20-Minute Neighborhood Walkability Analysis

for the Eugene-Springfield Metropolitan Area

Regional Transportation Options

Presentation Outline

- **How did we get here? & Why this analysis?**
- **What has been done?**
- **What could be improved?**
- **How can it be used? & What more might be gained?**
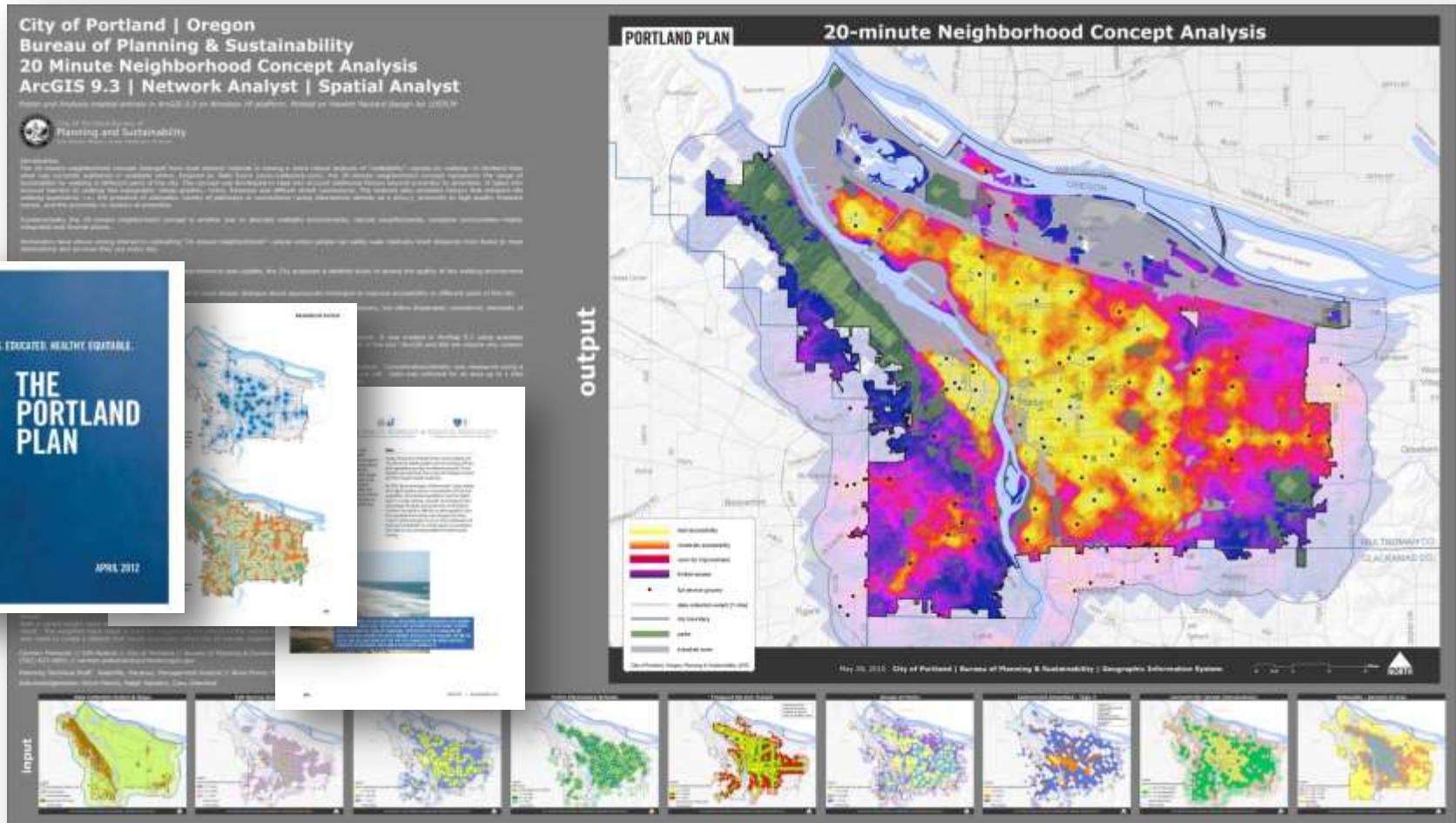
Presented to the MPO CAC September 20, 2012

Prepared by Lane Council of Governments
David Richey, GIS Analyst

Portland Plan

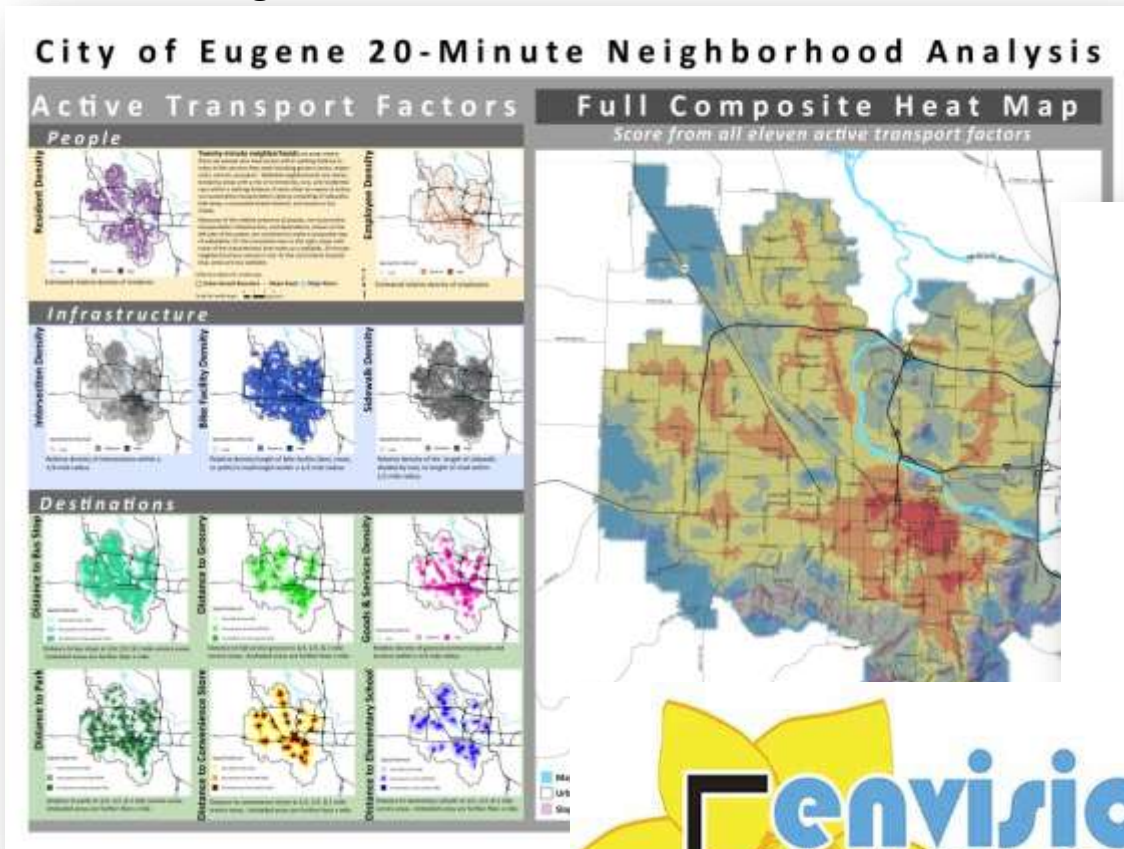## 20-Minute Neighborhood Walkability Analysis

Previous studies

Eugene Climate & Energy Action Plan
Envision Eugene
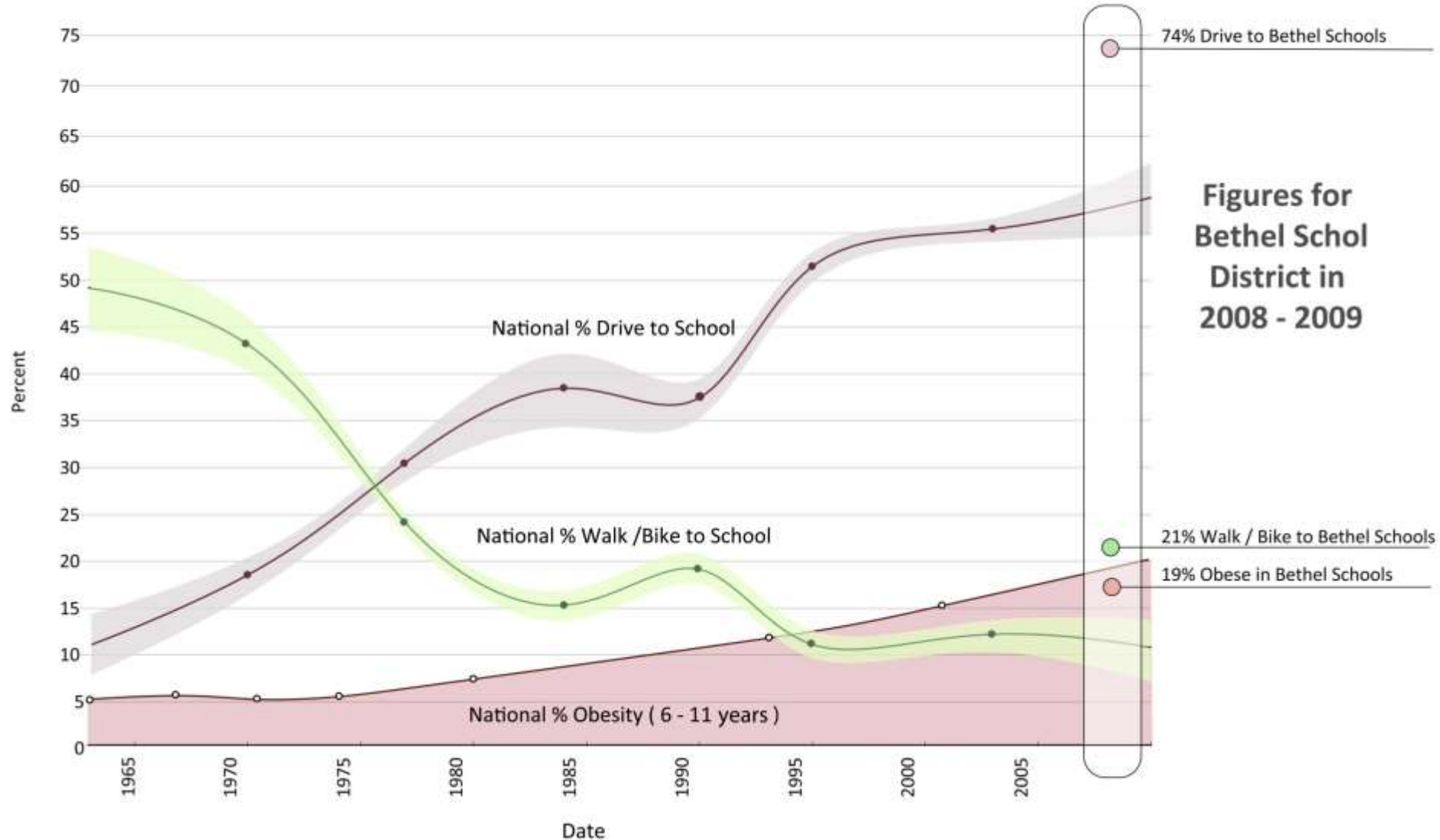
Previous studies

Lane Council of Governments

Why this analysis?

Increasing active transportation is a promising approach to counteract issues at the forefront of both public health and transportation:

- the obesity and inactivity epidemics,
- growing [automotive] congestion,
- and air and noise pollution.

1. Winters, M , Brauer, M, Setton E M, and K Teschke Built Environment Influences on Healthy Transportation Choices: Bicycling versus Driving. J Urban Health. 2010 December; 87(6): 969–993
2. Does the built environment influence physical activity?: examining the evidence. Washington, DC: National Academies of Sciences; 2005.
3. Frumkin H, Frank LD, Jackson R. Urban sprawl and public health: designing, planning and building for healthy communities. Washington, DC: Island; 2004.

National Trends in Childhood Obesity and Ride Share 1960 and 2000

Locally-based Research Solution for Child Health

CAST

COMMUNITY AND SCHOOLS TOGETHER

Percent

74% Drive to Bethel Schools

Figures for Bethel Schol District in 2008 - 2009

National % Drive to School

National % Walk /Bike to School

21% Walk / Bike to Bethel Schools

19% Obese in Bethel Schools

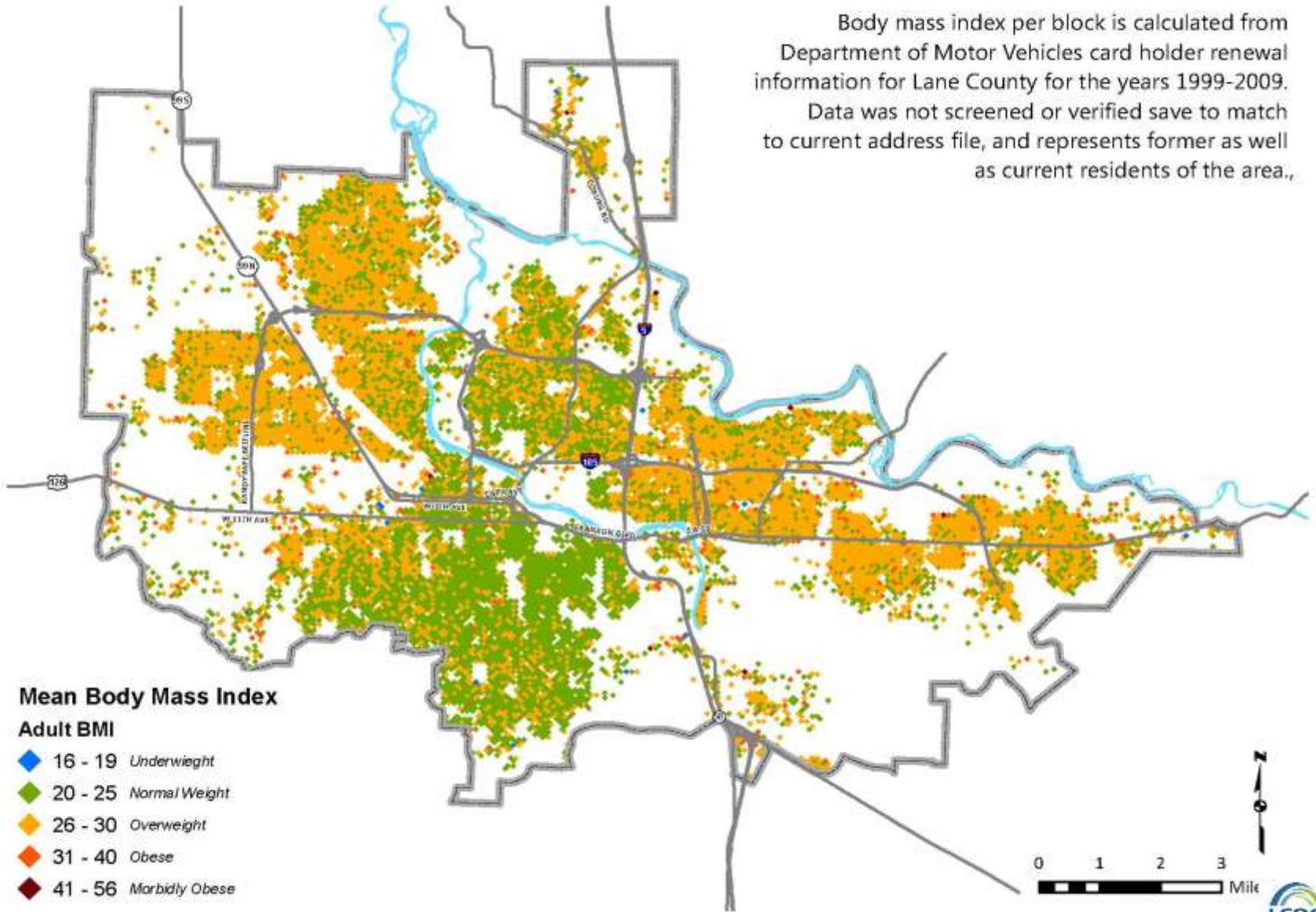National % Obesity (6 - 11 years)

Date

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20-Minute Neighborhood Walkability Analysis

Major Rivers **Major Roads** — **Transportation Management Area**

Mean Adult Body Mass Index 2009

Body mass index per block is calculated from Department of Motor Vehicles card holder renewal information for Lane County for the years 1999-2009. Data was not screened or verified save to match to current address file, and represents former as well as current residents of the area.,

Mean Body Mass Index
Adult BMI

◆ 16 - 19 *Underwieght*
◆ 20 - 25 *Normal Weight*
◆ 26 - 30 *Overweight*
◆ 31 - 40 *Obese*
◆ 41 - 56 *Morbidly Obese*

0   1   2   3   Mile

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20-Minute Neighborhood Walkability Analysis

Definition

Walkabilty is the extent to which the built environment is friendly to the presence of people living, shopping, visiting, enjoying or spending time in an area.

This study is modeled on the Portland 20-Minute Neighborhood analysis; walkability is defined by indices that can be measured quantitatively. The measures include the following factors:

People	Density	Destinations
Observed Variable	*Provision of Infrastructure*	*Goods and Services*
Residents	Bicycle Facilities	Full Service Grocery
Employees	Sidewalks	Convenience Stores
	Intersections	Elementary Schools
	Retail Goods and Services	Parks
		Bus Stops

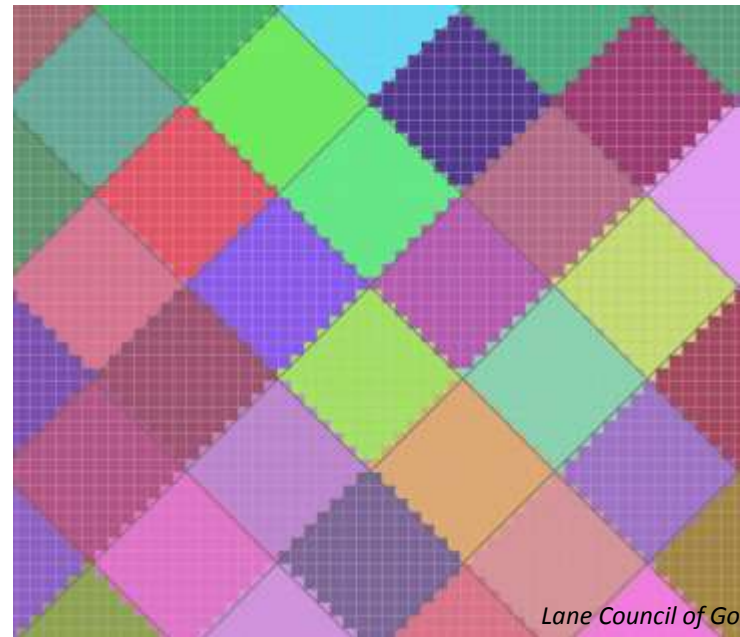# 20-Minute Neighborhood Walkability Analysis

330' Tile Grid
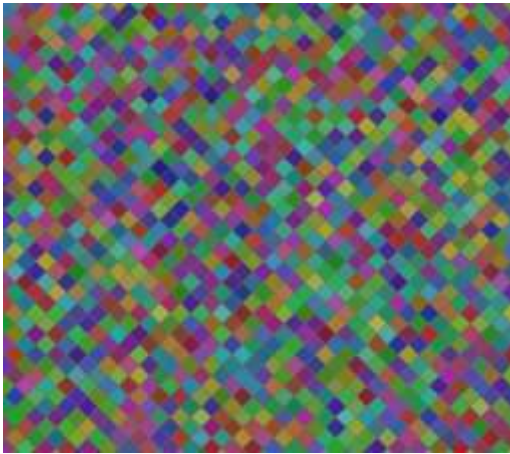
Analysis Framework

A grid of polygonal square tiles (40,000) is laid over the urban landscape and used to collect a series of metrics regarding the qualities of that landscape in terms of the presence of people and the presence of urban services in a walking and bike context. Collection of some of these attributes uses finer-scale, 33', geometries that are aggregated to the 330' tile. The lattice structure is tilted 45d to better capture network distances
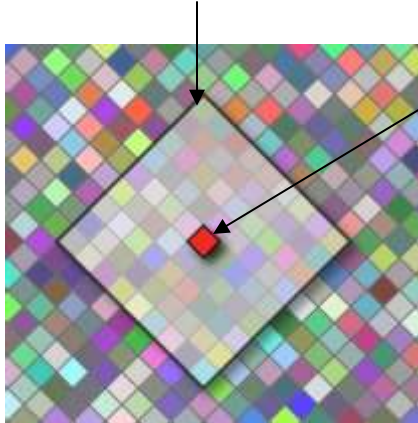
33' ESRI GRID

33' Polygonal Grid
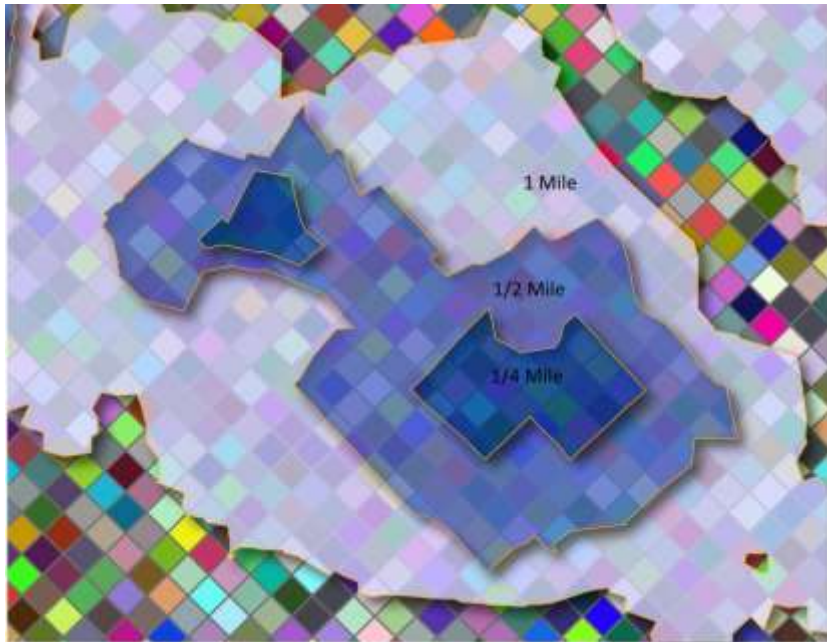

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Measurement Methods

Density calculations are made using the GRID Neighborhood function with a kernel file, and then summarized to the 330' tile with Zonal Statistics.

People are tabulated at the 330' tile level.

Distance calculations are a 300' tile-based area-weighted average.

People are aggregated to the 330' tile.

Density measures are calculated for a ¼ -mile Euclidean area.

Destinations are calculated based on ¼, ½, and 1-mile service areas. Service areas are calculated on a "flat" road network, with slopes over 20% excluded, and travel allowed in either direction along all roadways except limited access highways.

All **measures** are indexed to a 0-100 scale: distances are assigned a value of 99 for ¼ mile, 66 for ½ mile, and 33 for 1 mile, all other measures are divided by their maximum value to produce an **indexed** scale.

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20-Minute Neighborhood Walkability Analysis

People

Resident Density

Estimated number of residents per 330' tile.

Population Density

Unitless Index

- 0 - 1
- 2
- 3 - 4
- 5 - 16
- 17 - 100

Major Rivers Major Roads — Transportation Management Area

Willamette River McKenzie River

0   1   2   3   Miles

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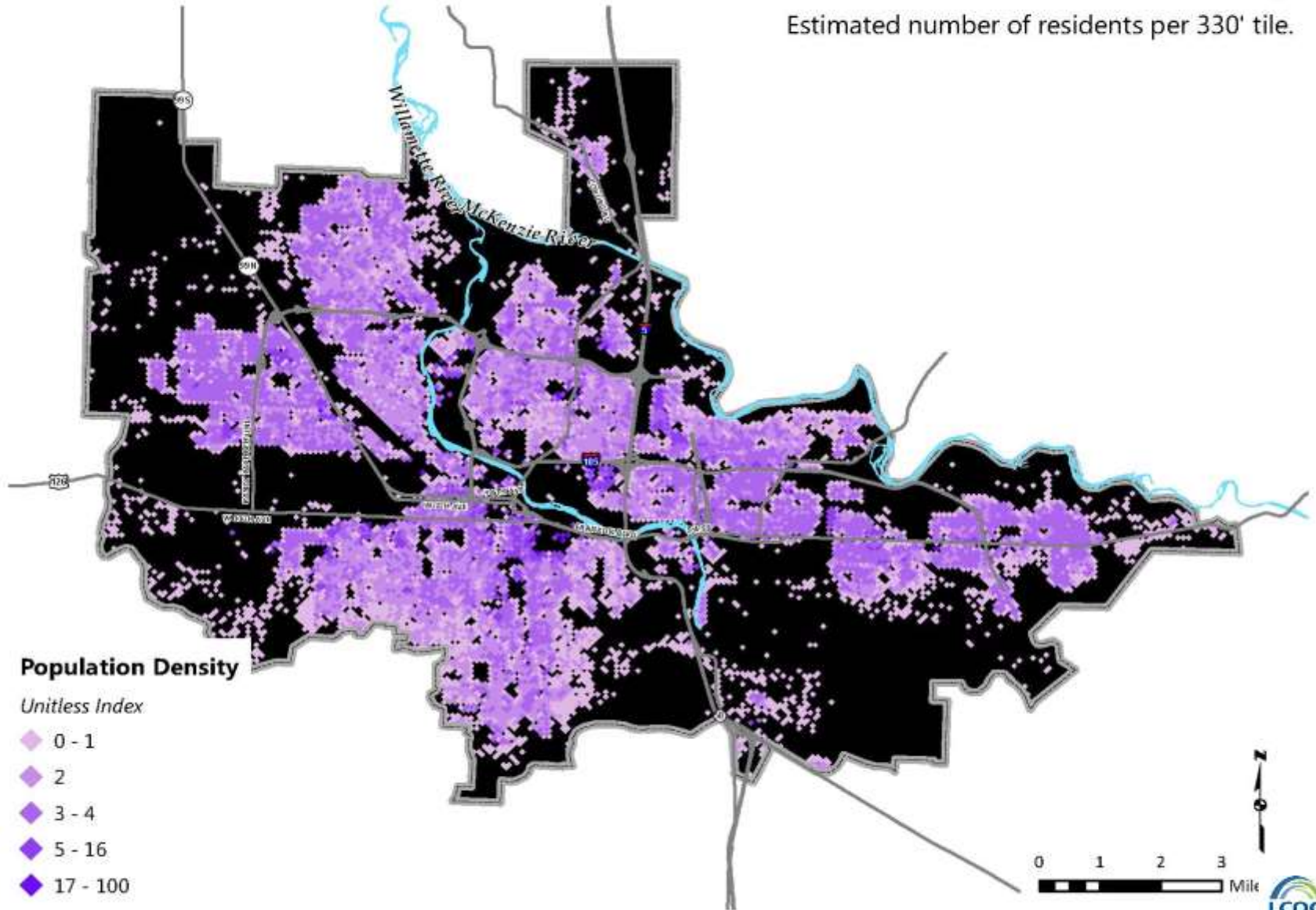
20-Minute Neighborhood Walkability Analysis

People

Major Rivers ▮ Major Roads ▬ Transportation Management Area ▢

Employee Density

Estimated number of employees per 330' tile.
The University of Oregon is shown seperately
with 9310 employees to increase the relief
in viewing the rest of the employment data.

■ 9310 Employees @ UO

Willamette River
McKenzie River

Employee Density

Unitless Index

◆ 0 - 1
◆ 2
◆ 3 - 4
◆ 5 - 16
◆ 17 - 55

0 1 2 3 Mile

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20-Minute Neighborhood Walkability Analysis
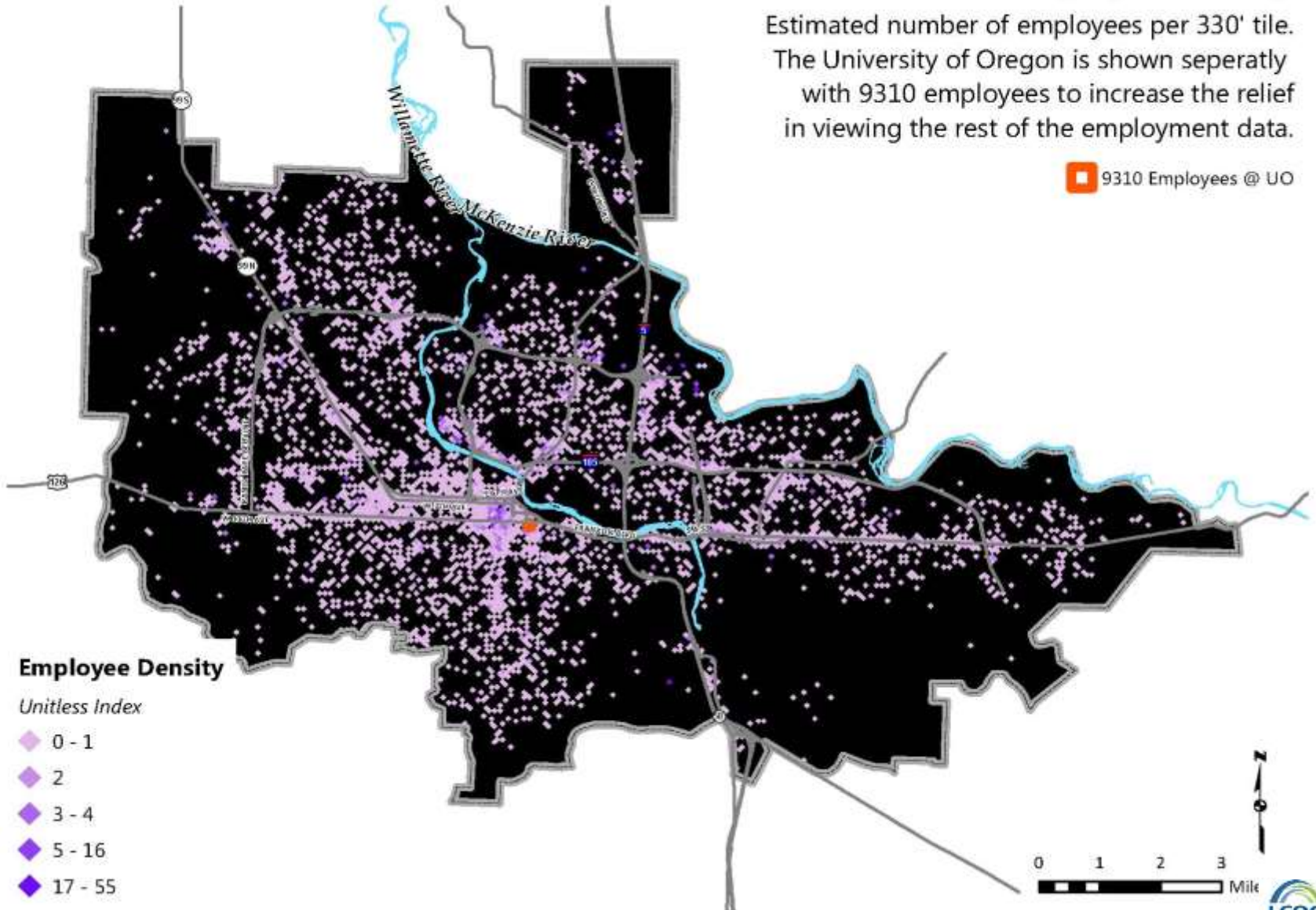
Major Rivers ▮ **Major Roads** — **Transportation Management Area** ▢

Destinations

Elementary School Distance

Average distance within 330' tile to elementary based on 1/4, 1/2, & 1-mile service areas weighted on an equal interval (99, 66, 33).

Elementary School Distance

Unitless Index

- ◆ 0 - 35
- ◆ 36 - 66
- ◆ 67 - 84
- ◆ 85 - 94
- ◆ 95 - 99

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20-Minute Neighborhood Walkability Analysis

Major Rivers ▮ **Major Roads** — **Transportation Management Area** ▢

Destinations

Bus Stop Distance

Average distance within 330' tile to bus stop based on 1/4, 1/2, & 1 mile service areas weighted on an equal interval (99, 66, 33).

Bus Stop Distance

Unitless Index

- ◆ 0 - 35
- ◆ 36 - 66
- ◆ 67 - 88
- ◆ 89 - 94
- ◆ 95 - 99

Lane Council of Governments
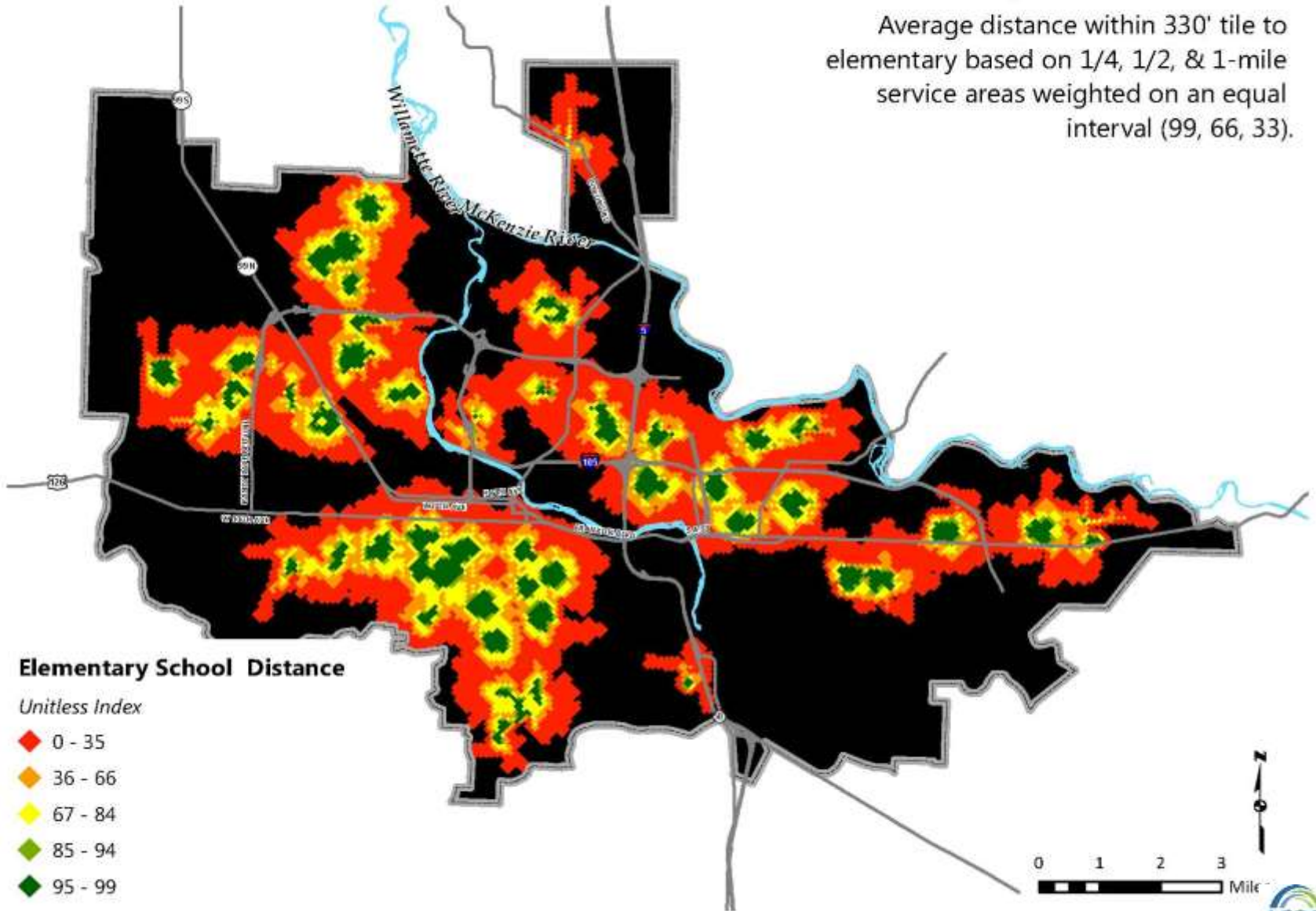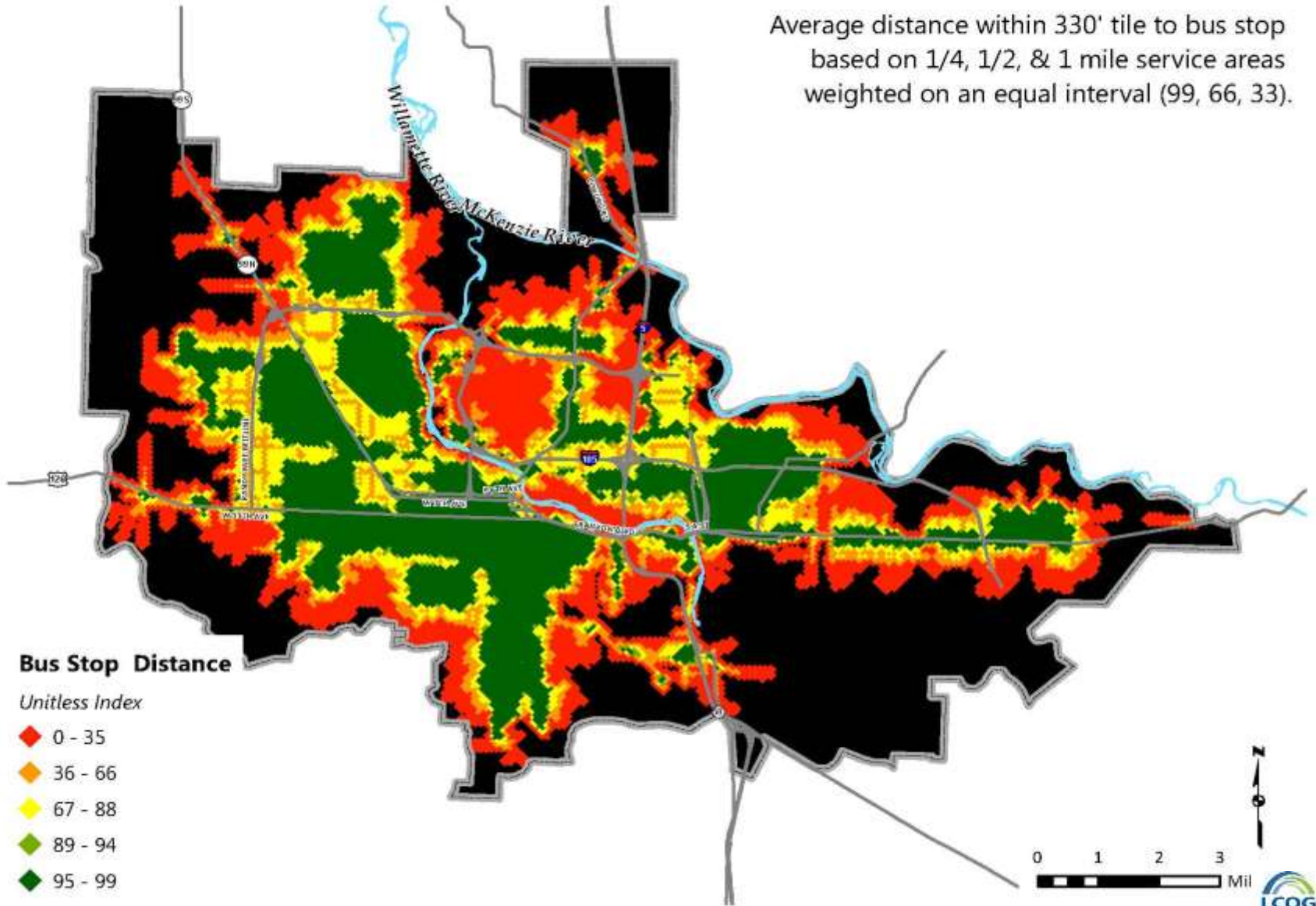
20-Minute Neighborhood Walkability Analysis

Destinations

Major Rivers ▢ Major Roads — Transportation Management Area ▢

Convenience Store Distance

Average distance within 330' tile to convenience store based on 1/4, 1/2, & 1-mile service areas weighted on an equal interval (99, 66, 33).

Convenience Store Distance

Unitless Index

- ◆ 0 - 35
- ◆ 36 - 66
- ◆ 67 - 88
- ◆ 89 - 94
- ◆ 95 - 99

0   1   2   3   Mile

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20-Minute Neighborhood Walkability Analysis

Destinations

Full Service Grocery Distance

Average distance within 330' tile to full service grocery based on 1/4, 1/2, & 1-mile service areas weighted on an equal interval (99, 66, 33).

Full Service Grocery Distance

Unitless Index
- 0 - 35
- 36 - 66
- 67 - 88
- 89 - 94
- 95 - 99

Major Rivers   Major Roads — Transportation Management Area

Lane Council of Governments

20-Minute Neighborhood Walkability Analysis

Major Rivers ▪ **Major Roads** — **Transportation Management Area** □

Destinations

Park Distance

Average distance within 330' tile to park based on 1/4, 1/2, & 1-mile service areas weighted on an equal interval (99, 66, 33).
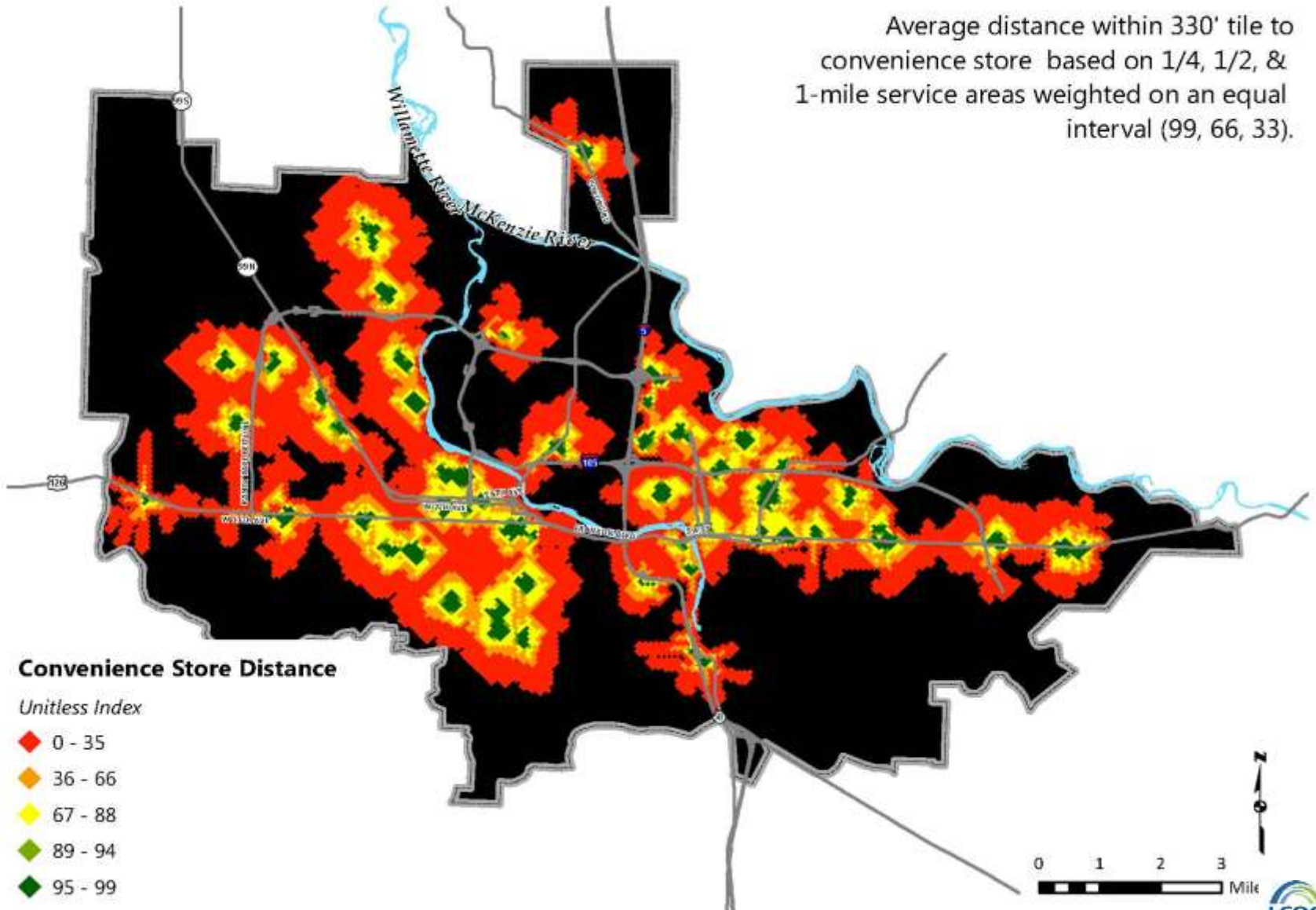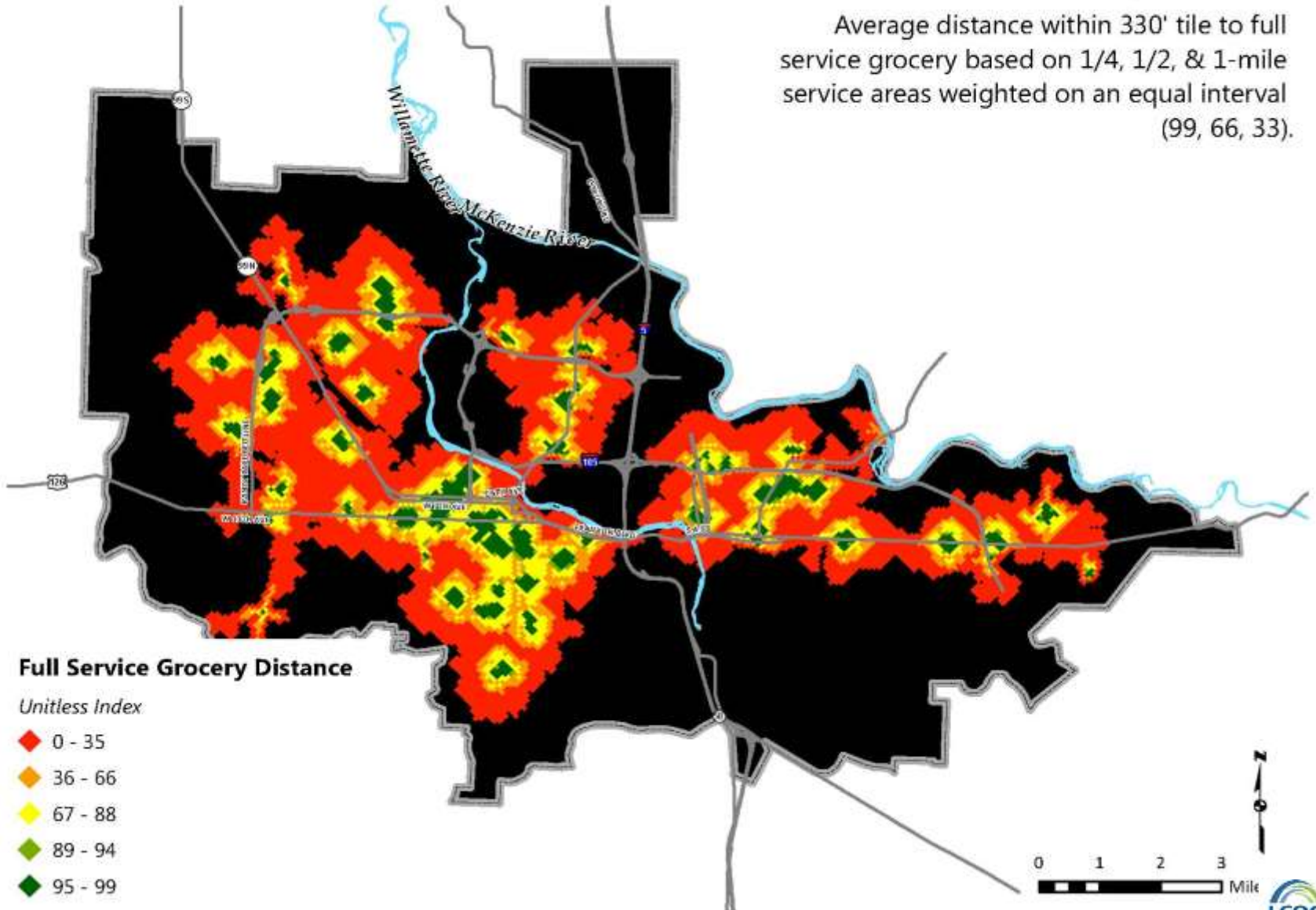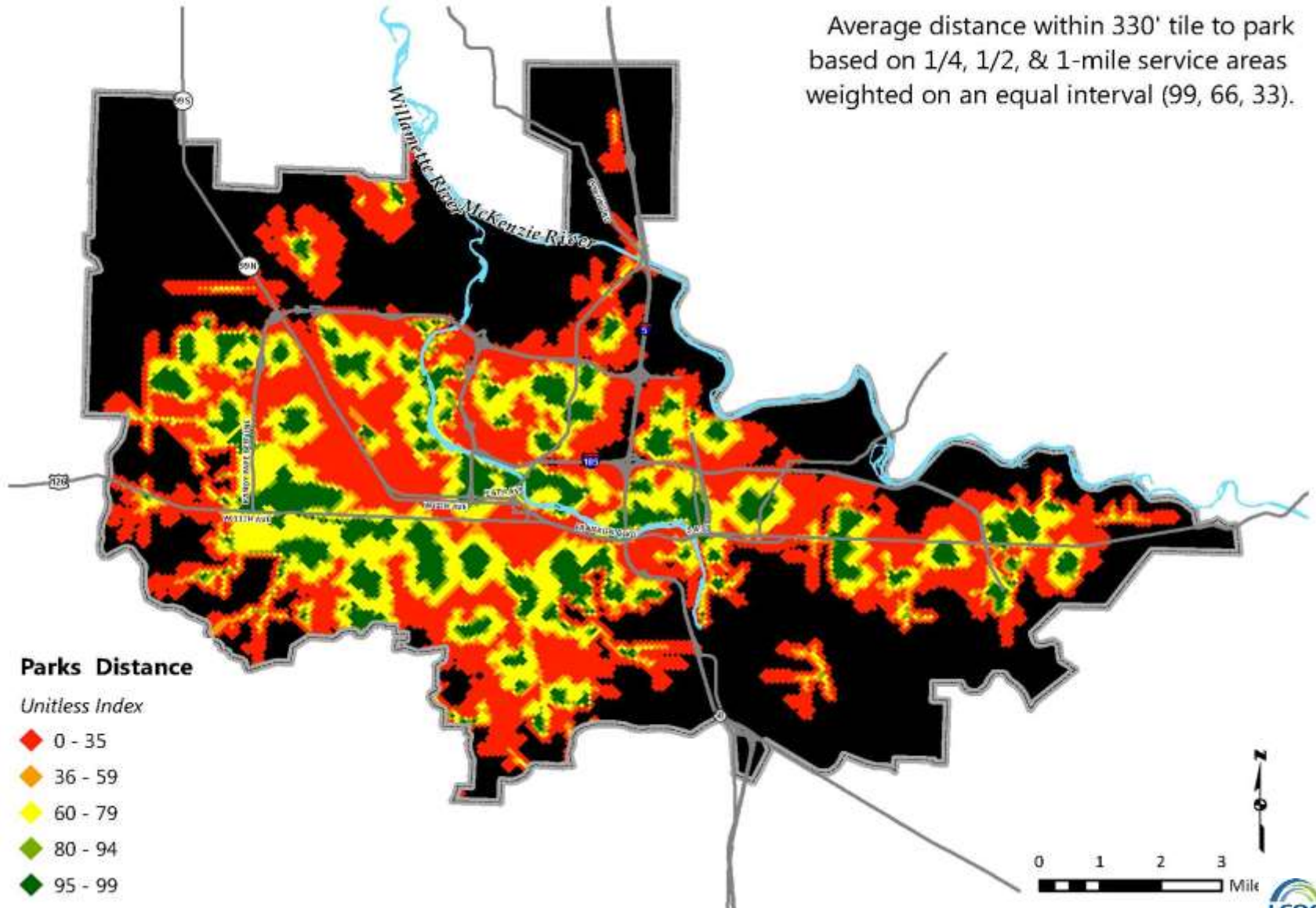
Parks Distance

Unitless Index

◆ 0 - 35
◆ 36 - 59
◆ 60 - 79
◆ 80 - 94
◆ 95 - 99

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20-Minute Neighborhood Walkability Analysis

Density

Major Rivers   Major Roads   — Transportation Management Area

Retail Goods and Services Density

Number of retail goods or service businesses
within 1/4 mile radius of each 33' cell
averaged to a 330' tile.

Retail Goods & Services Density

Unitless Index

- ◆ 0 - 1
- ◆ 2
- ◆ 3 - 4
- ◆ 5 - 16
- ◆ 17 - 100

Lane Council of Governments

20-Minute Neighborhood Walkability Analysis

Density

Major Rivers ▮ **Major Roads** — **Transportation Management Area** ▯

Intersection Density

Number of intersections within 1/4 mile radius of each 33' cell averaged to a 330' tile.

Intersection Density

Unitless Index

- ◆ 0 - 2
- ◆ 3 - 6
- ◆ 7 - 17
- ◆ 18 - 42
- ◆ 43 - 100

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20-Minute Neighborhood Walkability Analysis

Major Rivers ▪ **Major Roads** — **Transportation Management Area** ▫

Density

Bike Facility Density

Length of bike facility (including lanes, routes, and off street paths) to length of road within 1/4 mile radius of each 33' cell averaged to a 330' tile.

Bike Facility Density

Unitless Index

- ◆ 0 - 4
- ◆ 5 - 6
- ◆ 7 - 10
- ◆ 11 - 28
- ◆ 29 - 100

0   1   2   3 Mile

Lane Council of Governments
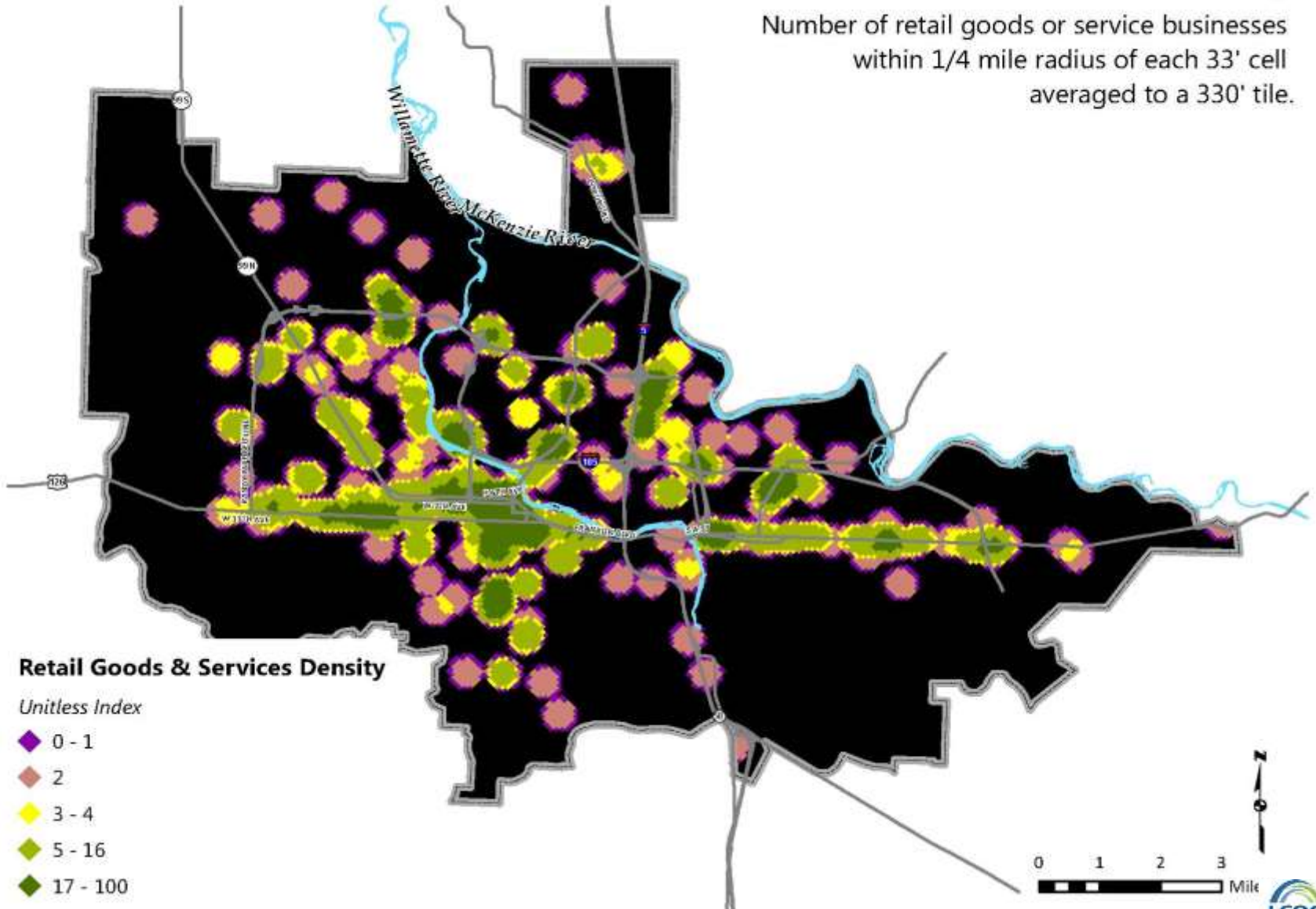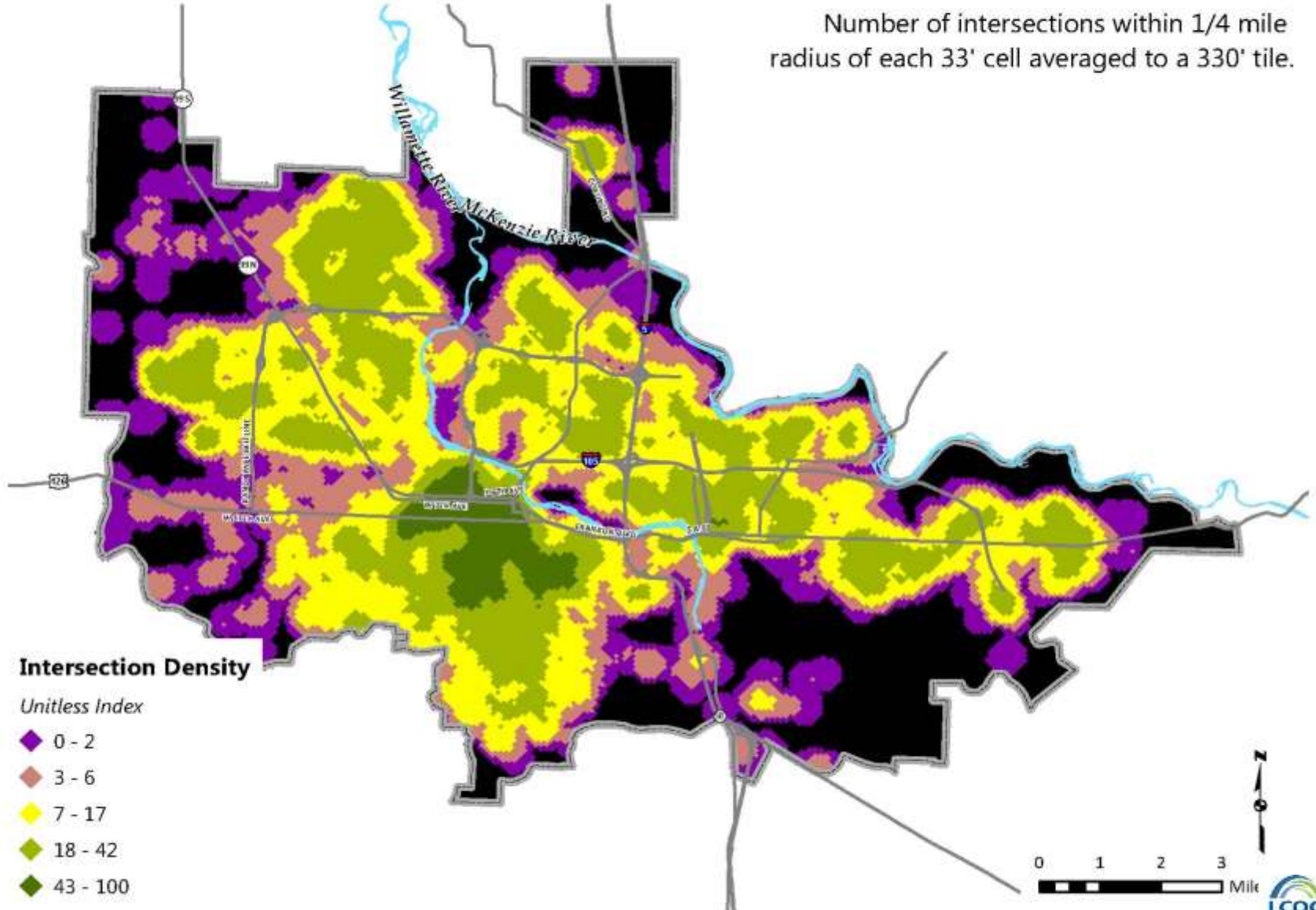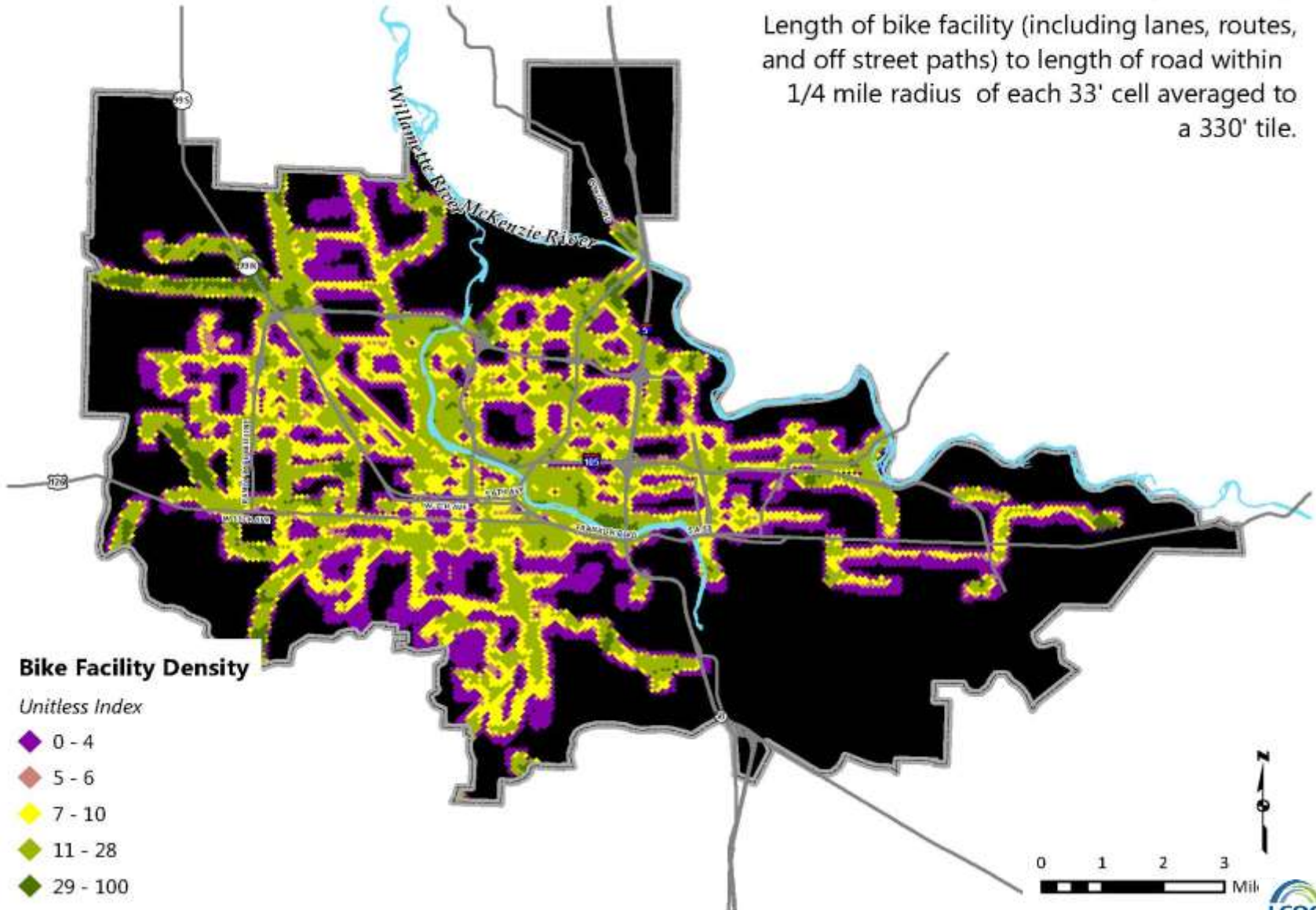
20-Minute Neighborhood Walkability Analysis

Density

Major Rivers   Major Roads —   Transportation Management Area

Sidewalk Density

Length of sidewalk divided by two
(representing full, two-side coverage)
to length of road within 1/4 mile radius
of each 33' cell averaged to a 330' tile.

Willamette River McKenzie River
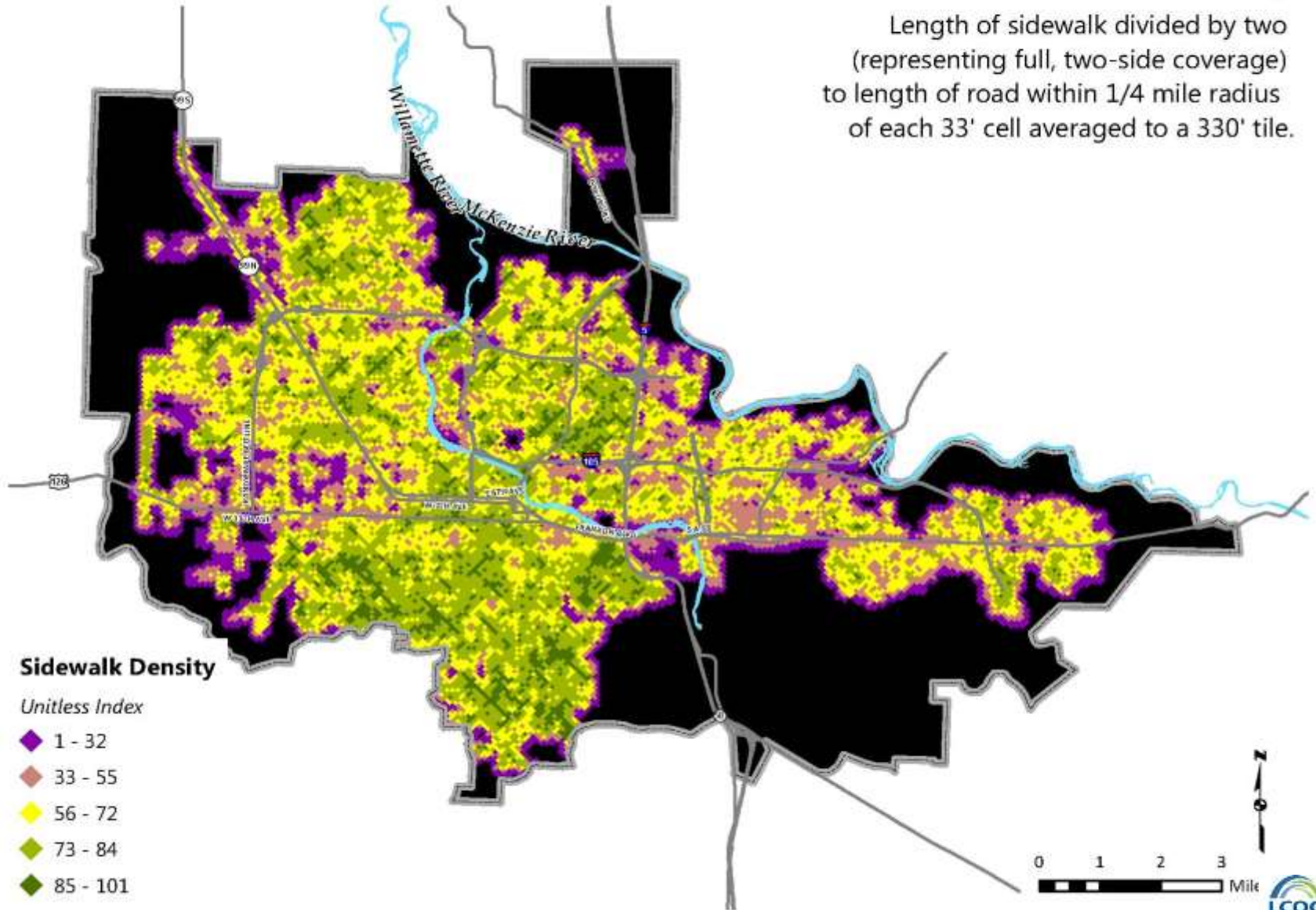
Sidewalk Density

Unitless Index

◆ 1 - 32
◆ 33 - 55
◆ 56 - 72
◆ 73 - 84
◆ 85 - 101

0   1   2   3   Mile

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Major Rivers ▢ Major Roads — Transportation Management Area ▢

Infrastructure Composite

Nine distance and infrastructure factors.

Infrastructure Composite

Unitless Index

◆ 0 - 14
◆ 15 - 29
◆ 30 - 43
◆ 44 - 57
◆ 58 - 72

Lane Council of Governments
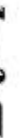
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Composites

Major Rivers Major Roads —— Transportation Management Area

Full Composite

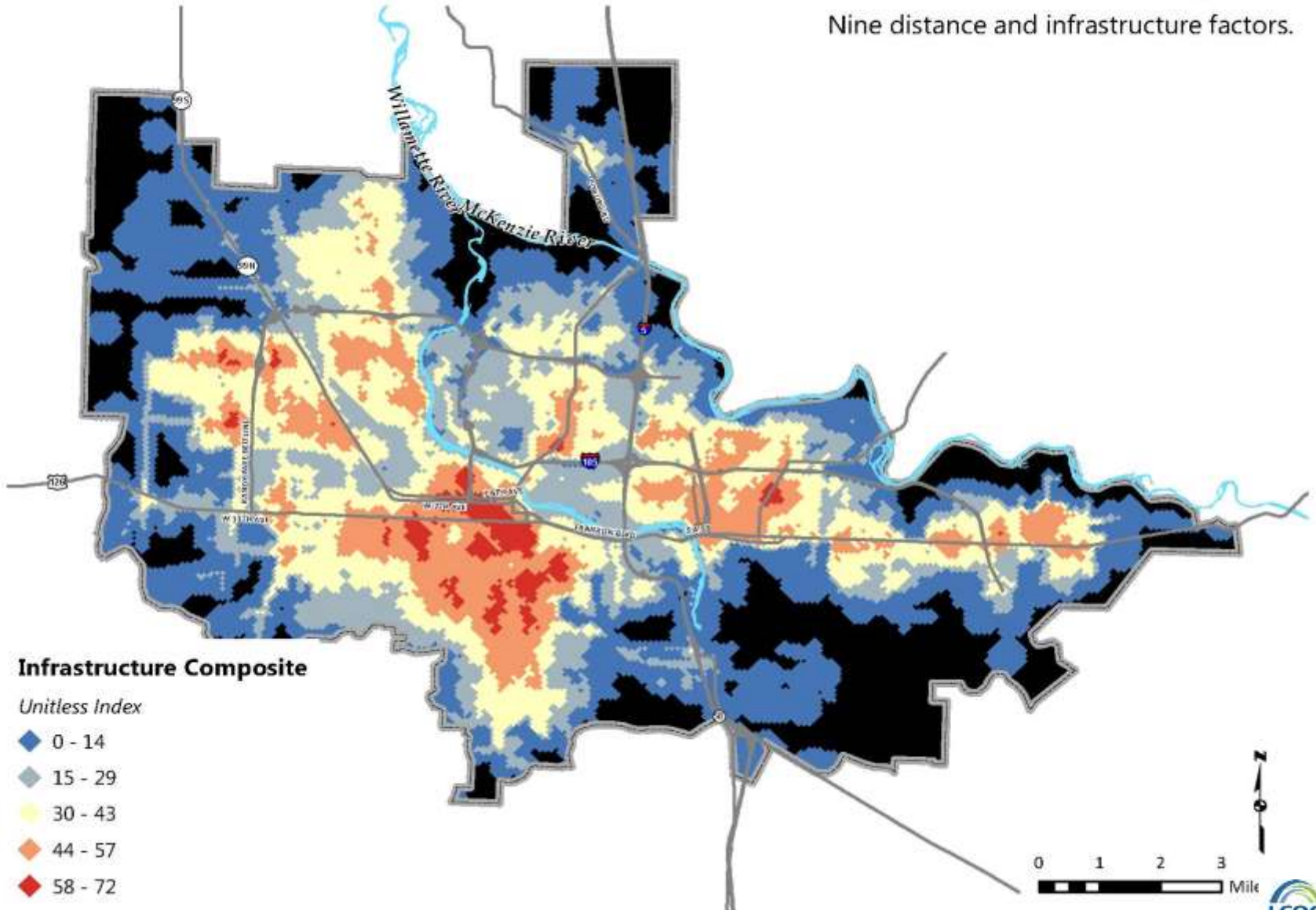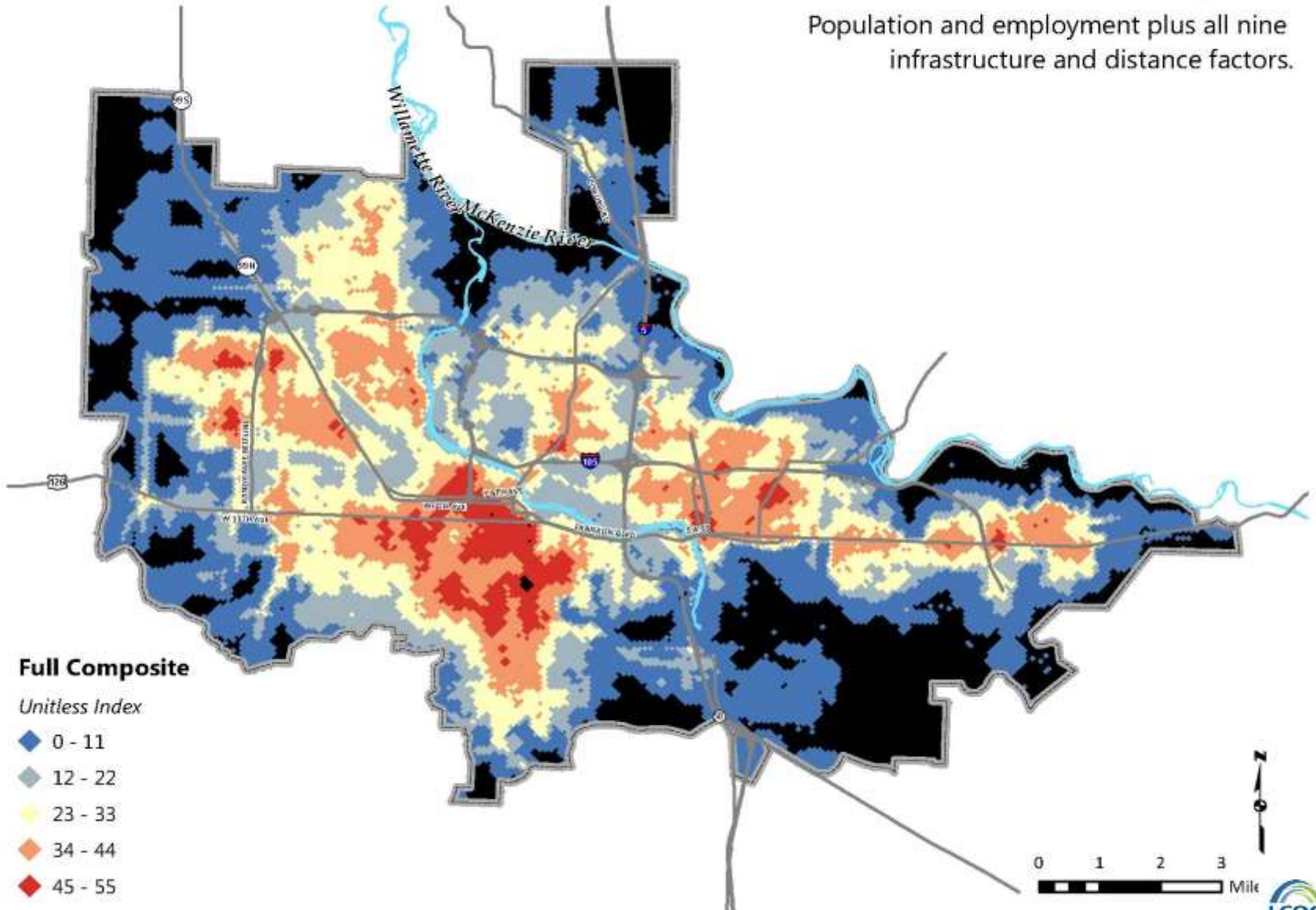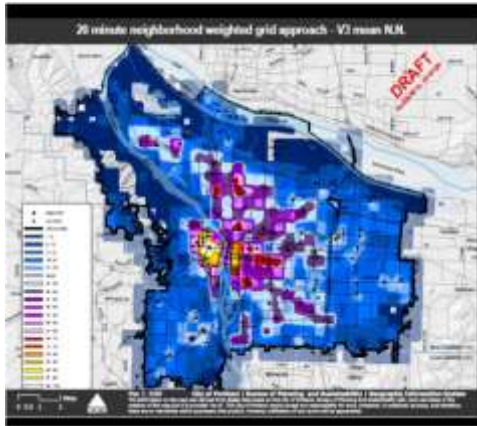Population and employment plus all nine infrastructure and distance factors.

Full Composite

Unitless Index

- ◆ 0 - 11
- ◆ 12 - 22
- ◆ 23 - 33
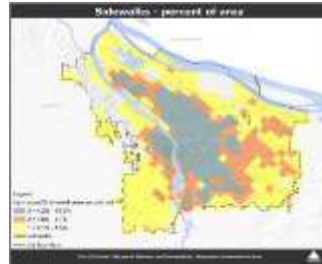- ◆ 34 - 44
- ◆ 45 - 55

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20-Minute Neighborhood Walkability Analysis

Portland

Population density (sightline.org)

Distance to Grocery (e.g. * #)

Sidewalk density (e.g. * #)

"By overlaying and weighing the three factors, we were able to identify where areas had more or less 20-minute neighborhood characteristics."

Sacramento

Potential

Deficiencies

Improvement Need
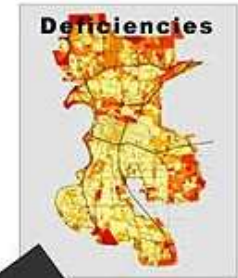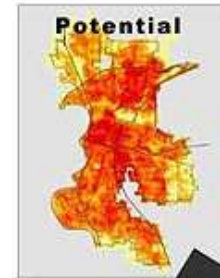
"The premise of this Plan is that areas lacking land use patterns that would support walking should be addressed through policy actions that would create walking demand. The City's scarce resources for improving Pedestrian environments should be targeted to areas with supportive land uses (that is, there are potential walkers) but lacking sidewalks and crosswalks."

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20-Minute Neighborhood Walkability Analysis

Major Rivers   Major Roads ——   Transportation Management Area

Infrastructure Opportunity

Estimated number of residents and employees (population) per 330' block. Blocks selected are the top 20% of population density and, within that, the bottom 20% of composite infrastructure score. These represnt the nuclei of opportunity areas for improving the composite of active transport factors.

Infrastructure Opportunity Areas

People

◆ 44 - 73
◆ 74 - 118
◆ 119 - 194
◆ 195 - 312
◆ 313 - 569

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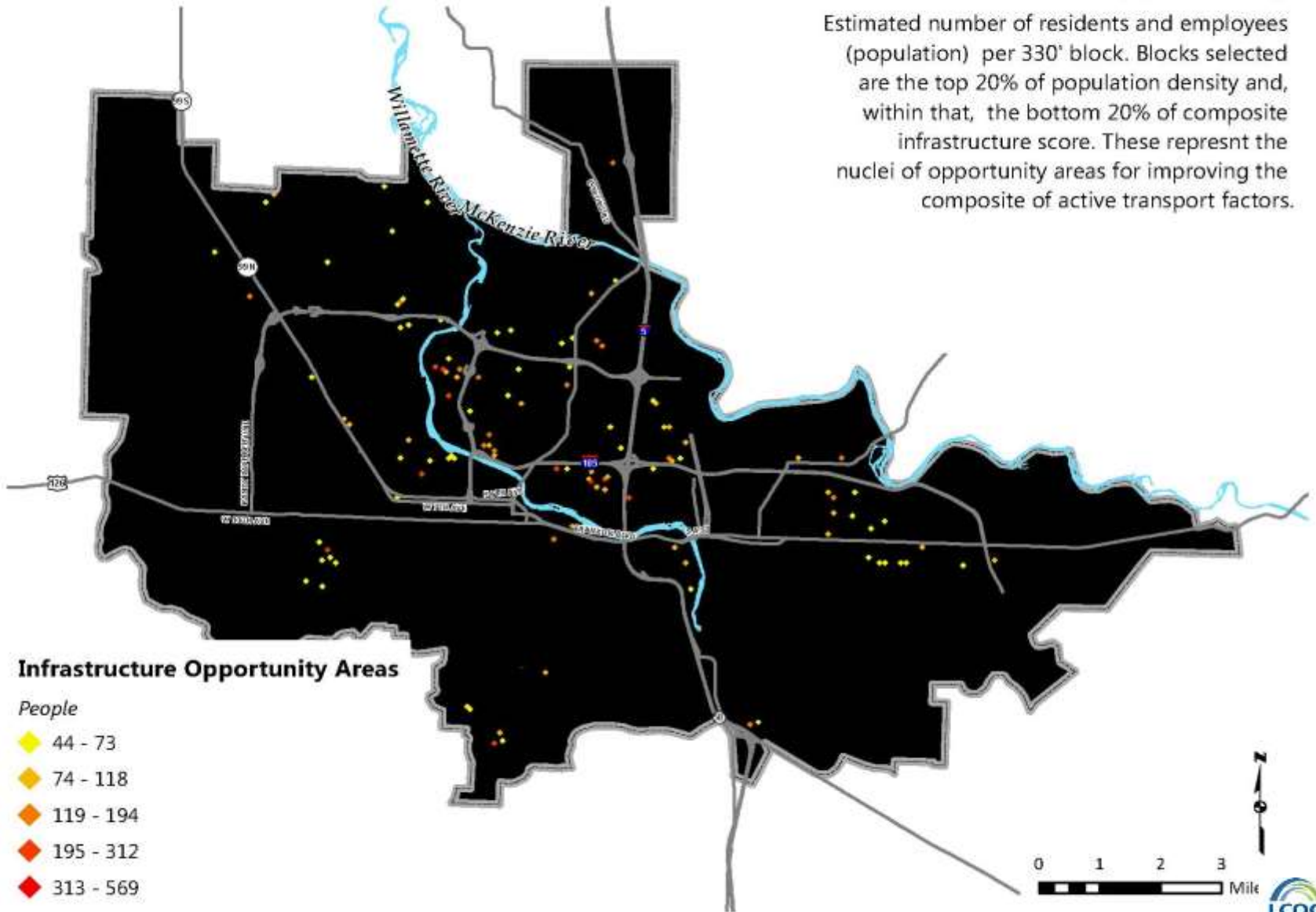
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Opportunity Hot Spots

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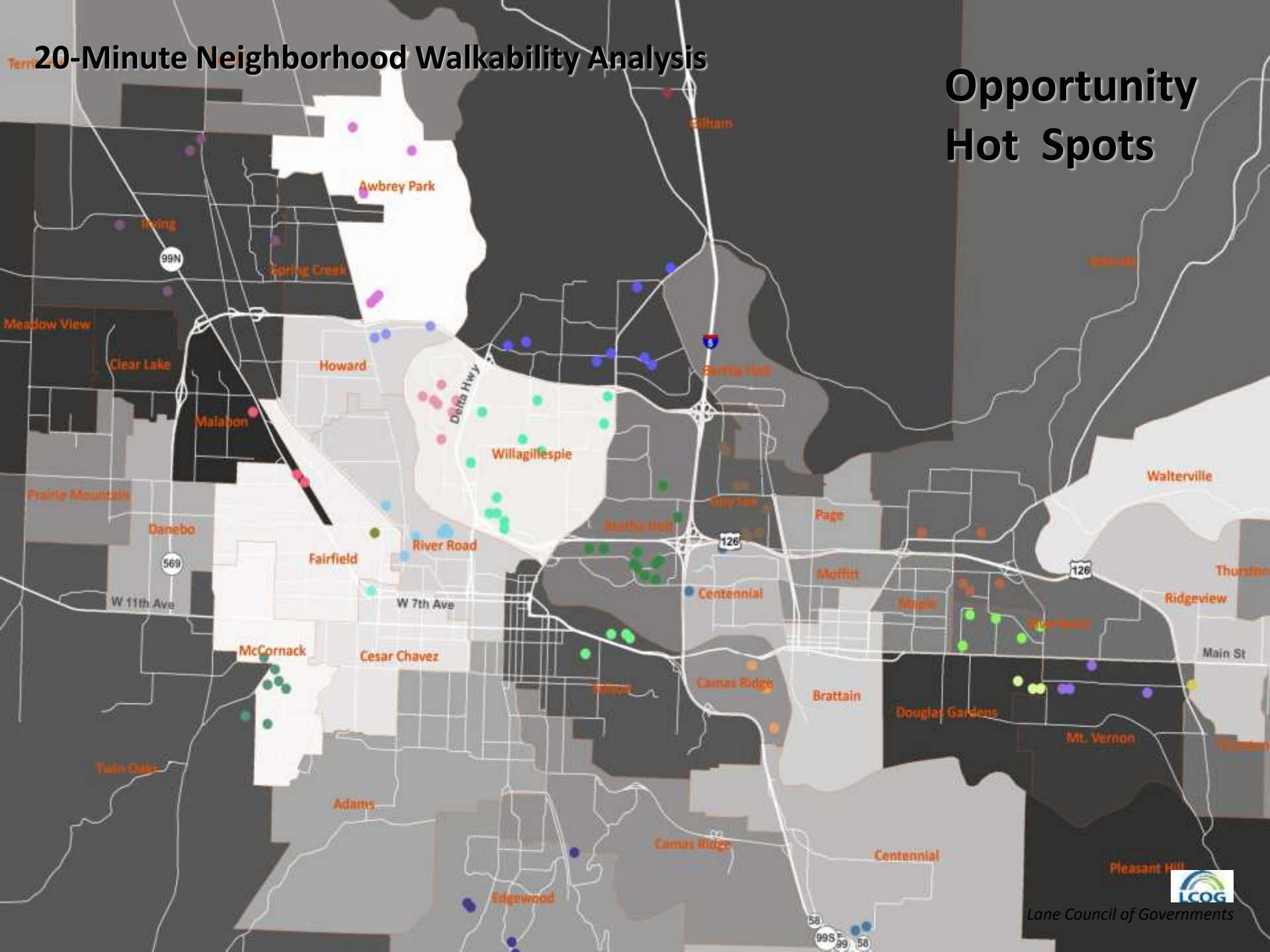
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Average Opportunity Area Infrastructure Scores
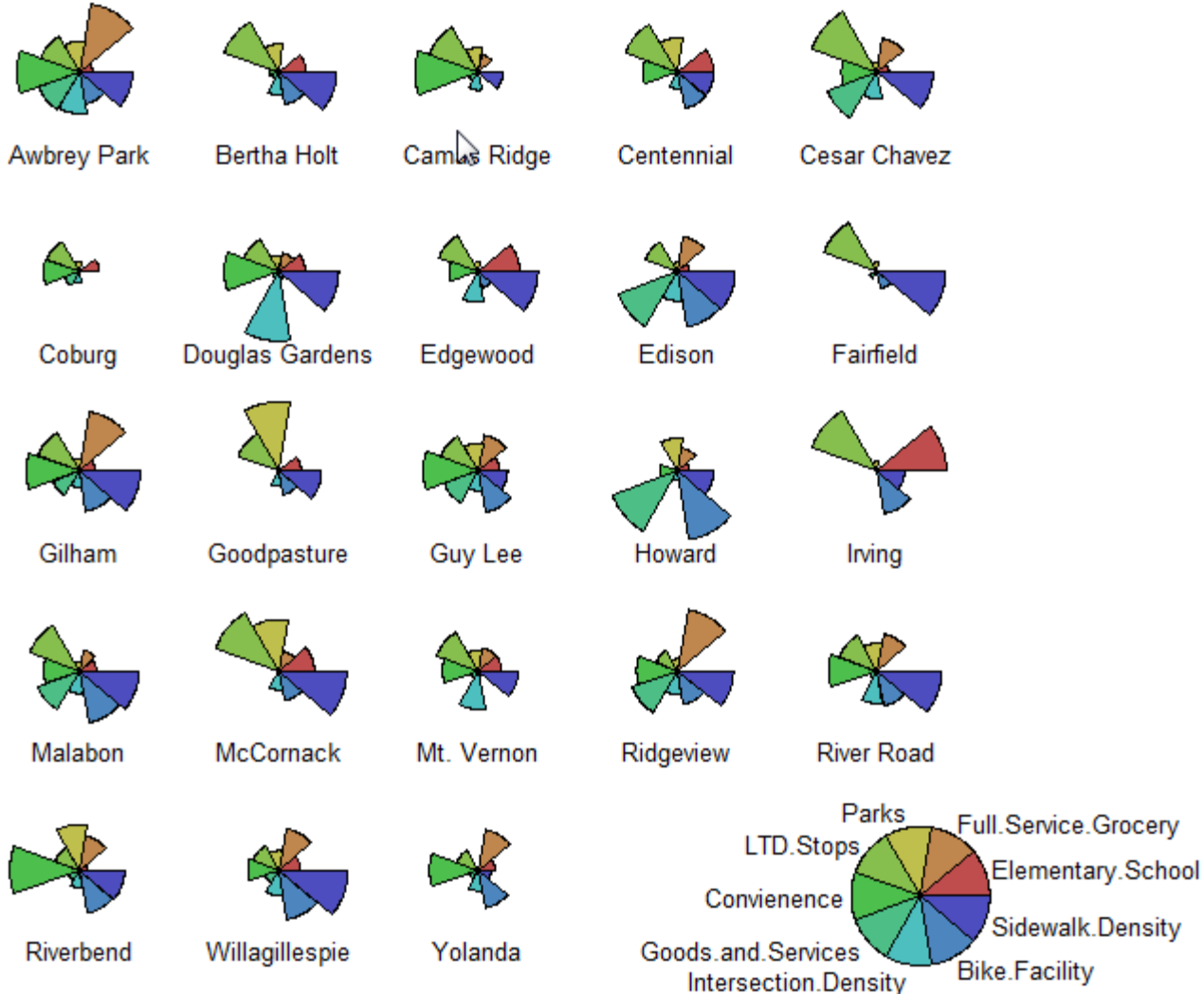
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Inverted Average Opportunity area Infrastructure Scores
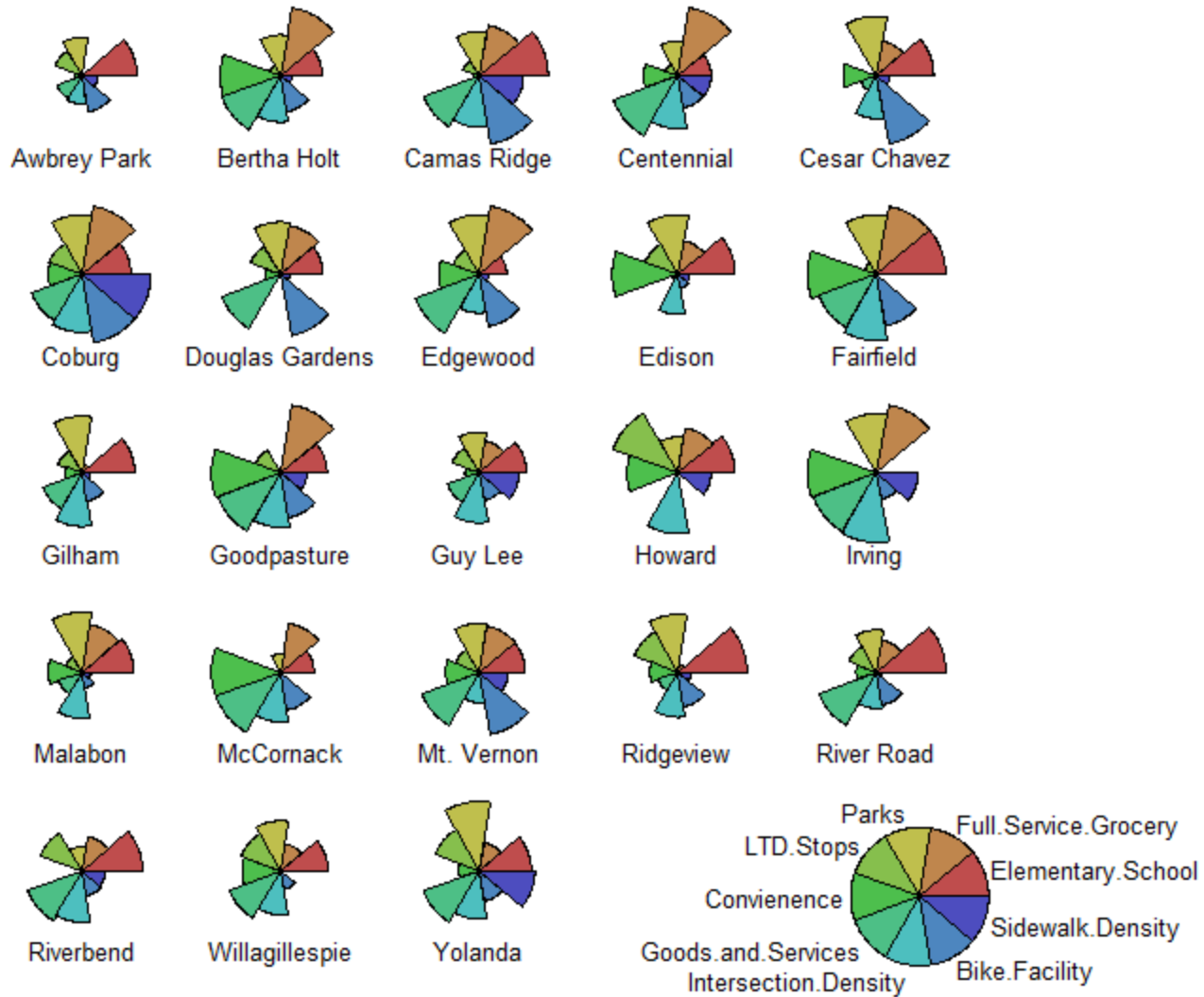
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- How did we get here? & Why this analysis?
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- How can it be used? & What more might be gained?

September 6, 2012

Improvements to the Model: Towards a Density, Diversity, & Design (3-D) Framework

- Contextualize parameters by performing a predictive factor analysis to identify those attributes of populations and environments that are locally relevant. This would be done using travel survey data.

- Apply Multi-Modal Level of Service (MM-LOS) ratings to street segments as a cost when calculating service areas for destinations.

- Calculating a continuous service area on the network as opposed to the ¼, ½, & 1-mile breaks.

- Applying an attractiveness (diversity, entropy) factor to business based on the business diversity context in which they occur.

- Specifying the effect on particular areas or demographic populations through area analysis and a small area population model.

20-Minute Neighborhood Walkability Analysis

Improvements to the Model: Predictors

Predictors of walking & biking in order of significance:

1. Large block size in context to origins discourage walking/biking

2. Areas with more higher valence intersections (4-5 segment junctions) are positively bike-walk associated

3. Land-use diversity in housing and employment, and areas with high employment and largely employed populations are positively walk-bike associated.

"To a significant extent, density attributes of neighborhoods are captured in what we are calling the *design and diversity factor*s, that is, neighborhoods with small blocks, grid street patterns, and mixed uses also tend to be fairly dense."

Cervero, R , and M Duncan. "Walking, Bicycling, and Urban Landscapes: Evidence From the San Francisco Bay Area" Am J Public Health. 2003 September; 93(9): 1478–1483.

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447996/

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447996/table/t2/

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447996/table/t3/

20-Minute Neighborhood Walkability Analysis

Improvements to the Model: Predictors

Exogenous factors > Built Environment Factors

(topography, darkness, and rainfall > well-connected streets, small city blocks, mixed land uses, and close proximity to retail activities)

Demographic characteristics of trip makers > Built Environment factors

Urban design exerts a greater influence on biking than walking.

Walking increases with increased land use diversity of origin.

Biking is equally influenced by density, diversity, and design.

Cervero, R , and M Duncan. "Walking, Bicycling, and Urban Landscapes: Evidence From the San Francisco Bay Area" Am J Public Health. 2003 September; 93(9): 1478–1483

20-Minute Neighborhood Walkability Analysis

Improvements to the Model: Predictors (biking)

"This study found that the built environment had a significant influence on the decision to use the active mode of transport, bicycling, instead of driving. For utilitarian travel, features of the physical environment—the road network, bicycle-specific facilities, and land use—were all associated with the likelihood of cycling, even after accounting for personal characteristics and trip distance.

The following features promoted cycling:

- less topographical variation,
- traffic calming and cyclist-activated traffic lights along bicycle routes,
- higher route connectivity (intersection density),
- local roads instead of highways and arterials,
- higher population density, and
- neighborhood commercial, educational, and industrial land uses."

Route characteristics > Origin or Destination Characteristics

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3005092/figure/Fig2/

Built Environment Influences on Healthy Transportation Choices: Bicycling versus Driving Meghan Winters, Michael Brauer, Eleanor M. Setton, and Kay Teschke J Urban Health. 2010 December; 87(6): 969–993

Street Results

Streets that **lacked a sidewalk** were **6.8** times more likely to feel unsafe.

Streets that **had turn lanes** were **6** times more likely to feel unsafe.

Streets that **lacked street trees** were **1.8** times more likely to feel unsafe.

Walking Path Results

Streets where the walking path **wasn't wheel-chair accessible** were **6** times more likely to feel unsafe.

Streets where the walking path **was narrow** were **3** times more likely to feel unsafe.

Streets where the walking path **had a bad walking surface** were **2.7** times more likely to feel unsafe.

Streets where the walking path was blocked by obstacles were **1.9** times more likely to feel unsafe.

20-Minute Neighborhood Walkability Analysis

Improvements to the Model: Route characteristics

The LOS models are ideal for evaluating the benefits of "complete streets" and "context sensitive" design options because the models quantify the interactions of the modes sharing the same street right-of-way. The models enable the analyst to test the tradeoffs of various allocations of the urban street cross section among autos, buses, bicycles, and pedestrians.
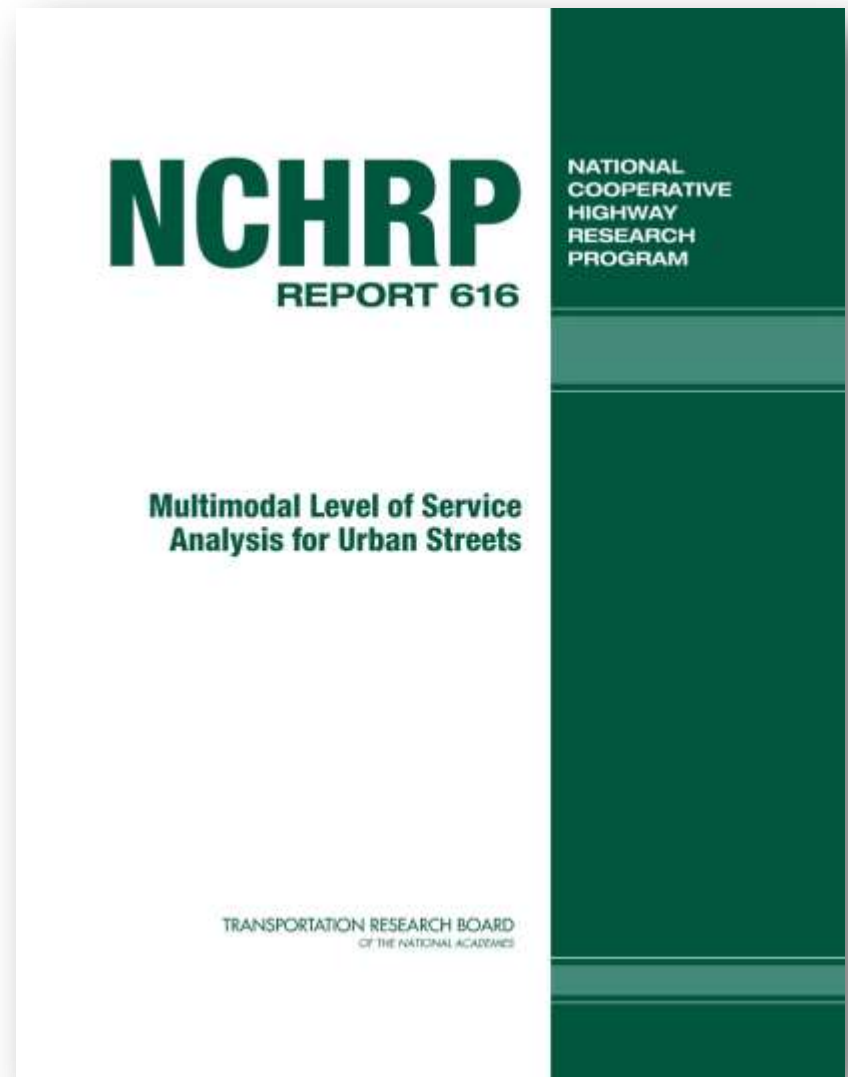
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Regional Transportation Options

What more might be gained?

- Investigate health-related questions and outcomes and form new connections between Planners those in the Public Health field.
- Evaluate how public policies could be revised to support 20-minute neighborhood and similar livability goals.
- Target specific areas for intervention based on identified opportunities.
- Use as a communication tool to engage neighbors in conversations about topics such as key community assets, individual choices and behavior changes, and mobility.
- Evaluate social equity considerations and identify key avenues to improve access to AT opportunities.