Measuring the Effect of Smart Growth Policies in Maryland Using LEHD and Other Data

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Abstract

- Discover how longitudinal employer-household dynamics data can be combined with other generally available data sources to measure smart growth policy successes:
  - Journey to Work
  - Access to Amenities and Services

LEHD Data: Key Points

- LEHD data locates areas where people live in close proximity to their workplaces
- Census block-based geography allows the examination of small, specific areas
  - But it works better in urban areas with smaller blocks
- Industry types are aggregated together to protect the confidentiality of surveyed firms
  - Makes it harder to break out specific services
- Data on workplace/residence and services together create a base layer for smart growth study

LEHD Data Analysis Using O-D Data

- To measure distance, Census block centroid to centroid air distance was calculated.
  - In future, air distance will be changed to road network distance
    - Though road networks don't exactly measure walkability, they are a good proxy
- Block data also includes:
  - Total number of workers by origin-destination
  - A breakdown of three categories of age, industry, and occupation.

Basic Smart Growth Factors

Neighborhood Walkability:

- Can people walk?
  - Proximity to work and walkable infrastructure (easier to measure)
- Do people walk?
  - Measuring behavior requires survey data (harder/more expensive)

Commuting:

- Can people work close to home?
  - Proximity of jobs to people (jobs-housing balance)
- Do they work close to home?
  - Need data on commuting patterns
- Can they walk or take transit? Do they?
  - "Can" is related to proximity, while "do" is behavior.

Amenities:

- Do people live near services and amenities?

EXAMINING THE WALK SCORE® METHODOLOGY

What is a Walk Score®?

- The Walk Score® methodology was designed to test the walkability of individual addresses on the micro level.
- It relies on relatively precise geocoding of both residences and services/amenities.
- Data of this precision is usually only available for a price from commercial vendors of through confidential establishment-level data from the QCEW data series, both of which have restricted availability.

The Walk Score® Method

- The Walk Score® uses nine categories of amenities (grocery stores, restaurants, shopping, coffee shops, banks, parks, schools, bookstores, and entertainment), weighted by type.
  - Some amenities (bookstores, for example) are counted once no matter how many are within walking distance
  - Others (such as restaurants) get weights depending on their location and proximity.
  - The weight of an amenity "decays" the further away from a starting point it is, and at 1.5 miles its weight becomes zero.

- The Walk Score® algorithm also measures intersection density and average block length, and looks for short blocks and a large number of intersections per square mile.
  - Best density: More than 200 intersections per sq. mi. and blocks shorter than 120 meters
  - Lesser values receive penalties.

Walk Score® Issues

- Walk Score® uses the location of coffee shops and bookstores to measure walkability
- Coffee shops (NAICS 722213-5)
  - Not included in confidential QCEW establishment-level, as no 7-digit NAICS codes are included
  - An analysis of establishment-level firm names shows only 246 coffee shops out of the 679 establishments in NAICS 722213
  - The concept of "coffee shop" is more colloquial than data-driven
- Bookstores (NAICS 451211)
  - There were only 211 bookstores in Maryland in the study year
  - Being required to be located within ½ mile or so of these locations was considered too limiting
  - Raises questions about the intergenerational and class-based biases that this may bring to the analysis
- Both bookstores and coffee shops were dropped from the analysis
  - Are included in their larger NAICS codes

Walk Score® Rankings

Walk Score®	Description
90–100	Walker's Paradise — Daily errands do not require a car.
70–89	Very Walkable — Most errands can be accomplished on foot.
50–69	Somewhat Walkable — Some amenities within walking distance.
25–49	Car-Dependent — A few amenities within walking distance.
0–24	Car-Dependent — Almost all errands require a car.

- http://www.walkscore.com/

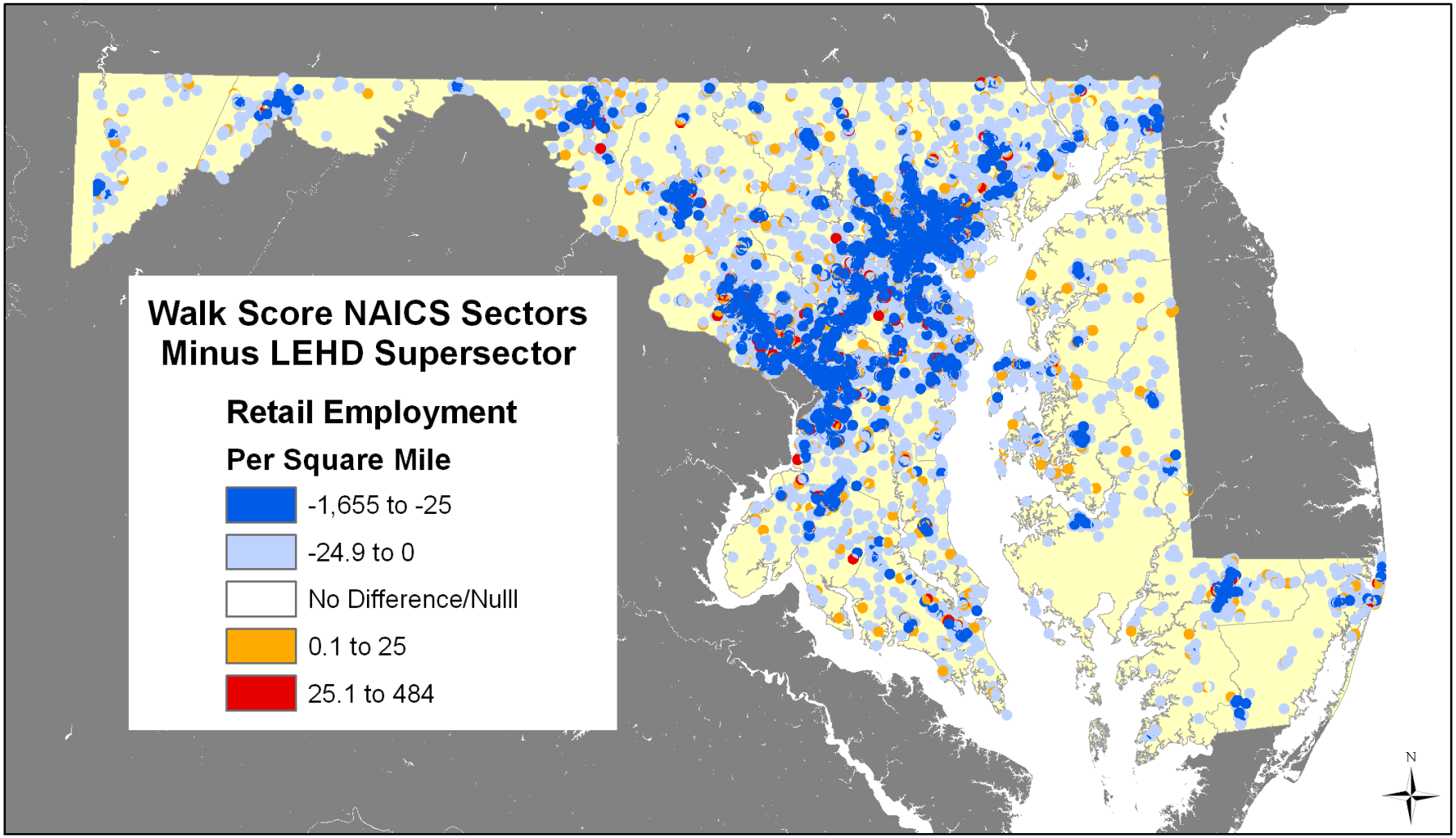
Divergence from Walk Score®

- The Walk Score® method is designed primarily to test the walkability of individual addresses on the micro level
- This analysis is better suited for looking at large areas on the macro level
- LEHD data lacks some of the data specificity available in the Walk Score® methodology.
  - However, this does not seem to make a major difference on the macro level

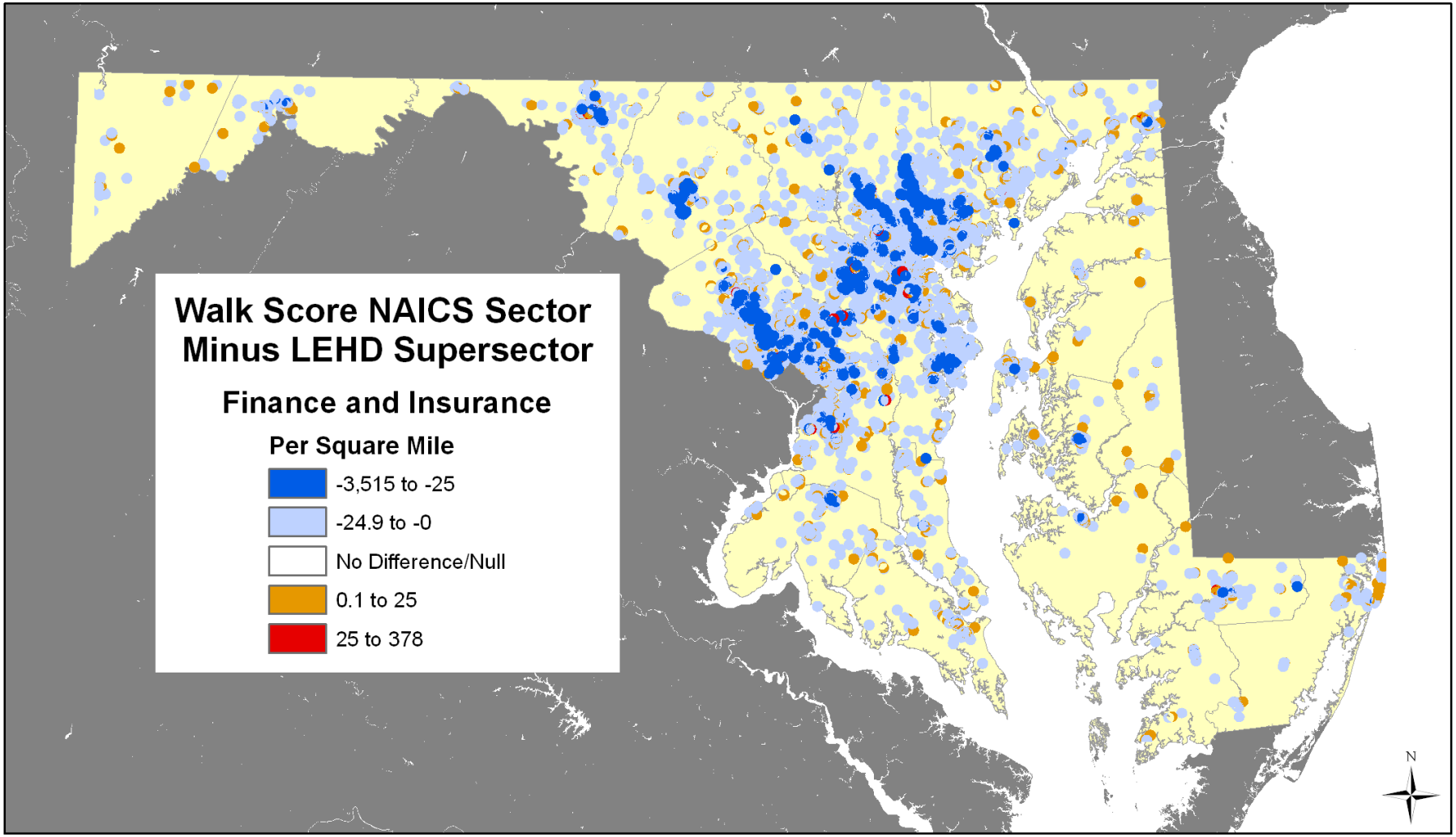
Testing LEHD Data: LEHD Supersector vs. QCEW Employment

- Walk Score® Employment is replicated using confidential establishment-level QCEW data, compared to LEHD
  - Accuracy of employment placement
  - Amount of employment covered by each data source
- Retail Employment – 46.6%
  - Walk Score® only measures groceries (NAICS 44511), "shopping" (NAICS 448 and 453), and bookstores (NAICS 451211)
- Finance and Insurance – 26.5%
  - Walk Score® only measures local bank branch location (NAICS 52211, 52212, and 52213)
- Education – 64.5%
  - Walk Score® only measures K-12 (NAICS 6111)
- Arts and Entertainment – 100%
- Accommodation and Food Services – 88.7%
  - Walk Score® measures restaurants only (including coffee shops (NAICS 722213-5))

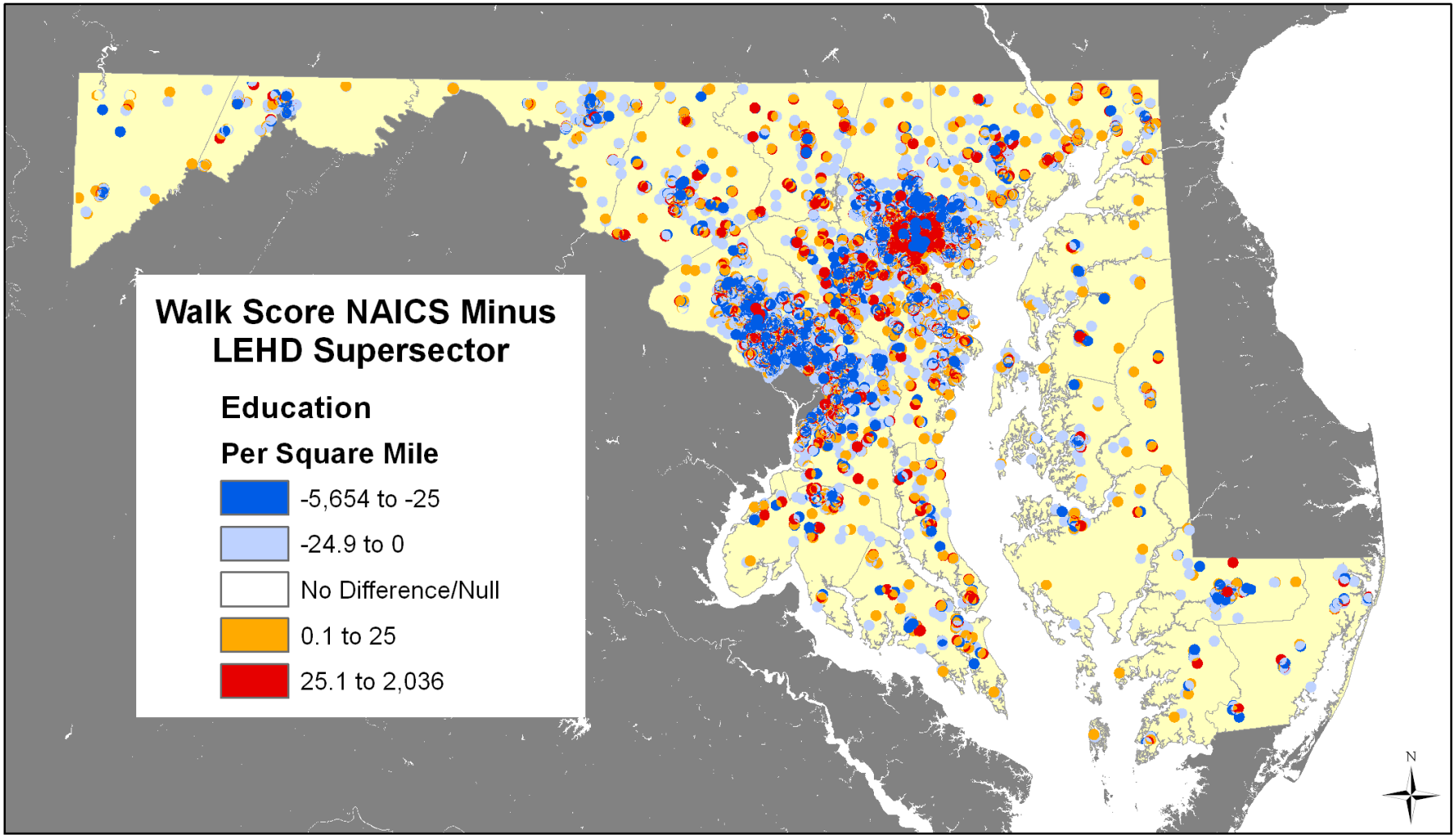
Difference between QCEW and LEHD Retail Employment, First Quarter 2007



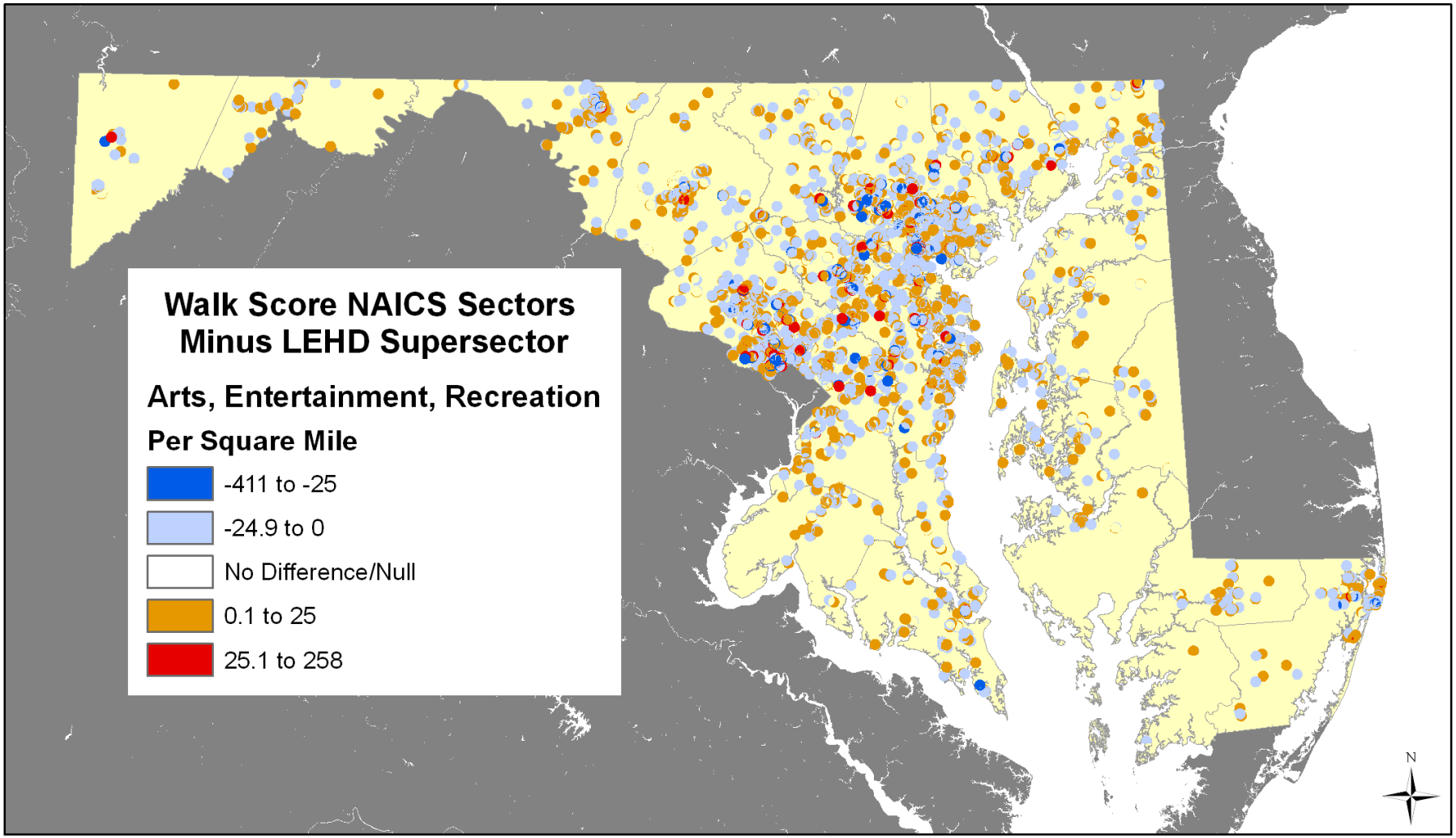
Difference between QCEW and LEHD Finance and Insurance Employment, First Quarter 2007



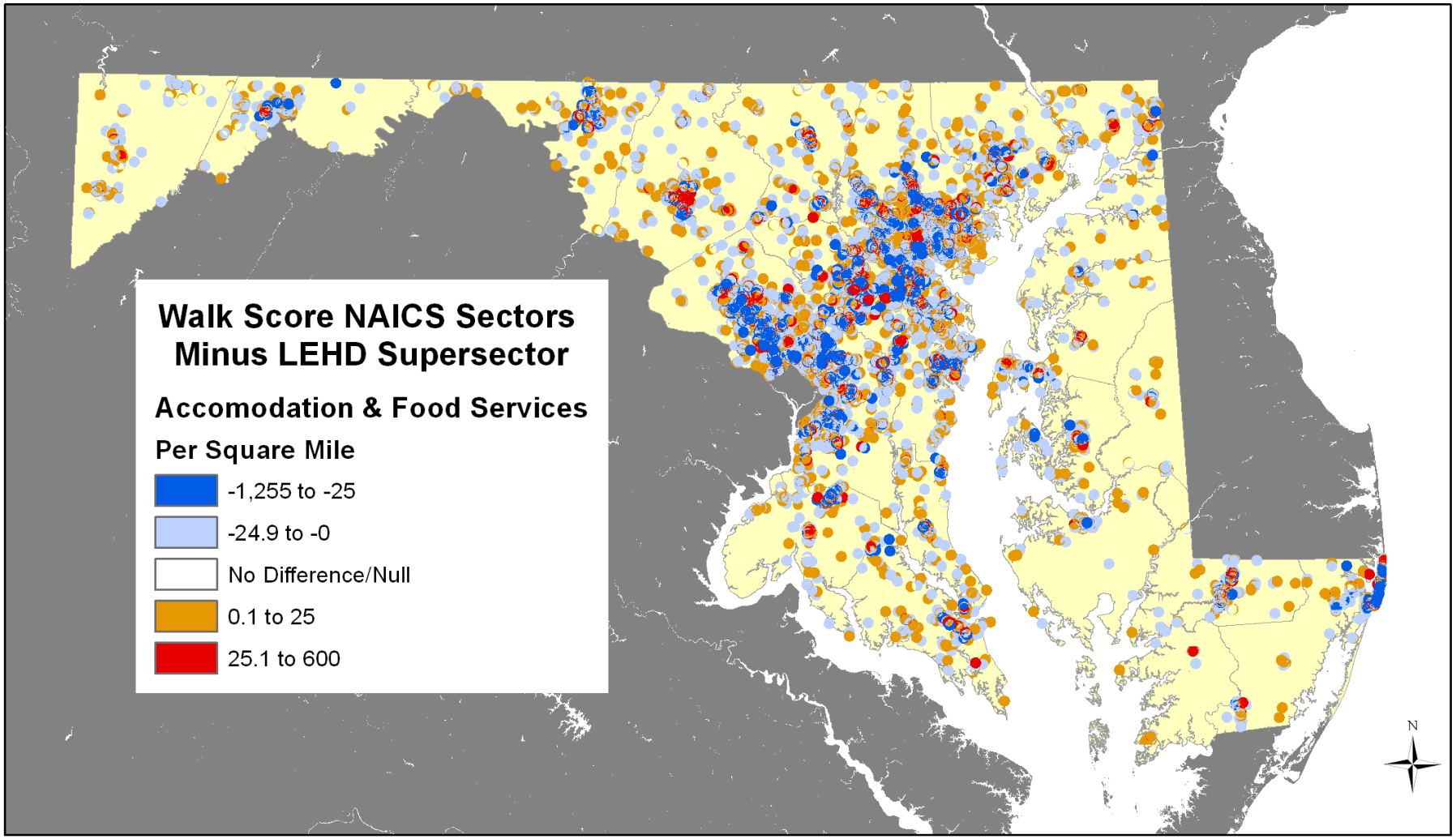
Difference between QCEW and LEHD Education Employment, First Quarter 2007



Difference between QCEW and LEHD Arts, Entertainment, and Recreation Employment, First Quarter 2007



Difference between QCEW and LEHD Accommodation and Food Services Employment, First Quarter 2007



ANALYZING WALKABILITY WITH LEHD DATA

Creating a Smart Growth "Base Layer"

Walkability:
- Measured through intersection density and road type
- Answers question "can people walk," not "do people walk"

Housing Unit Density
- Measures how close people live to one another

Access to employment
- Measured using LEHD employment data by block
- Number of workers residing in block vs. number of jobs in block

Commute length
- Measured using block-block LEHD origin-destination data

Access to transit
- Measured using LEHD and transit route data by block

Access to services
- Measured using LEHD employment data by block

Mapping "Walkable Nodes"

- Street node junctions for Maryland were extracted from MD SHA road network
- Most node junctions connecting only to highways were dropped
  - Not considered walkable
  - Highway = SHA classification 1
  - Ramps were also excluded
- Junctions connecting only to the same road were also dropped
  - Mostly tracked curb cuts or sharp corners
- No "ground truthing" of walkability yet
  - No consistent data on sidewalk quality

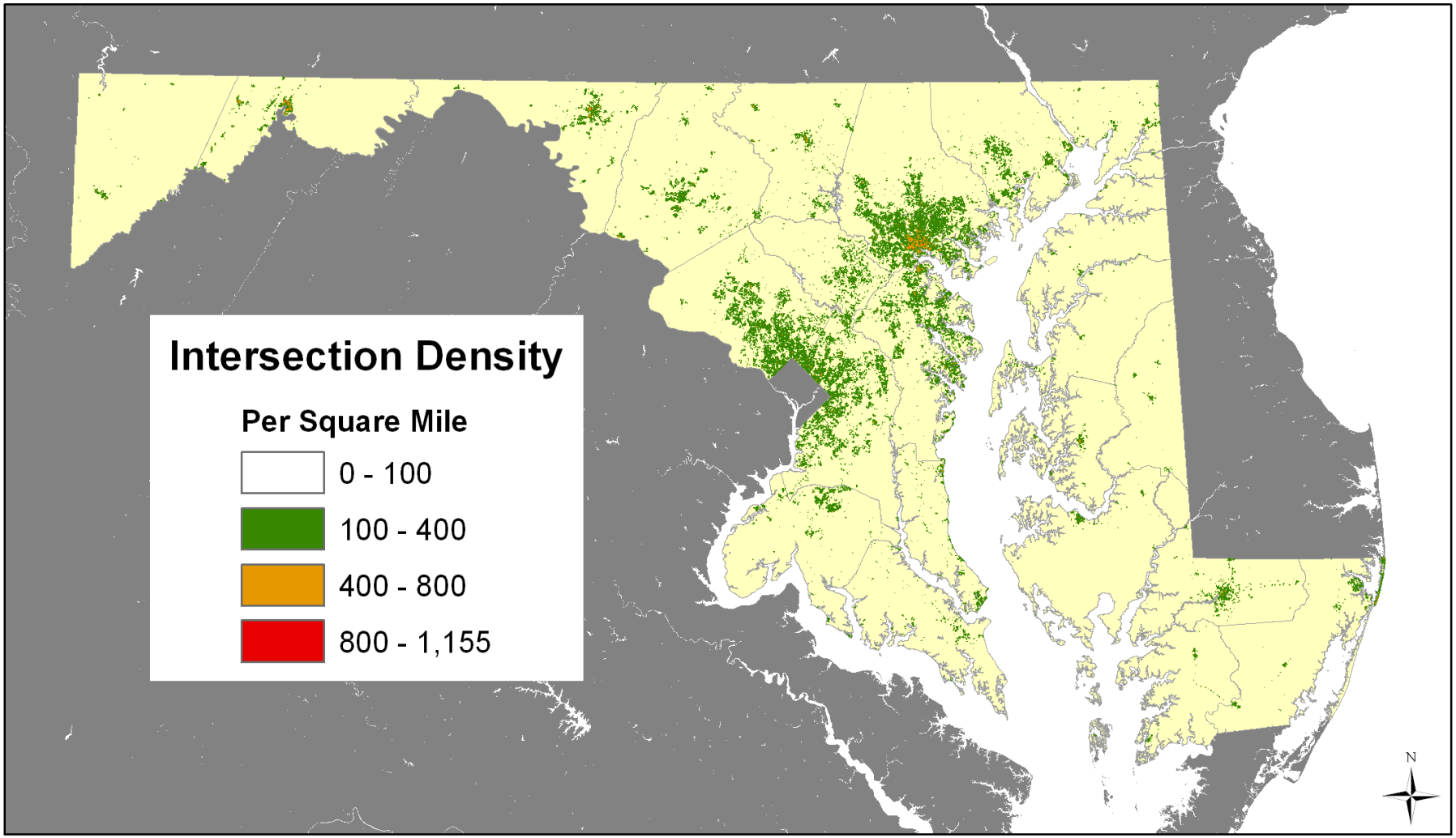
Included and Excluded SHA Junctions

Highway and inline junction nodes were excluded from the analysis.
All other junction nodes are included.

(1) Defining "Walkability"

- Walkable nodes were mapped in ArcGIS 10
- A point density raster layer was created in Spatial Analyst
  - Output cell size 25, circular neighborhood, radius of 200 meters (656 feet), scale in sq. mi.
- Walkable areas: Densities of 100 or more "walkable nodes" per square mile
  - 100 to 400: Somewhat walkable
  - 400 to 800: Walkable
  - 800 to 1,608: Very walkable
  - These categories are still under consideration

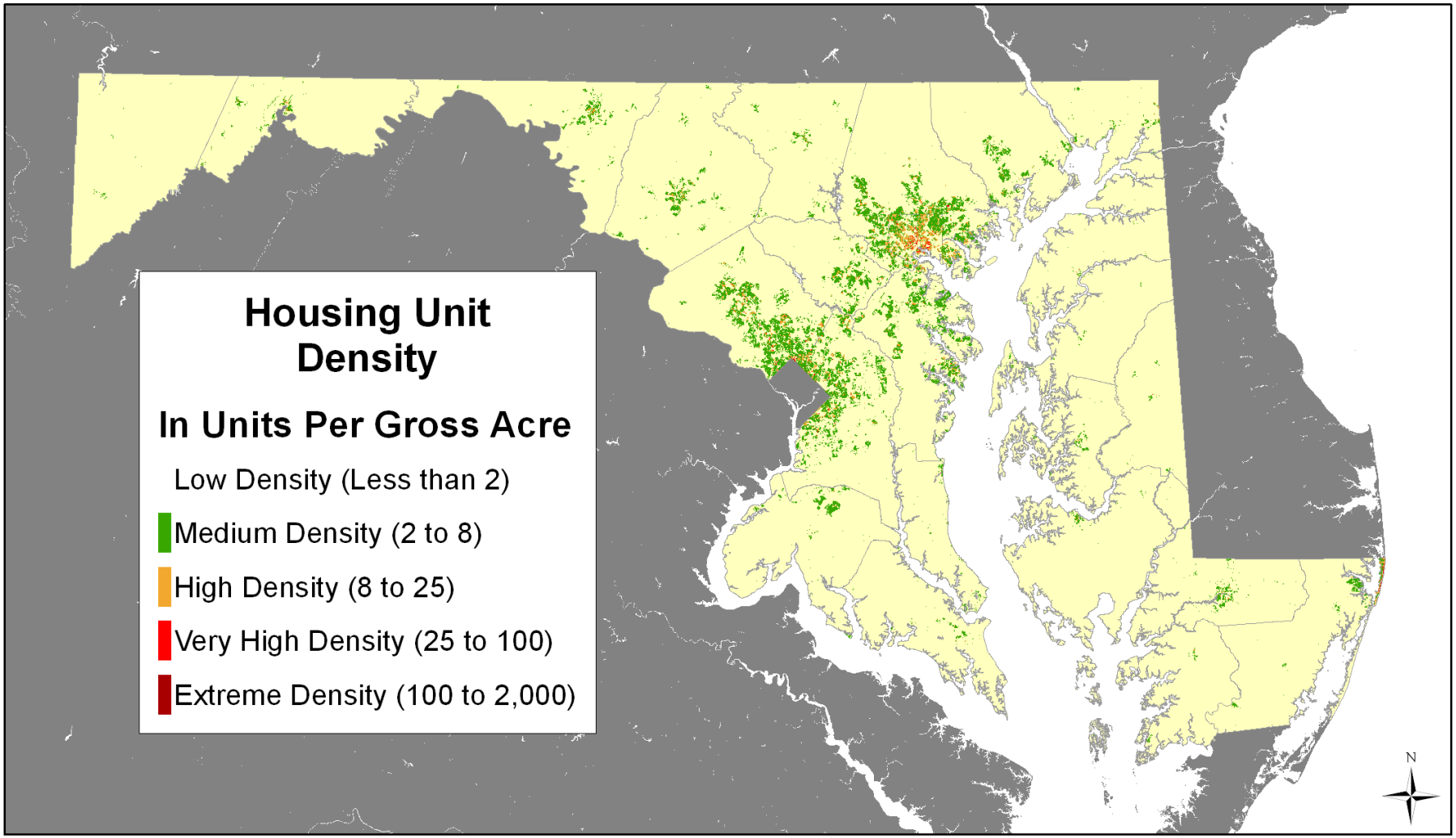
(1) Walkable Areas in Maryland by Intersection Density



(2) Housing Unit Density

- Housing unit density is another important factor in measuring smart growth
- Census block level data from Census2010 was used to measure density
  - Density was measured per acre
  - Census block area was divided by the count of housing units per block

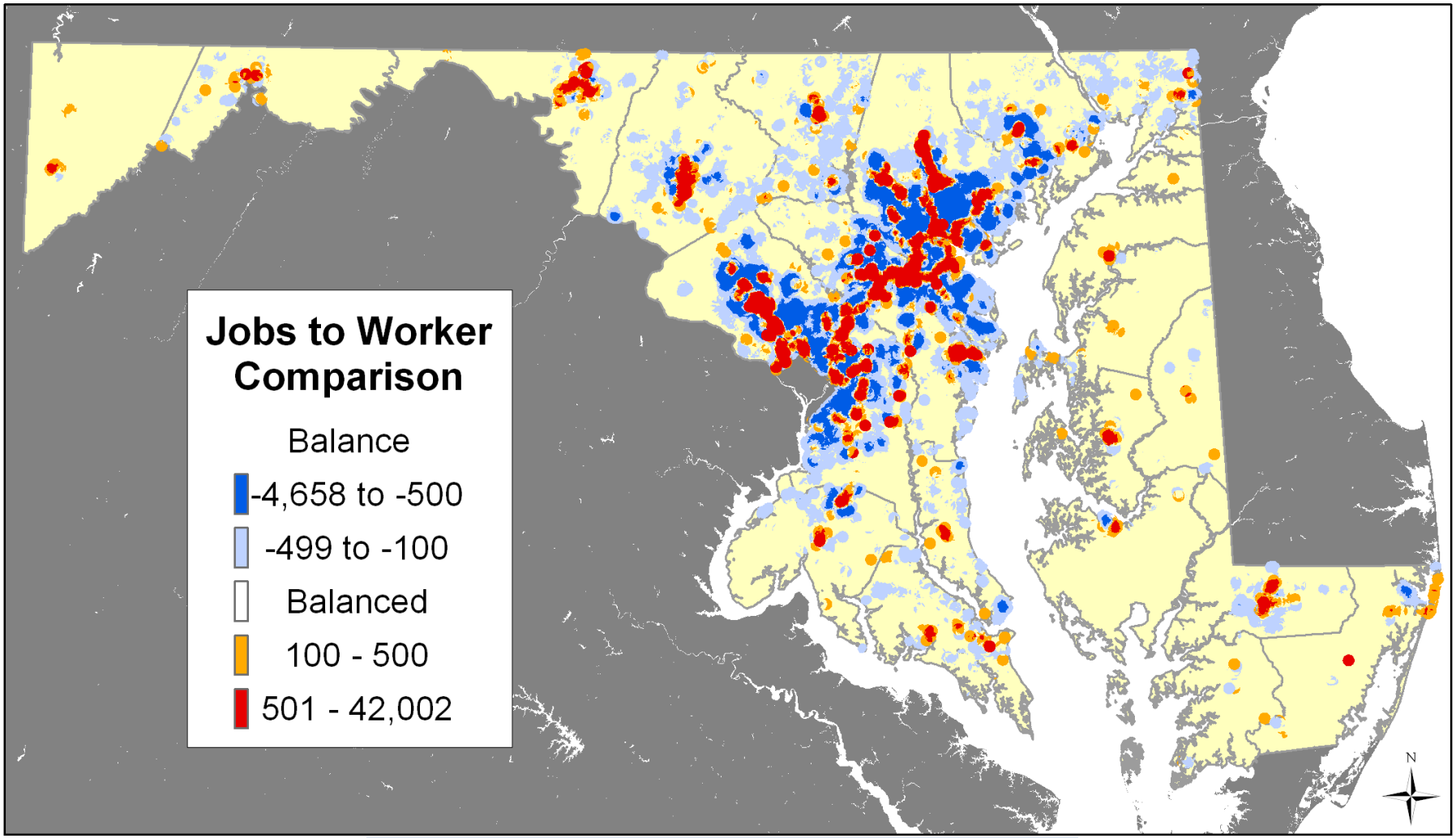
2. Housing Unit Density by Census Block in Maryland, 2010



(3) Jobs/Worker Balance

- LEHD data tracks the number of jobs by Census block for NAICS supersectors
- LEHD also tracks the number of resident workers in each block
- Block centroids were extracted and both job and resident worker totals were mapped as a point density layer
  - LEHD "all jobs" data was used
- The difference between job and worker location was calculated from each map

3. Job/Worker Balance in Maryland, 2007

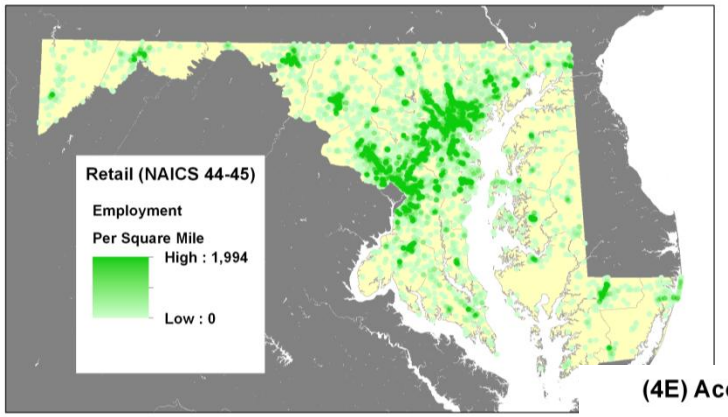


Note: Does not include federal employees.

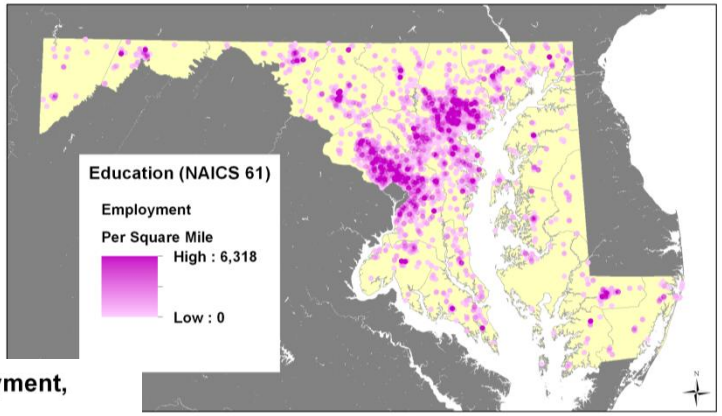
(4) Density of Services and Amenities

- LEHD data on the following NAICS supersectors was used as a proxy for access to services and amenities:
  - (4A) NAICS 44-45: Retail Trade
  - (4B) NAICS 52: Finance and Insurance (Banks)
  - (4C) NAICS 61: Educational services (Schools)
  - (4D) NAICS 71: Arts, Entertainment, and Recreation
  - (4E) NAICS 72: Accommodation and Food Services (Restaurants)

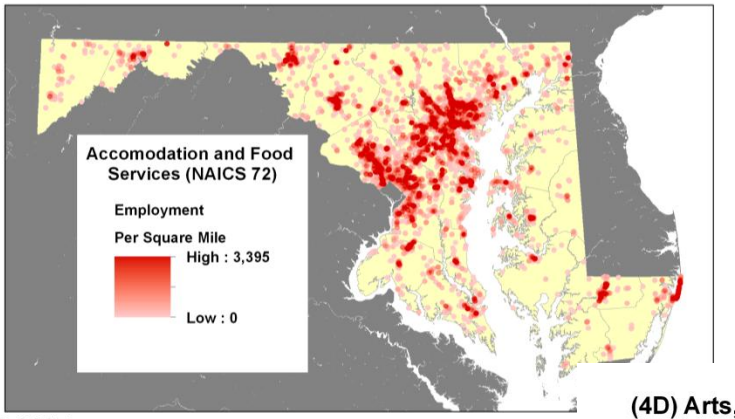
(4A) Retail Employment by Place of Work, LEHD 2007



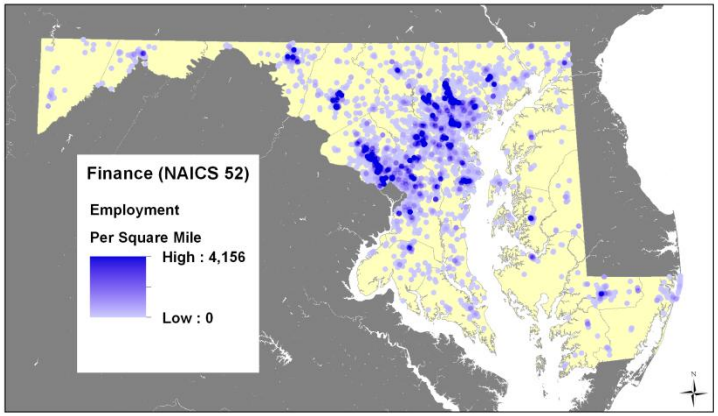
(4C) Education Employment, LEHD 2007



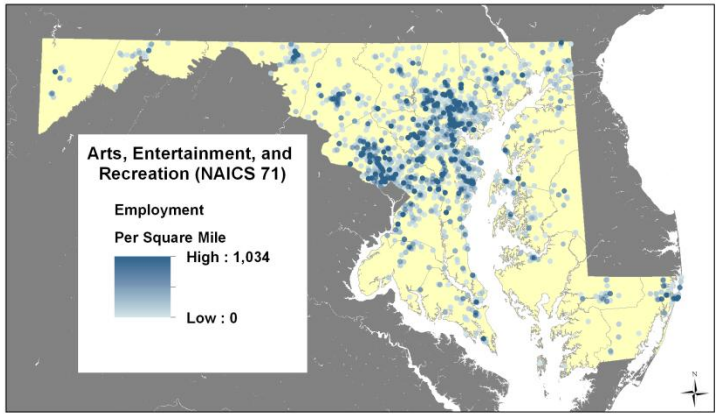
(4E) Accomodation and Food Services Employment, LEHD 2007



(4B) Finance and Insurance Employment, LEHD 2007



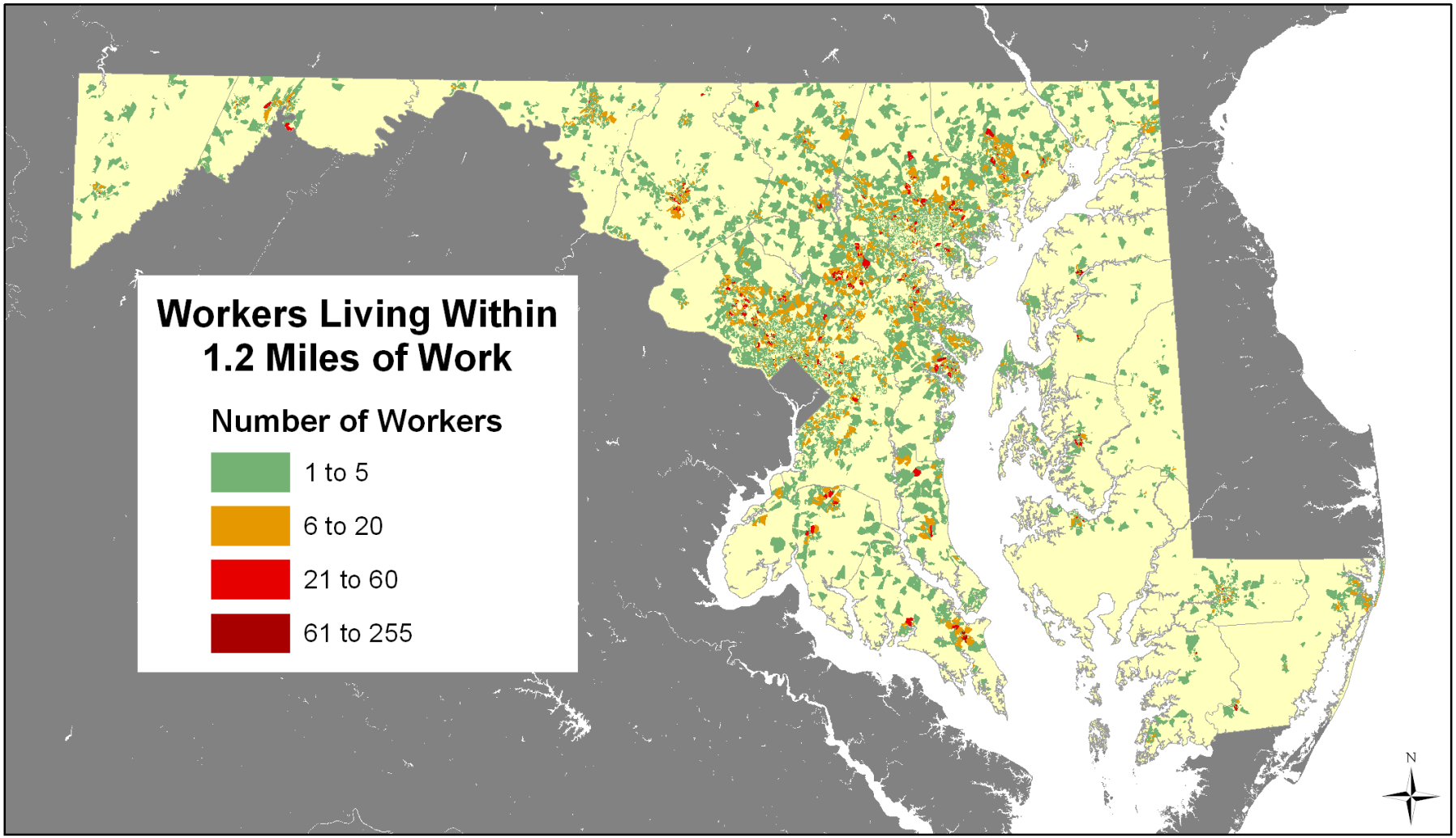
(4D) Arts, Entertainment, and Recreation Employment, LEHD 2007



(5A) Workers with Walkable Commutes

- LEHD data does *not* have information on commuting mode
- "Walkable" is defined as the *ability* to walk to work based on commute distance
- Distances are measured by block centroid-centroid distance
  - Centroid-centroid commute distance is in "air miles"
  - Workers whose air mile commute was one mile or less were considered to live within walking distance
- For reporting purposes, air distances were adjusted by a 1.2 multiplier to account for the local road network
  - Actual walking distance is a maximum of 1.2 miles
- LEHD Data compares well with other sources
  - According to 2005-09 ACS Data, 70,410 (+/-2,206) Maryland commuters walked to work, and an additional 7,524 (+/-770) rode a bicycle
  - LEHD shows that 76,339 workers lived within 1.2 miles of work
  - Though this is an apples-to-oranges comparison, it is interesting

(5A) Number of Workers With Commutes of 1.2 Miles or Less by 2000 Census Block, LEHD 2007

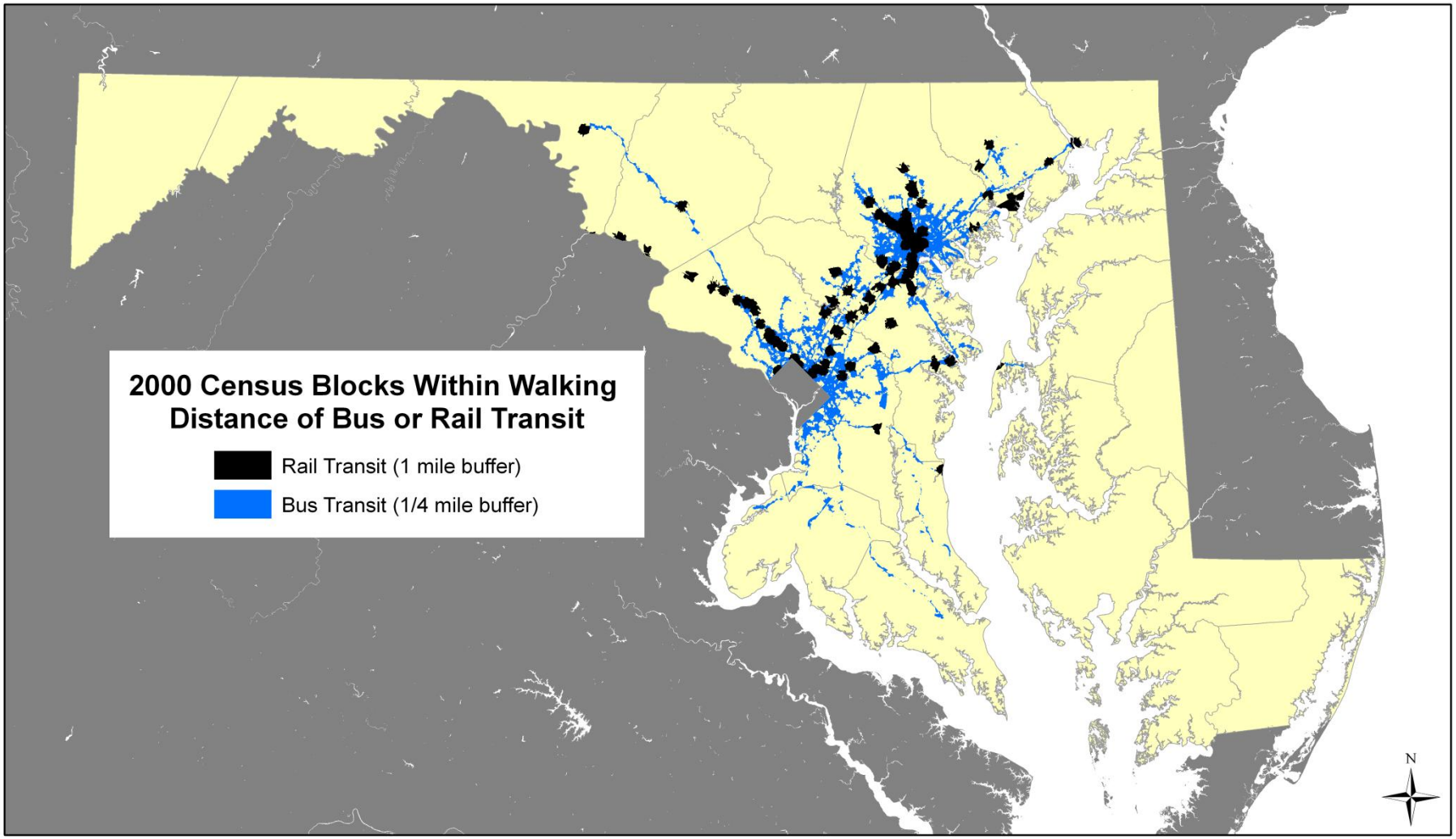


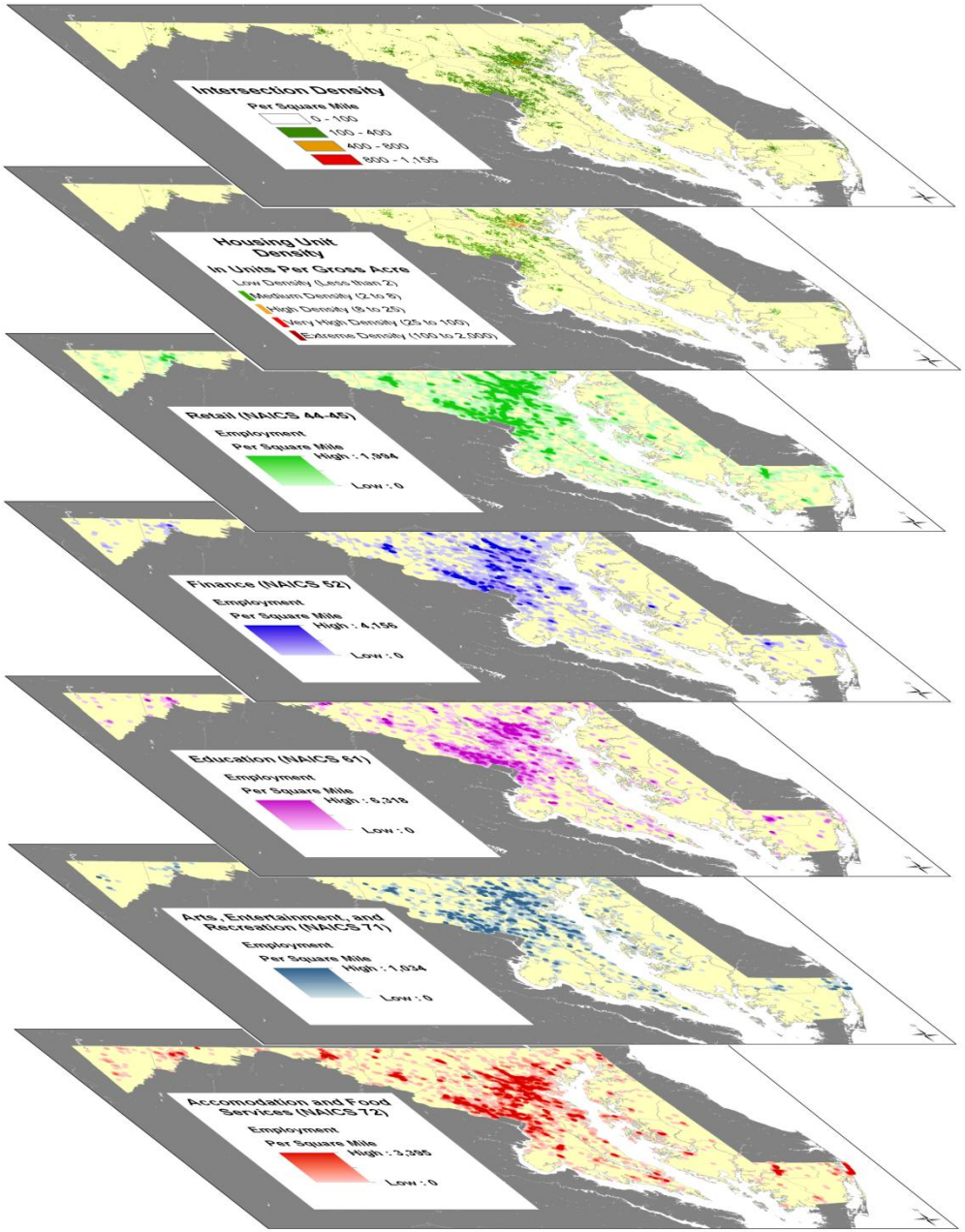
Note: Does not include federal employees.

(5B) Workers with Transit-Friendly Commutes

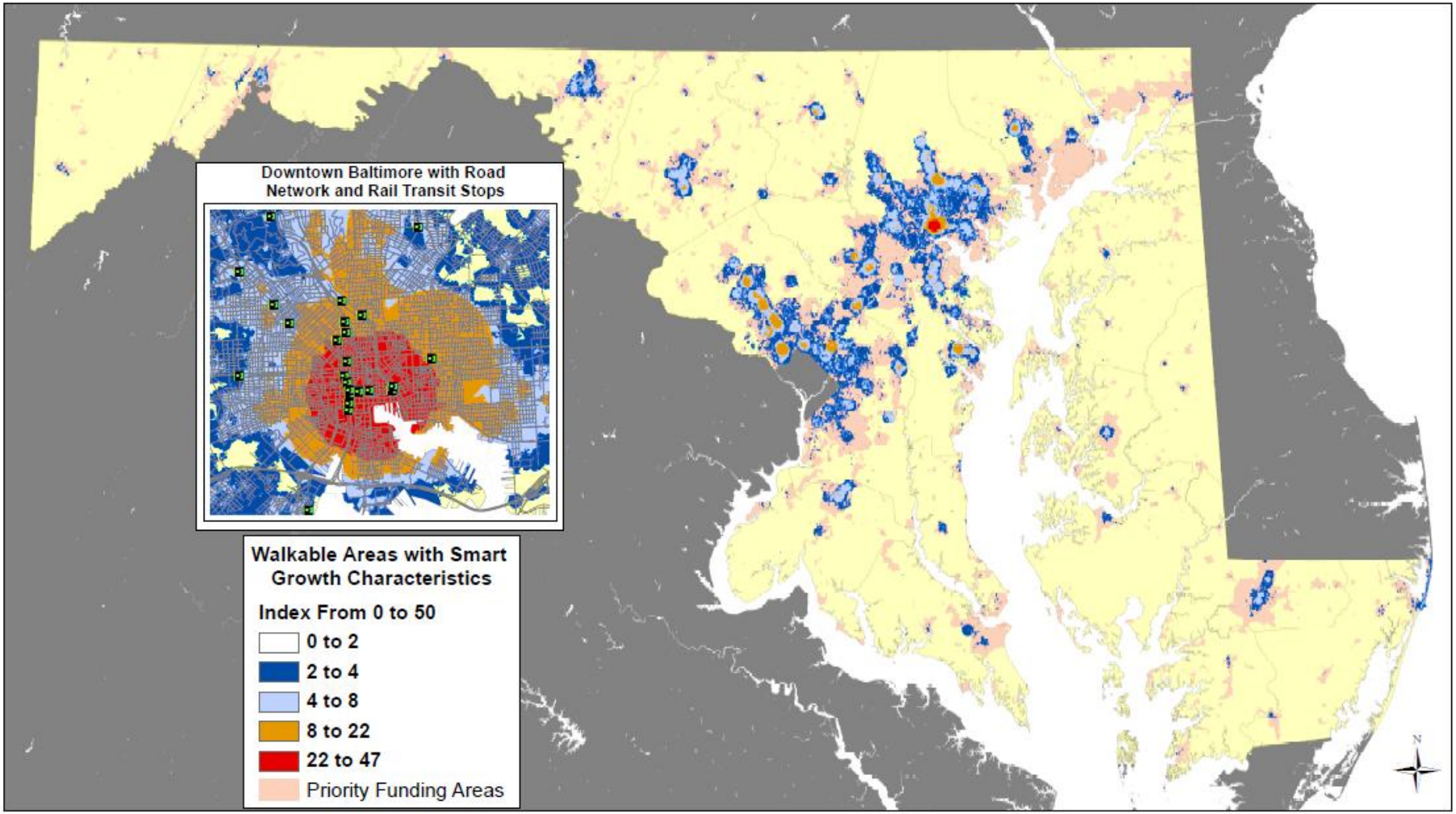
- Like walkable commutes, we have no information on actual commute mode, only access to transit
- Workers whose start and end point are both within one mile of a rail transit stop were tallied
  - Stops were buffered, and commutes to-from block centroids falling within the buffer were counted
- Station locations are available for:
  - Maryland Transit Authority
    - Light Rail
    - Metro (Subway)
    - MARC (Commuter Rail)
  - WMATA
    - Metro (Subway)
- Bus route data is problematic
  - Bus routes were surrounded by a ¼ mile buffer
  - Routes are lines, not station stops
  - Commuter bus station locations were also not available
    - Unlike local buses, commuter buses have few station stops, so location matters

(5B) Areas Accessible to Transit by 2000 Census Block




Intersection Density
Per Square Mile
0 - 100
100 - 400
400 - 800
800 - 1,155
Housing Unit Density
In Units Per Gross Acre
Low Density (Less than 2)
Medium Density (2 to 8)
High Density (8 to 25)
Very High Density (25 to 150)
Extreme Density (150 to 2,000)
Retail (NAICS 44-45)
Employment
Per Square Mile
High : 1,994
Low : 0
Finance (NAICS 52)
Employment
Per Square Mile
High : 4,156
Low : 0
Education (NAICS 61)
Employment
Per Square Mile
High : 5,318
Low : 0
Arts, Entertainment, and Recreation (NAICS 71)
Employment
Per Square Mile
High : 1,034
Low : 0
Accomodation and Food Services (NAICS 72)
Employment
Per Square Mile
High : 3,395
Low : 0

Areas Exhibiting Smart Growth Characteristics in Maryland, 2007 (Draft)



Next Steps: LEHD Data Improvement

- LEHD data is under constant improvement and will add new features the coming two years. Most importantly for Maryland:
  - Federal civilian employment will be added (excluding civilians who work for DoD and the Post Office)
    - 5.7% of all QCEW jobs in MD in 2009 were Federal
    - 9.6% of all MD residents had federal jobs in 2007-09
  - Data for Washington, D.C. will be added
    - 10.4% of all MD workers commuted to Washington, DC in 2007-09
  - In 2012, base geography is scheduled switch from Census 2000 to Census 2010
    - This change should take place for all years of data
  - In 2013, geocoding improvements are scheduled be applied to data for previous years
    - Currently, block level changes may be due to geocoding changes
    - Block data should become truly longitudinal back to 2002 for most states

Next Steps: Improved Analysis

- Fine-tuning LEHD employment data
  - Should there be upper or lower limits to the employment values included in the analysis? What should those limits be?
  - How best to add information on employment mix?
- Sensitivity Testing:
  - How sensitive is the analysis to different assumptions about walkability and density?
- Comparisons across time
  - Road network changes
  - New housing unit construction
- Sidewalk quality data
  - Does it exist?

Next Steps: Improved Analysis

- Data overlays
  - What other data can be added to the analysis?
- Neighborhoods vs. Hot Spots
  - Current analysis is based on a neighborhood analysis.
  - "Hot spots" look for statistically-significant areas of concentration
  - Which would be better?
- Cost Surfaces
  - Would the added complexity of computing a cost surface improve the analysis?

Questions?

- Contact Information:

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