
APPENDIX F

EXISTING ACTIVITY AND SUITABILITY ANALYSIS

**BIRMINGHAM METROPOLITAN PLANNING
ORGANIZATION (MPO)**

**Existing Activity and Development
Suitability Analysis**

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For further information, please contact
Darrell Howard
Regional Planning Commission of Greater Birmingham,
Birmingham, Alabama
Email: dhoward@rpcgb.org

This document was prepared as a cooperative effort of the U. S. Department of Transportation, Federal Highway Administration – Alabama Division, the Federal Transit Administration, the Alabama Department of Transportation, and local governments in partial fulfillment of requirements of Title 23 USC 134 and 135, amended in MAP-21 Sections 1201 and 1202, July 2012. The contents of this report do not necessarily reflect the official views or policies of the U. S. Department of Transportation.

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Charles Ball, Executive Director
Scott Tillman, Director of Planning and Operations
Darrell Howard, Deputy Director of Planning
Lindsay Gray, Deputy Director of Operations
Michael Kaczorowski, Principal Planner
Harry He, Transportation Engineer
Cissy Edwards, Public Information Officer

TABLE OF CONTENTS

1.0 INTRODUCTION	1
1.1 PURPOSE	1
1.2 MODEL DIAGRAM	1
2.0 CAPACITY	3
2.1 LAND AVAILABILITY	3
2.2 COMMITTED ACRES	4
2.3 AVAILABLE ACRES	4
2.4 PLACE TYPES, SMARTCODE, AND TRANSECT ZONES	7
2.5 NET DENSITY AND TRANSECT ASSIGNMENT	10
2.6 JOBS/HOUSING BALANCE	14
2.7 CAPACITY CALCULATION	18
3.0 SUITABILITY	23
3.1 HISTORICAL GROWTH PATTERS	25
3.2 PROXIMITY: MAJOR EMPLOYMENT CENTERS	26
3.3 PROXIMITY: MAJOR ROADS	26
3.4 PROXIMITY: HIGH SALES AREAS	26
4.0 MODEL ALLOCATIONS	31
4.1 RESIDENTIAL	31
4.1.2 PROJECTIONS AND CONTROL TOTALS	31
4.1.3 2040	32
4.2 EMPLOYMENT ALLOCATION	36
4.2.1 2040	36
5.0 CONCLUSIONS	41
5.1 AVAILABILTY AND CAPACITY	41
5.2 ALLOCATIONS	41
5.3 VARIABLES	41
5.3.1 PLACE TYPE DENSITY AND COMPOSITION	41
5.3.2 PLACE TYPE ASSIGNMENT	41
5.3.3 SUITABILITY FACTORS	41
5.4 REFINEMENT OF MODEL AND SCENARIOS	42
5.4.1 MODEL LINKAGES	42
6.0 COMMUNITYVIZ MODEL DOCUMENTATION	43
6.1 WHAT ARE SCENARIOS, ASSUMPTIONS, INDICATORS AND ATTRIBUTES?	43

LIST OF FIGURES

FIGURE 1. MODEL DIAGRAM	2
FIGURE 2. COMMITTED/UNDEVELOPABLE ACREAGE	5
FIGURE 3. AVAILABLE ACREAGE	6
FIGURE 4. SMARTCODE TRANSECT ZONE DESCRIPTIONS	8
FIGURE 5. 792 CENSUS BLOCK GROUPS IN THE SIX COUNTY REGION	9
FIGURE 6. ACTIVITY UNIT DENSITY	12
FIGURE 7. GENERAL TRANSECT ASSIGNMENT	13
FIGURE 8. JOBS TO HOUSEHOLDS RATIO	14
FIGURE 9. TRANSECT TYPE: RESIDENTIAL, BALANCED, JOBS, JOBS-RICH	16
FIGURE 10. PLACE TYPE ASSIGNMENTS	17
FIGURE 11. DWELLING UNIT CAPACITY	20
FIGURE 12. NONRESIDENTIAL SQUARE FEET CAPACITY	21
FIGURE 13. SUITABILITY FACTORS AND WEIGHTING	23
FIGURE 14. AGGREGATE SUITABILITY RANKING BY CENSUS BLOCK GROUP	24
FIGURE 15. HISTORIC GROWTH PATTERNS OF GROWTH OR DECLINE FROM 1980-2000	25
FIGURE 16. MAJOR EMPLOYMENT CENTERS	27
FIGURE 17. MAJOR ROADS	28
FIGURE 18. HIGH ACTIVITY AREAS: ABOVE AVERAGE SALES	29
FIGURE 19. DWELLING UNIT ALLOCATION WITH COUNTY CONTROL TOTALS	33
FIGURE 20. 2040 DWELLING UNIT ALLOCATION, FULL REGION WITHOUT COUNTY CONTROL TOTALS	34
FIGURE 21. NEW 2040 RESIDENTIAL ALLOCATION USING COUNTY CONTROL TOTALS	35
FIGURE 22. NEW 2040 RESIDENTIAL ALLOCATION USING REGION-WIDE CONTROL TOTAL	35
FIGURE 23. 2040 EMPLOYMENT ALLOCATION, FULL REGION USING COUNTY CONTROL TOTALS..	37
FIGURE 24. 2040 EMPLOYMENT ALLOCATION, FULL REGION WITHOUT COUNTY CONTROL TOTALS	38
FIGURE 25. NEW 2040 EMPLOYMENT ALLOCATION USING COUNTY CONTROL TOTALS	39
FIGURE 26. NEW 2040 EMPLOYMENT ALLOCATION USING REGION-WIDE CONTROL TOTALS	39
FIGURE 27. ASSUMPTION	45
FIGURE 28. ASSUMPTION DESCRIPTIONS	46
FIGURE 29. INDICATOR	47
FIGURE 29. INDICATOR (CONTINUED)	48
FIGURE 29. INDICATOR (CONTINUED)	49
FIGURE 30. INDICATOR DESCRIPTIONS	50-55

LIST OF TABLES

TABLE 1. EXISTING LAND USE AND AVAILABILITY ASSUMPTION	4
TABLE 2. LAND USE SUMMARY OF ACRES COMMITTED AND AVAILABLE BY COUNTY	8
TABLE 3. TRANSECT ACTIVITY UNIT DENSITIES	11
TABLE 4. PLACE TYPES	15
TABLE 5. PLACE TYPES WITH RESIDENTIAL AND NON-RESIDENTIAL PERCENTAGES AND EFFICIENCY FACTOR	18
TABLE 6. BUILDOUT CAPACITY FOR DWELLING UNITS AND EMPLOYMENT BY COUNTY	18
TABLE 7. POPULATION, HOUSING, AND EMPLOYMENT PROJECTIONS FROM 2010 THROUGH 2040 WITH INCREMENT	30

1.0 INTRODUCTION

The Birmingham Metropolitan Planning Organization (MPO) is currently updating the required Regional Transportation Plan (RTP). The RTP identifies needed transportation network improvements and establishes a financial plan for funding priority projects. Project identification and prioritization in the RTP development process rely, in part, on an understanding of future development patterns and rates of change in regional population and employment. In conjunction with the current RTP development, the Regional Planning Commission of Greater Birmingham (RPCGB) has taken the opportunity to assess future development patterns in the six counties in the Greater Birmingham region. The analysis and results will help to shape the RTP recommendations, provide reliable data for specific planning projects in the region, and explore assumptions for future population and employment forecasting at the regional and county levels.

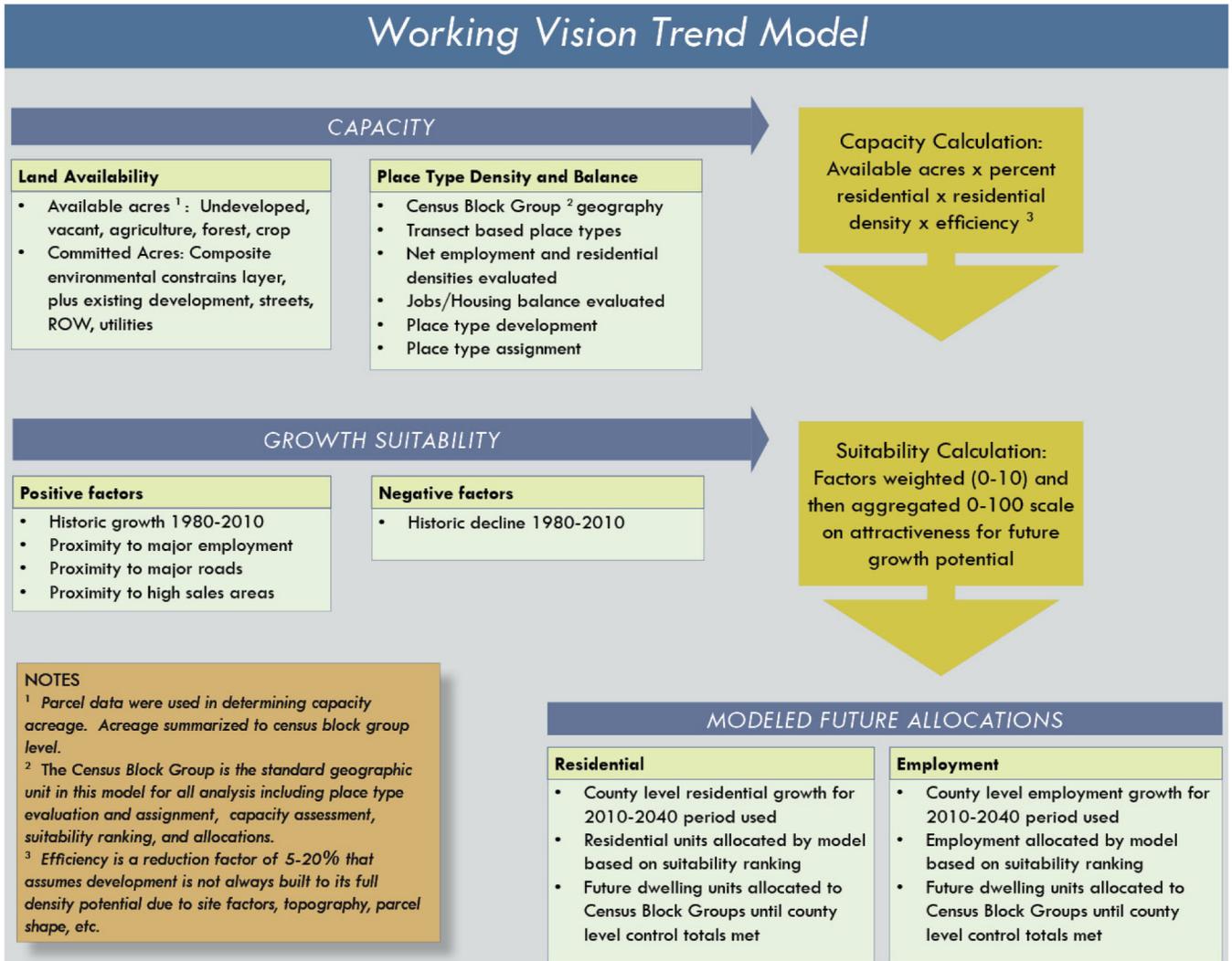
1.1 PURPOSE

The purpose of this report is to document the development of a land use and transportation performance measure evaluation model using CommunityViz software. Renaissance Planning Group (Renaissance) used RPCGB forecasts for population and employment at the county level to generate a model of potential development patterns for 2040 based on a continuation of past and recent trends. The process included data collection and an assessment of existing conditions. Parcel level data compiled and maintained by the RPCGB was used to conduct a place typology assignment and capacity analysis. Future development types and intensities were estimated at the US Census Block Group level based on place typology, land suitability and land capacity. The assumptions, process, findings and conclusions are included in this report.

1.2 MODEL DIAGRAM

The diagram below illustrates the basic building blocks of the working vision trend model. The major components of this diagram are Capacity, Suitability, and Allocations. Capacity can be understood as a combination of available land plus land use intensity. Suitability can be understood as an amalgamation of attractions or deterrents that would influence future growth patterns. Allocations of future dwelling units and jobs are assigned by the model based on probability of suitability, with allocations being assigned first to highest areas of suitability and available capacity.

Figure 1. Model Diagram



NOTES

¹ Parcel data were used in determining capacity acreage. Acreage summarized to census block group level.

² The Census Block Group is the standard geographic unit in this model for all analysis including place type evaluation and assignment, capacity assessment, suitability ranking, and allocations.

³ Efficiency is a reduction factor of 5-20% that assumes development is not always built to its full density potential due to site factors, topography, parcel shape, etc.

MODELED FUTURE ALLOCATIONS

Residential

- County level residential growth for 2010-2040 period used
- Residential units allocated by model based on suitability ranking
- Future dwelling units allocated to Census Block Groups until county level control totals met

Employment

- County level employment growth for 2010-2040 period used
- Employment allocated by model based on suitability ranking
- Future dwelling units allocated to Census Block Groups until county level control totals met

2.0 CAPACITY

Capacity is a measure of how much future growth can be either absorbed or accommodated. The development capacity, often understood as buildout, is a calculation of available land multiplied by a density factor derived from a place type classification. The factors and assumptions that went into both land available assessment and place type assignment are explained in greater detail in Table 1.

2.1 LAND AVAILABILITY

The process of assessing land available for development starts with a general classification of land into two groups: available or committed/undevelopable. Census Block Group data contains values for acres of land and acres of water, but not more detail than that. Parcel level existing land use data were available region-wide from GIS data provided by RPCGB, and are shown by their PAINTID in Table 1.

Table 1. Existing Land Use and Availability Assumption

PAINTID	Existing Land Use	Availability Assumption
1	Vacant	Available
100	Res SF Low	Committed/Undevelopable
104	Res SF Med	Committed/Undevelopable
109	Res SF High	Committed/Undevelopable
110	Com Retail / Services	Committed/Undevelopable
115	Com Office	Committed/Undevelopable
120	Mixed Use Com / Res	Committed/Undevelopable
130	Industrial	Committed/Undevelopable
138	Warehouse	Available
140	School	Committed/Undevelopable
145	Institutional	Committed/Undevelopable
150	Agriculture - Crops	Available
151	Agriculture - Pasture	Available
152	Open Space - Field	Available
153	Open Space - Forest	Available
154	Park	Committed/Undevelopable
155	Parking	Available
156	ROW - Street	Committed/Undevelopable
157	ROW - Utility	Committed/Undevelopable
200	Open Water	Committed/Undevelopable

An availability assumption was made for each land use type. For this broad, sketch-level regional model, the base assumption was that all existing development fell into the committed/undevelopable category when considering future development capacity. Understandably, this is a simplistic assumption and real world realities are far more complex. Scenario planning sometimes separates out residential from non-residential and makes residential committed, and all existing non-residential essentially available. Some practices call for adding a third availability assumption called redevelopable for properties that are presently developed but could be replaced or intensified in the future. These redevelopment assumptions can be further refined by evaluating such factors as investment level (building to land value ratio) or tax delinquency status. All the redevelopment assumptions are equally valid, but they introduce complexities into the modeling processes without immediate benefit. The base level of geography for this regional model was larger than traditional parcel or existing land use categories. The relative coarseness of the geography did not require, nor greatly benefit from, taking the extra steps to address redevelopment factors for existing development. If necessary, this extra refinement can be introduced later on. Thus, all existing development was not placed in the available category. Exceptions were made for parking and warehousing, which were considered fallow or low investment land uses and could be considered available for absorption of future development.

The GIS processes involved a dissolving of Existing Land Uses by Paint ID and Availability Assumption, then intersecting this with the Census Block Groups, summarizing the acreages for each land use type and then calculating the summaries over to the Block Groups.

2.2 COMMITTED ACRES

Committed or undevelopable acres are lands that are either presently developed or have some constraint or use that will prevent or severely limit future development potential. The existing/committed map in Figure 2 below shows a combination of existing development along with a composite environmental layer. The composite environmental layer is a merging of a number of features that would limit or prevent future development, namely:

- 100 year flood hazard zones
- Steep slopes
- Parks and Protected Conservation Areas
- Wetlands
- Water

An argument could be made that wetlands and steep slopes do not completely prevent development, as mitigation and greater investments can be made to realize development. However, the reverse argument could be made that these areas present enough market deterrence to profitable and substantial development that it is justifiable to exclude them from the availability equation.

The GIS processes for the composite environmental layer included conducting a series of unions to create one unified composite shapefile that could be intersected with the Census Block Group analysis layer and acreage associated for purposes of subtracting away from available land.

2.3 AVAILABLE ACRES

Lands that are uncommitted, unconstrained, unprotected, or undeveloped are generally considered available for future development. The map in Figure 3 depicts available lands, the majority of which are undeveloped open space and agriculture. Availability is not an indicator that growth will occur and should not be confused with attractiveness for future growth. Growth propensity or attractions are handled by the suitability component of the model.

In summary, all counties in the region have at least 72% to 89% land available for future development. The results of the committed lands and available lands by county are summarized in Table 2. Even more developed, urban Jefferson County has 72% availability while more rural counties like Blount and Chilton top the high end of the scale approaching 89% land availability.

Figure 2. Committed/Undevelopable Acreage

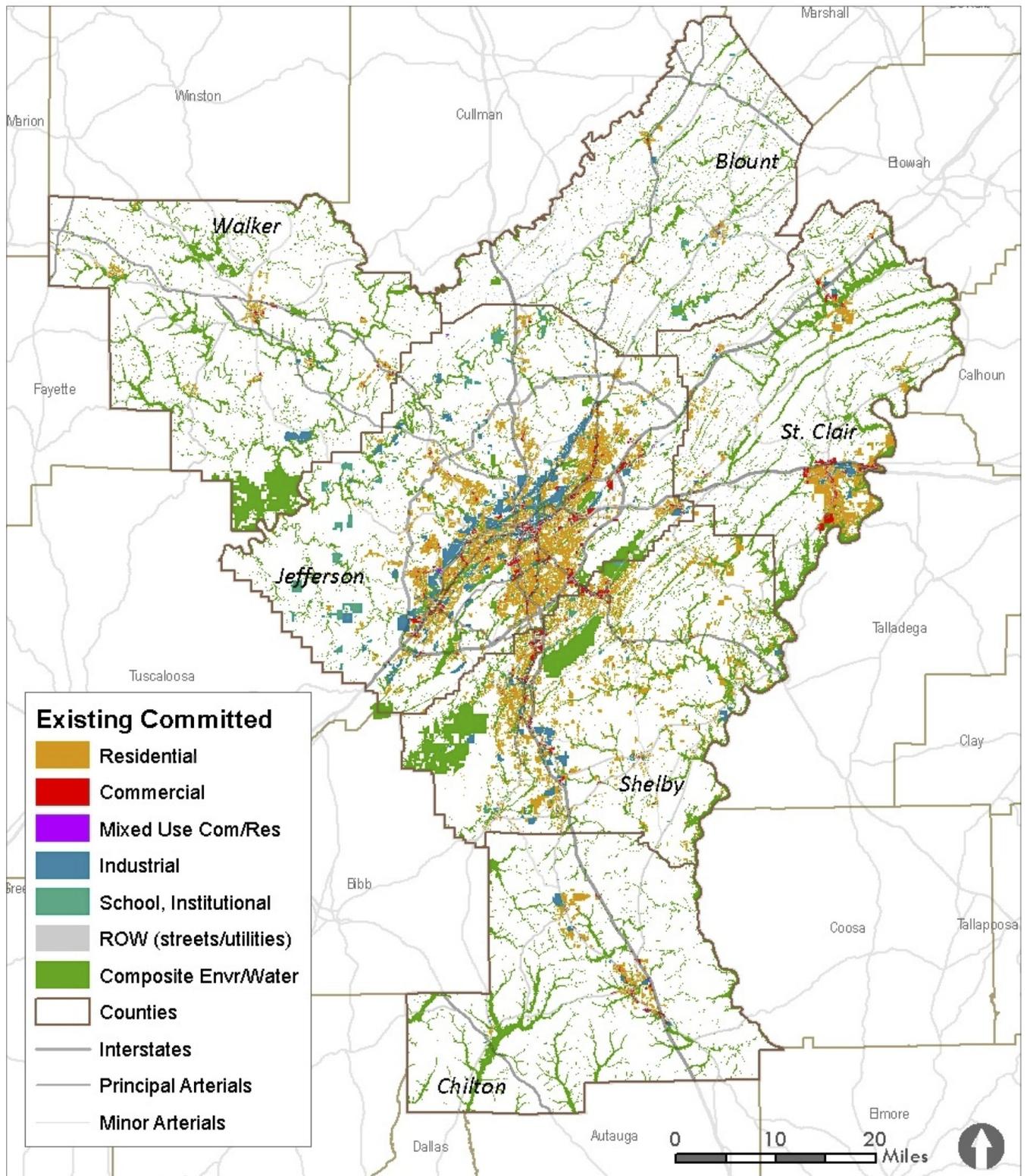


Figure 3. Available Acreage

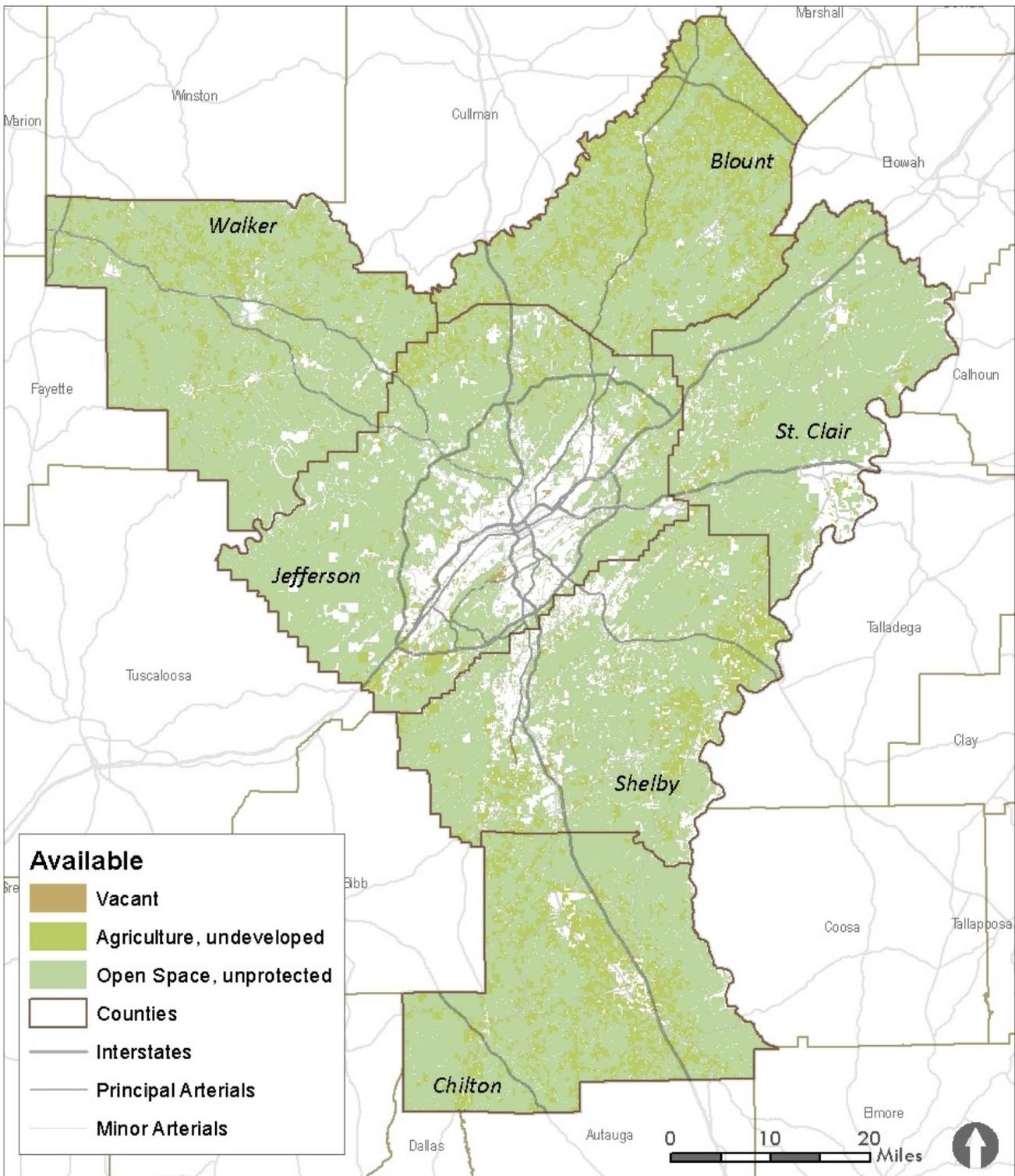


Table 2. Land Use Summary of Acres Committed and Available by County

County	Developed Residential	Developed Non Residential	Composite Environmental / Water	Available	Acres Land (Census)	Pct Available
Blount	2,427	15,173	32,697	366,112	412,664	88.7%
Chilton	6,643	2,780	45,494	393,606	443,435	88.8%
Jefferson	81,656	50,327	73,593	514,215	711,230	72.3%
St Clair	20,466	17,702	63,097	318,109	404,425	78.7%
Shelby	47,718	14,137	90,048	366,288	502,365	72.9%
Walker	5,497	2,895	70,036	436,905	506,372	86.3%
Totals	164,406	103,014	374,965	2,395,235	2,980,491	80.4%

2.4 PLACE TYPES, SMARTCODE, AND TRANSECT ZONES

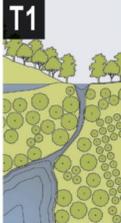
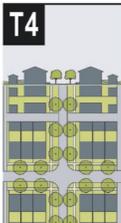
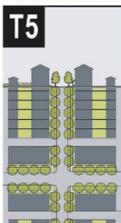
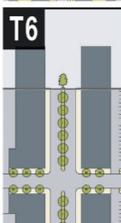
To use a metaphor, if a future growth scenario is a painting, and available lands are the canvas, then the place types are the colors in the painting. The colors have numbers associated with them, namely jobs and households that are the building blocks of communities. Place types define the land use density, intensity, composition, character and scale of development. A place type approach was intentionally chosen for this sketch level scenario planning effort. Place types are more than traditional single use land use classifications such as residential, commercial, or institutional. The common building block for this model is the Census Block Group, which in geographic scales lends itself to place types rather than general land use types. Places combine people and houses in different intensities and balances.

Place types developed for this modeling effort emulated the SmartCode¹ approach to land use and urban design. This approach is oriented around a rural to urban transect zone. The transect zone, SmartCode approach, lends itself to planning at the Census Block Group level, where a range of land uses may exist, not just residential or commercial. Figure 5 shows the region's Census Block Groups. There are data efficiencies in adopting census geographies for planning efforts, and Traffic Analysis Zones are likewise oriented around census geographies. Creating a Place Type palette of colors, such as land use intensity, density and degrees of jobs/housing balance works well for regional scenario planning. One could argue that greater precision can be obtained by doing parcel-level analysis and future allocation. However, the level of effort to conduct regional scenarios down to a parcel or small grid cell level is exponentially more difficult and complex. Greater complexity can yield more accurate results, but can also introduce more opportunity for error and imprecision if the process is done hastily or lacks data. The goal for this regional sketch model was to develop a relatively low-investment, sketch-level planning scenario tool that utilized transect-oriented place types reasonably matched to existing development patterns. Parcel data were to be used in creating and evaluating the place type composition, while future allocations would be applied to a larger, Census Block Group geography. Summarizing parcel level existing land use to the Census Block Group geography represents a hybrid approach that uses data from the parcel scale but models results to a larger geography, one that is similar in size to Traffic Analysis Zones.

¹The SmartCode is a form-based code that incorporates Smart Growth and New Urbanism principles. It is a unified development ordinance, addressing development at all scales of design, from regional planning on down to the building signage. It is based on the rural-to-urban transect rather than separated-use zoning, thereby able to integrate a full range of environmental techniques. The SmartCode is published by the Center for Applied Transect Studies, <http://www.transect.org/codes.html> and the code is available here: <http://curis.msstate.edu/publish/3000-BookletSC.pdf>

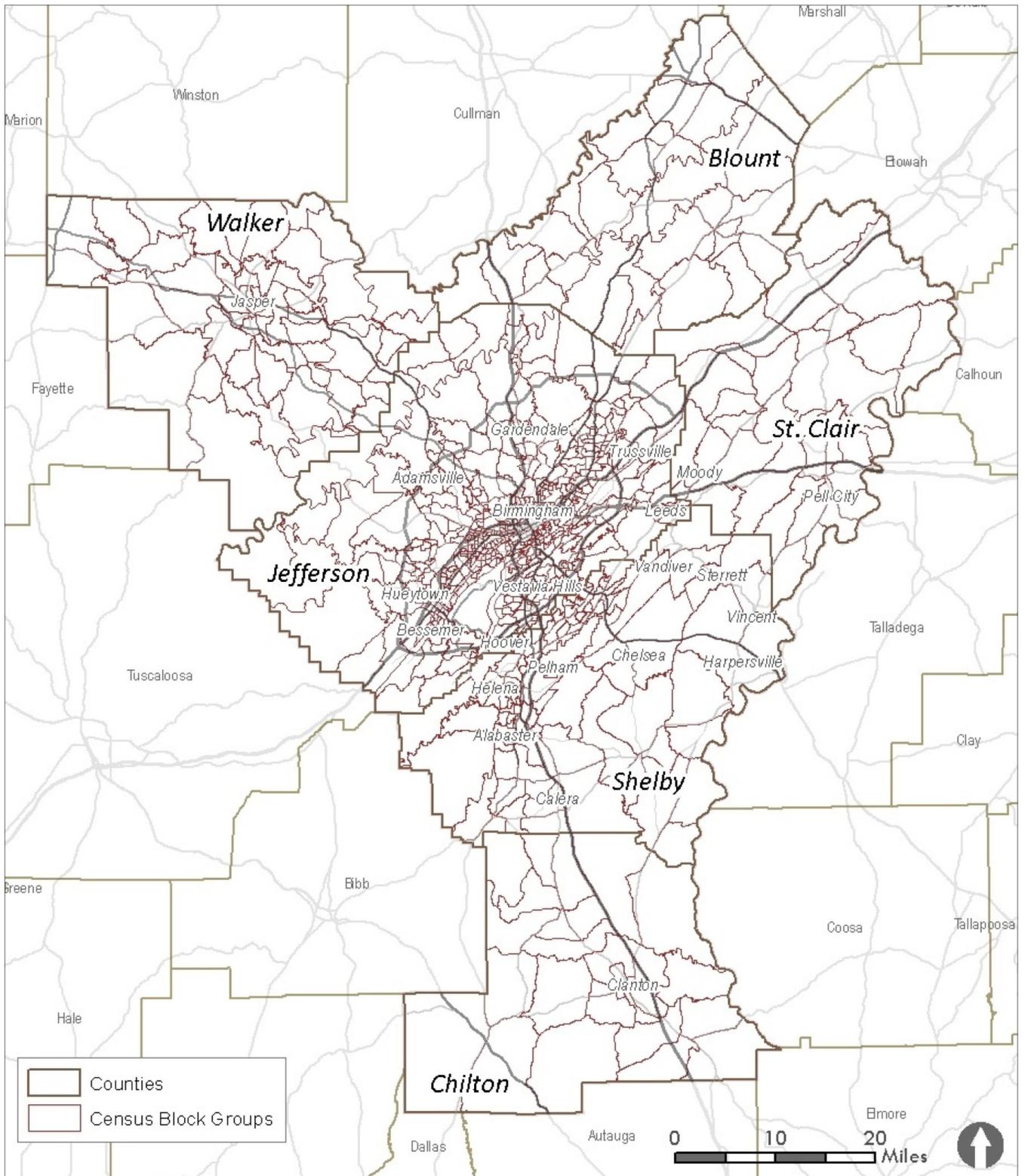
The six transect zones are illustrated in an excerpt from the SmartCode in Figure 4, with T1 representing the most rural end of the spectrum and T6 representing the most urban. These six transects form the foundation of the model place type palette used in this process. The transect identification process involved evaluating Census Block Group densities, then the jobs/housing makeup to produce a Place Type set for modeling. The transect densities and type evaluations are described in greater detail in Figure 4.

Figure 4. SmartCode Transect Zone Descriptions

	<p>T-1 NATURAL T-1 Natural Zone consists of lands approximating or reverting to a wilderness condition, including lands unsuitable for settlement due to topography, hydrology or vegetation.</p>	<p>General Character: Natural landscape with some agricultural use Building Placement: Not applicable Frontage Types: Not applicable Typical Building Height: Not applicable Type of Civic Space: Parks, Greenways</p>
	<p>T-2 RURAL T-2 Rural Zone consists of sparsely settled lands in open or cultivated states. These include woodland, agricultural land, grassland, and irrigable desert. Typical buildings are farmhouses, agricultural buildings, cabins, and villas.</p>	<p>General Character: Primarily agricultural with woodland & wetland and scattered buildings Building Placement: Variable Setbacks Frontage Types: Not applicable Typical Building Height: 1- to 2-Story Type of Civic Space: Parks, Greenways</p>
	<p>T-3 SUB-URBAN T-3 Sub-Urban Zone consists of low density residential areas, adjacent to higher zones that some mixed use. Home occupations and outbuildings are allowed. Planting is naturalistic and setbacks are relatively deep. Blocks may be large and the roads irregular to accommodate natural conditions.</p>	<p>General Character: Lawns, and landscaped yards surrounding detached single-family houses; pedestrians occasionally Building Placement: Large and variable front and side yard Setbacks Frontage Types: Porches, fences, naturalistic tree planting Typical Building Height: 1- to 2-Story with some 3-Story Type of Civic Space: Parks, Greenways</p>
	<p>T-4 GENERAL URBAN T-4 General Urban Zone consists of a mixed use but primarily residential urban fabric. It may have a wide range of building types: single, sideyard, and rowhouses. Setbacks and landscaping are variable. Streets with curbs and sidewalks define medium-sized blocks.</p>	<p>General Character: Mix of Houses, Townhouses & small Apartment buildings, with scattered Commercial activity; balance between landscape and buildings; presence of pedestrians Building Placement: Shallow to medium front and side yard Setbacks Frontage Types: Porches, fences, Dooryards Typical Building Height: 2- to 3-Story with a few taller Mixed Use buildings Type of Civic Space: Squares, Greens</p>
	<p>T-5 URBAN CENTER T-5 Urban Center Zone consists of higher density mixed use building that accommodate retail, offices, rowhouses and apartments. It has a tight network of streets, with wide sidewalks, steady street tree planting and buildings set close to the sidewalks.</p>	<p>General Character: Shops mixed with Townhouses, larger Apartment houses, Offices, workplace, and Civic buildings; predominantly attached buildings; trees within the public right-of-way; substantial pedestrian activity Building Placement: Shallow Setbacks or none; buildings oriented to street defining a street wall Frontage Types: Stoops, Shopfronts, Galleries Typical Building Height: 3- to 5-Story with some variation Type of Civic Space: Parks, Plazas and Squares, median landscaping</p>
	<p>T-6 URBAN CORE T-6 Urban Core Zone consists of the highest density and height, with the greatest variety of uses, and civic buildings of regional importance. It may have larger blocks: streets have steady street tree planting and buildings are set close to wide sidewalks. Typically only large towns and cities have an Urban Core Zone.</p>	<p>General Character: Medium to high-Density Mixed Use buildings, entertainment, Civic and cultural uses. Attached buildings forming a continuous street wall; trees within the public right-of-way; highest pedestrian and transit activity Building Placement: Shallow Setbacks or none; buildings oriented to street, defining a street wall Frontage Types: Stoops, Dooryards, Forecourts, Shopfronts, Galleries, and Arcades Typical Building Height: 4-plus Story with a few shorter buildings Type of Civic Space: Parks, Plazas and Squares; median landscaping</p>

(Source: SmartCode 9.2, <http://curis.msstate.edu/publish/3000-BookletSC.pdf>, Table 1 on p SC27)

Figure 5. 792 Census Block Groups in the Six County Region



2.5 NET DENSITY AND TRANSECT ASSIGNMENT

Using census data and InfoUSA employment data provided by the RPCGB, the activity unit density was calculated for the region. Activity units are population and employment combined, and represent a unified measure of human activity that is not separated into residential or non-residential. The acreage used in the density calculations was net developed acreage comprised of a summary of all parcel data of existing land uses with some level of built environment primary used in identifying committed or developed areas. These included residential, commercial, institutional, schools, parking, warehouses right-of-ways and streets and utilities. Net activity unit densities (AU density) were compared across the region, as shown in Figure 6. A few different ranges of AU density were tested and evaluated by staff in consultation with RPCGB staff. The maximum net density in the region was 51.7 AU/acre; the average was 4.07 and the standard deviation was 5.36. The final ranges were calibrated to the regional densities and a final range was identified (shown in Table 3) and assigned to Census Block Groups (shown in Figure 7).

Table 3. Transect Activity Unit Densities

Transect	AU/Acre	Character
T1	2	Natural
T2	5	Rural
T3	10	Suburban
T4	20	General Urban
T5	35	Urban Center
T6	45	Urban Core

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There are a couple of technical points worth calling out in the process of determining net density, choosing ranges of density, and applying them. First, the Census Block Group geography lends itself to generalization. For example, an otherwise rural Block Group with a medium-sized town in it may appear more urban. Conversely, an urban area with lots of developed land but with relatively fewer jobs and people may appear more suburban when, in reality, it has an urban feel and built pattern. The maps in Figure 6 and Figure 7 should be understood from this generalized perspective. Anomalies may appear, but this is acceptable given that the same standards were applied across the whole region and to a consistent census geography. Second, the existing land use parcel data classifications did not always fully account for possible employment in more rural Block Groups. For example, a variety of employment can occur on agricultural or farm land—lands which were not considered ‘developed’ in the available land analysis. During the process of assigning place types for more rural areas², the 2006 USGS Land Use Land Cover classifications for low, medium, and high developed areas were a better indicator of net density than acreages derived from parcel land use classifications.

Figure 6. Activity Unit Density

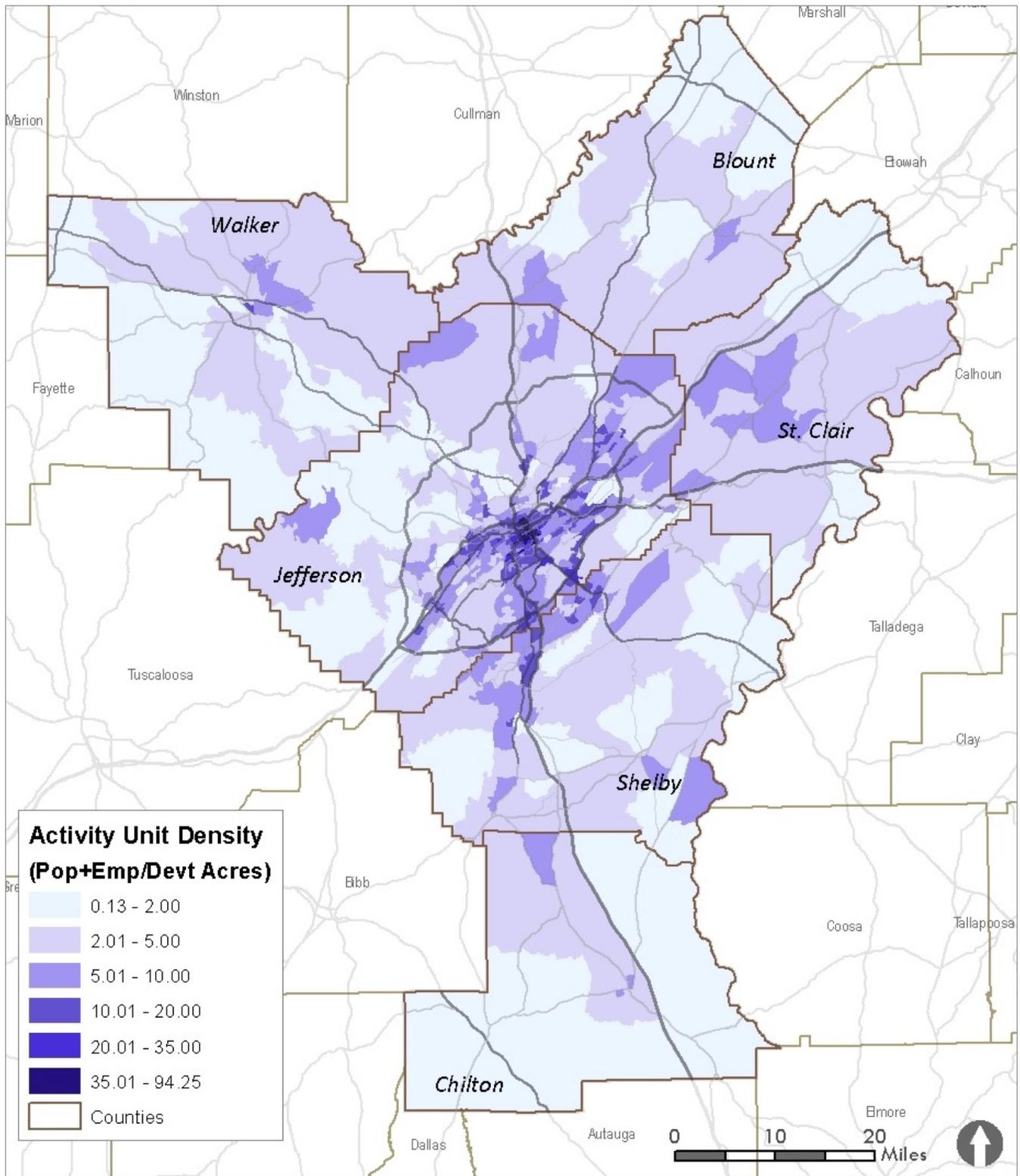
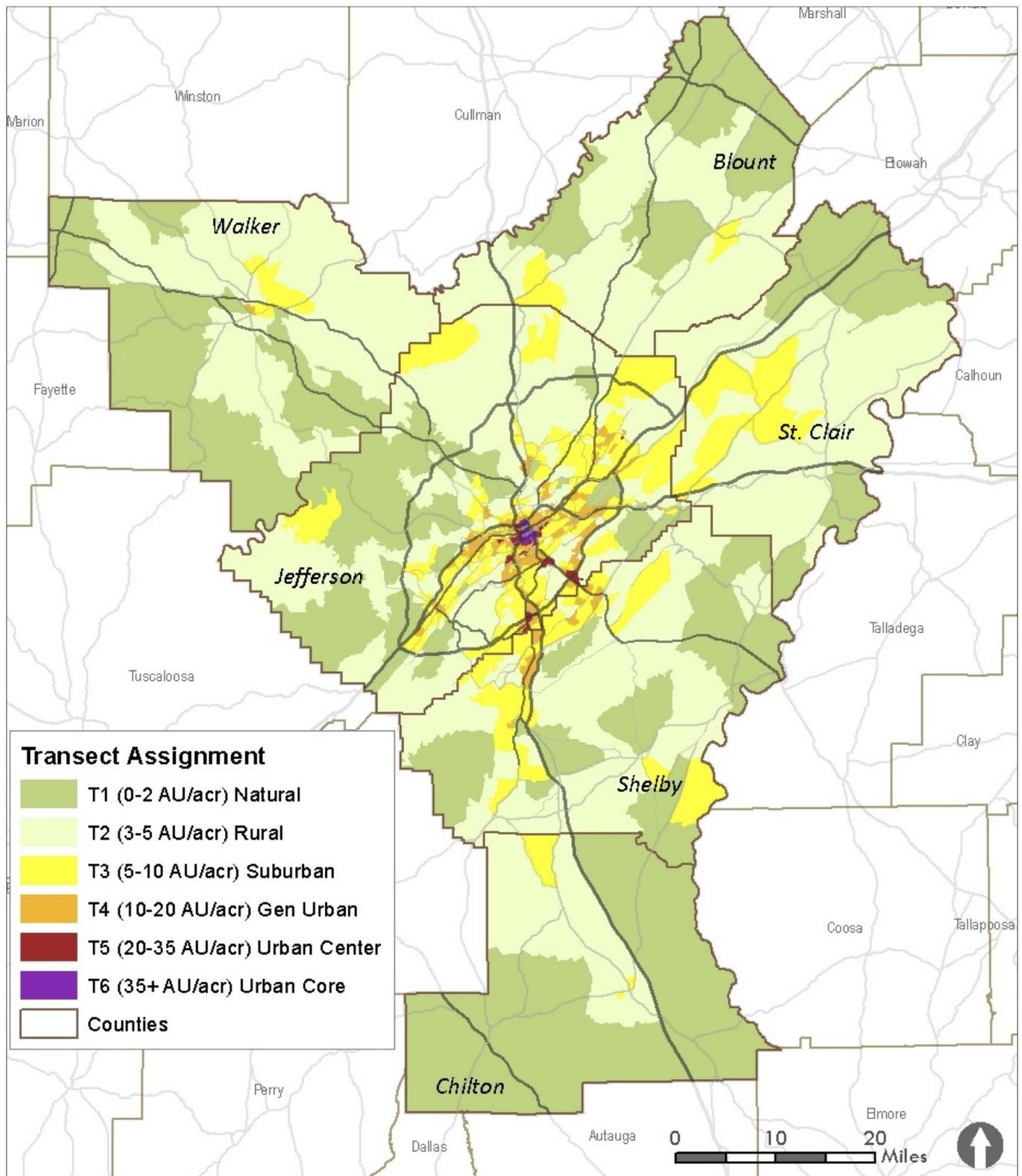


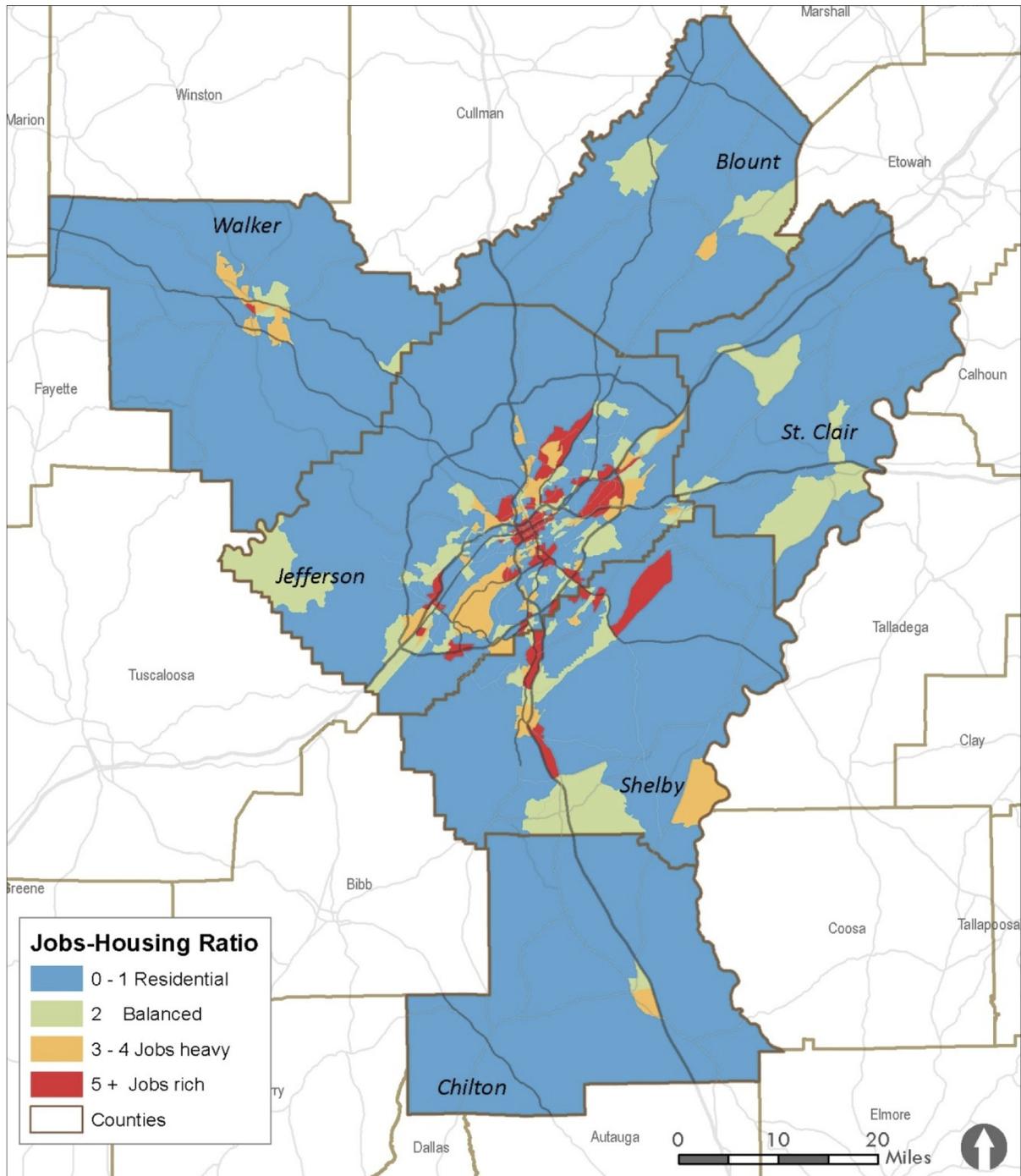
Figure 7. General Transect Assignment



2.6 JOBS/HOUSING BALANCE

The land use model is not configured to allocate activity units, but rather is designed to allocate jobs and households. Therefore, the next step, after transect type identification and assignment, is to assess whether a Census Block Group is more residential in nature, is more balanced in jobs and households, is heavier in jobs, or very jobs rich. The map in Figure 8 shows the jobs to housing balance with cool colors showing more residential and warm more jobs oriented.

Figure 8. Jobs to Households Ratio



²Rural areas are where more than 75% of area was not in a developed land use per parcel classifications. The 75% threshold was just a starting point, and individual Census Block Groups were individually assessed. Rural parcels used LULC acre for net density calculations

Moving from a six-tiered, transect-based assignment to a more nuanced place type assignment with job and household density values is the next step in model development. The inputs to allow this were completed with the transect assessment and the jobs-to-households ratio assessment. Every transect was classified into a transect type, depending on its residential-to-jobs composition; the marriage of these two inputs is represented in Figure 9.

From the marriage of transect plus type, a set of 24 place types was crafted that built upon the density ranges of the transect, but further defined the classification by percent residential and percent employment. Table 4 is the place type table that summarizes the numeric characteristics necessary for allocating future jobs and households to Census Block Groups based on density.

It should be noted that the transect to transect type to place type assignment is founded upon activity unit on net developed acres. It does not imply that a given block group is entirely made up of this place type, but that the dominant built environment for developed land in this Block Group currently has these place type characteristics. The model assumes that the remaining available land in a given Block Group could buildout at the same density and job-housing balance, should attractiveness (see Suitability, below) deem it probable. Existing and future place type is just one assignment, rather than two. There is enough range of density and enough available land in each Block Group that there is a significant amount of future development capacity available even under present place type assignments shown in Figure 10. The introduction of a future, alternative place type is a relatively straightforward modeling step, should this be a desirable factor to adjust and evaluate in alternatives. For the trend vision model there was just one standard place type assigned and used in allocations.

Table 4. Place Types

Place Type	HH Per Acre	Pop Per Acre	Emp Per Acre	Emp/HH Ratio	Pop/HH	Activity Unit Density	Transect	Type	Percent Res	Percent Emp
Rural Ag-Forest	0.15	0.38	0.10	0.67	2.50	0.48	T1	Res	60%	40%
Rural Residential	0.25	0.53	0.15	0.60	2.10	0.68	T1	Res	63%	38%
Suburban Residential Low	0.50	1.33	0.25	0.50	2.67	1.58	T1	Res	67%	33%
Suburban Residential Medium	1.00	2.50	0.50	0.50	2.50	3.00	T2	Res	67%	33%
Rural Village	0.75	1.91	1.50	2.00	2.55	3.41	T1	Bal	33%	67%
Traditional Town Mixed Use	1.50	3.30	1.50	1.00	2.20	4.80	T2	Res	50%	50%
Suburban Institutional	0.50	1.25	4.00	8.00	2.50	5.25	T2	Bal	11%	89%
Suburban Residential High	1.75	4.06	1.25	0.71	2.32	5.31	T3	Res	58%	42%
Suburban Mixed Use	1.50	3.60	3.00	2.00	2.40	6.60	T3	Bal	33%	67%
Traditional Town Center	2.00	4.40	2.50	1.25	2.20	6.90	T3	Bal	44%	56%
Suburban Retail	1.50	3.58	4.00	2.67	2.38	7.58	T3	Jobs	27%	73%
EnhSubEdge Residential	2.50	6.32	1.50	0.60	2.53	7.82	T3	Res	63%	38%
Urban Village Industrial	1.00	2.00	7.00	7.00	2.00	9.00	T3	Jobs	13%	88%
Urban Village Residential	4.00	8.80	1.00	0.25	2.20	9.80	T3	Res	80%	20%
EnhSubEdge Retail	2.00	4.20	6.00	3.00	2.10	10.20	T4	Jobs	25%	75%
EnhSubEdge Emp	1.00	2.55	9.00	9.00	2.55	11.55	T4	Jobs	10%	90%
EnhSubEdge Mixed Use	3.00	6.39	6.00	2.00	2.13	12.39	T4	Jobs	33%	67%
Urban Village Mixed Use	3.50	8.54	4.50	1.29	2.44	13.04	T4	Bal	44%	56%
Urban Residential	8.00	16.00	2.00	0.25	2.00	18.00	T4	Jobs	80%	20%
Urban Mixed Use	4.00	8.00	20.00	5.00	2.00	28.00	T5	Jobs	17%	83%
EnhSubEdge Institutional	6.00	14.04	18.00	3.00	2.34	32.04	T5	Bal	25%	75%
Urban Core Residential	16.00	32.00	4.00	0.25	2.00	36.00	T5&6	Res	80%	20%
Urban Core Mixed Use	8.00	16.00	36.00	4.50	2.00	52.00	T6	JobsRich	18%	82%
Urban Core Institutional	7.00	12.60	50.00	7.14	1.80	62.60	T6	JobsRich	12%	88%

Figure 9. Transect Type: Residential, Balanced, Jobs, Jobs-Rich

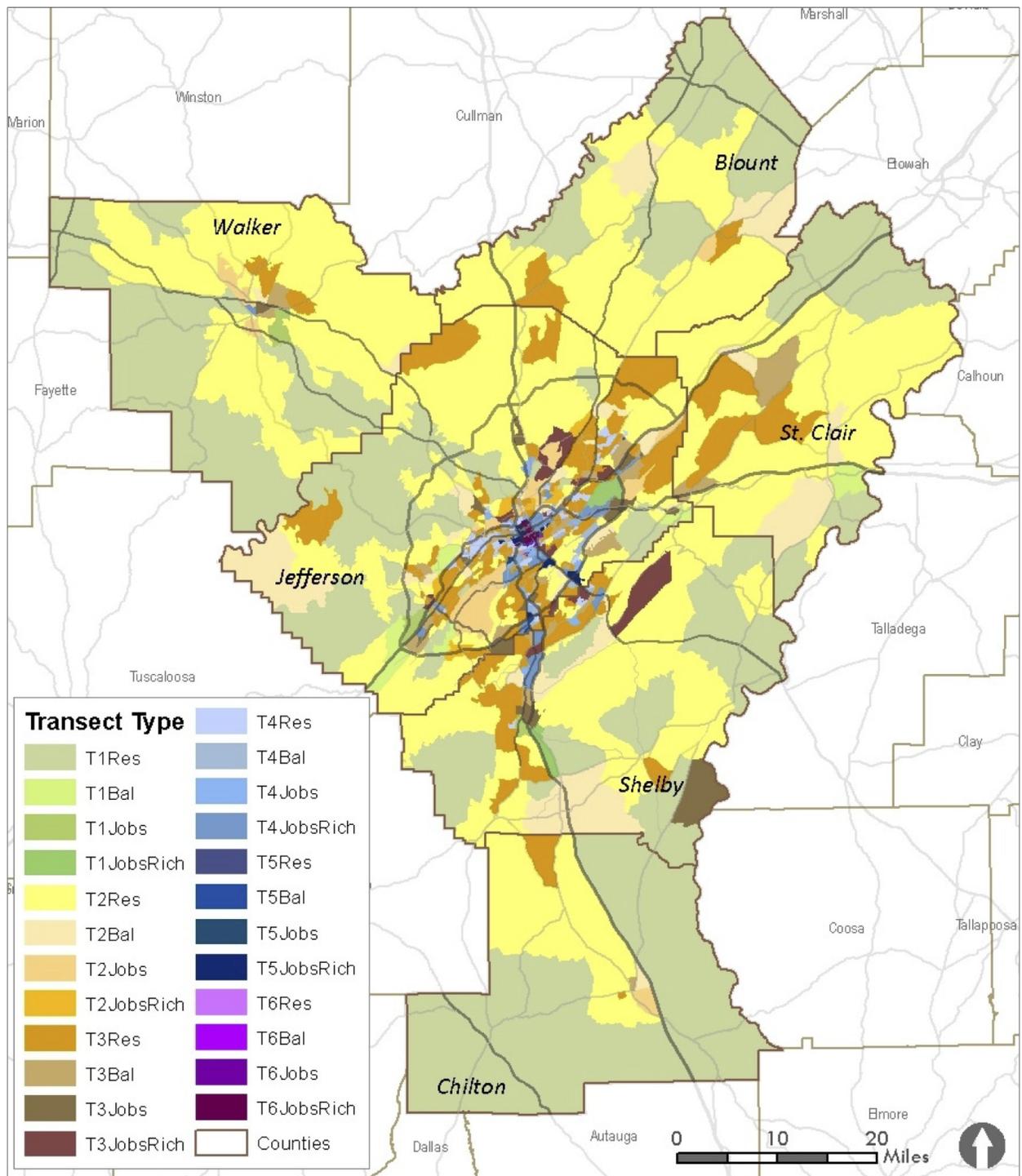
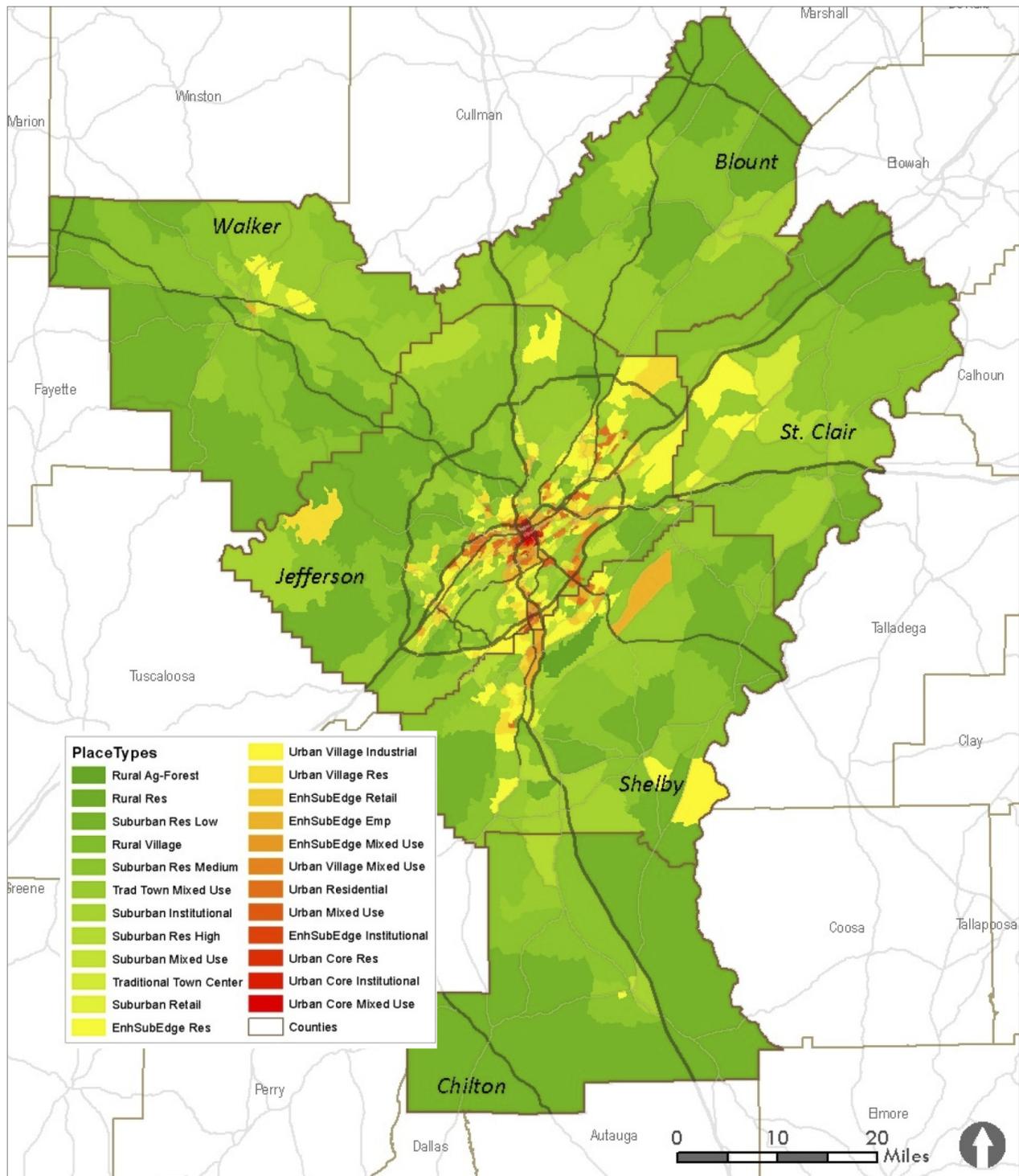


Figure 10. Place Type Assignments



2.7 CAPACITY CALCULATION

The CommunityViz model calculates future buildout capacity of households and jobs per Census Block Group. This calculation draws on the place type density values and percent residential or non-residential, expressed as follows: [Available Acres x Percent Residential/Non-Residential x Density Value x Efficiency]. Efficiency is an adjustment factor used in land use modeling to account for inefficiencies in development under the assumption that seldom is land use built out to 100% of its given density value. Factors such as site and parcel configuration, site plan, and layout can reduce development potential, or developers may opt to not build out to the maximum density possible. Efficiency factors can range from 0% to 50% reductions. Table 5 shows the general residential vs. non-residential percentages by place types, density and efficiency factors used in performing the capacity calculations. As place types become more dense and intense, the efficiency factor is assumed to increase given the high value of land in these more urbanized areas. For example, T5 and T6 categories have 100% or full efficiency.

Table 5. Place Types with Residential and Non-Residential Percentages and Efficiency Factor

Place Type	Transect Type	FAR	NonRes Percent	DU/Acre	Residential Percent	Efficiency Factor
Rural Ag-Forest	T1 Res	0.00	40	0.3	60	75%
Rural Residential	T1 Res	0.01	38	0.4	63	75%
Suburban Residential Low	T1 Res	0.01	33	0.8	67	75%
Suburban Residential Medium	T2 Res	0.03	33	1.5	67	75%
Rural Village	T1 Bal	0.04	67	2.3	33	75%
Traditional Town Mixed Use	T2 Res	0.06	50	3.0	50	75%
Suburban Institutional	T2 Bal	0.08	89	4.5	11	75%
Suburban Residential High	T3 Res	0.06	42	3.0	58	80%
Suburban Mixed Use	T3 Bal	0.08	67	4.5	33	80%
Traditional Town Center	T3 Bal	0.08	56	4.5	44	80%
Suburban Retail	T3 Jobs	0.10	73	5.5	27	80%
EnhSubEdge Residential	T3 Res	0.07	38	4.0	63	80%
Urban Village Industrial	T3 Jobs	0.15	88	8.0	13	80%
Urban Village Residential	T3 Res	0.09	20	5.0	80	80%
EnhSubEdge Retail	T4 Jobs	0.15	75	8.0	25	90%
EnhSubEdge Emp	T4 Jobs	0.18	90	10.0	10	90%
EnhSubEdge Mixed Use	T4 Jobs	0.17	67	9.0	33	90%
Urban Village Mixed Use	T4 Bal	0.15	56	8.0	44	90%
Urban Residential	T4 Res	0.18	20	10.0	80	90%
Urban Mixed Use	T5 Jobs	0.44	83	24.0	17	100%
EnhSubEdge Institutional	T5 Bal	0.44	75	24.0	25	100%
Urban Core Residential	T5 and 6 Res	0.37	20	20.0	80	100%
Urban Core Mixed Use	T6 JobsRich	0.81	82	44.0	18	100%
Urban Core Institutional	T6 JobsRich	1.05	88	57.0	12	100%

The buildout capacity values for both residential and employment are shown in Table 6, and are illustrated in Figure 11 and Figure 12.

Table 6. Buildout Capacity for Dwelling Units and Employment by County

County	Number of Census Block Groups	DU Capacity	Employment Capacity
Blount	35	248,730	253,459
Chilton	30	190,579	110,321
Jefferson	518	511,475	623,260
St Clair	39	262,108	248,236
Shelby	112	272,282	422,026
Walker	58	302,781	236,979
Region	792	1,787,955	1,894,279
* Employment capacity assumes 800 sq ft of building space per employee			

Figure 11. Dwelling Unit Capacity

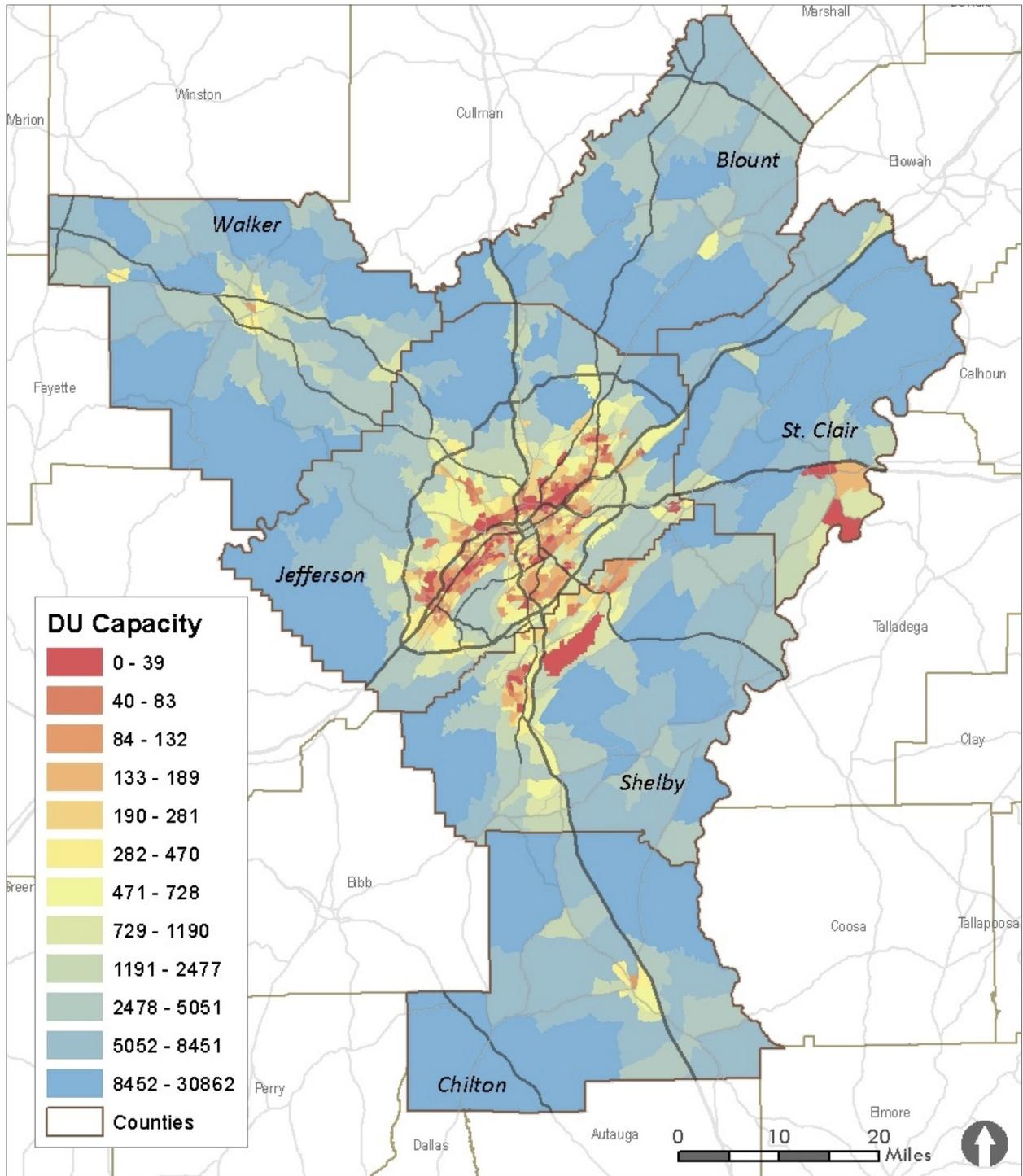
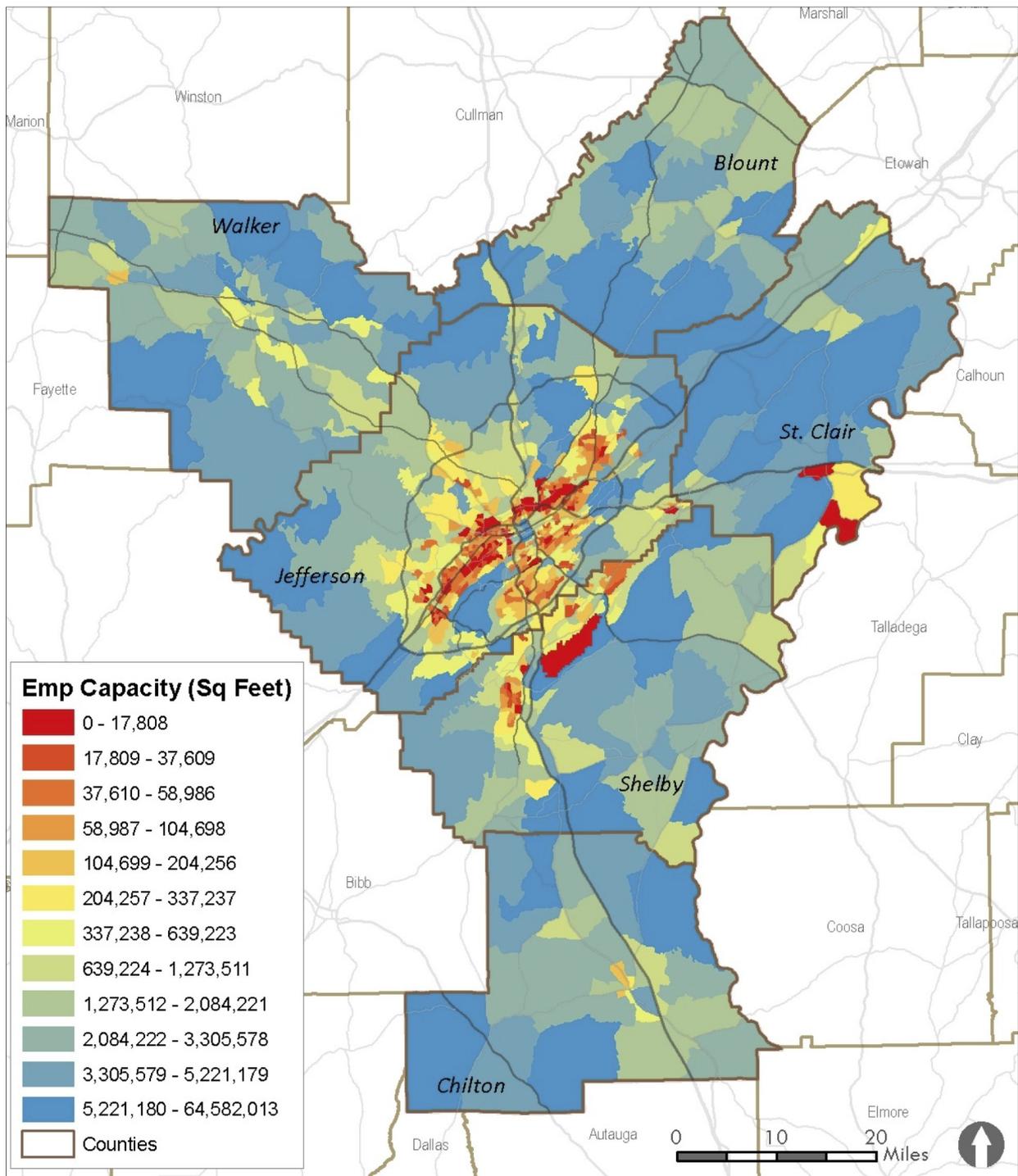


Figure 12. Nonresidential Square Feet Capacity



3.0 SUITABILITY

Suitability is a CommunityViz analysis that computes the relative attractiveness of a Census Block Group to receive growth and development in the future. Suitability scores are calculated based on any number of user-defined attributes and spatial relationships, such as proximity, overlap, slope, or value, and calculating a combined rating or score for each unit of analysis. Weighted suitability analysis places more importance on some factors and less on others, so that the combined rating more fairly represents the relative importance of each location criterion. The suitability score is a relative score, meaning that the most attractive Block Group receives the maximum score (100) and the least attractive receives the lowest score (0). The suitability ranking is utilized in the model's allocation processes to distribute future growth, either jobs or dwelling units, to Census Block Groups that have the highest suitability rankings first. Figure 13 shows the six suitability factors that were selected as relevant to influence the trend allocations. These were major roads, historic trends of growth or decline, sales activity and employment centers. The results of the suitability rankings using these factors is shown in Figure 14, where blue (cooler) colors show less suitability and warmer colors (red) show greater overall suitability. The factors aggregated to calculate suitability (Figure 13) are all user-defined, and can be adjusted to match different scenario assumptions, such as adding new factors, subtracting current factors, or adjusting the weights. The factors shown in Figure 13 are mapped and explained in greater detail in following sections.

Figure 13. Suitability Factors and Weighting

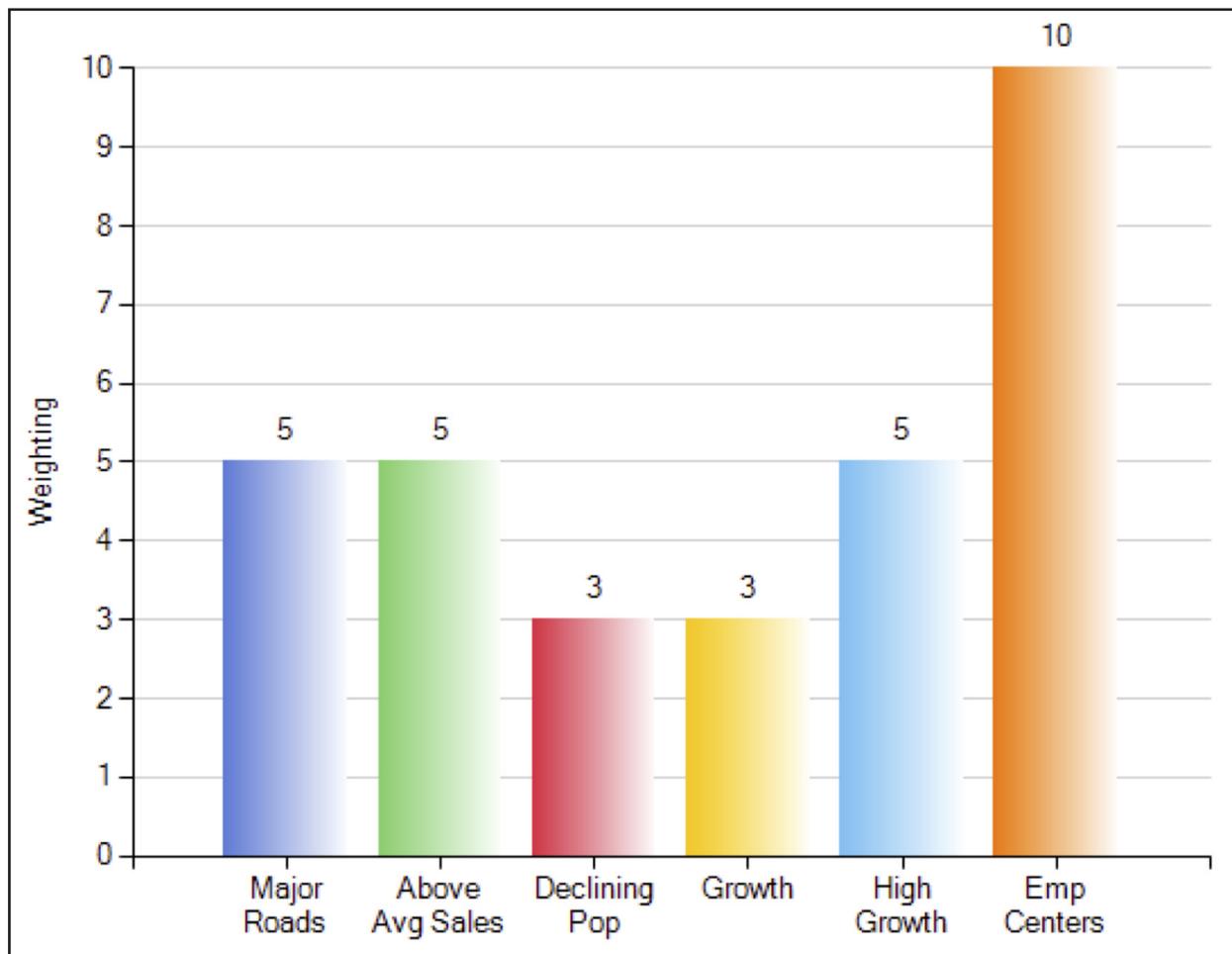
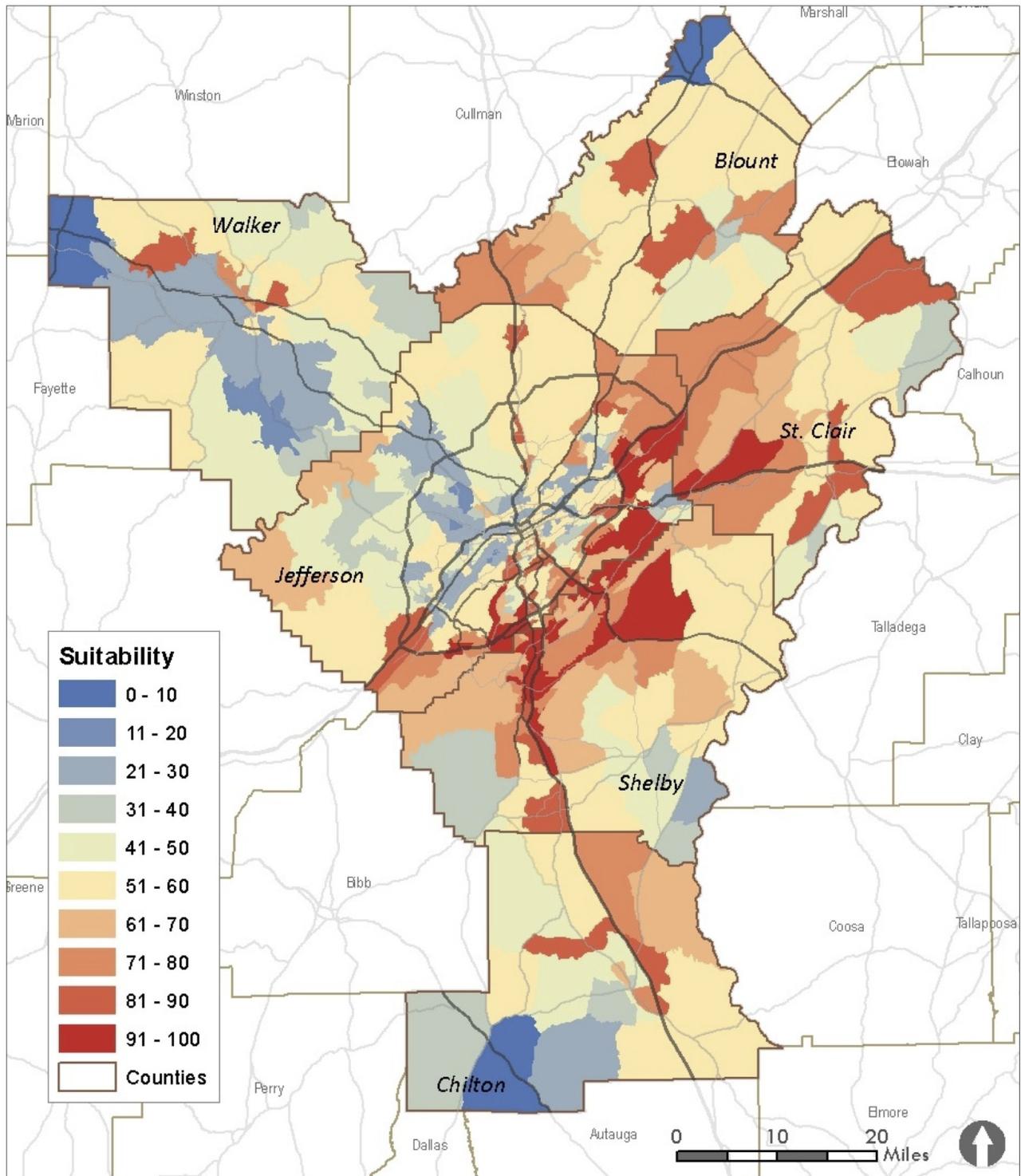


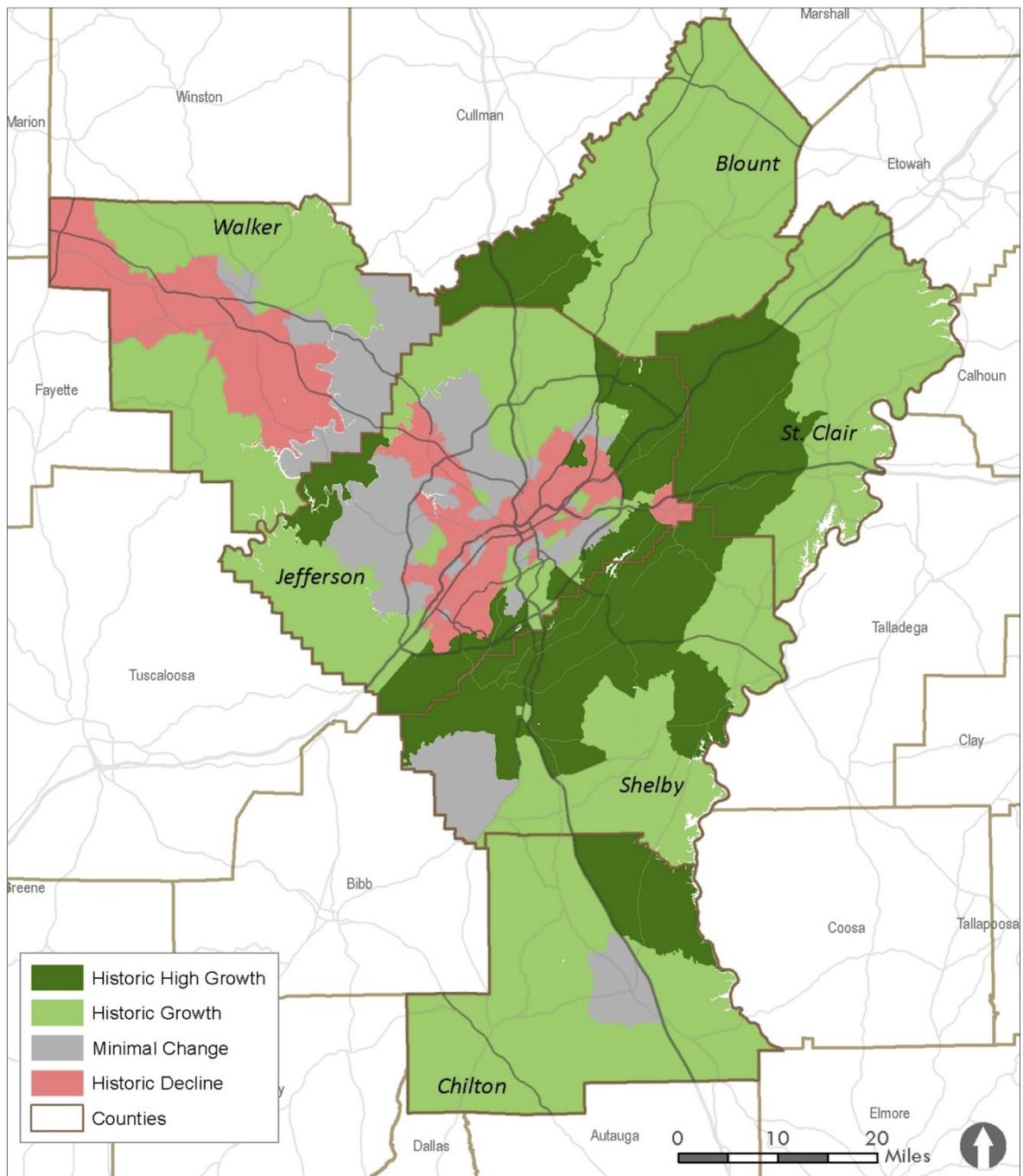
Figure 14. Aggregate Suitability Ranking by Census Block Group



3.1 HISTORICAL GROWTH PATTERS

Historical US Census population data were obtained from RPCGB for previous decades at the census tract level. The historic trends were calculated by evaluating the percent change in the period 1980 through 2000. Tracts in 2010 have different geographies than in 2000, so for consistency of data, the thirty year period of 1980-2000 was used to identify historic change. Areas of high and steady growth both received positive suitability rankings; areas of neutral growth received no suitability factoring, while area of decline received a negative suitability ranking. If the percent change for this period was 60% or greater it was considered highest growth; greater than 10% but less than 60% was considered growth; less than 10% but greater than -5% was considered neutral/minimal growth; and less than -5% was considered to have a historic declining trend.

Figure 15. Historic Growth Patterns of Growth or Decline from 1980-2000



3.2 PROXIMITY: MAJOR EMPLOYMENT CENTERS

Concentration of employment is a positive attractor for future jobs and housing. To identify higher density employment areas a kernel density function was performed in GIS on US Census LEHD data for employment at the block-point level. The map in Figure 16 shows an employment density footprint that accounts for 90% of the total regional employment and, therefore, represents a statistically valid higher employment area for purposes of factoring a positive suitability ranking. The lowest employment density shown in green is .4 jobs per acre; the highest is 14.4.

3.3 PROXIMITY: MAJOR ROADS

Proximity to major roads is considered a positive suitability attractor for future development. Major roads here are defined as either Interstates or Principal Arterials (Function Class 1, 11, 12, 2, or 14) and are mapped in brown in Figure 17.

3.4 PROXIMITY: HIGH SALES AREAS

Sales activity is a proxy for human activity. Areas of above average sales volume can be considered high activity areas, which could also prove to be attractive to future growth and increased investment. The magenta areas shown in Figure 18 are 175 of the region's 792 Census Block Groups that have higher than average sales volumes.

Figure 16. Major Employment Centers

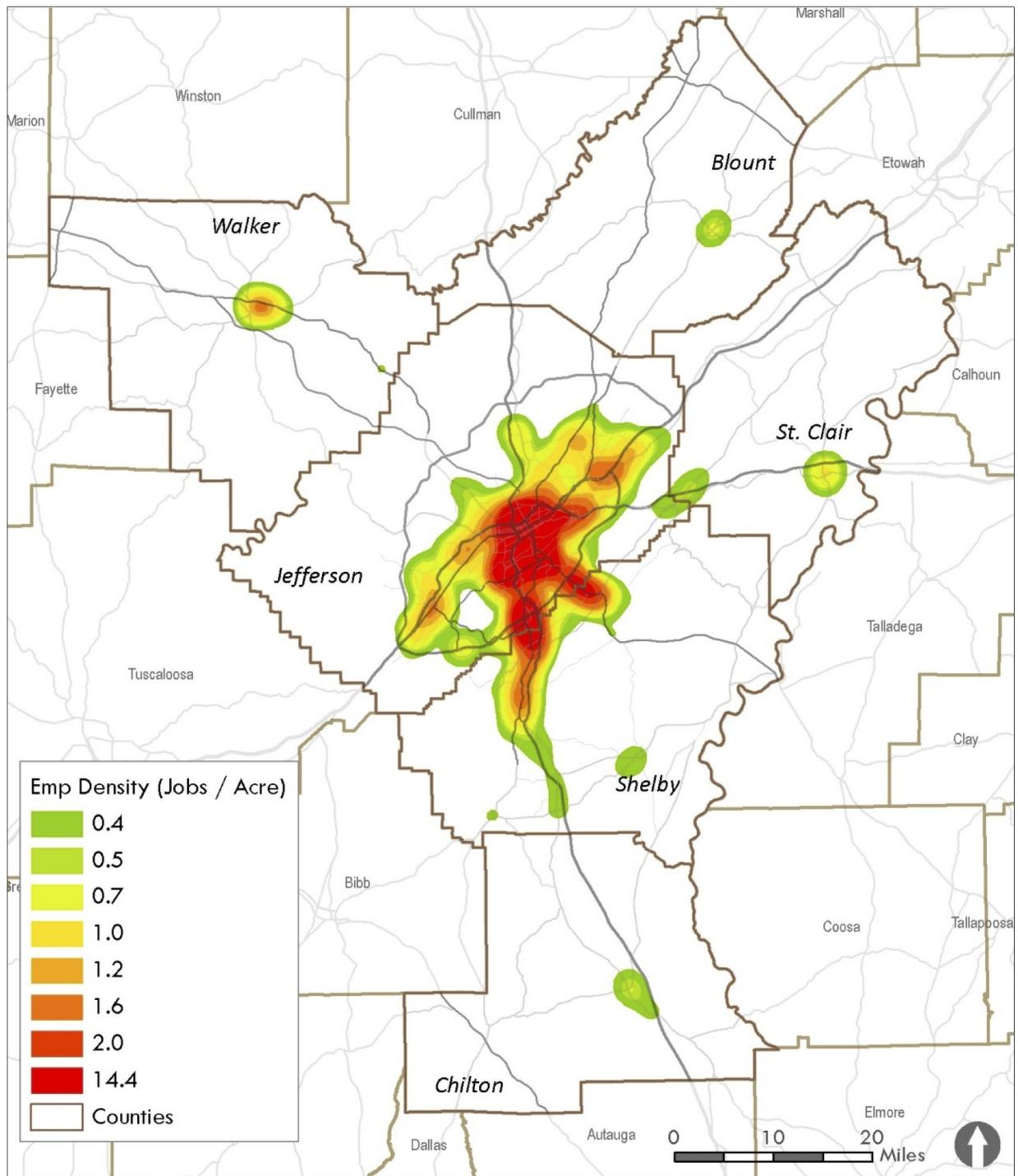


Figure 17. Major Roads

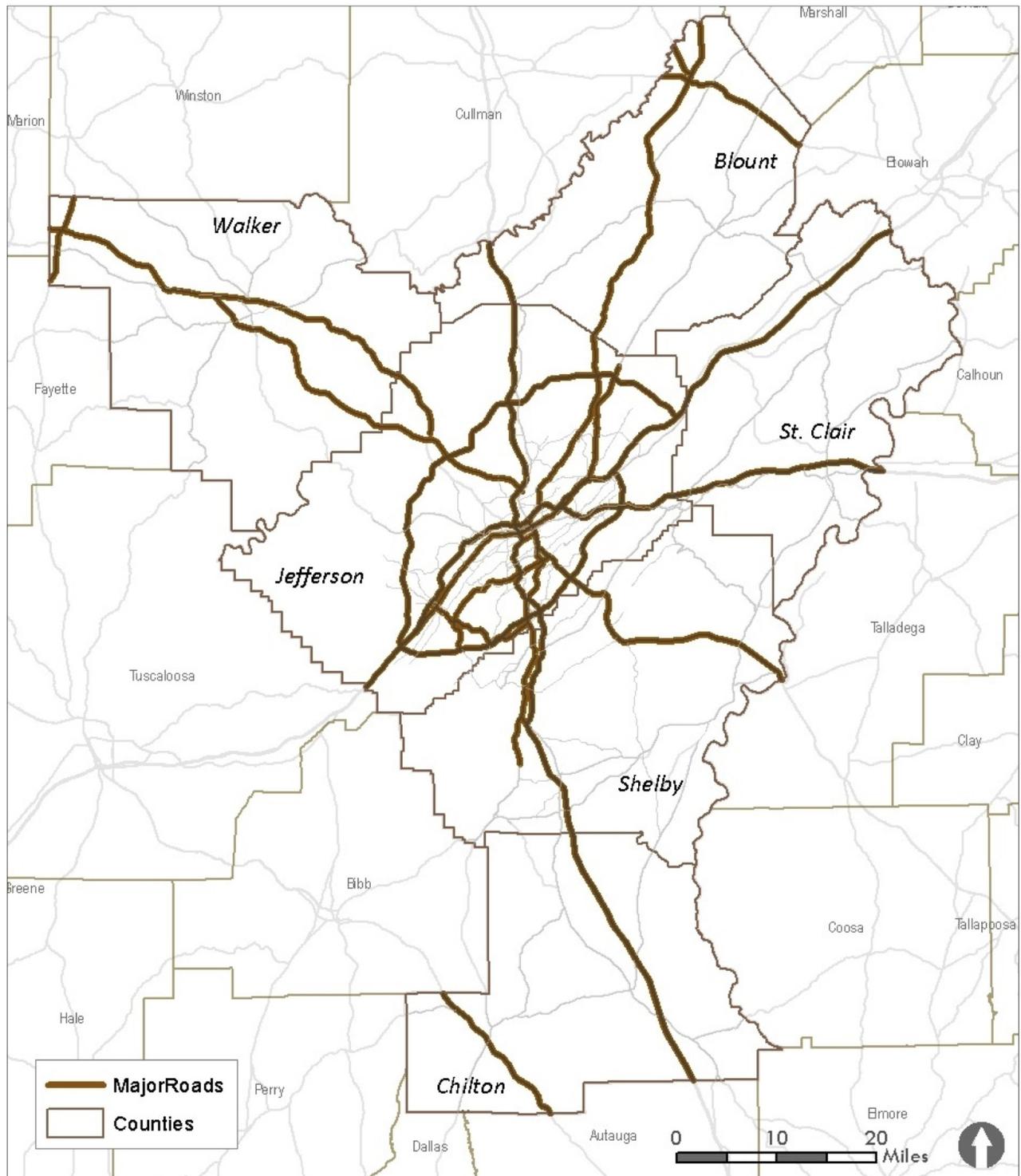
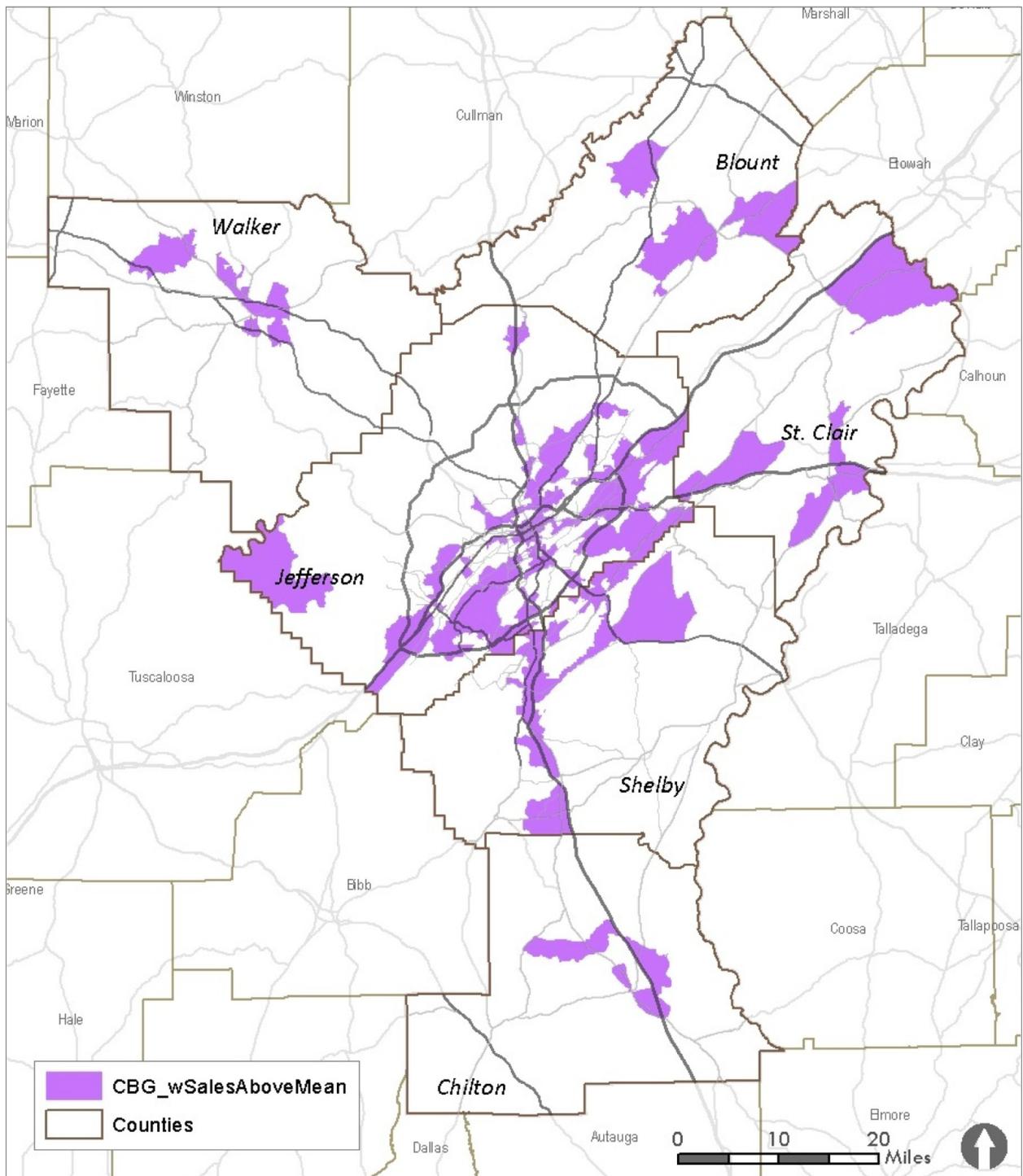


Figure 18. High Activity Areas: Above Average Sales



4.0 MODEL ALLOCATIONS

4.1 RESIDENTIAL

The model architecture distributes future jobs and households using a probability-based method. The principle of probability-based (also called random) allocation is the probability that a future house or job will go to a particular polygon is proportional to the relative desirability score of that polygon. The proportionality can either be linear or exponential. In the linear model, suitability (desirability) scores are used exactly as they appear from the suitability attribute. In the exponential model, suitability scores are re-scaled. In the exponential method, the suitability score is divided into 10 to create a scaling factor, then the score is multiplied by the scaling factor to create scaled scores with a maximum value of 10. These scaled scores are exponentiated³ to produce a modified suitability score for the result. Thus the exponential method places greater emphasis on the suitability ranking when performing allocations, while the linear method more evenly distributes future growth strictly on suitability without scaling or adjustment. The model can be modified to perform probability allocations in either fashion, and the probability-based linear order was chosen as a straightforward first start that would not overly emphasize suitability rankings, but rather allocate by suitability in a linear, not exponential fashion.

4.1.2 PROJECTIONS AND CONTROL TOTALS

Demographic projection data provided by the RPCGB demographer were input into the model. Table 7 shows the projections in population, housing and employment from 2010 and 2040 with the growth increment. The model is designed to allocate housing and employment, so the increments were used as the control totals for the allocation process. It should be noted that Jefferson County is showing a negative trend in employment from 2010 to 2040. The model is not designed to subtract jobs from one area, so the growth allocation control total for Jefferson was simply left at zero for the current model run.

Table 7. Population, Housing, and Employment Projections from 2010 through 2040 with Increment

Jurisdiction	Population			Housing			Employment		
	2010	2040	Increment	2010	2040	Increment	2010	2040	Increment
Blount	57,322	77,902	20,580	23,887	32,658	8,771	9,267	12,579	3,312
Chilton	43,643	54,233	10,590	19,278	24,458	5,180	8,287	11,435	3,148
Jefferson	658,466	650,789	-7,677	300,552	308,595	8,043	360,920	357,345	-3,575
St. Clair	83,593	140,023	56,430	35,541	57,598	22,057	15,777	31,447	15,670
Shelby	195,085	318,536	123,451	80,970	131,225	50,255	76,943	137,905	60,962
Walker	67,023	69,963	2,940	30,816	32,488	1,672	17,600	21,155	3,555
Region	1,105,132	1,311,446	206,314	491,044	587,022	95,978	488,794	571,866	83,072

³Mathematically this is expressed as: $D_{new} = e^{(10 * D_{old} / D_{max})}$ The re-scaled suitability scores, which can range from 1 to 22,026.47, are then used in place of the original scores when doing an allocation.

4.1.3 2040

The allocation process utilizes the results of both the suitability and capacity analyses to distribute jobs and housing units among Census Block Groups based on their attractiveness and capacity to host residential and/or non-residential activity. The total number of jobs and dwelling units to allocate for a given analysis year is derived from the growth increments for housing and employment shown in Table 7. The allocation process distributes jobs and housing units among the Census Block Groups on a one-job (or household)-at-a-time basis. The allocation order is dictated by the suitability score. The buildout results define the capacity of each Census Block Group to host residential or non-residential activity. The basic process unfolds as follows. The first housing unit to be distributed is placed in the most attractive Block Group. If that Block Group can accommodate residential activity, the unit will be placed and the next residential unit is queued for allocation. If the most attractive Block Group cannot host more housing, the next most attractive Block Group is sought. Once a Block Group has been filled with as many dwelling units as it can host, it is removed from the allocation. This process continues until all housing units are placed, and it is repeated as a separate allocation for employment.

Demographic projection data were provided by county and by region control totals for growth. The allocation process requires a future total. The default allocation model is to allocate the total increment of growth for the whole study area, or in this case the whole region. The CV model was thus modified so that control totals for housing and employment could be set at the county level instead of just the regional level. The county control total based allocation and the regional allocations represent two very different future growth patterns, although both processes utilized the same suitability rankings, these did not change. These are shown in Figures 19 and 20. Figure 19 is a map that shows new housing allocations using county control totals. Six separate allocation processes were coded and run individually on Census Block Groups for those individual counties. The allocation process for a given county stopped when that control total was reached. For example, when Blount reached 8,771 future housing units the allocation process stopped for that county. Figure 20 shows the regional allocation model, which was prepared to demonstrate the effect of the suitability rankings absent county level control totals. This model also demonstrates the distribution of new dwelling units if regional accessibility to jobs and central place attractiveness trumped the factors that have led to dispersed growth throughout the region and the loss of population in the City of Birmingham and Jefferson County. For the regional allocation model, 95,978 housing units were allocated across the whole region. A comparison of new residential allocations by county in Figures 21 and 22 illustrates the difference between the county level control total and a region-wide allocation.

Figure 19. Dwelling Unit Allocation with County Control Totals

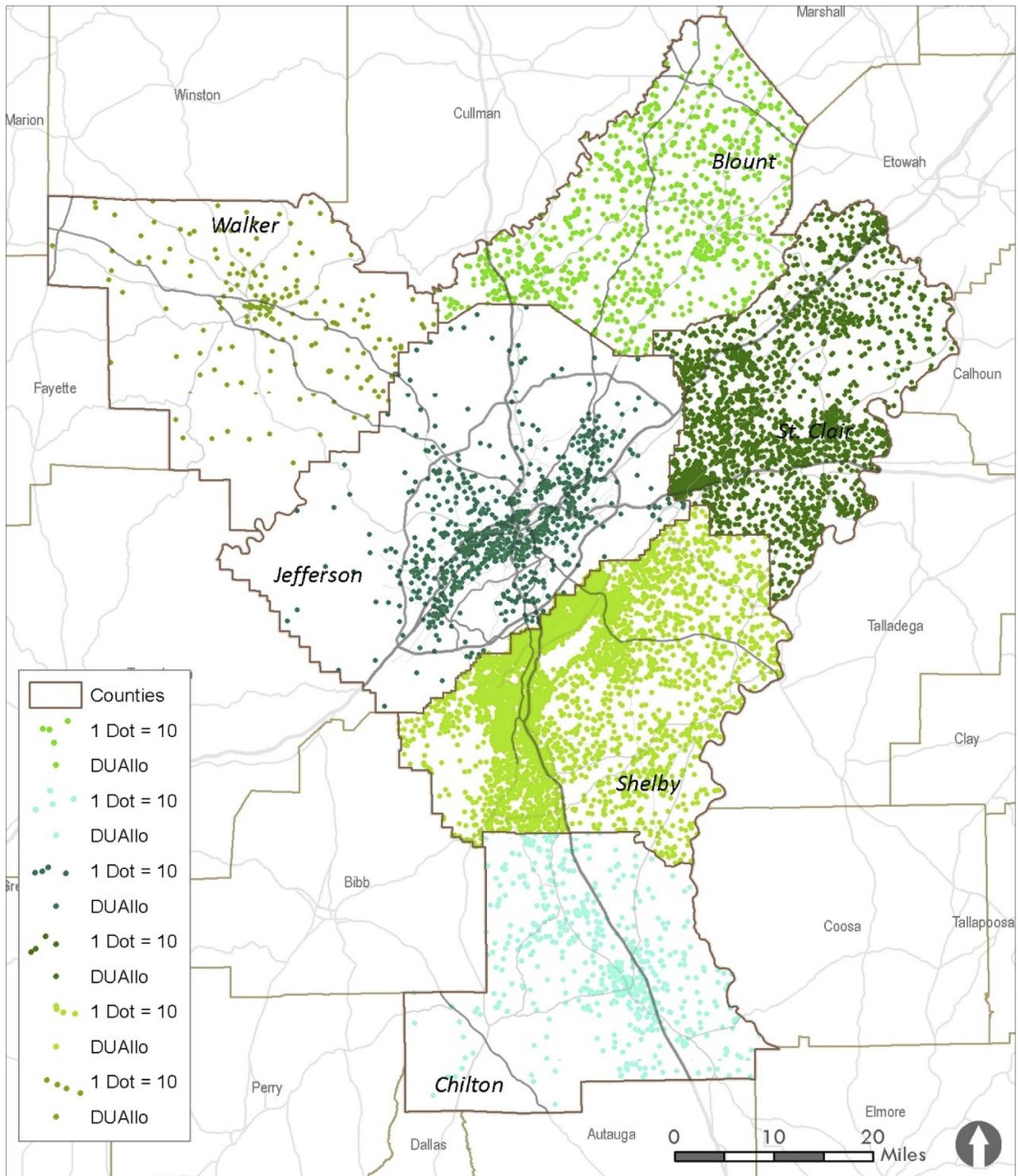


Figure 20. 2040 Dwelling Unit Allocation, Full Region without County Control Totals

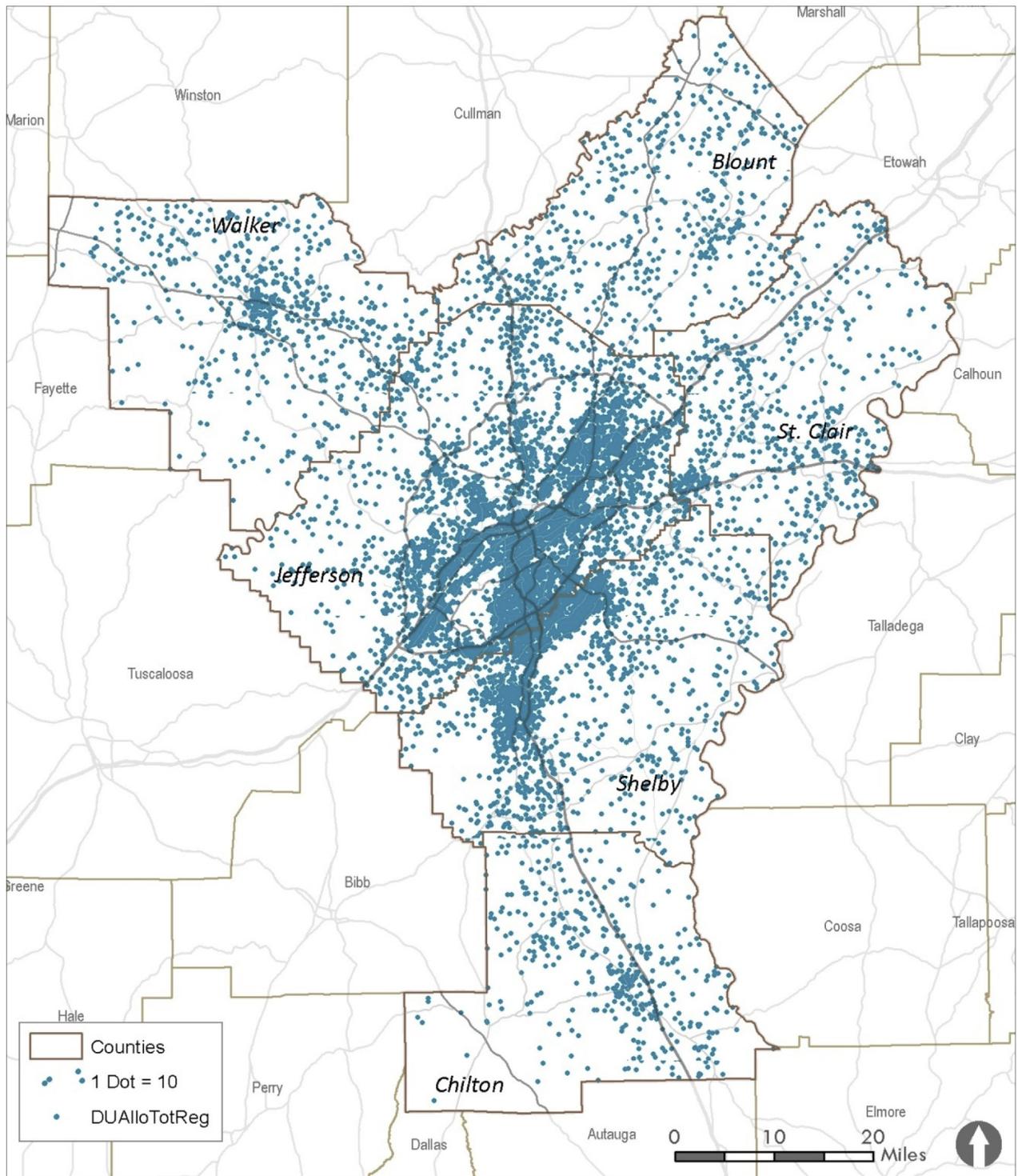


Figure 21. New 2040 Residential Allocation using County Control Totals

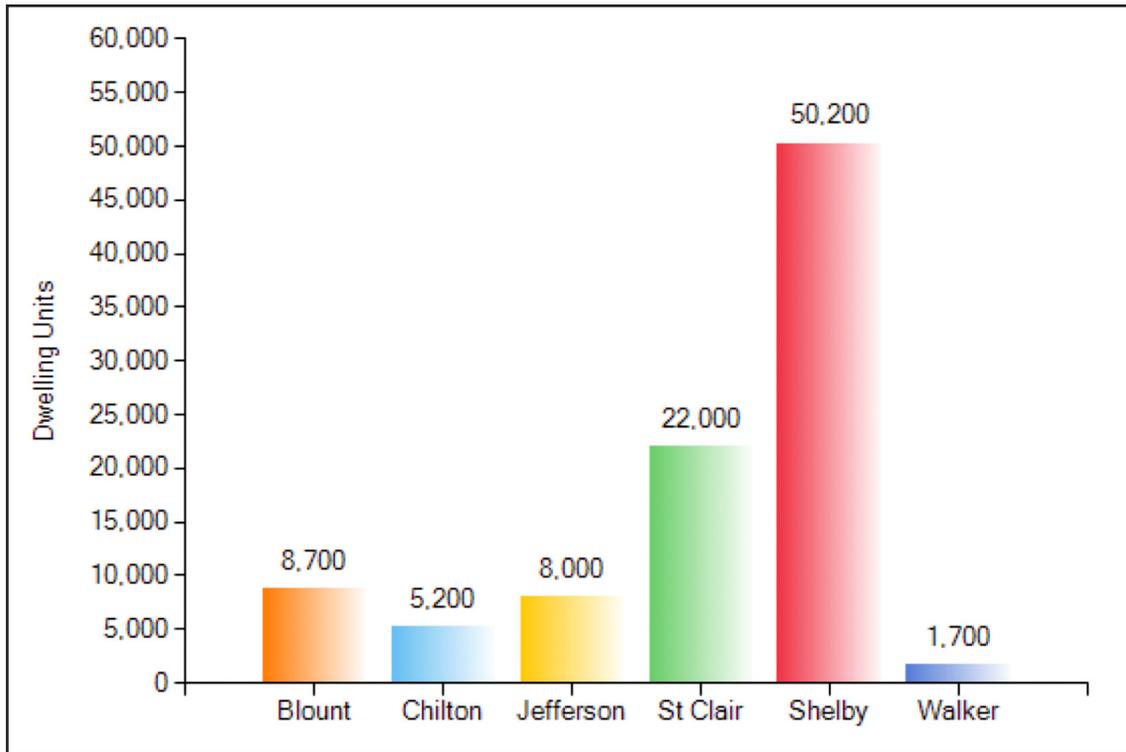
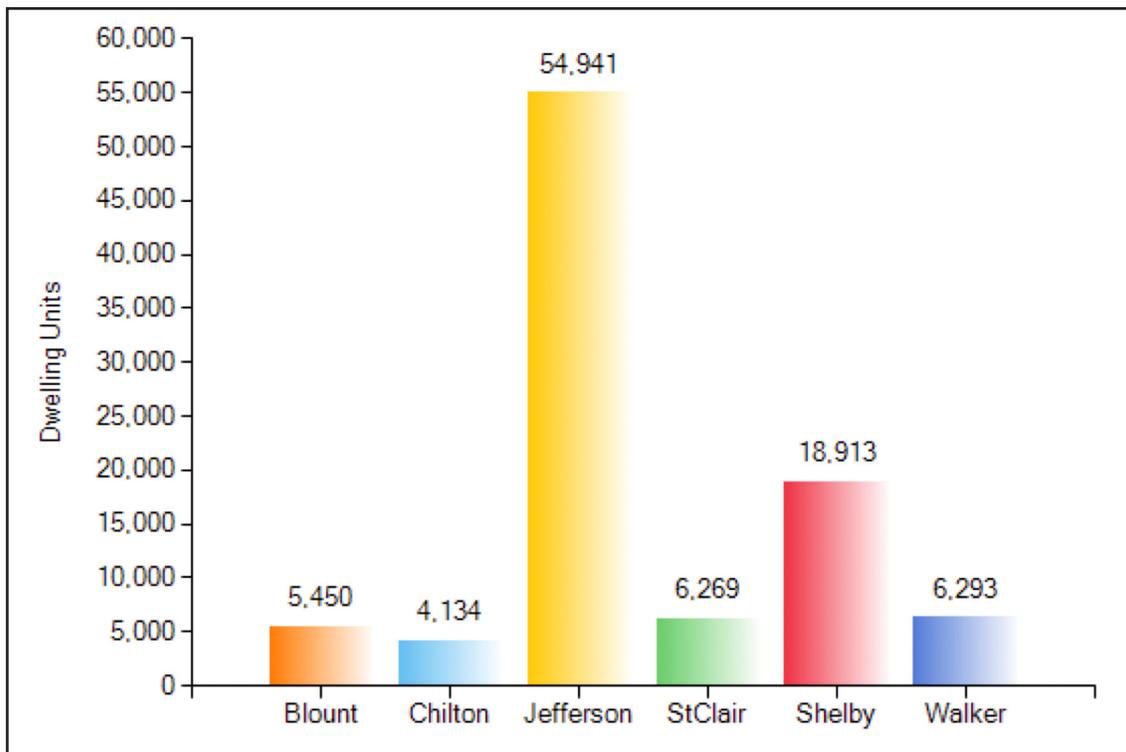


Figure 22. New 2040 Residential Allocation using Region-wide Control Total



4.2 EMPLOYMENT ALLOCATION

The employment allocation process mirrors the procedure used for allocation of residential units but for non-residential square feet instead. The place type calculations for capacity are expressed in a square foot per acre using a floor-to-area ratio (FAR) (see Table 5 for place type non-residential percentage and FAR). As capacity is expressed in square feet, the conversion to employment is based on an average of 800 sq. ft. per employee. The CommunityViz default is an average of 823 square feet of non-residential floor area per employee based on the Commercial Buildings Energy Consumption Survey (1999), Energy Information Administration. 800 sq. ft. was adopted as a round number, and is a variable that can be adjusted as necessary. If this variable is adjusted, it should be noted that the control total assumptions (in square feet) should likewise be adjusted with the same employment per square foot variable.

4.2.1 2040

The allocation procedure for employment followed the same county level vs. region-wide control total scheme as the residential allocations. Thus, the default was the regional level allocation and the adjusted was the county level control total, both illustrated in Figures 23 and 24, and charted in Figures 25 and 26. Similar to the residential allocations, the county-control total distribution emphasizes an outward growth pattern trend, with the majority of new jobs occurring in Shelby and St. Clair counties. The region-wide allocation tends to favor an inward trend around both the core urban areas as well as new growth areas to the east and south of Birmingham. The outlook for Jefferson County in particular is more optimistic using the region-wide allocation based purely on the suitability as presented in Figure 14.

Figure 23. 2040 Employment Allocation, Full Region Using County Control Totals

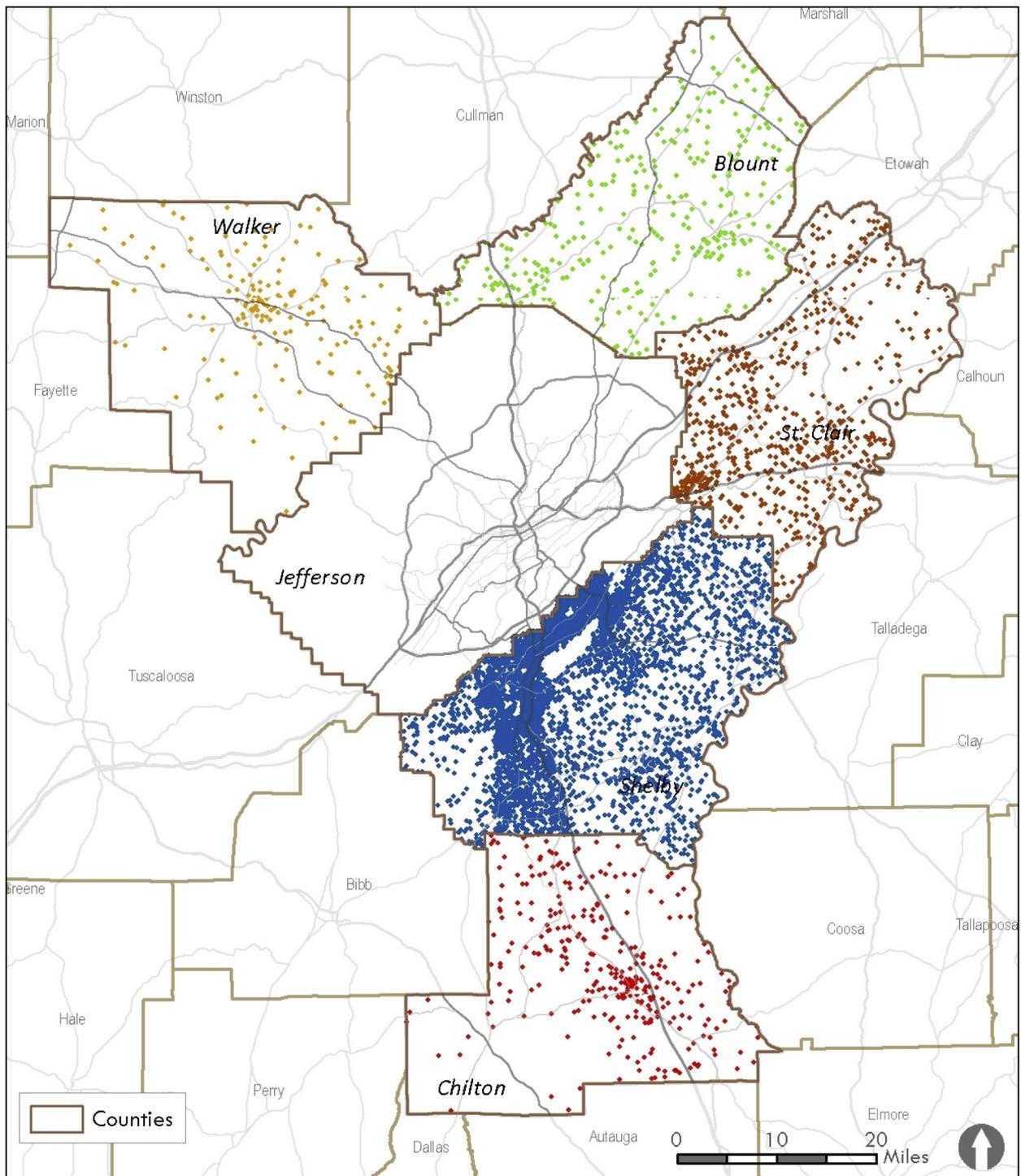


Figure 24. 2040 Employment Allocation, Full Region without County Control Totals

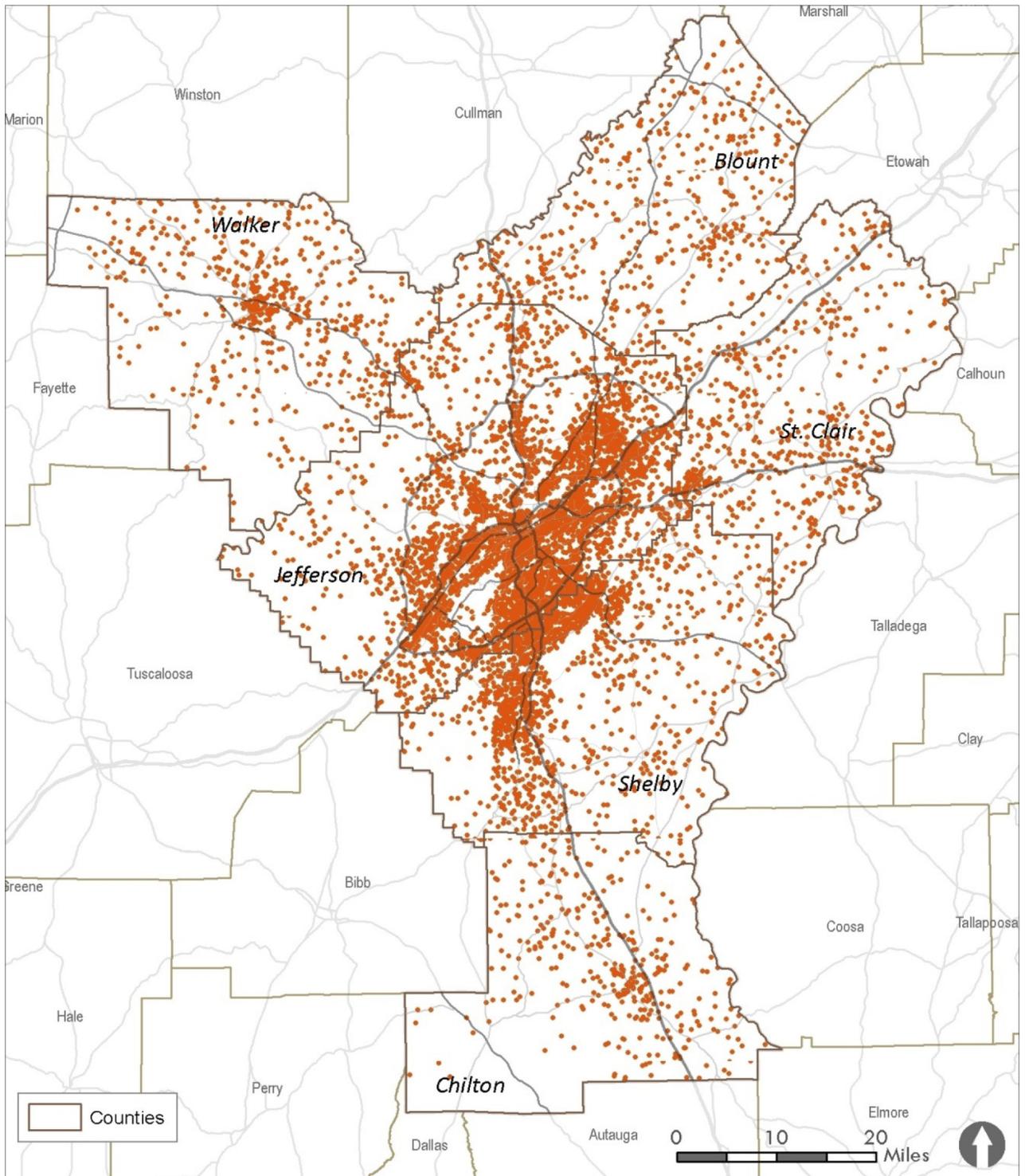


Figure 25. New 2040 Employment Allocation using County Control Totals

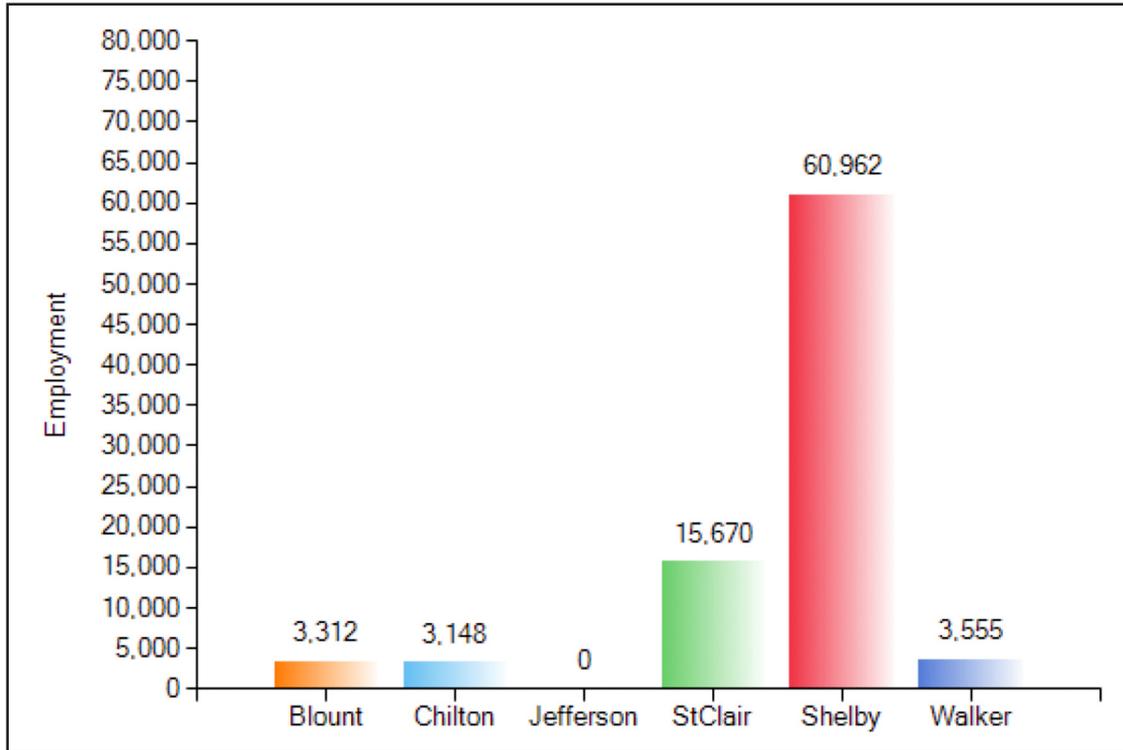
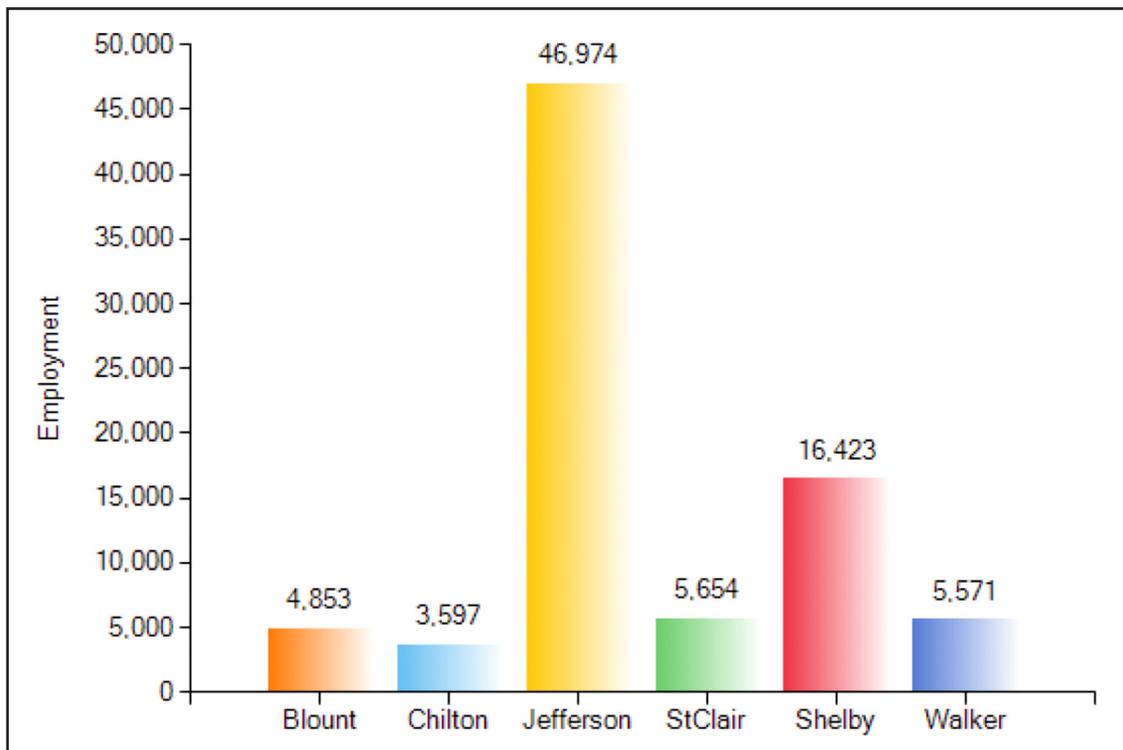


Figure 26. New 2040 Employment Allocation using Region-wide Control Totals



5.0 CONCLUSIONS

5.1 AVAILABILITY AND CAPACITY

Ample land availability and development capacity exists both at the individual county level as well as the regional level to easily accommodate projected development by 2040.

5.2 ALLOCATIONS

The allocation results and methods are valid within the confines of the control total assumptions. What the regional allocation shows is that if control totals are lifted, the central place attractiveness of existing density form future development patterns more inward than outward. The control-totals-by-county scenario ensures a trend pattern of outward growth from the urban core. Removal of the county control totals indicates that patterns are directed towards places of more recent growth, with current development densities and employment areas in an overall pattern that is generally more inward. In the absence of county control totals, the region-wide allocation more closely follows unconstrained suitability factors.

5.3 VARIABLES

The model architecture is generally in place and is in a position where variables can be changed or modified to produce different results. Below are some of the inputs and variables that if adjusted will yield changes in scenario assumptions.

5.3.1 PLACE TYPE DENSITY AND COMPOSITION

The existing place type palette has been calibrated to existing net densities, and to existing jobs and housing balance by Census Block Group. The range of densities and jobs balance have been carefully constructed around transects and jobs-housing balance of existing census data. In general there is a pretty high degree of confidence in the density and characteristics of the place type set.

5.3.2 PLACE TYPE ASSIGNMENT

The process of assigning a place type to a given Census Block Group was a pretty straightforward process for about 80% of the Census Block Groups. About 158 or 20% of the Block Groups in the process of place type assignment required some manual professional judgment calls. These are places that the combination of net activity unit density and jobs-housing balance did not fit neatly into one of the existing 24 place types. For example, there were 13 Block Groups that were more rural in character based on activity unit density, which had pockets of high employment resulting in a jobs-rich type classification. There was no jobs-rich T2 classification, so these were labeled as T2-Balanced (Suburban Institutional). Every effort was made to provide the closest, most reasonable match as possible.

5.3.3 SUITABILITY FACTORS

Suitability, if left unconstrained by factors such as control totals by county, are perhaps the biggest factor that will adjust future allocations. Future scenarios can be adjusted or composed by alerting the suitability or attractiveness assumptions. For example, if average sales or employment are not deemed to be as significant an attractor, they can be removed from the equation or lessened in weight. New factors can be introduced. There is a large difference between the county-control-totals allocation and the region-wide if you compare the summaries by county (see Figures 25 and 26, for example).

5.4 REFINEMENT OF MODEL AND SCENARIOS

It is possible that by further adjusting the scenario inputs, a more balanced vision of the future could be achieved. For example, suitability factors could be added, subtracted and/or re-weighted so the allocations more closely resemble the allocation to the county-control totals. This could be done by removing the employment centers factors and introducing more weight to high growth areas outside the urban core. However, the county-level control totals present an undesirable image of the future for some counties like Jefferson and Walker, so perhaps existing demographic forecasts should be re-evaluated. The demographic forecasts themselves are one component that could use some further evaluation and/or adjustment. The county level control totals could be adjusted to more closely match region-wide central place attractiveness forces. In short, it is possible to adjust model inputs to achieve a balance between outward and inward growth patterns. This can be done by adjusting the county control totals and/or suitability factors and weights. This model is designed to be used as an adjustment and scenario testing tool to develop, test and refine both scenarios and assumptions with the goal of achieving a better and more balanced vision for the future of the region.

5.4.1 MODEL LINKAGES

At present the model has not been linked to TAZ level travel demand model geographies or variables. However, there is a similarity between the TAZ and the Census Block Group geographies so building an associative link between these two geographies should not be a complex process. This way TAZ control totals for the future can be examined against alternative future allocations by housing unit or employment count.

It should be noted that residential units in the CV model are transect based and are not differentiated by housing type such as single family vs. multifamily. The same holds true for employment which is not differentiated by office, retail, industrial and other (ORIO), often required by travel demand models. These additional modeling steps could be introduced at a later time, but would require thinking through the place type composition to analyze the SF/MF residential type or the employment type balance for Census Block Groups.

6.0 COMMUNITYVIZ MODEL DOCUMENTATION

The following tables are report outputs from the CommunityViz model. They outline the Assumptions and Indicator. A brief explanation of CommunityViz definitions follows.

6.1 WHAT ARE SCENARIOS, ASSUMPTIONS, INDICATORS AND ATTRIBUTES?

An analysis contains one or more **scenarios**. Each scenario represents a different decision-making alternative. The first scenario in the analysis is called the base scenario. It can represent existing conditions, the primary proposal under evaluation, business as usual, or the first of several alternatives compared in an analysis.

An assumption is a value that is used as input to an analysis. It is usually changeable and applies to an entire scenario. Assumptions can be a way to express subjective inputs, such as how much weighting to give to a particular community value like open space or economic development.

Indicators are impact or performance measures that help people choose alternatives that best match their objectives or desired outcomes. An indicator is a calculated value that represents the impacts or outcomes of a scenario. An indicator might be used to evaluate costs, revenues, average household size, community benefit, or total daily auto trips.

An attribute is a piece of information describing a map feature. The attributes of a census tract, for example, might include its area, population, and average per capita income. Attributes can also be a characteristic of a geographic feature described by numbers, characters, images, and CAD drawings. For example, the attributes of a well might include depth and gallons per minute.

Figure 27. Assumption

Assumption	Default	Trend
Declining Weight	5	3.0
DU - Blount	8771	8,700
DU - Chilton	5180	5,200
DU - Jefferson	8043	8,000
DU - Regional	95978	96,000
DU - Shelby	50255	50,200
DU - St Clair	22057	22,000
DU - Walker	1672	1,700
EmpCenProx Weight	5	10.0
EmpCenters Weight	5	10.0
FAR-Blount	2649600	2,649,600
FAR-Chilton	2518400	2,518,400
FAR-Jefferson	0	0
FAR-Region	66457600	66,457,600
FAR-Shelby	48769600	48,769,600
FAR-StClair	12536000	12,536,000
FAR-Walker	2844000	2,844,000
Growth Weight	5	3.0
HiGrowth Weight	5	5.0
HiSales Weight	5	5.0
MajorRoads Weight	5	5.0
SqFt Per Employee	800	800

Figure 28. Assumption Descriptions

Assumption	Description
Declining Weight	Assumption weighting the relative importance of the suitability factor 'Declining'.
DU - Blount	New Dwelling Units Added from 2010 to 2040.
DU - Chilton	New Dwelling Units Added from 2010 to 2040.
DU - Jefferson	New Dwelling Units Added from 2010 to 2040.
DU - Regional	New Dwelling Units Added from 2010 to 2040. Region-wide.
DU - Shelby	New Dwelling Units Added from 2010 to 2040.
DU - St Clair	New Dwelling Units Added from 2010 to 2040.
DU - Walker	New Dwelling Units Added from 2010 to 2040.
EmpCenProx Weight	Assumption weighting the relative importance of the suitability factor 'EmpCenProx'.
EmpCenters Weight	Assumption weighting the relative importance of the suitability factor 'EmpCenters'.
FAR-Blount	2010-2040 non-res growth in sq ft calculated separately in spreadsheet SOR. Starting assumption was 800 sq ft per employee.
FAR-Chilton	2010-2040 non-res growth in sq ft calculated separately in spreadsheet SOR. Starting assumption was 800 sq ft per employee.
FAR-Jefferson	2010-2040 non-res growth in sq ft Calculated separately in spreadsheet SOR. Starting assumption was 800 sq ft per employee.
FAR-Region	Region-wide 2010-2040 non-res growth in sq ft calculated separately in spreadsheet SOR. Starting assumption was 800 sq ft per employee.
FAR-Shelby	2010-2040 non-res growth in sq ft calculated separately in spreadsheet SOR. Starting assumption was 800 sq ft per employee.
FAR-StClair	2010-2040 non-res growth in sq ft Calculated separately in spreadsheet SOR. Starting assumption was 800 sq ft per employee.
FAR-Walker	2010-2040 non-res growth in sq ft calculated separately in spreadsheet SOR. Starting assumption was 800 sq ft per employee.
Growth Weight	Assumption weighting the relative importance of the suitability factor Growth.
HiGrowth Weight	Assumption weighting the relative importance of the suitability factor HiGrowth.
HiSales Weight	Assumption weighting the relative importance of the suitability factor HiSales.
MajorRoads Weight	Assumption weighting the relative importance of the suitability factor MajorRoads.
SqFt Per Employee	Average sq ft per employee

Figure 29. Indicator

Indicator	Trend	Units
CI - School Children	43,336	school children
CI - Annual CO Auto Emissions	42,470,231	mile / gallons
CI - Annual CO2 Auto Emissions	832,406	tons
CI - Annual Hydrocarbon Auto Emissions	4,867,358	lbs
CI - Annual NOx Auto Emissions	3,131,696	mile / gallons
CI - Commercial Sq Feet	69,317,600	dwelling units
CI - Labor Force	145,475	workers
CI - New 2040 Employment	86,647	dwelling units
CI - Population	174,671	persons / household dwelling units
CI - Residential Dwelling Units	95,792	dwelling units
CI - Residential Energy Use	9,100,240	million btu / household / year dwelling units
CI - Residential Water Use	9,859,870,560	gallon / household / day dwelling units
CI - Vehicle Trips per Day	542,183	household vehicle trips / day dwelling units
Ctny DU 2040 - Blount	8,700	Summary of County DU Allocations
Ctny DU 2040 - Chilton	5,200	Summary of County DU Allocations
Ctny DU 2040 - Jefferson	8,000	Summary of County DU Allocations
Ctny DU 2040 - Shelby	50,200	Summary of County DU Allocations
Ctny DU 2040 - StClair	22,000	Summary of County DU Allocations
Ctny DU 2040 - Walker	1,700	Summary of County DU Allocations
Ctny Emp 2040 - Blount	3,312	Summary of County Emp Allocations
Ctny Emp 2040 - Chilton	3,148	Summary of County Emp Allocations
Ctny Emp 2040 - Jefferson	0	Summary of County Emp Allocations
Ctny Emp 2040 - Shelby	60,962	Summary of County Emp Allocations
Ctny Emp 2040 - StClair	15,670	Summary of County Emp Allocations
Ctny Emp 2040 - Walker	3,555	Summary of County Emp Allocations
Declining Max	1.00	Used in suitability calculations
Declining Min	0.00	Used in suitability calculations
DU Blount	8,700.00	DU
DU Chilton	5,200.00	DU
DU Jefferson	8,000.00	DU
DU Shelby	50,200.00	DU

Figure 29. Indicator (continued)

Indicator	Trend	Units
DU StClair	22,000.00	DU
DU Walker	1,700.00	DU
EmpCenProx Max	0.00	Used in suitability calculations
EmpCenProxMax MinDistance	-1.00	Used in suitability calculations
EmpCenProx Min	0.00	Used in suitability calculations
EmpCenters Max	1.00	Used in suitability calculations
EmpCenters Min	0.69	Used in suitability calculations
FAR-Blount	2,649,600.00	Com Sq Ft
FAR-Chilton	2,518,400.00	Com Sq Ft
FAR-Jefferson	0.00	Com Sq Ft
FAR-Region	66,457,600.00	Com Sq Ft
FAR-Shelby	48,769,600.00	Com Sq Ft
FAR-StClair	12,536,000.00	Com Sq Ft
FAR-Walker	2,844,000.00	Com Sq Ft
Growth Max	1.00	Used in suitability calculations
Growth Min	0.00	Used in suitability calculations
HiGrowth Max	1.00	Used in suitability calculations
HiGrowth Min	0.00	Used in suitability calculations
HiSales Max	1.00	Used in suitability calculations
HiSales Min	0.00	Used in suitability calculations
MajorRoads Max	51,710.69	Used in suitability calculations
MajorRoads Max MinDistance	51,710.69	Used in suitability calculations
MajorRoads Min	0.00	Used in suitability calculations
Proportional Declining Weight	0.07	Used in suitability calculations
Proportional EmpCenProx Weight	0.24	Used in suitability calculations
Proportional EmpCenters Weight	0.24	Used in suitability calculations
Proportional Growth Weight	0.07	Used in suitability calculations
Proportional HiGrowth Weight	0.12	Used in suitability calculations
Proportional HiSales Weight	0.12	Used in suitability calculations
Proportional MajorRoads Weight	0.12	Used in suitability calculations
Reg DU 2040 - Blount	5,450	Summary of DU Allocations (Regional CT)

Figure 29. Indicator (continued)

Indicator	Trend	Units
Reg DU 2040 - Chilton	4,134	Summary of DU Allocations (Regional CT)
Reg DU 2040 - Jefferson	54,941	Summary of DU Allocations (Regional CT)
Reg DU 2040 - Shelby	18,913	Summary of DU Allocations (Regional CT)
Reg DU 2040 - StClair	6,269	Summary of DU Allocations (Regional CT)
Reg DU 2040 - Walker	6,293	Summary of DU Allocations (Regional CT)
Reg Emp 2040 - Blount	4,853	Summary of EMP Allocations (Regional CT)
Reg Emp 2040 - Chilton	3,597	Summary of EMP Allocations (Regional CT)
Reg Emp 2040 - Jefferson	46,974	Summary of EMP Allocations (Regional CT)
Reg Emp 2040 - Shelby	16,423	Summary of EMP Allocations (Regional CT)
Reg Emp 2040 - StClair	5,654	Summary of EMP Allocations (Regional CT)
Reg Emp 2040 - Walker	5,571	Summary of EMP Allocations (Regional CT)
Regional	96,000.00	Summary of DU Allocations (Regional CT)
Suitability Max	92.68	Used in suitability calculations
Suitability Min	51.22	Used in suitability calculations
Sum DU 40 Total	95,800.00	DU
Total Suitability Weights	41.00	

Figure 30. Indicator Descriptions

Indicator	Description
CI - School Children	Total number of school children living in the dwelling units in the buildings layer. See Help for details and disclaimer.
CI - Annual CO Auto Emissions	Total carbon monoxide emissions generated by vehicles associated with residential buildings in the Common Impacts buildings layer. See Help for details and disclaimer.
CI - Annual CO ₂ Auto Emissions	Total carbon dioxide emissions generated by vehicles associated with residential buildings in the Common Impacts buildings layer. See Help for details and disclaimer.
CI - Annual Hydrocarbon Auto Emissions	Total hydrocarbon emissions generated by vehicles associated with residential buildings in the Common Impacts buildings layer. See Help for details and disclaimer.
CI - Annual NO _x Auto Emissions	Total emissions of oxides of nitrogen generated by vehicles associated with residential buildings in the Common Impacts buildings layer. See Help for details and disclaimer.
CI - Commercial Sq Feet	Total number new commercial square feet
CI - Labor Force	Total number of jobholders living in the dwelling units in the Common Impacts building layer. See Help for details and disclaimer.
CI - New 2040 Employment	New Employment in 2040
CI - Population	Total number of people living in the dwelling units in the Common Impacts building layer. See Help for details and disclaimer.
CI - Residential Dwelling Units	Total number of residential dwelling units in the Common Impacts building layer.
CI - Residential Energy Use	Total annual energy used by residential buildings for all applications, including electricity and heating. See Help for details and disclaimer.
CI - Residential Water Use	Total annual water use by dwelling units in the Common Impacts building layer for all indoor and outdoor applications. See Help for details and disclaimer.
CI - Vehicle Trips per Day	Total number of motorized trips taken each day, on average, by residential households (dwelling units) in the Common Impacts buildings layer. See Help for details and disclaimer.
Ctny DU 2040 - Blount	Summary of new 2040 dwelling units with allocations performed using county control totals

Figure 30. Indicator Descriptions (continued)

Indicator	Description
Ctny DU 2040 - Chilton	Summary of new 2040 dwelling units with allocations performed using county control totals
Ctny DU 2040 - Jefferson	Summary of new 2040 dwelling units with allocations performed using county control totals
Ctny DU 2040 - Shelby	Summary of new 2040 dwelling units with allocations performed using county control totals
Ctny DU 2040 - StClair	Summary of new 2040 dwelling units with allocations performed using county control totals
Ctny DU 2040 - Walker	Summary of new 2040 dwelling units with allocations performed using county control totals
Ctny Emp 2040 - Blount	Summary of new 2040 employment with allocations performed using county control totals
Ctny Emp 2040 - Chilton	Summary of new 2040 employment with allocations performed using county control totals
Ctny Emp 2040 - Jefferson	Summary of new 2040 employment with allocations performed using county control totals
Ctny Emp 2040 - Shelby	Summary of new 2040 employment with allocations performed using county control totals
Ctny Emp 2040 - StClair	Summary of new 2040 employment with allocations performed using county control totals
Ctny Emp 2040 - Walker	Summary of new 2040 employment with allocations performed using county control totals
Declining Max	Intermediate variable for calculating the Suitability Factor, 'Declining' used in the Suitability Measure, 'Suitability'.
Declining Min	Intermediate variable for calculating the Suitability Factor, 'Declining' used in the Suitability Measure, 'Suitability'.
DU Blount	Allocator wizard - DU in 2040 allocated to individual county CBG.
DU Chilton	Allocator wizard - DU in 2040 allocated to individual county CBG.

Figure 30. Indicator Descriptions (continued)

Indicator	Description
DU Jefferson	Allocator wizard - DU in 2040 allocated to individual county CBG.
DU Shelby	Allocator wizard - DU in 2040 allocated to individual county CBG.
DU StClair	Allocator wizard - DU in 2040 allocated to individual county CBG.
DU Walker	Allocator wizard - DU in 2040 allocated to individual county CBG.
EmpCenProx Max	Intermediate variable for calculating the Suitability Factor, 'EmpCenProx' used in the Suitability Measure, 'Suitability'.
EmpCenProx Max MinDistance	Intermediate variable for calculating the Suitability Factor, 'EmpCenProx' used in the Suitability Measure, 'Suitability'.
EmpCenProx Min	Intermediate variable for calculating the Suitability Factor, 'EmpCenProx' used in the Suitability Measure, 'Suitability'.
EmpCenters Max	Intermediate variable for calculating the Suitability Factor, 'EmpCenters' used in the Suitability Measure, 'Suitability'.
EmpCenters Min	Intermediate variable for calculating the Suitability Factor, 'EmpCenters' used in the Suitability Measure, 'Suitability'.
FAR-Blount	Allocator wizard - New Sq Ft in 2040 allocated to individual county CBG.
FAR-Chilton	Allocator wizard - New Sq Ft in 2040 allocated to individual county CBG.
FAR-Jefferson	Allocator wizard - New Sq Ft in 2040 allocated to individual county CBG.
FAR-Region	Allocator wizard - New Sq Ft in 2040 allocated to whole region using regional control total
FAR-Shelby	Allocator wizard - New Sq Ft in 2040 allocated to individual county CBG.
FAR-StClair	Allocator wizard - New Sq Ft in 2040 allocated to individual county CBG.

Figure 30. Indicator Descriptions (continued)

Indicator	Description
FAR-Walker	Allocator wizard - New Sq Ft in 2040 allocated to individual county CBG.
Growth Max	Intermediate variable for calculating the Suitability Factor, 'Growth' used in the Suitability Measure, 'Suitability'.
Growth Min	Intermediate variable for calculating the Suitability Factor, 'Growth' used in the Suitability Measure, 'Suitability'.
HiGrowth Max	Intermediate variable for calculating the Suitability Factor, 'HiGrowth' used in the Suitability Measure, 'Suitability'.
HiGrowth Min	Intermediate variable for calculating the Suitability Factor, 'HiGrowth' used in the Suitability Measure, 'Suitability'.
HiSales Max	Intermediate variable for calculating the Suitability Factor, 'HiSales' used in the Suitability Measure, 'Suitability'.
HiSales Min	Intermediate variable for calculating the Suitability Factor, 'HiSales' used in the Suitability Measure, 'Suitability'.
MajorRoads Max	Intermediate variable for calculating the Suitability Factor, 'MajorRoads' used in the Suitability Measure, 'Suitability'.
MajorRoads Max MinDistance	Intermediate variable for calculating the Suitability Factor, 'MajorRoads' used in the Suitability Measure, 'Suitability'.
MajorRoads Min	Intermediate variable for calculating the Suitability Factor, 'MajorRoads' used in the Suitability Measure, 'Suitability'.
Proportional Declining Weight	Assumption weighting the relative importance of the suitability factor 'Declining'.
Proportional EmpCenProx Weight	Assumption weighting the relative importance of the suitability factor 'EmpCenProx'.
Proportional EmpCenters Weight	Assumption weighting the relative importance of the suitability factor 'EmpCenters'.
Proportional Growth Weight	Assumption weighting the relative importance of the suitability factor 'Growth'.
Proportional HiGrowth Weight	Assumption weighting the relative importance of the suitability factor 'HiGrowth'.

Figure 30. Indicator Descriptions (continued)

Indicator	Description
Proportional HiSales Weight	Assumption weighting the relative importance of the suitability factor 'HiSales'.
Proportional MajorRoads Weight	Assumption weighting the relative importance of the suitability factor 'MajorRoads'.
Reg DU 2040 - Blount	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg DU 2040 - Chilton	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg DU 2040 - Jefferson	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg DU 2040 - Shelby	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg DU 2040 - StClair	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg DU 2040 - Walker	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg Emp 2040 - Blount	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg Emp 2040 - Chilton	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg Emp 2040 - Jefferson	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg Emp 2040 - Shelby	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg Emp 2040 - StClair	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Reg Emp 2040 - Walker	Summary of new 2040 dwelling units with allocations performed using region-wide control total.
Suitability Max	Intermediate variable for calculating the Suitability Factor, 'Suitability' used in the Suitability Measure, 'Suitability'.

Figure 30. Indicator Descriptions (continued)

Indicator	Description
Suitability Min	Intermediate variable for calculating the Suitability Factor, 'Suitability' used in the Suitability Measure, 'Suitability'.
Sum DU 40 Total	Sum of county level control total allocations
Total Suitability Weights	'Suitability' suitability analysis value