Measuring Urban Form and Walkability in Rural Communities

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Smart Mobility, Inc.

Research Activities

- "Obesity and the Built Environment"
  - Study of over 2,000 students in 48 schools in VT and NH
  - Evaluated walkability for schools and residence locations
- "NETI Rural Transportation Issues Survey "
  - Over 3,500 survey respondents in VT, NH and ME
  - Evaluated the built environment for walkability, accessibility, for residences and communities

Rural Public Transit Ridership Factors

- Accessibility to trip origin and final destination
- Relative cost and convenience compared to other potential options
  - travel time, waiting time
  - Fare cost
- Safety and comfort of transit alternative
  - walking to bus stop,
  - waiting for the bus

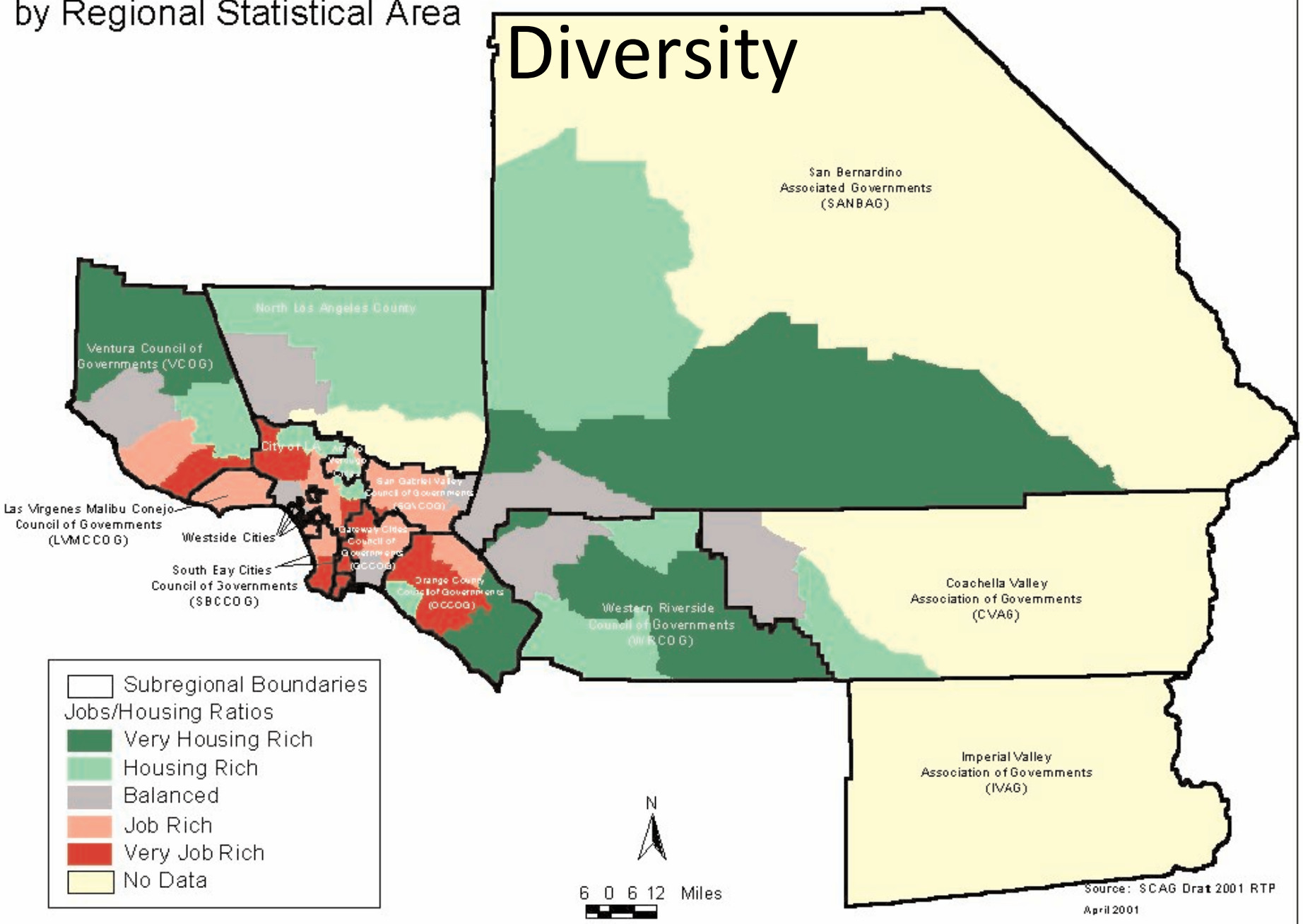
The Four D's of the Land Use/ Transportation Connection

- Density (population per square mile)
- Diversity (jobs/housing balance)
- Design (street connectivity)
- Destinations (accessibility)

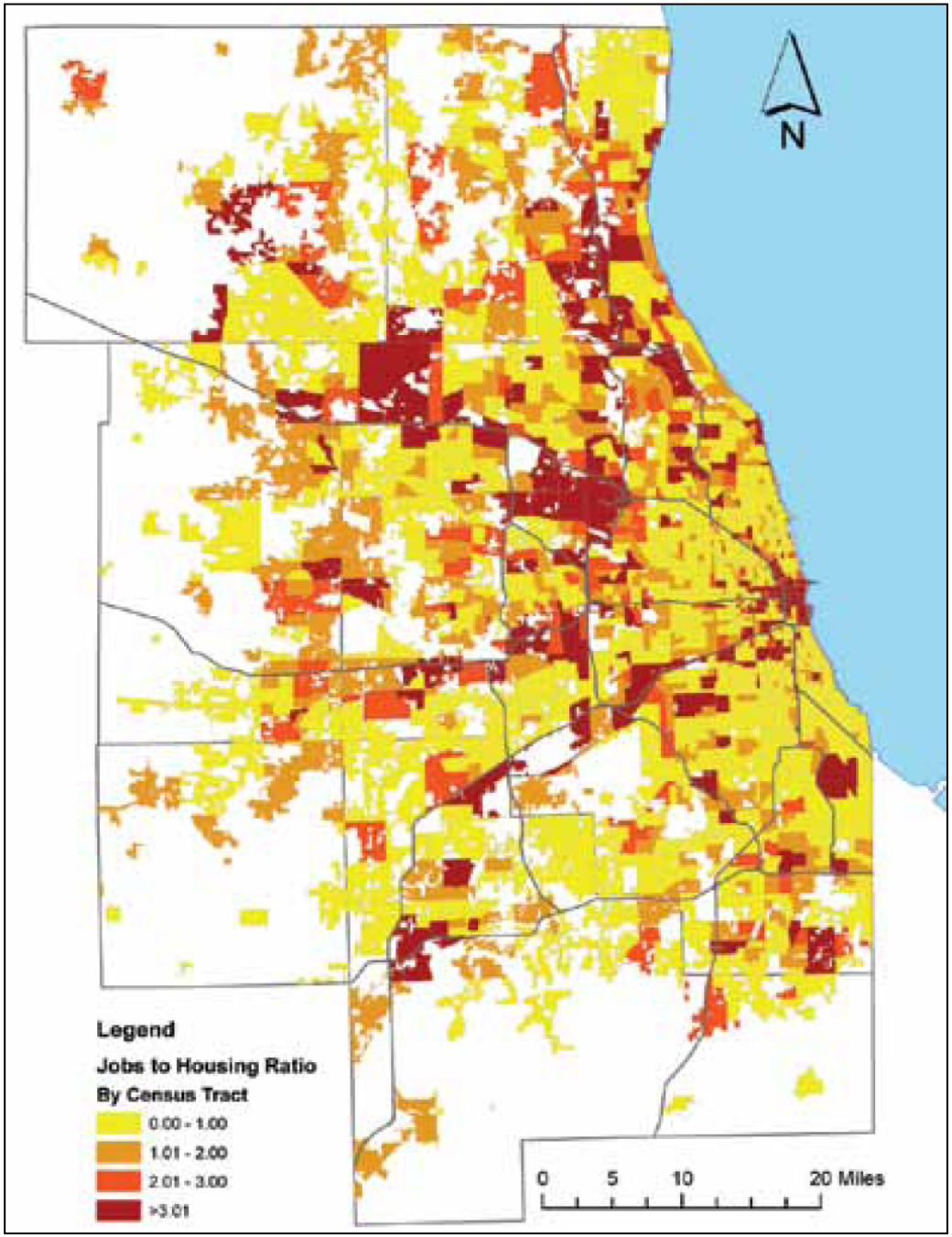
Density

Map 2. Jobs/Housing Balance in the SCAG Region - 1997 by Regional Statistical Area

Diversity



Ratio of Jobs to Households by Census Tract, 2000



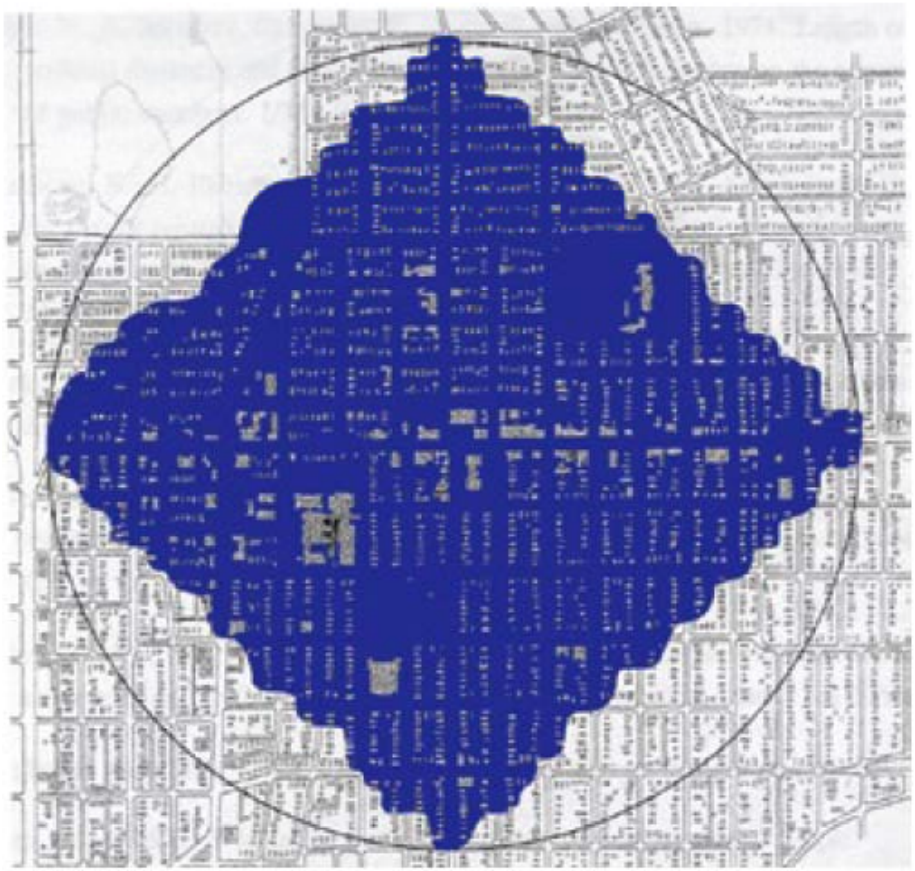
Source: Census Transportation Planning Package 2000, U.S. Census 2000

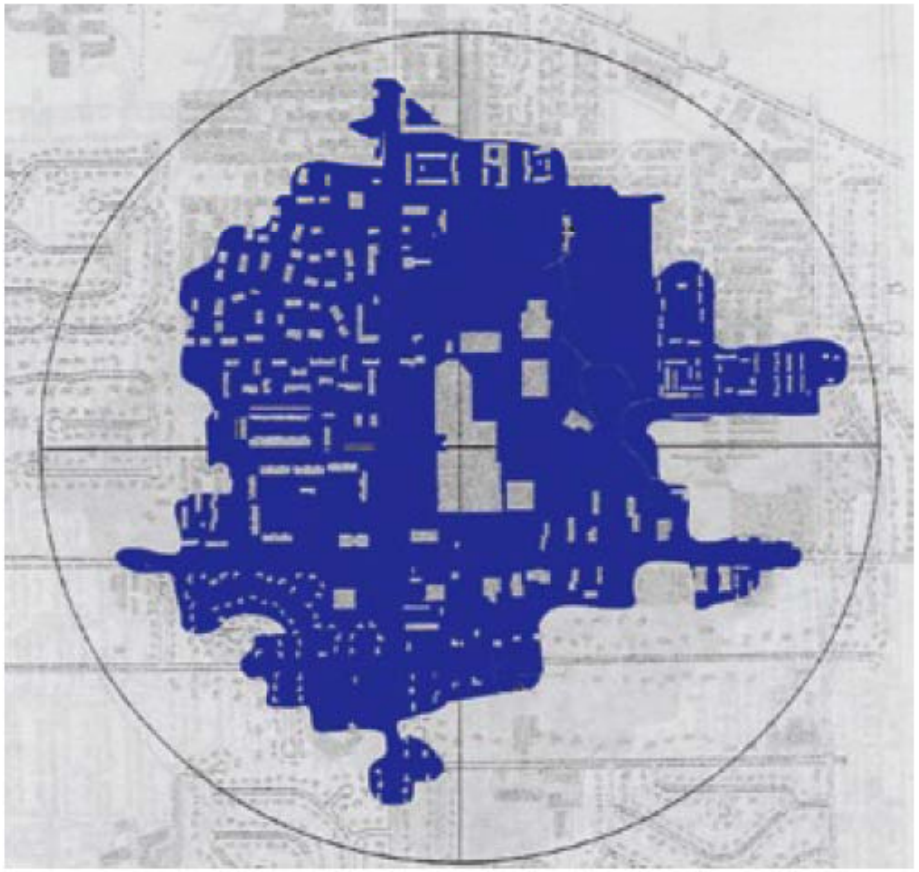
Local Scale


London Dock
THE COFFEE TREE ROASTERS
Fotoshop
FOR LEASE
412 471 9500
Herky Pollock
CBRE
PROCESSING
REPAIRS

Design

Housing within One-Quarter Mile of Commercial Centers for Contrasting Development Patterns in Seattle






QUALITY USED CARS
COUNTRY KITCHEN


38,000 SF
RETAIL
SPACE
FOR
LEASE
MT AUBURN
DHL

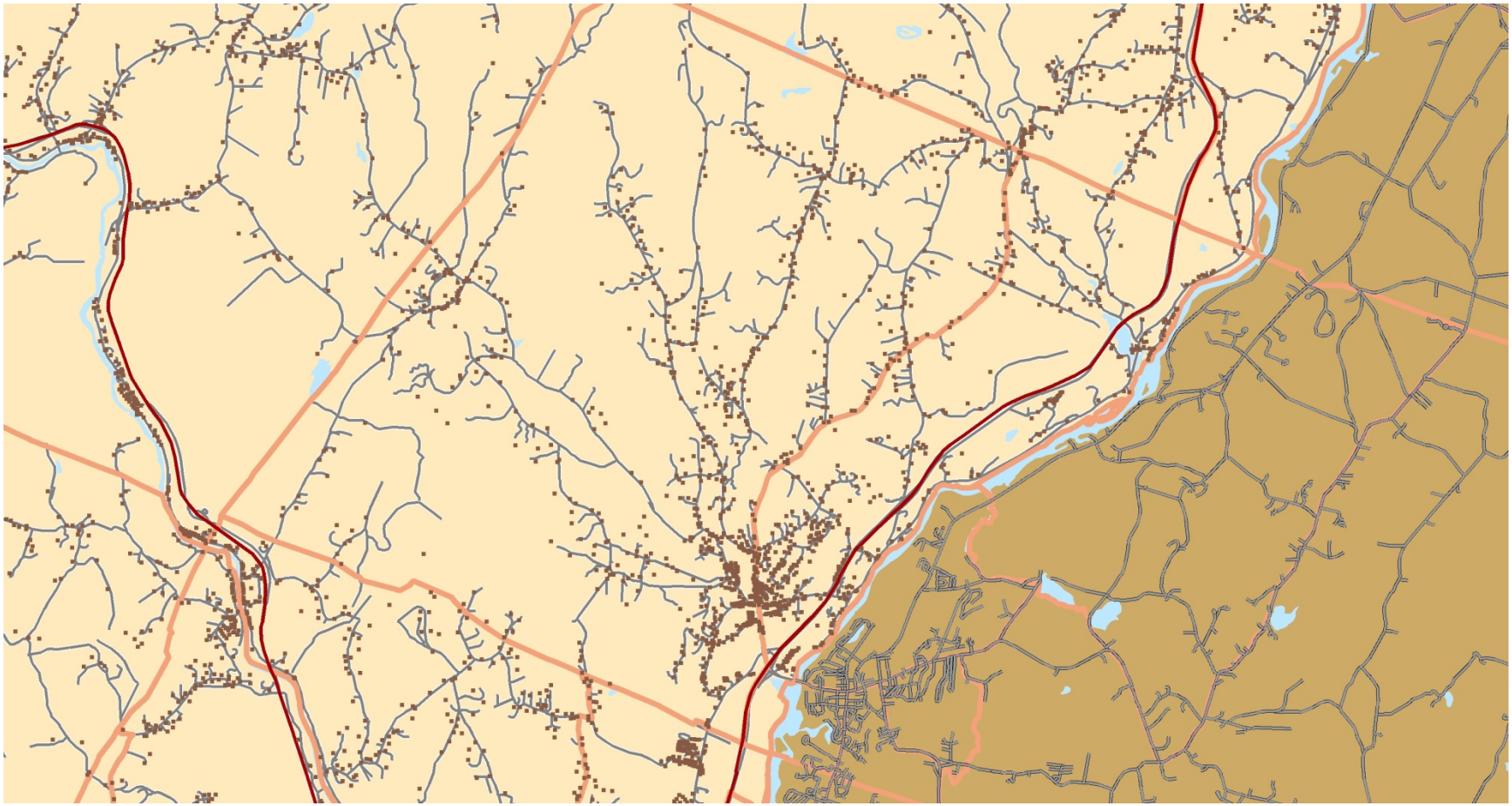

7-ELEVEN
7
ELEVEN

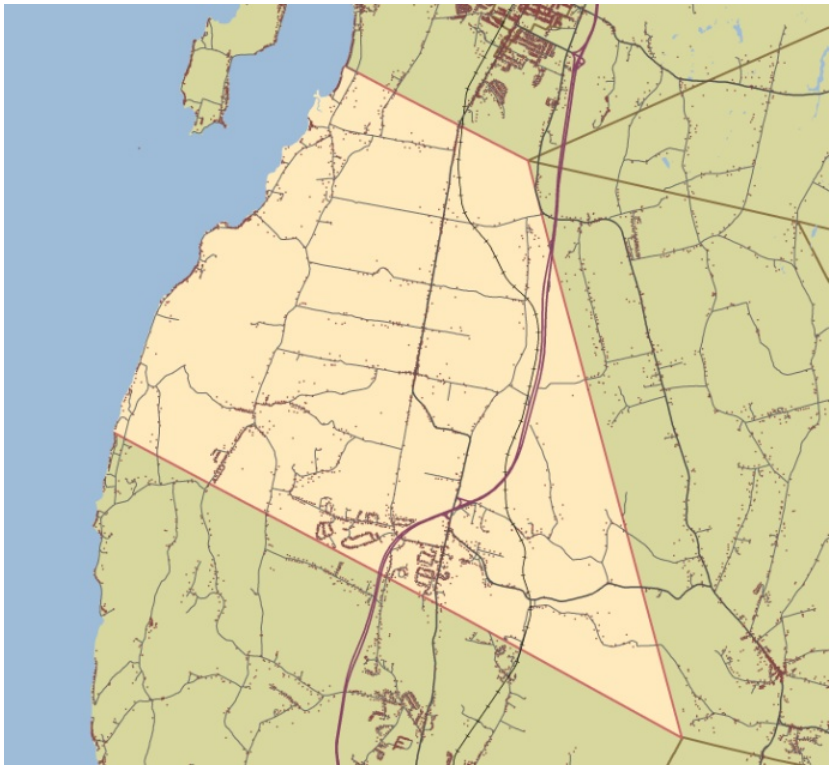
Destinations

Four D’s in Rural Areas

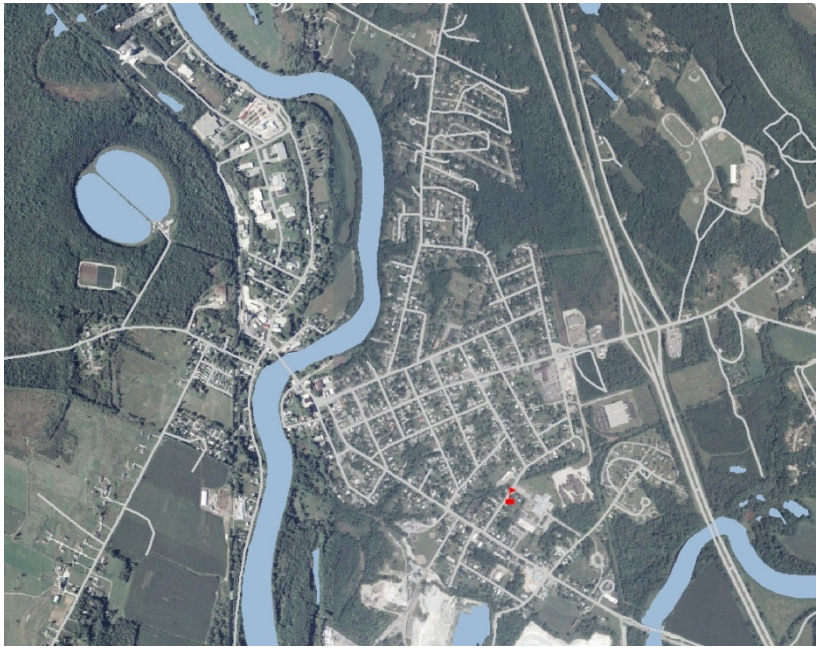
- Data is more sparse,
- geographic units are very large, and
- settlement patterns can be very heterogeneous

Block Group





A Tale of Two Towns		
Town Wide Data	Swanton	Georgia
Population	6,415	4,480
Population Density	128	111



Refined 3D's GIS Site Specific Analysis *Applied to Area 1 kilometer radius from school*		
Population	1,463	77
Households	894	23
Intersections	32	7

Owens *et al. International Journal of Health Geographics* 2010, **9**:8
http://www.ij-healthgeographics.com/content/9/1/8

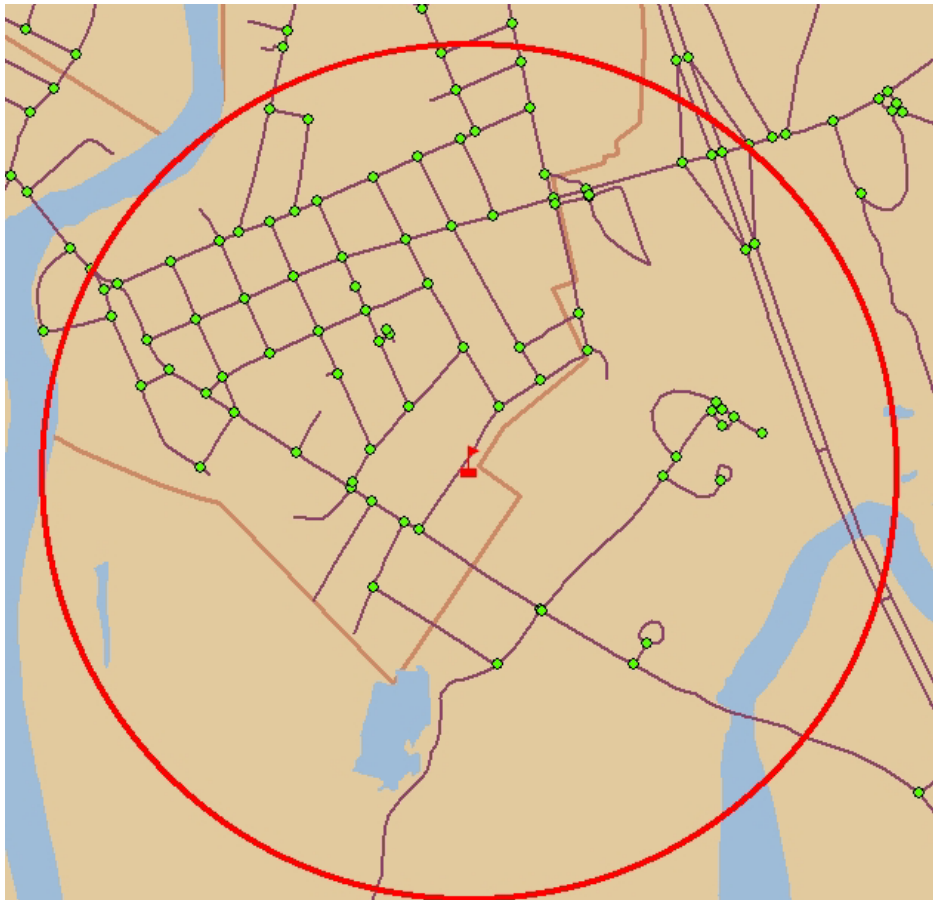
INTERNATIONAL JOURNAL
OF HEALTH GEOGRAPHICS

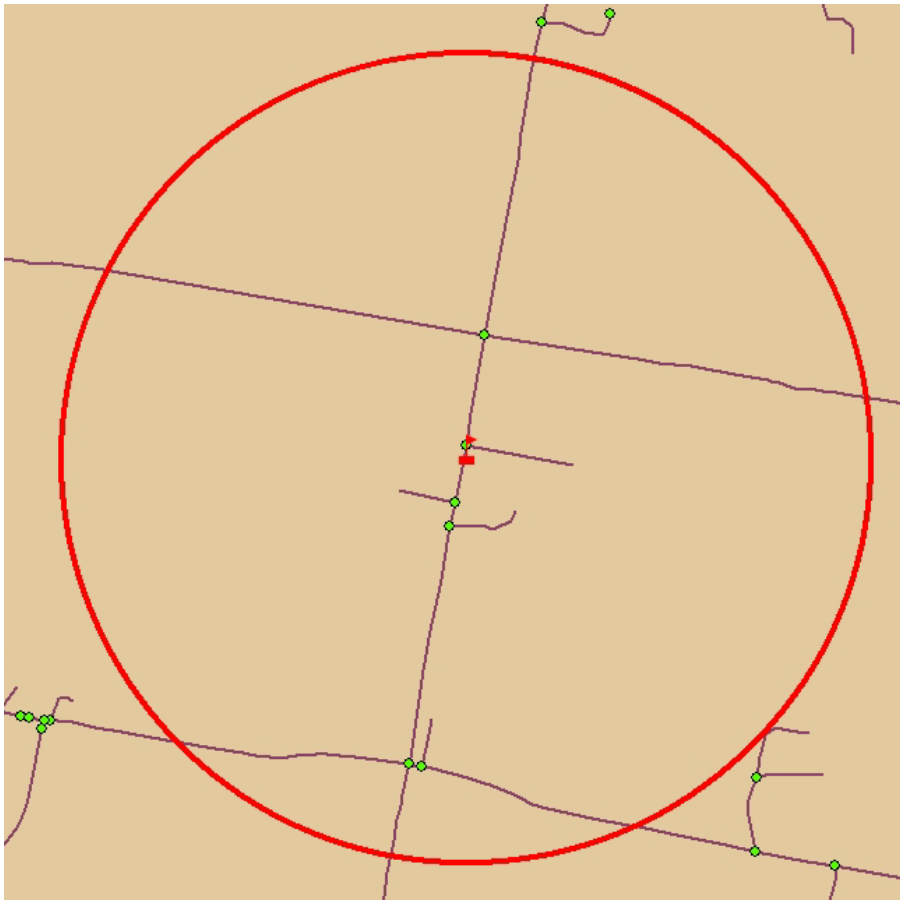
METHODOLOGY Open Access

Smart density: a more accurate method of measuring rural residential density for health-related research

Peter M Owens[1], Linda Titus-Ernstoff[2,3,4], Lucinda Gibson[1], Michael L Beach[2,4,5], Sandy Beauregard[1] and Madeline A Dalton*[2,3,4]

Intersection Density





Design: Intersection Density

- Even in rural Vermont, some of our communities can meet these guidelines:

LEED 2009 FOR NEIGHBORHOOD DEVELOPMENT

LEED® for Neighborhood Development

Total Possible Points**	110*
Smart Location & Linkage	27
Neighborhood Pattern & Design	44
Green Infrastructure & Buildings	29

** Out of a possible 100 points + 10 bonus points*

*** Certified 40+ points, Silver 50+ points, Gold 60+ points, Platinum 80+ points*

Innovation & Design Process	6
Regional Priority Credit	4

Figure 1. Clarence Perry's Neighborhood Unit, 1929. Source: Regional Plan Association

Figure 2. A "sustainable" update of Perry's neighborhood unit. Source: Douglas Farr, *Sustainable Urbanism*

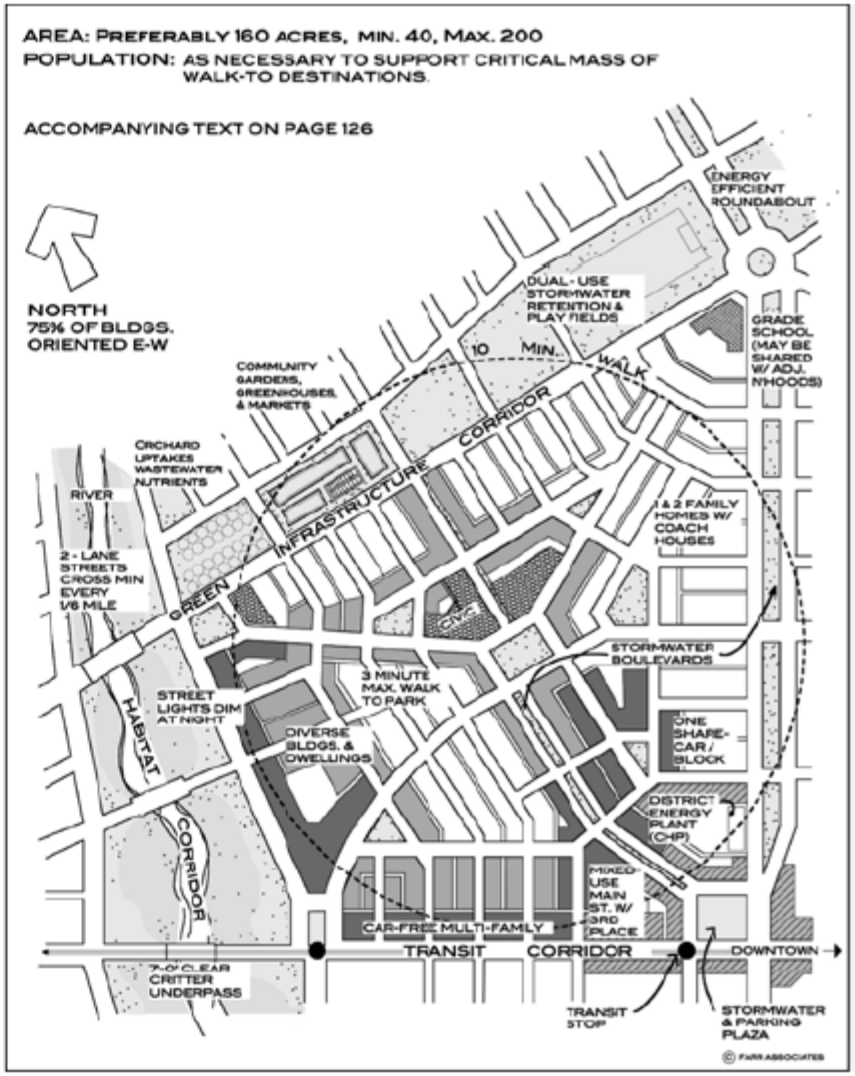
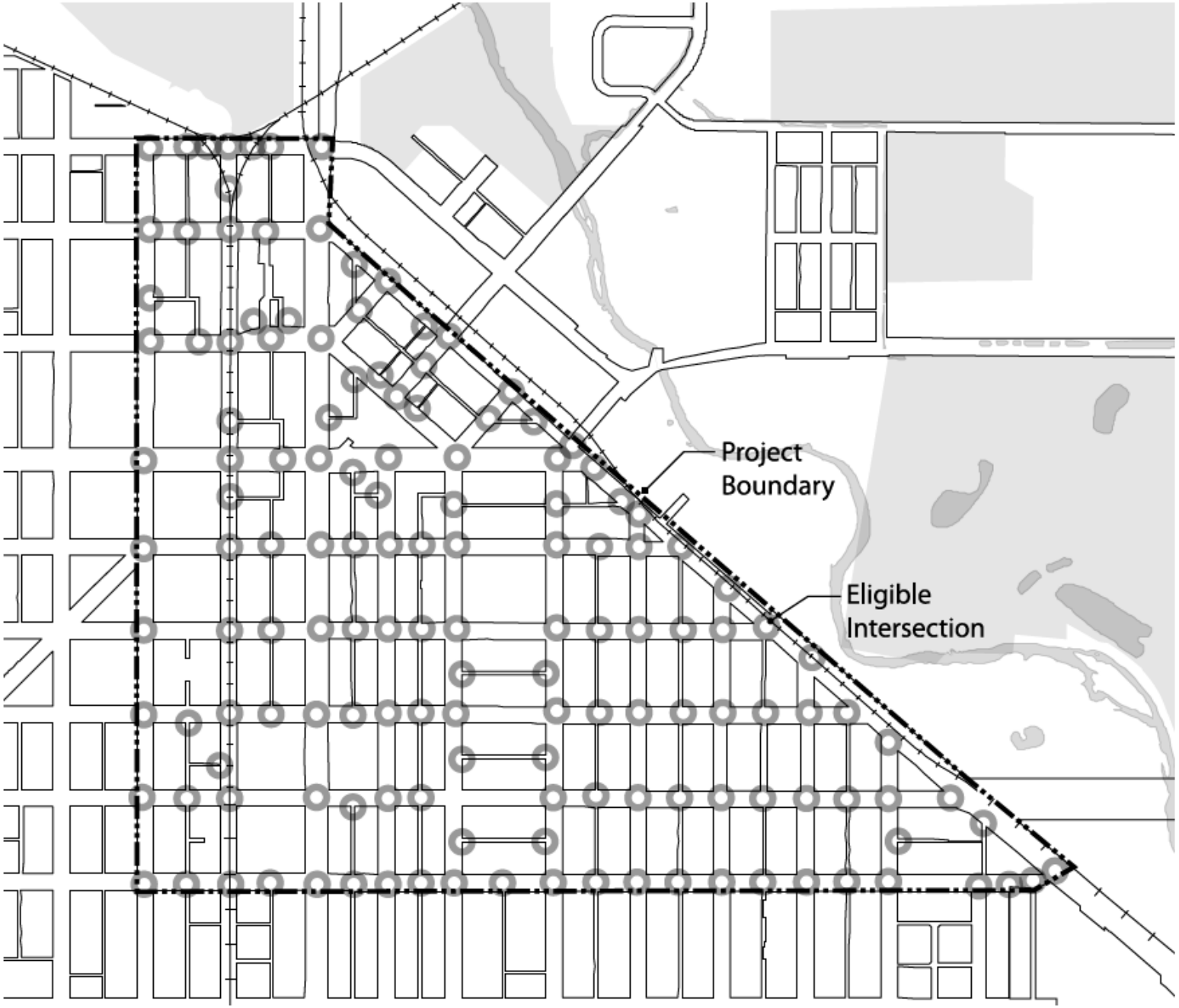


Figure 1. Project site design with 140 eligible intersections per square mile on streets that are not gated



Respondents by intersection density

LEED-ND Category	Description	Count
Below eligible	Fewer than 90 per square mile	2,828
Meets Minimum eligibility	Between 90 and 144 per square mile	421
Meets LEED ND Target	Between 144 and 300 per square mile	366
Extra points for connectivity	More than 300 per square mile	15

Respondents by transit supportiveness

Land Use Characteristics	*Transit Implications*	*Neighborhood HH Density (hh/sqmi)**	*Count*
Rural/ Exurban, 3+ acre lot rural	Paratransit marginal	Less than 200	1,763
Semi-rural, 0.6 to 3 acre lot semi-rural	Paratransit only	200 to 1,200	1,256
Suburban or Village density (2 to 6 units per acre)	Lower Frequency Fixed Route Bus	1,200 to 2,400	360
Walkable/Urban density (6 to 12 units)	High Frequency Fixed Route Bus	2,400 to 4,800	133
Over 12 units per acre	Premium Bus or Rail	Over 4,800	36

•These ranges are adjusted to reflect the difference between gross density and net density, which reflects land not consumed by roads,
•utilities, etc. in urban areas.

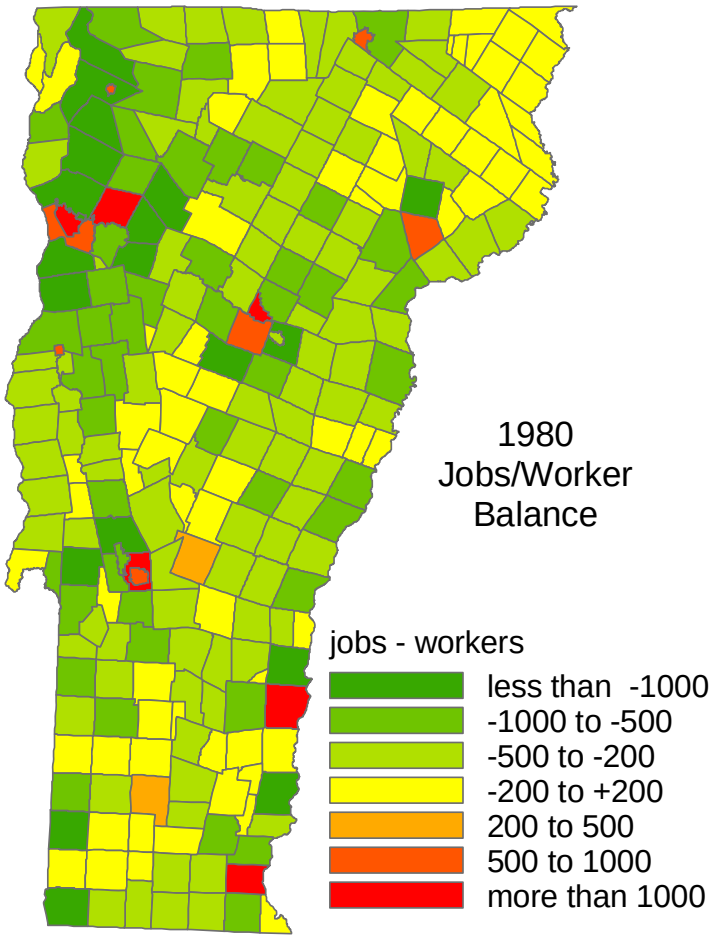
Diversity

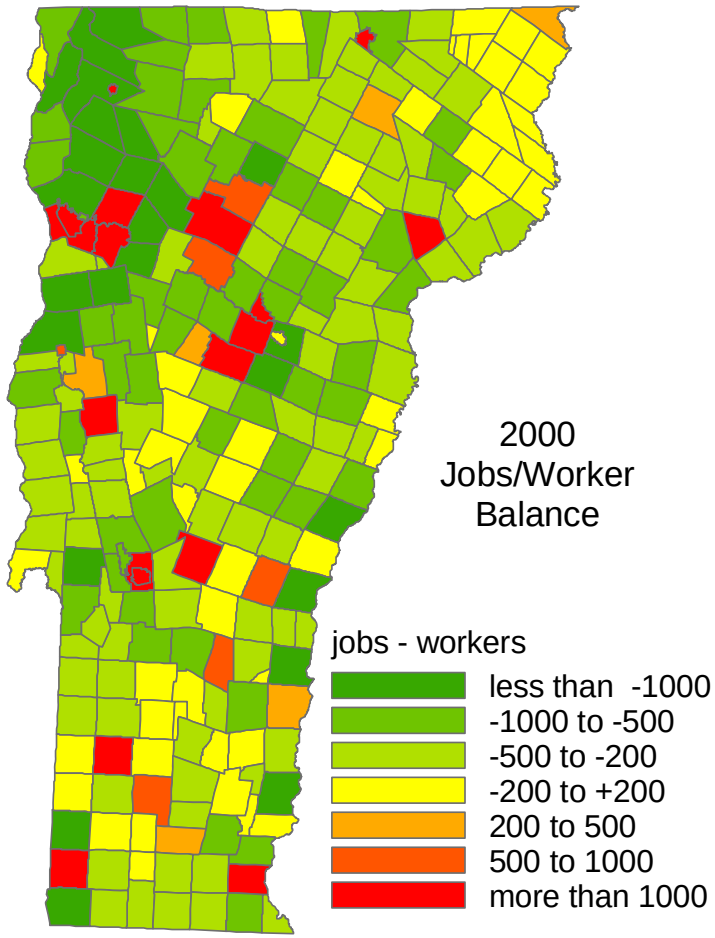
- Only town-wide statistics available for rural areas, but can be combined with more local measures to get a 3'ds surrogate.

Table 1. Points for diverse uses within 1/4-mile walk distance, by time of occupancy

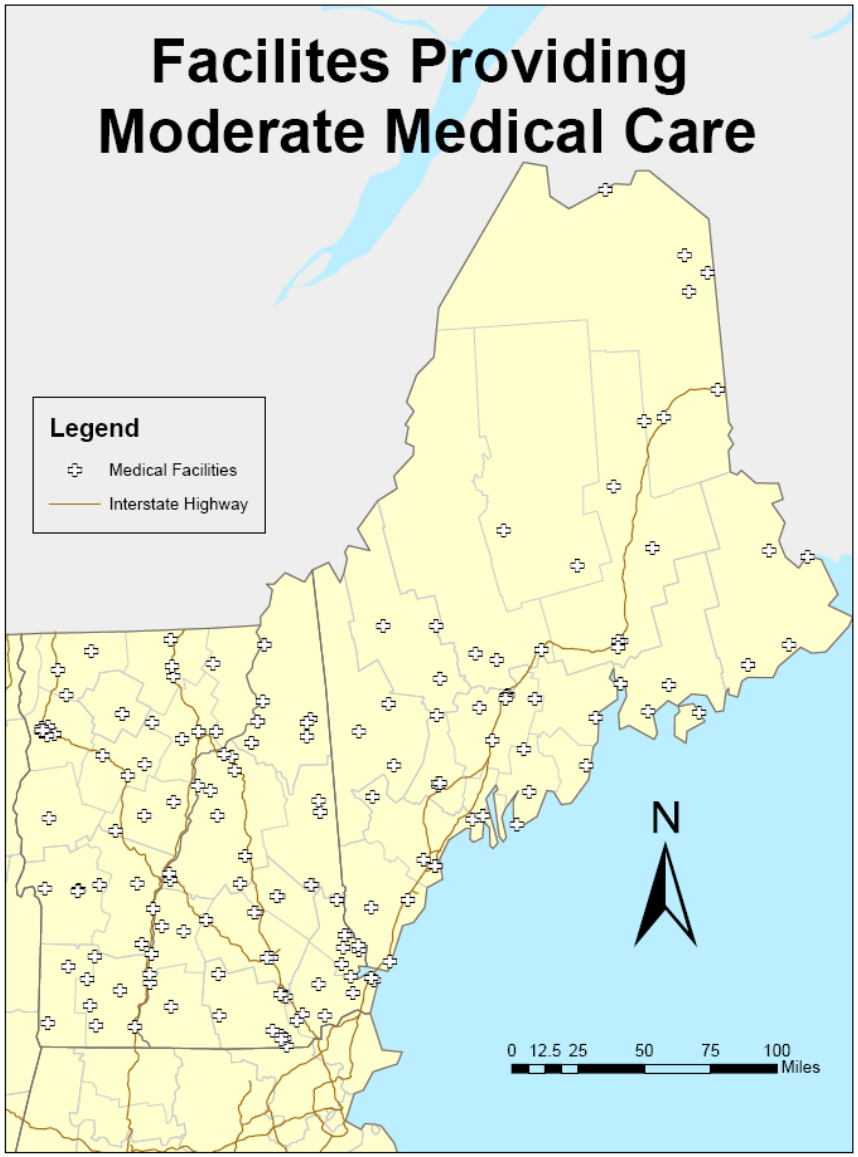
Diverse uses	Percentage occupancy of total square footage	Points
4–6	20%	1
7–10	30%	2
11–18	40%	3
≥ 19	50%	4

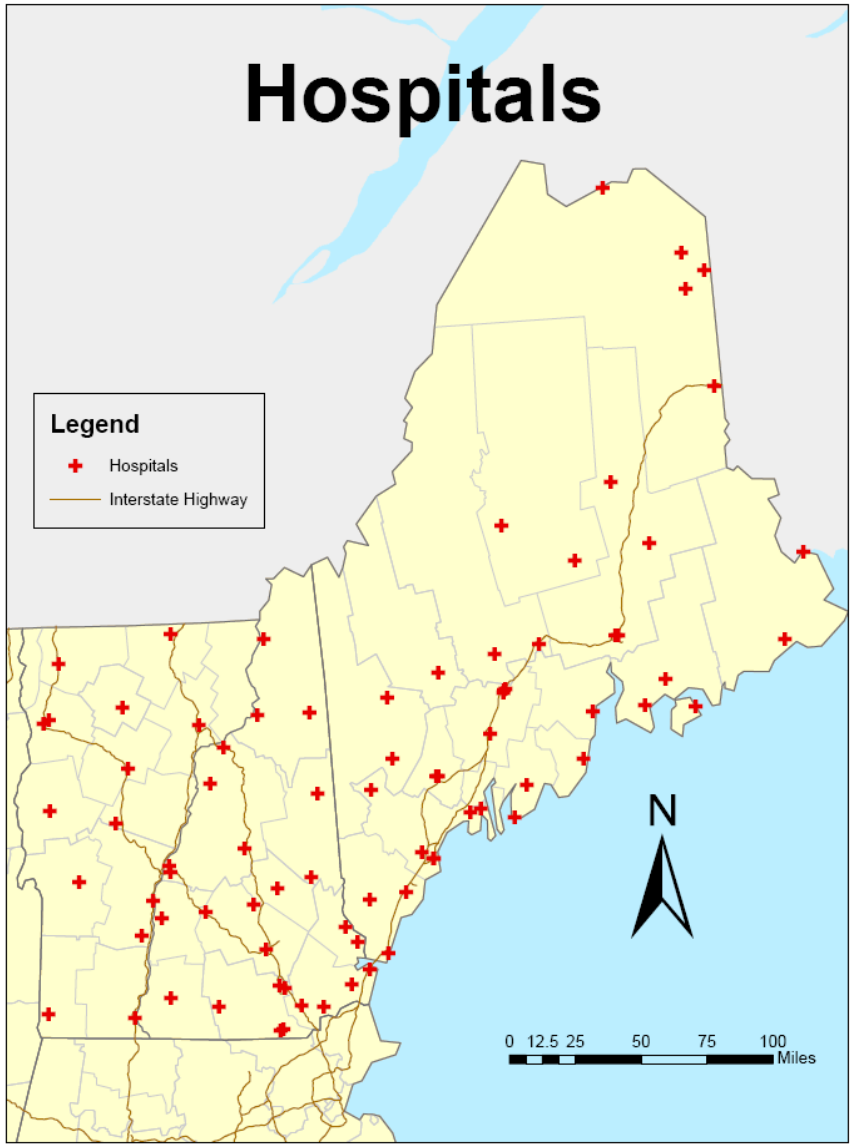
Jobs/Housing Balance in Vermont

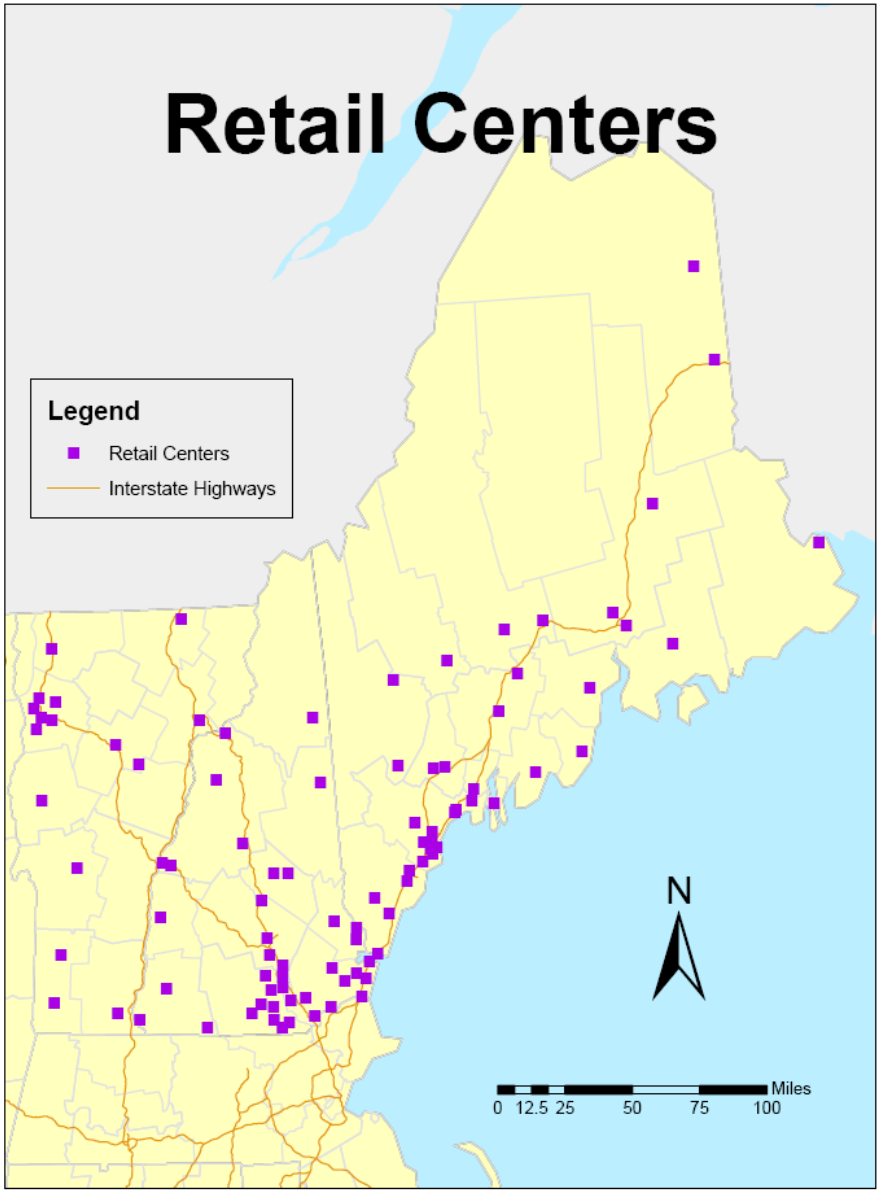


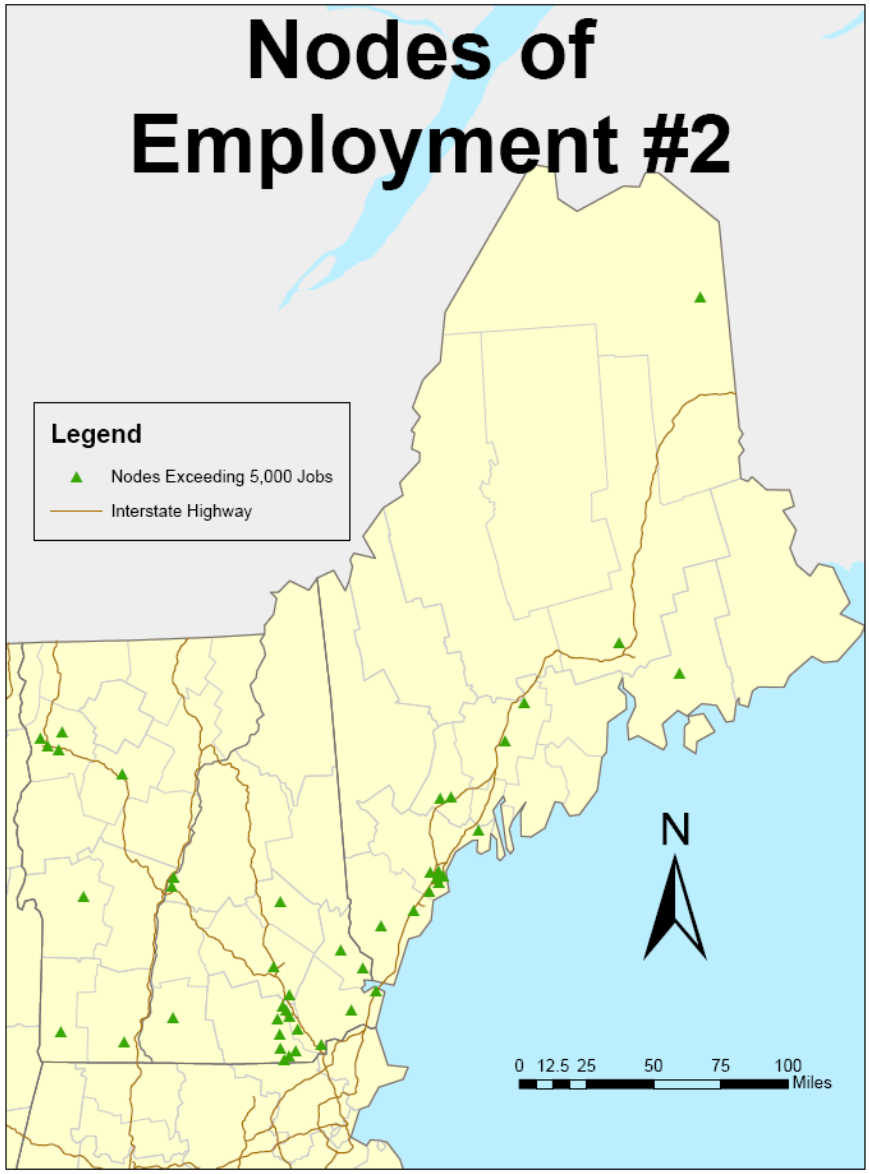


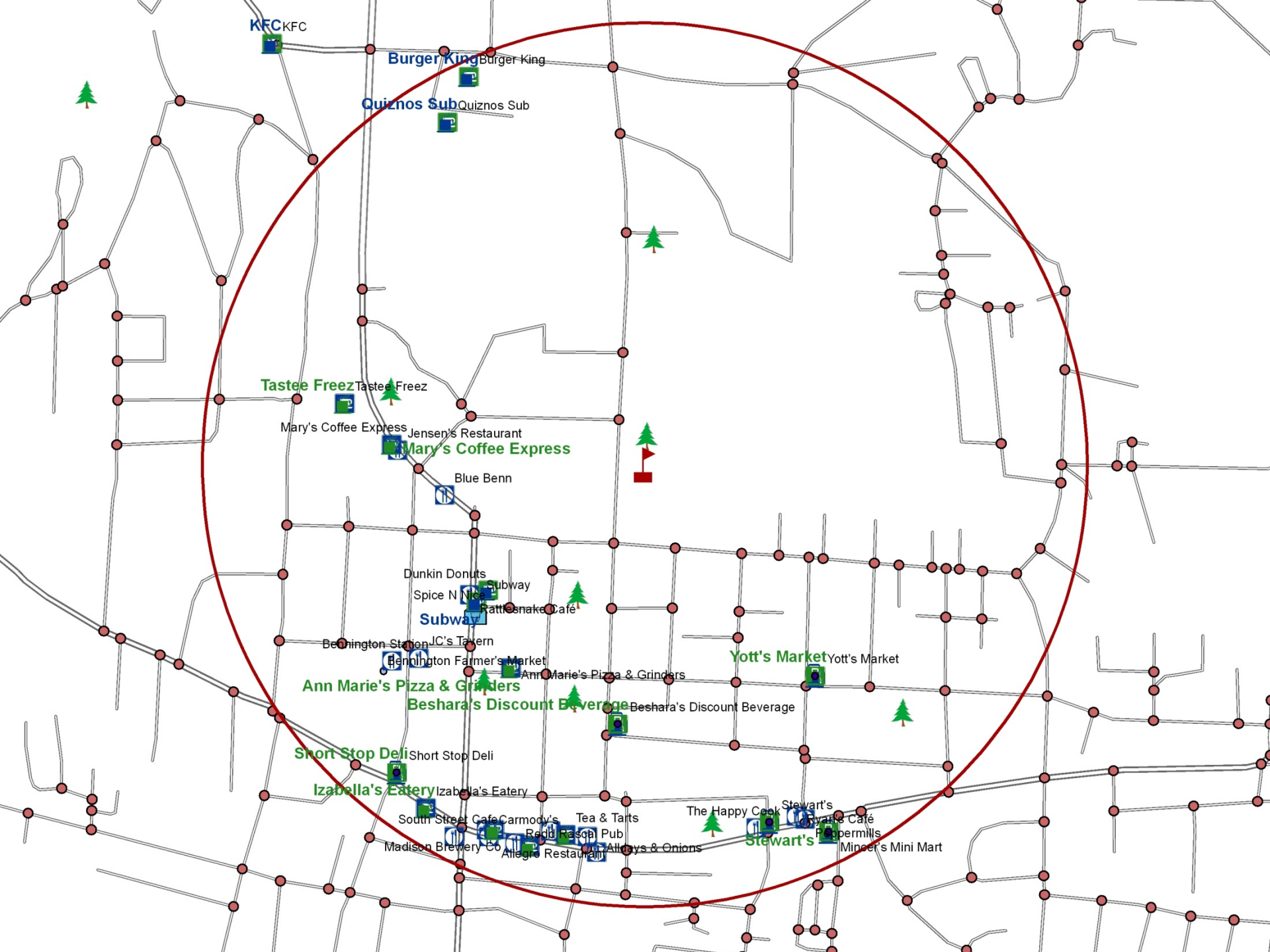
Destinations



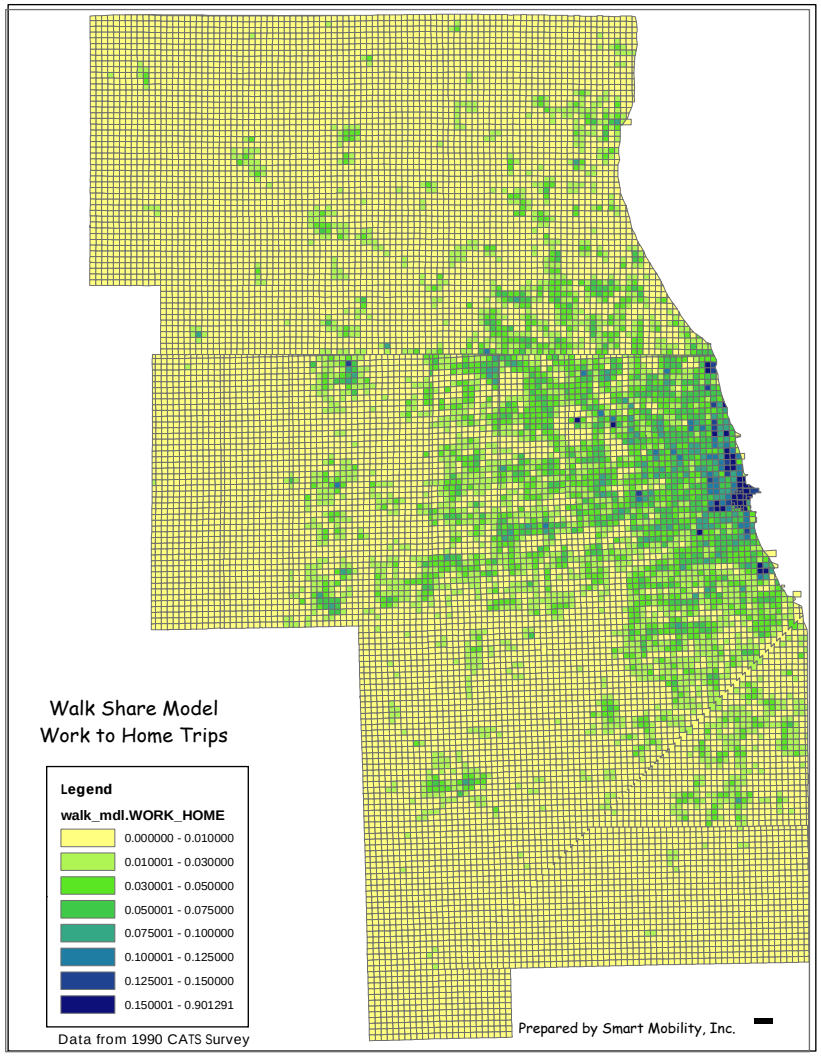


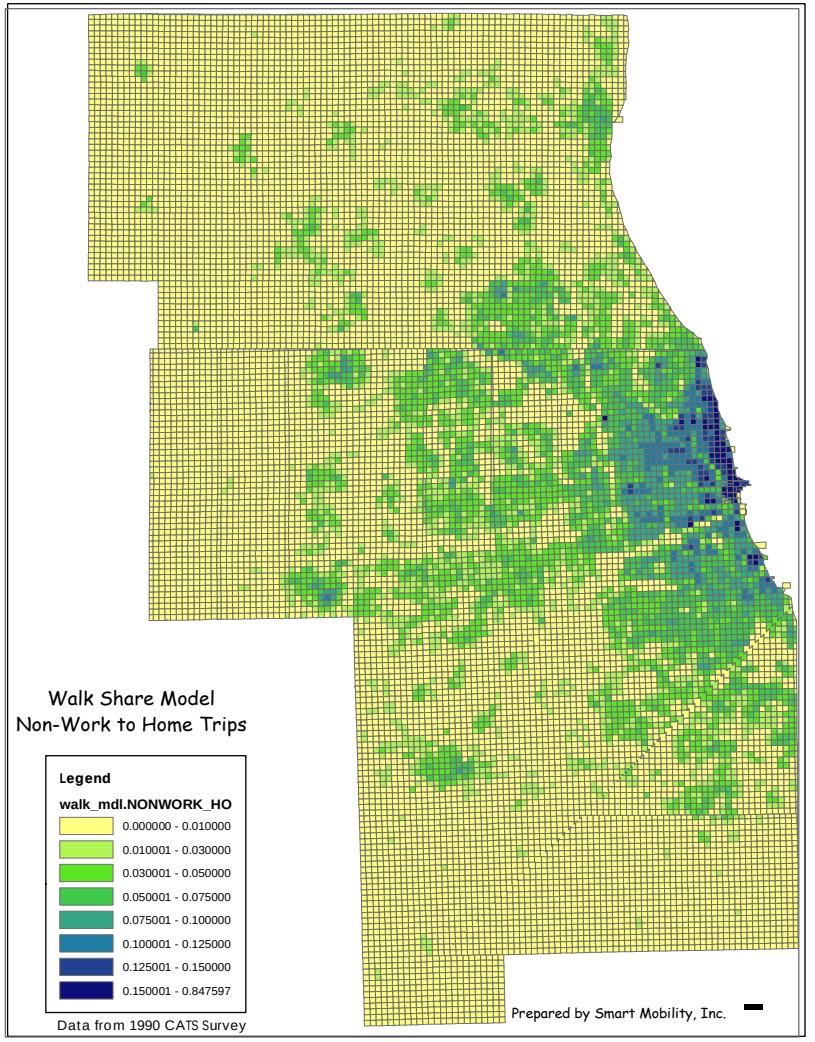

Retail Centers
Legend
Retail Centers
Interstate Highways
N
0 12.5 25 50 75 100
Miles


Nodes of Employment #2
Legend
Nodes Exceeding 5,000 Jobs
Interstate Highway
N
0 12.5 25 50 75 100
Miles


KFC
KFC
Burger King
Burger King
Quiznos Sub
Quiznos Sub
Tastee Freez
Tastee Freez
Mary's Coffee Express
Jensen's Restaurant
Mary's Coffee Express
Blue Benn
Dunkin Donuts
Subway
Spice N Nice
Rattlesnake Café
Subway
Bennington Station
JC's Tavern
Bennington Farmer's Market
Ann Marie's Pizza & Grinders
Ann Marie's Pizza & Grinders
Yott's Market
Yott's Market
Beshara's Discount Beverage
Beshara's Discount Beverage
Short Stop Deli
Short Stop Deli
Izabella's Eatery
Izabella's Eatery
South Street Cafe
Carmody's
Tea & Tarts
Redd Rascal Pub
Madison Brewery Co
Allegro Restaurant
Allidays & Onions
The Happy Cook
Stewart's
Stewart's
Ryan's Café
Peppermills
Mincer's Mini Mart

Walk Model Based on 3 D's (Density, Diversity, Design)





Conclusions

- Land Use and the Built Environment affects transportation in rural and urban areas alike.
- Most methods to model, measure and predict were developed for urban settings.
- Different scales and heterogeneity of rural areas requires some adaptation of these methods, but the basic principles still apply.

How can we use these methods?

- Research, modeling and analysis of different land use patterns and travel behavior.
- Transit planning: identifying most accessible locations.
- Land Use Policy: identify locations with greatest walkability.

Thank You!

Questions?