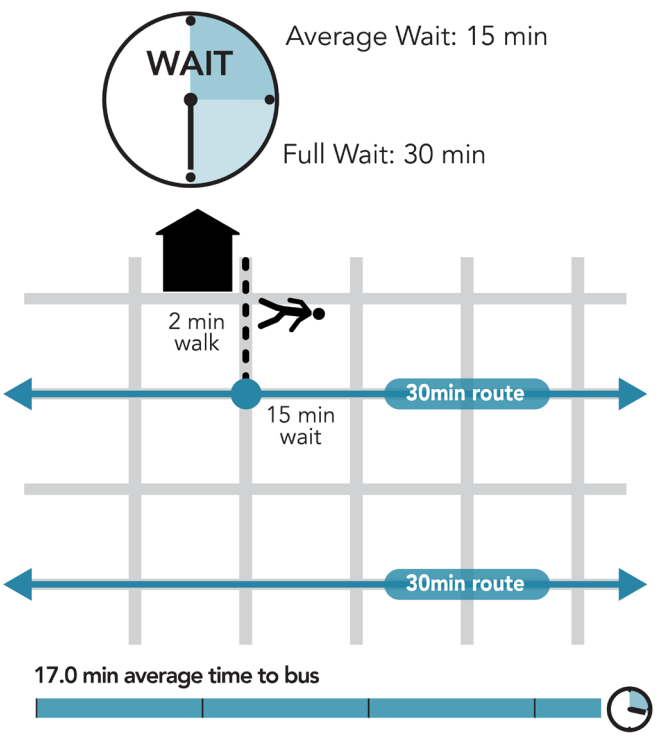
Shorter Walks or Shorter Waits?

Transit service being divided among more streets inevitably leads to lower frequencies on each street, and therefore longer waits. This is used as a coverage tool to get buses as close to people as possible. However, if someone misses their bus, the wait is quite long.

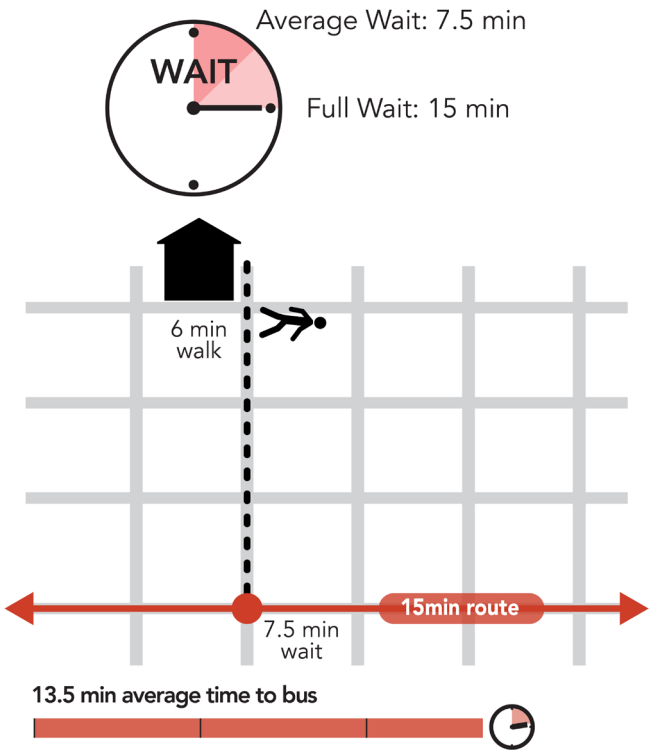
If two routes on parallel streets come every 30 minutes, then they can be combined onto the same street to arrive exactly 15 minutes apart, and someone traveling a short distance could wait at a single stop for either bus.

This is a similar case with Route 30 on North Maryland Avenue and North Downer Avenue during the weekends. These streets are a quarter-mile apart and each has 30-minute frequency. If they were combined, they could provide 15-minute service. This is one approach to increasing frequency on some corridors without significantly sacrificing coverage. Some people would have to walk longer, but when they reach a stop, the bus is coming sooner.

Shorter Walk, Longer Wait
Closely spaced routes with buses coming every 30 min



Longer Walk, Shorter Wait
Wider spaced routes with buses coming every 15 min



5 Next Steps

What's next?

Key Choice: Ridership vs Coverage

MCTS Forward will take place over the next year, with a new transit network to be implemented as early as Fall 2027.

This project is a unique opportunity for the county to consider and clearly define the right balance between desirable but competing goals for transit. The key choice for the public, stakeholders, and the Board will be between providing **high ridership** and providing **wide coverage**. This tradeoff is explained in detail starting on page 17.

This choice is not binary. A transit agency can pursue high ridership and extensive coverage at the same time, but the more it pursues one, the less it can provide of the other. Every dollar that is spent providing very high frequency along a dense mixed use corridor is a dollar that cannot be spent bringing transit closer to each person's home or reaching residential areas in the less dense parts of the county, and vice versa.

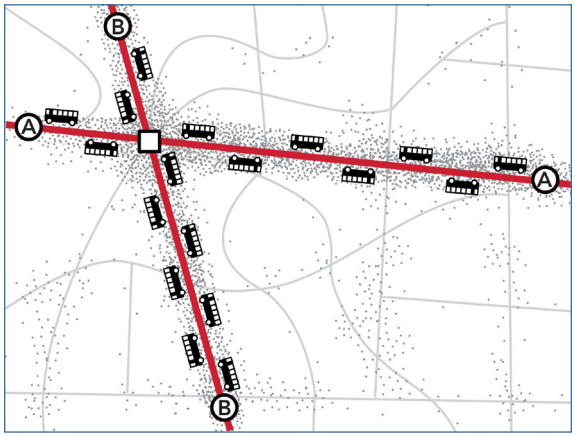
The Concepts

To help the community understand how different goals would result in different network designs and outcomes, we will develop two conceptual alternatives. The two concepts, the Ridership and Coverage Concepts, will have the same amount of service, but they will show different ways to allocate these same resources.

The concepts will differ in the degree to which they emphasize Ridership and Coverage goals. The Ridership Concept will put more resources toward Ridership goals and less towards Coverage goals. The Coverage Concept in this report puts more resources toward Coverage goals and less toward Ridership goals.

By showing the public, stakeholders, and decision-makers the range of possibilities, MCTS will be asking: "Now that you see the outcomes of emphasizing one goal over another, how should we balance the Ridership and Coverage goals? In other words, what is your definition of better service?"

Ridership Network



Coverage Network