

Historic Growth Memorandum

For

Complete 540 – Triangle Expressway Southeast Extension

DRAFT



Wake and Johnston Counties

STIP Nos. R-2721, R-2828, R-2829

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I N T E R N A T I O N A L

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Executive Summary

The North Carolina Department of Transportation (NCDOT) and the Federal Highway Administration (FHWA) propose to build a new, full-control of access highway from NC 55 Bypass in Apex to the US 64/US 264 Bypass (I-495) in Knightdale, a distance of approximately 28 miles. This proposed highway, known as Complete 540 – Triangle Expressway Southeast Extension, is proposed as a toll facility.

This memo was developed to examine historic demographic trends that may influence existing or future regional population and employment growth trends. Most of these historic growth trends are not directly related to transportation infrastructure, and examining them may indicate likely growth patterns that would occur with or without a specific roadway project. Growth trends were examined for the Raleigh-Durham-Chapel Hill, NC Combined Statistical Area (CSA) and the Complete 540 Future Land Use Study Area (FLUSA) for recent reporting periods beginning in 1990.

This region, also known more informally as the Research Triangle Region, has unique economic drivers that have created economic success and continue to foster growth. The three major universities in the region, University of North Carolina at Chapel Hill, North Carolina State University, and Duke University, formed the Research Triangle Park (RTP) in 1959 to link their talent and resources with public- and private-sector research entities and companies focused on innovation. Over 250 businesses employing over 50,000 people are currently located in RTP, the nation's largest research park. Areas of specialization include biotechnology and information technology, and the region's research and partnerships also support a world-class medical community. Further, in addition to all the employment generated to serve a region of over 1 million population with education, social services, retail, and other services, regional employment is also boosted by the presence of the State government in Raleigh.

CSA and FLUSA level data show a pattern of sustained population and employment growth and increases in population density in addition to a concentration of recent growth within Wake County. The other FLUSA counties (Harnett and Johnston) also show strong growth and are projected to increase in population through 2035. Growth indicators at the CSA level, namely employment, average household size, educational attainment, median income, and school quality indicate that growth will very likely continue in the counties comprising the project FLUSA. Analysis of population, population density, average household size, school quality, and commute in the FLUSA counties at the sub-county level further indicates growth is likely within the FLUSA.

The FLUSA area has both positive and negative indicators for growth compared to the other zones in the three-county study area. Within the FLUSA counties, growth indicators suggest that much of the future population growth will occur within Wake County. Population densities are still relatively low outside of the urban core of the City of Raleigh, leaving ample room for additional growth in the suburban and rural portions of the county. In particular, population density is relatively low in the FLUSA, suggesting that there may be land available for development. With higher median household income and a greater perceived school quality than neighboring counties, many new residents and potential homebuyers would be attracted to Wake County. School quality appears to be highest in central, western and northern Wake. Northern Harnett County and eastern Johnston County appear to have some positive growth factors, particularly the relatively low population densities and increases in employment and median income. Johnston County appears to have a higher quality school district, and would therefore be more likely to attract growth, relative to Harnett County.

Introduction

The North Carolina Department of Transportation (NCDOT) and the Federal Highway Administration (FHWA) propose to build a new, full-control of access highway from NC 55 Bypass in Apex to the US 64/US 264 Bypass (I-495) in Knightdale, a distance of approximately 28 miles. This proposed highway, known as Complete 540 – Triangle Expressway Southeast Extension, is proposed as a toll facility.

The project is located within the greater Raleigh area, known as the Research Triangle Region, which includes Raleigh, Durham, Chapel Hill, and the surrounding counties. The Research Triangle refers to the three premier universities in the region, University of North Carolina in Chapel Hill, North Carolina State University in Raleigh, and Duke University in Durham. Raleigh is both the state capital and the seat of Wake County. Durham is the county seat of Durham County and Chapel Hill is the largest city in Orange County. More specifically, the project would be located in southern Wake County and western Johnston County.

The Research Triangle region is known for its medical, technology, and education economic clusters.¹ It contains the largest research business park in the U.S. (Research Triangle Park or RTP) and has spent decades harnessing the synergy between the three premier universities in the region, public sector research, and private sector research and development. RTP alone hosts over 250 businesses employing over 50,000 people, with over 3,000 patents awarded to RTP tenants since 1970². The region ranks 5th in educational attainment among 36 comparable regions, with about half of residents attaining a Bachelor's Degree or higher, and nearly 1 in 5 residents holding a graduate degree.³

The purpose of this memo is to examine historic trends in population and employment growth, along with other changes in demographic factors, which may affect existing or future regional population and employment growth trends. Information about the region's economic drivers and notable trends related to growth are also provided to add context to the regional and study area trend analysis. Most of these historic growth trends are not directly related to transportation infrastructure, and examining them may indicate likely growth patterns that would occur with or without a specific roadway project. This memo examines population growth, population density, average household size, educational attainment, median income, employment, school quality, and commute time to understand the historic growth trends and to assess what these trends and factors suggest about growth trends in the future. These factors were chosen based on readily available historic data from state and federal resources. In addition, as described in subsequent sections of this memo, research indicates that these factors may help explain past and future growth trends.

Methodology and Region Definition

The US Census includes Raleigh and the surrounding area in multiple geographies. This memo is concerned with the following geographies:

- Raleigh-Cary, NC Metropolitan Statistical Area (MSA), defined by the US Census Bureau as Franklin, Johnston, and Wake counties; and
- Raleigh-Durham-Chapel Hill, NC Combined Statistical Area (CSA), defined by the US Census Bureau as Franklin, Johnston, Wake, Chatham, Durham, Granville, Harnett, Lee, Orange, Person, and Vance counties.

¹ Research Triangle Regional Partnership n.d.

² The Research Triangle Park, 2017.

³ Ibid

Prior to initiating studies of potential Indirect and Cumulative Effects (ICE), NCDOT and FHWA, in consultation with resource agencies, defined a Future Land Use Study Area (FLUSA). The FLUSA is the area surrounding the proposed Complete 540 project that may be affected as a result of the project in combination with other public and private development projects (see Figure 1), and includes parts of Harnett, Johnston, and Wake counties. The FLUSA was identified in the Qualitative ICE Report and will continue to be the main study area in the analysis of the Quantitative ICE Report to be conducted for the Final Environmental Impact Statement (EIS) for the proposed roadway.⁴

The MSA regional definition does not include Harnett County; using the MSA designation as the basis for the regional analysis would ignore a part of the FLUSA. In addition, the Triangle Region is an interconnected and polycentric metropolitan region and limiting the regional analysis to the MSA would exclude key counties, such as Durham and Orange counties, from the analysis. Therefore, this memo uses the CSA definition of the region as the basis for evaluating historic growth patterns across the larger Raleigh-Durham-Chapel Hill area.

In addition to analyzing growth and trends over time at a regional level, this memo examines growth and trends at a sub-county level among the three counties comprising the FLUSA, where such information is available. Sub-county zones (called Census regions in this memo) were established based on block group boundaries created by the US Census Bureau (see Figure 2). Block group boundaries often change with each decennial census. For this reason, only boundaries that remained constant between the 1990, 2000, and 2010 Censuses were used to develop the Census regions. The zones defined are aggregations of Census block groups, but the specific block groups vary for each census year.

This memo only analyzes trends at the Census region level for the three counties in the FLUSA region (Harnett, Johnston, and Wake), rather than all counties in the CSA. Census regions include the first letter of the county name and a number. Eight Census regions are within the FLUSA boundary. These are Zone H1, Zone J1, Zone J5, Zone W1, Zone W3, Zone W4, Zone W6 and Zone W8. Table 1 provides the percentage of each Census region within the FLUSA boundary.

⁴ H.W. Lochner, Inc. 2014

Table 1: Census Regions within the FLUSA Boundary

Census Region	Within FLUSA Boundary	% of Zone within FLUSA Boundary
Harnett		
Zone H1	Yes	13
Zone H2	No	0
Zone H3	No	0
Zone H4	No	0
Johnston		
Zone J1	Yes	78
Zone J2	No	0
Zone J3	No	0
Zone J4	No	0
Zone J5	Yes	14
Wake		
Zone W1	Yes	<1
Zone W2	No	0
Zone W3	Yes	83
Zone W4	Yes	45
Zone W5	No	0
Zone W6	Yes	82
Zone W7	No	0
Zone W8	Yes	1

Figure 1: FLUSA and MSA Location

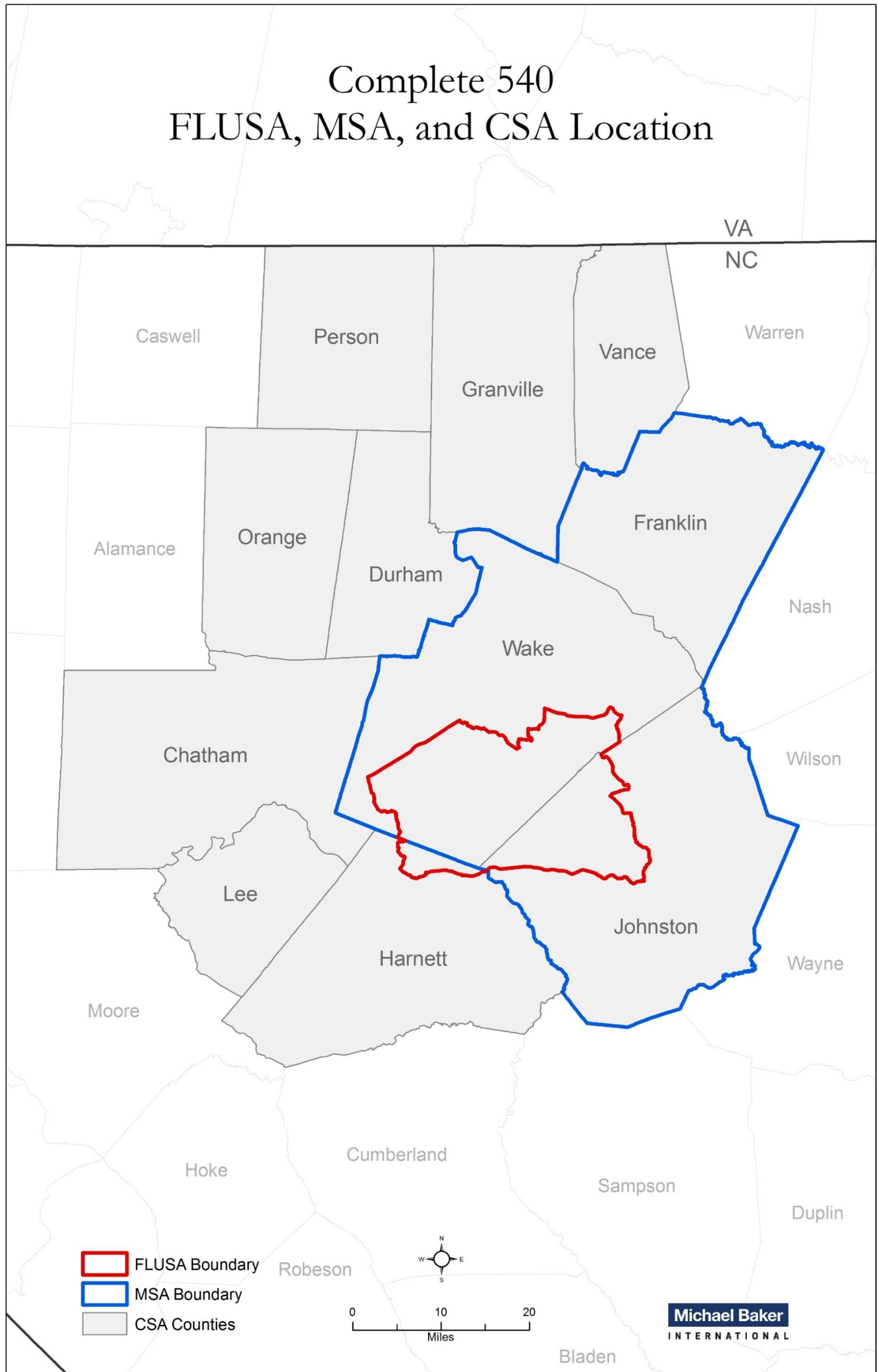
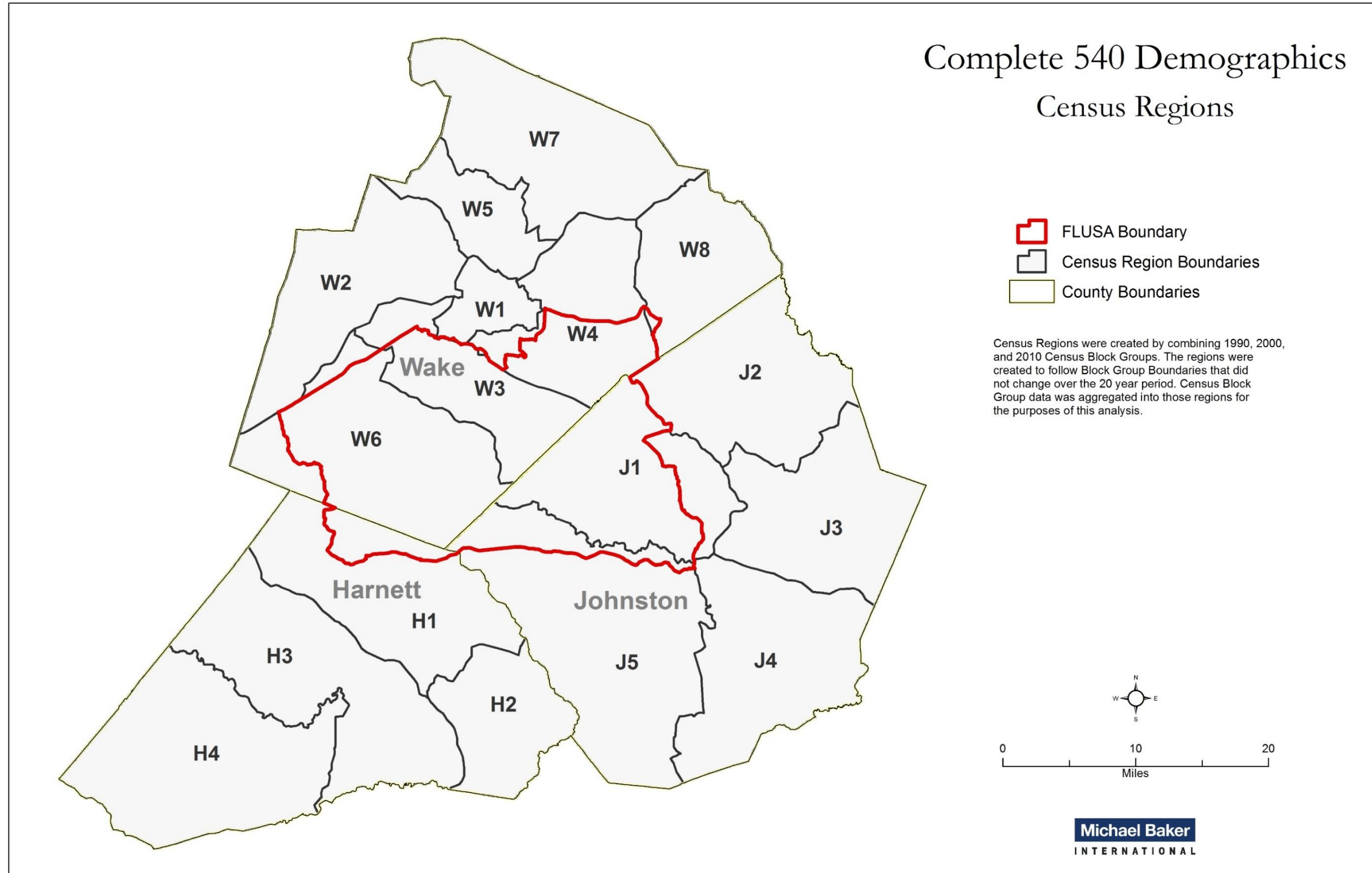


Figure 2: FLUSA Census Regions



Population

Regional Trends

Both historic population data from the US Census and population forecasts produced by the North Carolina Office of State Budget and Management (NCOSBM) State Demographics branch show a pattern of high population growth in the CSA from 1990 to 2010 that is anticipated to continue into 2035. As shown in Table 2, between 1990 and 2000, the CSA grew by 36 percent; followed by a growth of 31 percent between 2000 and 2010. Overall, the population of the CSA grew by 78 percent between 1990 and 2010. Wake County had the highest overall population in 1990, 2000, and 2010.

The counties that have historically experienced the greatest growth rates are Wake and Johnston counties, at 113 percent and 108 percent growth, respectively, from 1990 to 2010. While every county in the CSA experienced growth, Lee, Person, and Vance counties grew more slowly than the CSA as a whole. Between 1990 and 2010, the population grew by 40 percent in Lee County, 31 percent in Person County, and 17 percent in Vance County. Figure 3 illustrates the population growth rate trends within the CSA.

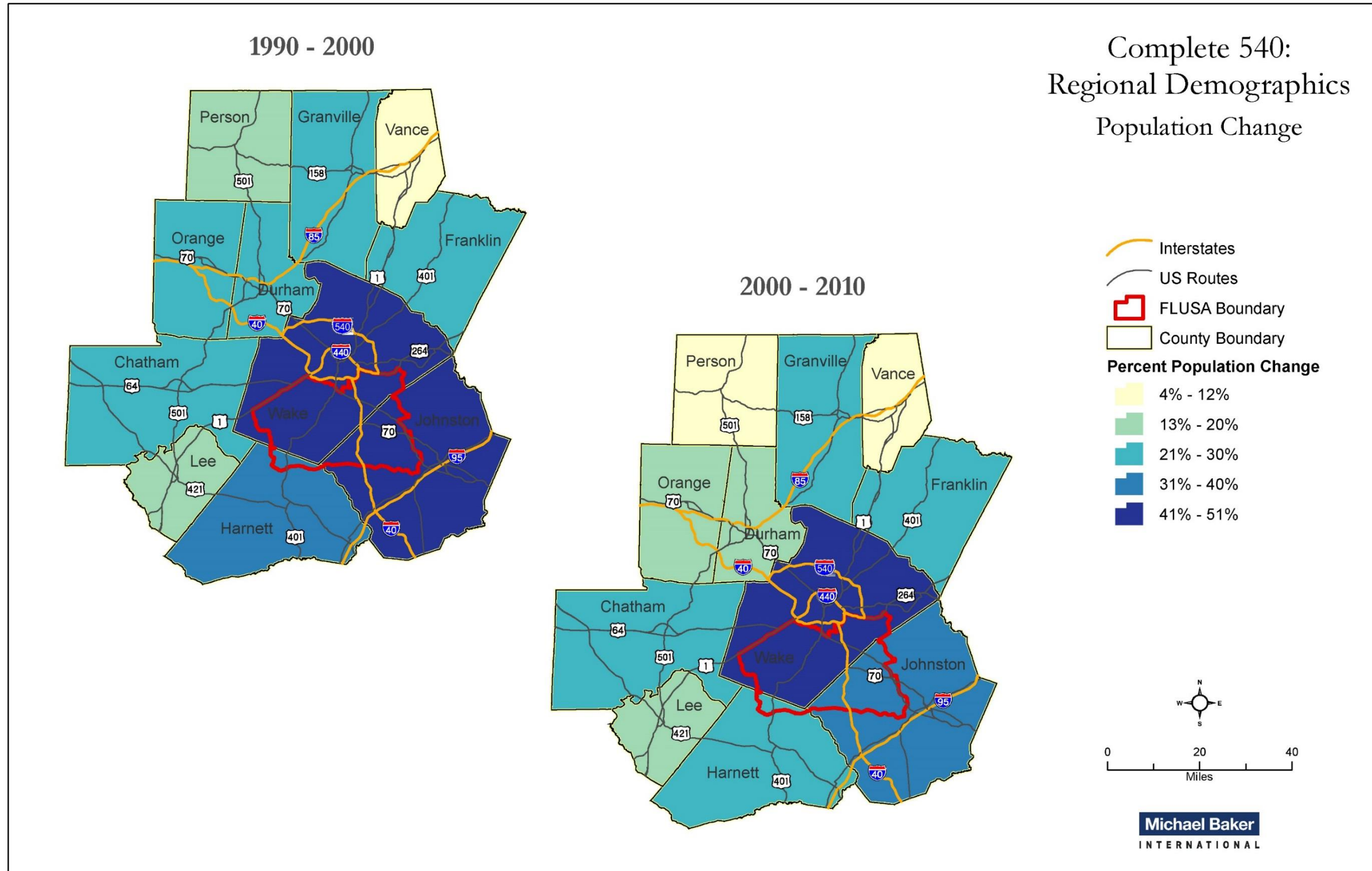
Analyzing county growth as a percent of the CSA shows the distribution of population growth across the CSA. This is reflected in the Table 2 column “County Share of CSA Population Growth (%) 1990-2010.” Historically, Wake County captured the greatest percentage of CSA population growth, accounting for 57 percent of growth between 1990 and 2010. Durham and Johnston counties both captured 10 percent of CSA population growth.

Table 2: Population Changes for Raleigh-Durham-Chapel Hill, NC CSA Counties

County	Population					
	1990	2000	2010	1990-2010 Growth	% Growth 1990-2010	County Share of CSA Population Growth (%) 1990 - 2010
FLUSA Counties						
Harnett	67,822	91,025	114,678	46,856	69	6
Johnston	81,306	121,965	168,878	87,572	108	10
Wake	423,380	627,846	900,993	477,613	113	57
Remaining CSA Counties						
Chatham	38,759	49,329	63,505	24,746	64	3
Durham	181,835	223,314	267,587	85,752	47	10
Franklin	36,414	47,260	60,619	24,205	66	3
Granville	38,345	48,498	59,916	21,571	56	3
Lee	41,374	49,040	57,866	16,492	40	2
Orange	93,851	118,227	133,801	39,950	43	5
Person	30,180	35,623	39,464	9,284	31	1
Vance	38,892	42,954	45,422	6,530	17	1
CSA Total	1,072,158	1,455,081	1,912,729	840,571	78	-

Source: US Decennial Census, Summary File 1, Table P1, 1990, 2000 and 2010.
Percentages are rounded and the sum may not equal 100%.

Figure 3: Regional Population Trends



Based on forecasts produced by the State Demographics branch, these population growth patterns are anticipated to continue (see Table 3). Overall, the population of the CSA is forecast to grow by 46 percent between 2010 and 2035, a 2 percent annual growth rate. According to forecasts, Johnston County will experience the highest percentage of population growth during that period, eclipsing Wake County. However, this difference is largely a function of the smaller population base in Johnston County. Wake County will experience the second highest percentage growth between 2010 and 2035.

Forecasts indicate that historic trends in the distribution of regional growth by county will continue between 2010 and 2035. As shown in Table 3, Wake County is forecast to capture 57 percent of the regional population growth from 2010 to 2035, while Durham County is forecast to capture 16 percent. Johnston County is forecast to capture 11 percent of CSA growth, while Harnett County is expected to capture 7 percent. Forecasts anticipate that Granville, Lee, and Person counties will capture less than 5 percent of the region’s growth. Vance County is forecast to lose population between 2010 and 2035.

Table 3: Population Forecasts for Raleigh-Durham-Chapel Hill, NC CSA Counties

County	Population					
	2010	2020	2035	2010-2035 Growth	% Growth 2010-2035	County Share of CSA Population Growth (%) 1990 -2010
FLUSA Counties						
Harnett	115,724	139,259	173,080	57,356	50	7
Johnston	169,612	201,850	263,815	94,203	56	11
Wake	906,910	1,105,706	1,406,726	499,816	55	57
Remaining CSA Counties						
Chatham	63,786	75,494	92,418	28,632	45	3
Durham	271,303	325,799	408,936	137,633	51	16
Franklin	60,823	66,881	76,008	15,185	25	2
Granville	57,599	59,236	62,100	4,501	8	1
Lee	57,879	59,242	59,363	1,484	3	0
Orange	134,053	149,922	174,888	40,835	30	5
Person	39,428	39,588	40,071	643	2	0
Vance	45,314	44,847	44,775	-539	-1	0
Regional Total	1,922,431	2,267,824	2,802,180	879,749	46	-

Source: NCOSBM State Demographics, last updated October 8, 2015

Note: 1) Based on estimated populations in July of that year. 2) Regional Total % may not sum to 100% due to rounding.

Current population forecasts predict continued growth for the majority of CSA counties. Historic population data shows a pattern of high growth, which forecasts indicate will continue at a more modest rate from 2010 to 2035. Wake and Johnston counties are forecast to capture the highest percentage of population growth in the CSA and Wake County is expected to continue to capture the majority of the region’s growth.

FLUSA Trends

When analyzing population data for the FLUSA counties, growth varies within each county. Table 4 further outlines population trends within the FLUSA. Harnett County experienced the least growth and the lowest growth rate among the FLUSA counties, growing at 69 percent between 1990 and 2010. During this time, the population distribution shifted within the county. In 1990, Zone H2, in the eastern section of the county, had the highest population. By 2010, Zone H4, the southern portion bordering the

Fayetteville and Fort Bragg areas in Cumberland County, had the largest share of the county population, growing by 157 percent since 1990. Population in Zone H1, which borders Wake County, grew by 91 percent in the same period. As seen in Figure 4, population increased in the northern and southern sections of the county (Zones H1 and H4). Zone H2 and Zone H3 grew at a slower pace than the other two zones and had lower populations in the 2010 Census.

Johnston County also experienced a shift in population distribution during this period. Historical Census data indicates that the population shifted from a relatively even distribution across the county to a more concentrated population along the Wake-Johnston border.

In 1990, Zone J1, Zone J3, and Zone J5 in the western, eastern, and southern areas of Johnston County, respectively, had similar total populations. Between 1990 and 2010, the population of Zone J1 more than doubled (growing by 41,805). By 2010, Zone J1 had the highest population in the county (62,053). Zone J2, which also borders Wake County, also doubled in population. This zone experienced the fastest growth, 215 percent. Zone J5, which includes part of the southern portion of the FLUSA experienced a 90 percent growth rate between 1990 and 2010.

Table 4: Population Growth in FLUSA Counties

County	1990	2000	Population		% Growth 1990-2010
			2010	1990-2010 Growth	
Harnett	67,822	91,025	114,678	46,856	69
Zone H1	16,164	24,064	30,931	14,767	91
Zone H2	23,018	23,881	24,358	1,340	6
Zone H3	12,585	16,416	18,098	5,513	44
Zone H4	16,055	26,664	41,291	25,236	157
Johnston	81,306	121,965	168,878	87,572	108
Zone J1	20,248	38,995	62,053	41,805	206
Zone J2	8,591	15,474	27,070	18,479	215
Zone J3	20,122	24,354	26,199	6,077	30
Zone J4	11,404	12,968	13,845	2,441	21
Zone J5	20,941	30,174	39,711	18,770	90
Wake	423,380	627,846	900,993	477,613	113
Zone W1	86,516	94,597	103,454	16,938	20
Zone W2	44,531	100,307	177,512	132,981	298
Zone W3	70,353	92,540	109,933	39,580	56
Zone W4	46,854	74,895	124,867	78,013	166
Zone W5	94,928	117,138	126,772	31,844	34
Zone W6	32,497	66,915	114,625	82,128	252
Zone W7	30,271	59,008	116,664	86,393	285
Zone W8	17,430	22,446	27,166	9,736	56

Source: US Decennial Census, Summary File 1, Table P1, 1990, 2000 and 2010

Notes: 1) Population totals for Harnett County in 1990 and 2000 vary slightly from the *Indirect and Cumulative Effects Report* by H.W. Lochner, Inc. The difference in population is 11 people and 4 people lower, respectively. There is no clear reason for this small difference as this memo and the Lochner report used official US Census Bureau data collected from authoritative sources. 2) FLUSA Census regions are shown in **bold**.

In 1990, the population in Wake County was concentrated in and around the City of Raleigh, which is mostly included in Zone W1, with portions in FLUSA area Zones W3 and W4. However, during the following two decades Wake County experienced high population growth and much of that growth occurred in surrounding zones. By 2010, population in Wake County was more evenly distributed across

the county. According to the 2010 Census, all but one zone (Zone W8) in Wake County had populations over 100,000. During this period Zone W6 experienced an exceptionally high growth rate (252 percent). Both Zones W6 and W8 are FLUSA zones. Zones W3 and W4 grew by 56 percent and 166 percent, respectively.

To summarize, Census data show Wake County was and continues to be the dominant population center in the region. The FLUSA counties, Harnett, Johnston, and Wake, had the highest percent growth in the CSA from 1990 to 2010. Population projections indicate that FLUSA counties are likely to grow at a rate higher than the CSA average through 2035. Zones within Harnett and Johnston Counties that are part of the FLUSA experienced substantial growth between 1990 and 2010. While growth within Wake County was more variable, Zones W3, W4, and W6, which include the majority of the FLUSA in Wake County, had growth rates of 56 percent, 166 percent, and 252 percent, respectively.

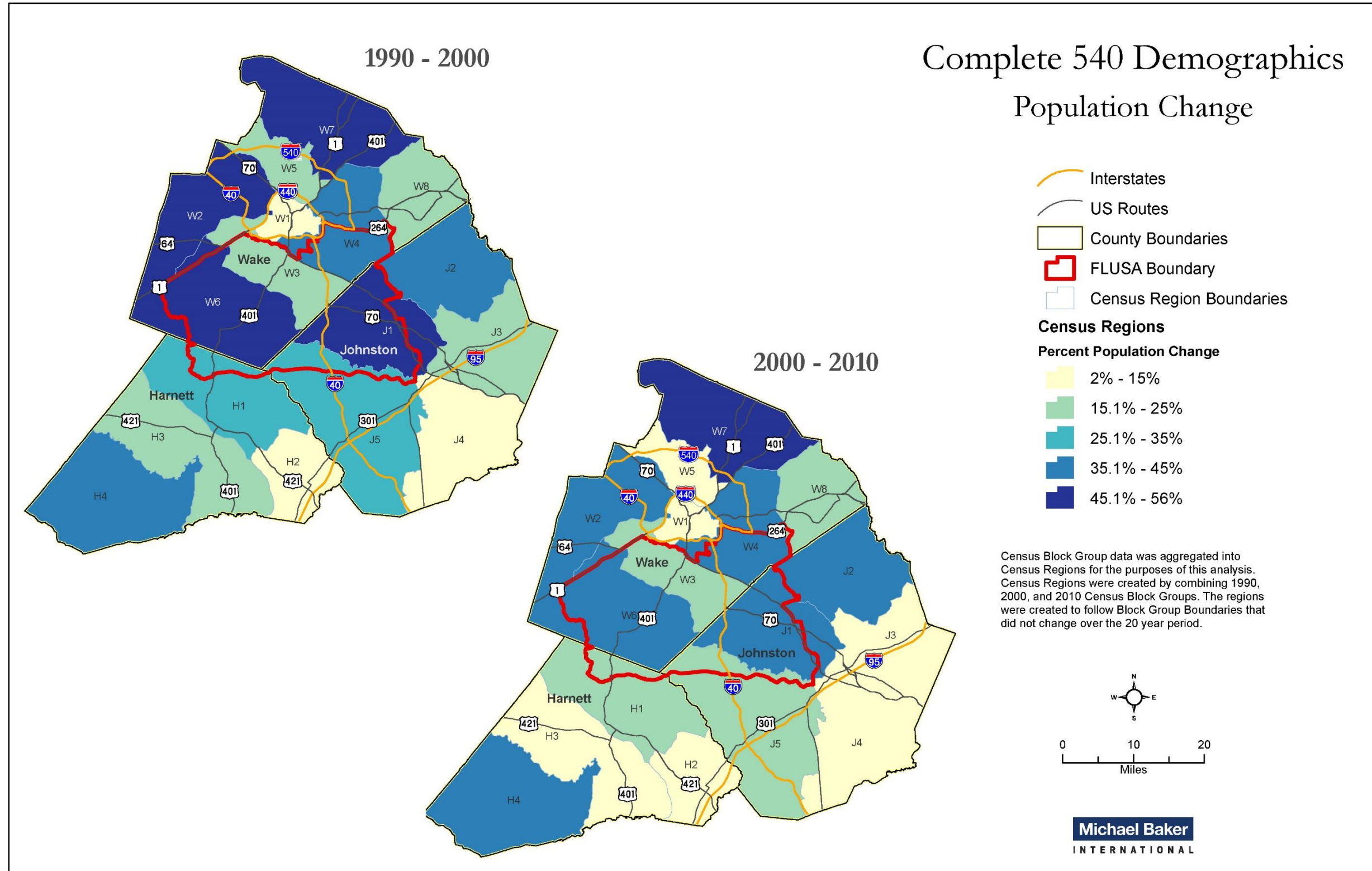
The population growth trends during and after the recession that began in late 2008 are also relevant to an understanding of growth trends in the FLUSA. Historical data taken from the ACS shows continual population growth in Harnett, Johnston, and Wake Counties over the last decade. The year of slowest growth occurred between 2009 and 2010 when the population grew by only 2.3 percent -- Harnett County's by less than one percent. Between 2010 and 2015 the three counties experienced a combined growth of 14 percent. The FLUSA experienced an even larger growth during the same period of approximately 18 percent. The robust growth of the FLUSA counties and the FLUSA itself during and after the recession suggests the area has highly resilient drivers of growth.

Table 5: Population Growth Trends in the FLUSA since 2009

County	Population						
	2009	2010	2012	2015	% Growth 2009-2010	CAGR 2010-2015	% Growth 2010-2015
Harnett	108,885	109,031	115,559	124,320	0.1	2.7	14
Johnston	156,888	160,675	169,122	178,396	2.4	2.1	11
Wake	828,759	850,546	905,573	976,019	2.6	2.8	15
Total	1,094,532	1,120,252	1,190,254	1,278,735	2.3	2.7	14
FLUSA	N/A	256,959	278,436	303,383	N/A	3.4	18

Source: US Census American Community Survey, Five Year, Table S0101

Figure 4: Population Changes in the FLUSA Counties



Population Density

Regional Trends

Population density is the number of people per square mile. Changes in population density over time often show similar patterns as population growth, but can also be a helpful indicator of the availability of land for future development. Where population density is particularly high, it suggests that there is less land available for development; therefore, the area may see slower growth in the future.

Census data show a pattern of increasing population density in the CSA region (see Table 6). The average population density in the CSA increased from 198 people per square mile in 1990 to 327 people per square mile in 2010. This is a 65 percent increase in population density between 1990 and 2010. Overall, population density increased continuously over the twenty years of data analyzed in each of the CSA counties.

In 1990 and 2000, Durham County had the highest population density in the CSA. Wake County had the second highest population density, followed distantly by Orange County. Eight of the eleven counties in the CSA had population densities below the regional average. These counties are farther from the urban centers of Raleigh, Durham, and Chapel Hill, and include Chatham, Franklin, Granville, Vance and Person counties. Table 5 shows population density data for the CSA over time.

While population density continued to increase between 2000 and 2010, growth varied through the CSA (see Figure 5). Wake County eclipsed Durham in the 2010 Census with a population density of 1,079 people per square mile, compared to Durham's population density of 936 people per square mile. Both Wake and Durham counties consistently had population densities higher than the CSA average.

Table 6: Population Density for Raleigh-Durham-Chapel Hill, NC CSA Counties

County	Population Density (People per Square Mile)				
	1990	2000	2010	Population Density Change (1990-2010)	% Change (1990 – 2010)
FLUSA Counties					
Harnett	114	153	193	79	69
Johnston	103	154	213	110	107
Wake	508	755	1,079	571	112
Remaining CSA Counties					
Chatham	57	72	93	36	63
Durham	626	769	936	310	50
Franklin	74	96	123	49	66
Granville	72	91	113	41	57
Lee	161	191	227	66	41
Orange	235	296	336	101	43
Person	77	91	101	24	31
Vance	153	169	179	26	17
Regional Average	198	258	327	129	65

Source: US Decennial Census, 1990, 2000 and 2010, Summary File 1, Table GHT-PH1
Percentages are rounded to the nearest whole percent.

While Wake County had a population density of 1,079 people per square mile in 2010, this does not necessarily mean that the area has reached build out or that additional growth cannot occur. An illustrative comparison is the growth pattern of population density in the Charlotte-Gastonia-Rock Hill CSA. Like the Raleigh-Durham-Chapel Hill CSA, the Charlotte-Gastonia-Rock Hill CSA has a strong urban core in Charlotte and interdependent surrounding counties and municipalities. Charlotte is located in Mecklenburg County, whose population density of 1,322 people per square mile in 2000 exceeded Wake County's 2010 population density. However, Mecklenburg County has continued to grow, reaching 1,756 people per square mile in 2010. If Wake County follows a similar trend to Mecklenburg County, its population density is likely to increase during the foreseeable future. While population densities in surrounding counties suggest that they may have a greater amount of developable land, it does not appear that population density in Wake County has reached a level that would limit growth.

FLUSA Trends

Population density in the FLUSA counties follows similar trends as population growth. Densely populated areas in the FLUSA are predominantly concentrated in zones near urban areas. As with population growth, higher population densities occurred in zones along the Wake County border in Johnston County and in zones along both the Wake and Cumberland borders in Harnett County. Overall trends in Wake County show population density is highest in and around the urban core of the City of Raleigh and Town of Garner (Zones W1, W3, W4, and W5) (see Table 7).

Harnett County population density is highest in Zone H2. However, this zone only grew by six percent between 1990 and 2010. The highest increase in population density occurred in Zone H4, which is adjacent to Cumberland County. Zone H1, which is adjacent to Wake County, experienced the second highest increase in population density between 1990 and 2010. Both Zone H1 and Zone H4 had lower population densities than Zone H2. Current data suggests that these zones still have developable land that could support future growth (Figure 6).

Population density in Johnston County is highest in Zone J1, which is adjacent to Wake County. The zones with the highest population density increases between 1990 and 2010 are Zone J1 and Zone J2 (near the Town of Clayton). These areas appear to have ample space for continued development in the future. Zone J3 has a similar population density to Zone J2; however, it experienced a much lower increase in population density. Trends suggest that Zone J1 and Zone J2 will continue to be areas of high population growth.

Within Wake County, the area with the highest population density is Zone W1, which is primarily the center of the City of Raleigh. However, population density in Zone W1 increased slowly, indicating that much of the land there is already developed. Zones that experienced the greatest increase in population density are Zone W2, Zone W6, and Zone W7. While Zone W6 and Zone W7 had high population density growth, the population densities in the 2010 US Census are low when compared to other zones. Lower relative density suggests that there is still available land for development in those areas. This, coupled with the increasing density and continuing trends in population growth in these zones, indicates that these areas may continue to support development and increased population in the future.

Figure 5: Regional Population Density Trends

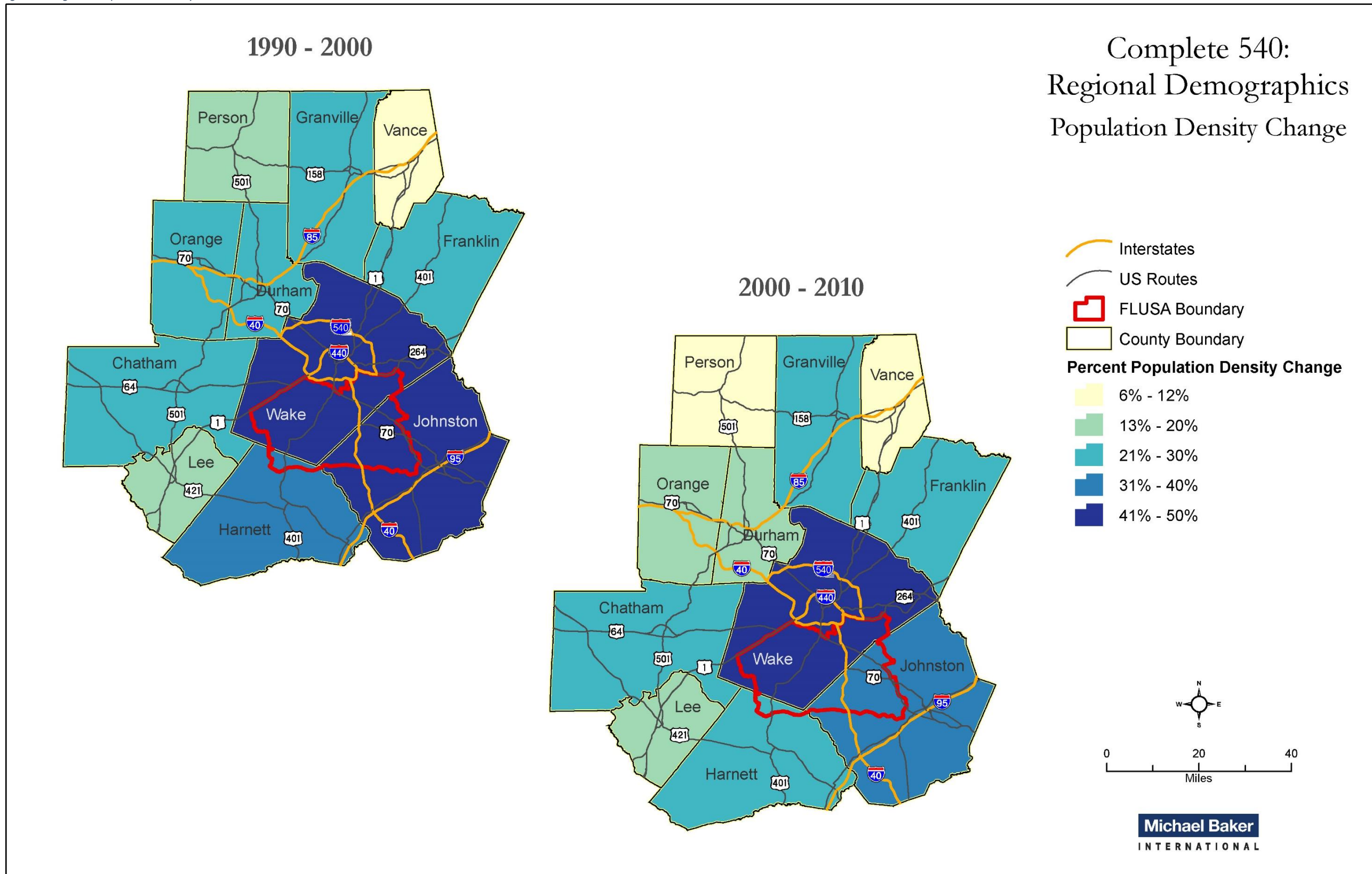


Table 7: Population Density in the FLUSA Counties

County	Population Density (People per Square Mile)				
	1990	2000	2010	Population Density Change (1990 – 2010)	% Change (1990 – 2010)
Harnett	114	153	193	79	69
Zone H1	105	156	200	95	90
Zone H2	284	295	301	17	6
Zone H3	71	94	103	32	45
Zone H4	84	140	216	132	157
Johnston	103	154	213	110	107
Zone J1	148	286	455	307	207
Zone J2	62	113	198	136	219
Zone J3	149	180	194	45	30
Zone J4	74	84	90	16	22
Zone J5	90	130	170	80	89
Wake	508	755	1,079	571	112
Zone W1	2,881	3,150	3,445	564	20
Zone W2	335	755	1,335	1,000	299
Zone W3	760	1,000	1,187	427	56
Zone W4	403	644	1,074	671	166
Zone W5	1,746	2,155	2,332	586	34
Zone W6	185	380	652	467	252
Zone W7	186	363	717	531	285
Zone W8	189	243	295	106	56

Source: US Decennial Census, 1990, 2000 and 2010, Summary File 1, Table P1.

Note: FLUSA Census regions are shown in **bold**.

Population densities within the FLUSA counties suggest certain Census regions of Harnett, Johnston, and Wake counties have sufficient available land to support continued growth. In Harnett County, areas adjacent to Cumberland and Wake counties (including FLUSA Zone H1) show a trend of increasing, but still relatively low population density. Johnston County follows similar trends, with areas of increasing population density in FLUSA Zones J1 and J2 adjacent to Wake County. Growth in Wake County shows population density is increasing in areas north and south of the City of Raleigh (FLUSA Zones W3, W4, and W6), which contain most of the FLUSA in Wake County. Population density in Zone W1, which includes the urban core of Raleigh, grew at a slower rate.

Average Household Size

Regional Trends

Analyzing household size may aide in the understanding of the type of household living in a particular area. Typically, if household size is greater than two residents, that household is more likely to include dependent children. These households are also more likely to make more daily trips. Conversely, households with two or fewer residents are considered less likely to have dependent children and, for that reason, are expected to make fewer daily trips. National Census data from the 1990, 2000, and 2010 show a pattern of household size decreases, with more people living alone, waiting to have children, and/or having fewer children.⁵

As shown in Table 8 and Figure 7, Harnett, Johnston, Orange, and Wake counties experienced an increase in household size between 1990 and 2010. However, a majority of the counties in the CSA experienced a decline in household size. These counties include Chatham, Durham, Franklin, Granville, Person and Vance. The decline in household size for these counties varies from two to five percent. Lee County experienced a slight increase in household size between 1990 and 2000; however, the household size decreased between 2000 and 2010, and overall decreased slightly between 1990 and 2010.

Table 8: Change in Average Household Size

County	Average Household Size (Persons)			
	1990	2000	2010	% Change 1990-2010
FLUSA Counties				
Harnett	2.60	2.61	2.68	3
Johnston	2.55	2.58	2.70	6
Wake	2.46	2.51	2.55	4
Remaining CSA Counties				
Chatham	2.51	2.47	2.43	-3
Durham	2.40	2.40	2.35	-2
Franklin	2.61	2.58	2.56	-2
Granville	2.68	2.58	2.57	-4
Lee	2.59	2.61	2.58	-1
Orange	2.34	2.36	2.41	3
Person	2.61	2.50	2.47	-5
Vance	2.69	2.60	2.56	-5
CSA Average	2.49	2.50	2.53	2

Source: US Decennial Census, 1990, 2000 and 2010, Summary File 1, Table H1

Note: Raleigh-Durham-Chapel Hill, NC CSA Counties, 1990-2010

⁵ US Census Bureau. 2010 Census Briefs – Households and Families 2010. Issued April 2012.

Figure 6: FLUSA Population Density Trends

Complete 540 Demographics Population Density Change

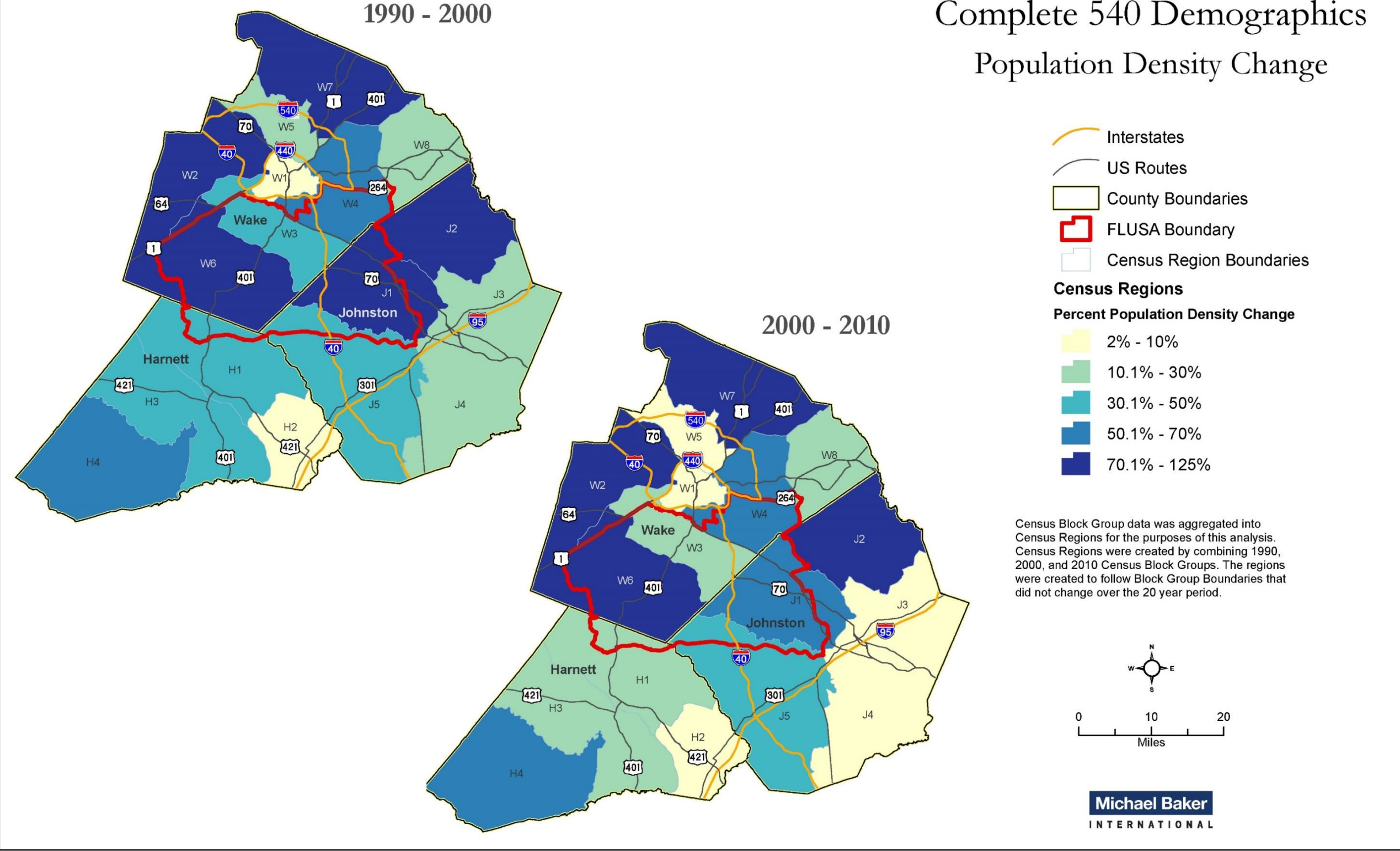
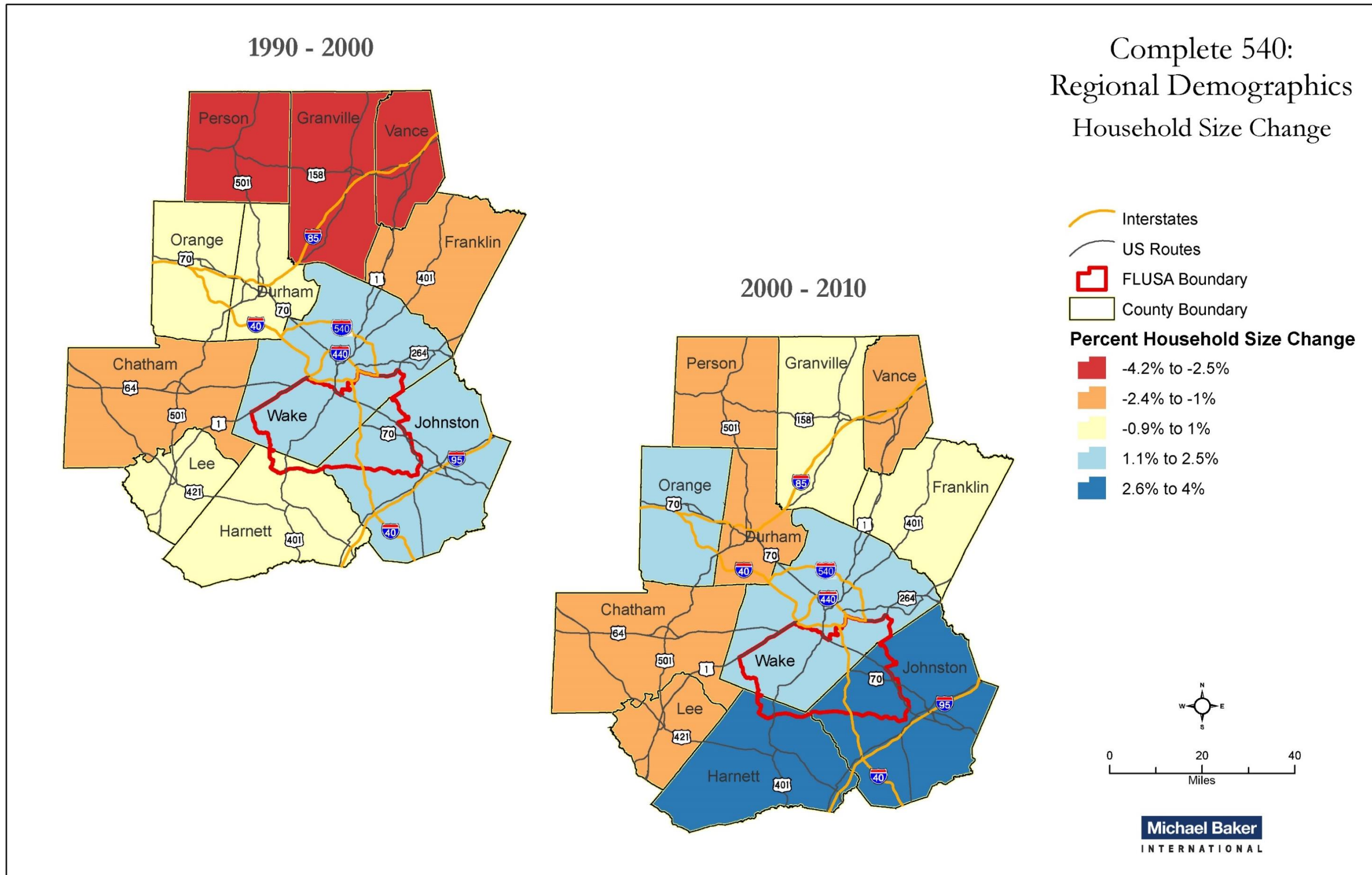


Figure 7: Regional Changes in Average Household Size



FLUSA Trends

As discussed previously in this document, an average household size greater than two can indicate that there are dependent children in the household. In addition to being an indicator of a greater number of trips per day, the presence of children within the household may increase the perceived importance of school quality in home buying decisions relative to other counties in the CSA. All counties within the FLUSA experienced an increase in household size, indicating the demand for high quality schools is likely higher in these areas.

The average household size in Harnett County was the highest within the FLUSA in the 1990 and 2000 Censuses (see Table 9). However, Johnston County had a larger average household size than Harnett County in the 2010 Census. Zones H2 and H3 had declining average household sizes while Zone H4 had a consistently increasing household size (see Table 9 and Figure 8). Zone H1, which is included in the FLUSA, had a slight increase in household size from 1990 to 2010.

The average household size in Johnston County grew between 1990 and 2010, increasing by 6 percent during that time. The average household size is highest in Zone J1 and Zone J2, which are part of the FLUSA and adjacent to Wake County.

The average household size in Wake County grew between 1990 and 2010, albeit more slowly than either Johnston or Harnett County. As depicted in Figure 8, the household size in Wake County at the Census region level varies greatly in each of the decennial censuses. In Zone W1, the urban core of the City of Raleigh, the household size grew by the largest margin in the county between 1990 and 2010. The highest average household sizes are in Zone W4, Zone W6, and Zone W7.

Table 9: Average Household Size in the FLUSA Counties

County	Average Household Size			
	1990	2000	2010	% Change 1990-2010
Harnett	2.60	2.61	2.68	3
Zone H1	2.79	2.73	2.80	<1
Zone H2	2.55	2.50	2.47	-3
Zone H3	2.84	2.81	2.74	-4
Zone H4	2.73	2.77	2.93	7
Johnston	2.55	2.58	2.70	6
Zone J1	2.68	2.72	2.80	4
Zone J2	2.63	2.70	2.84	8
Zone J3	2.53	2.54	2.60	3
Zone J4	2.49	2.47	2.60	4
Zone J5	2.55	2.58	2.69	5
Wake	2.55	2.59	2.61	2
Zone W1	2.48	2.60	2.67	8
Zone W2	2.48	2.51	2.50	<1
Zone W3	2.57	2.59	2.48	-4
Zone W4	2.63	2.68	2.78	6
Zone W5	2.46	2.42	2.34	-5
Zone W6	2.77	2.77	2.82	2
Zone W7	2.76	2.79	2.78	<1
Zone W8	2.74	2.70	2.73	<-1

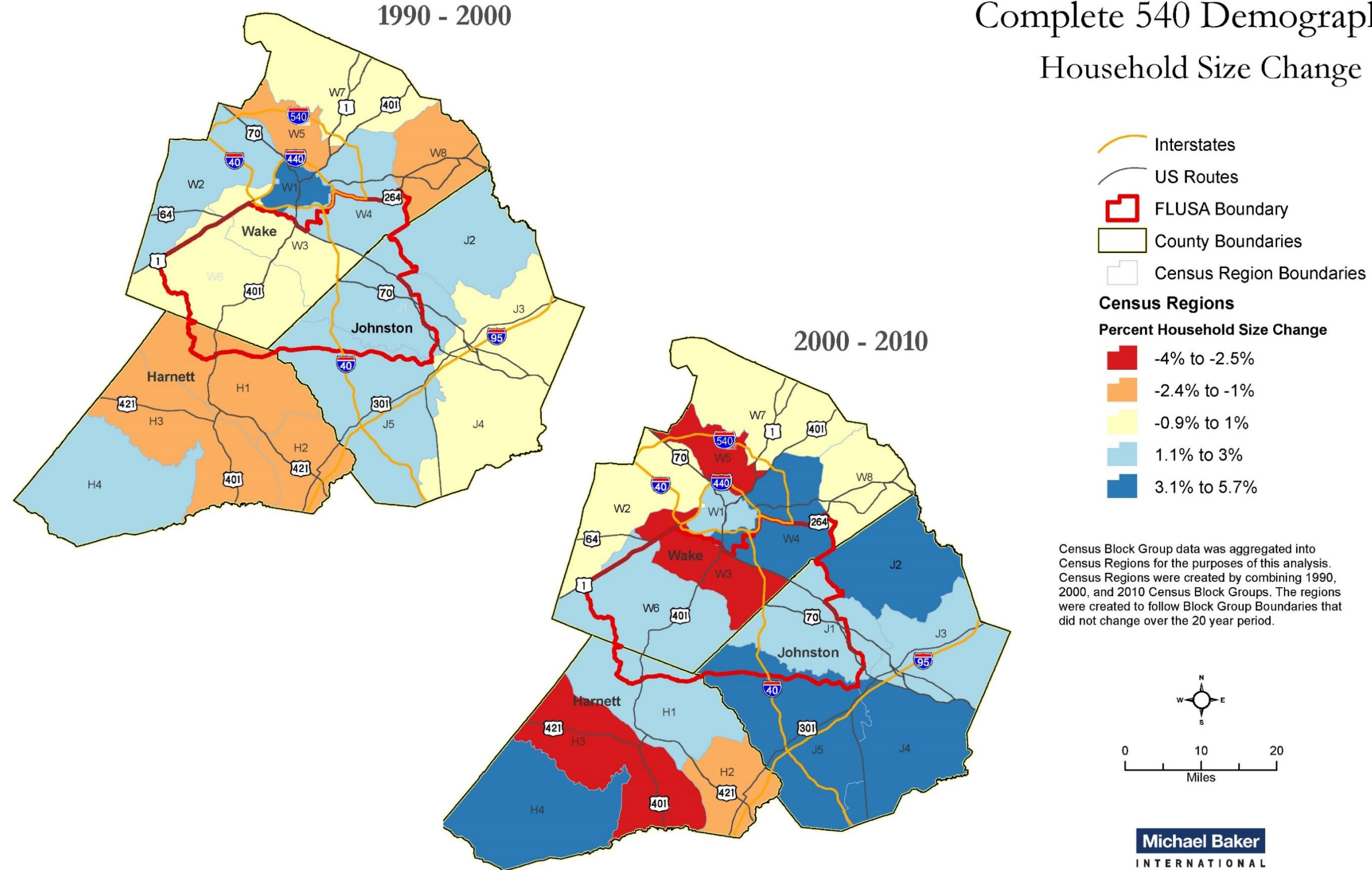
Source: US Decennial Census, 1990, 2000 and 2010, Summary File 1, Table H1

Notes: 1) Raleigh-Durham-Chapel Hill, NC CSA Counties, 1990-2010. 2) FLUSA Census regions are shown in **bold**.

Overall, average household size for counties in the FLUSA has grown during the last 20 years. In Harnett County, average household sizes are highest along the borders with Wake and Cumberland counties. The average household size in Johnston County is higher along the Wake County border, with lower household sizes in the central and eastern parts of the county. Lower household sizes in Wake County occurred in the middle and western parts of the county. Higher household sizes occurred in the northern and southern portions of the county. Wake County zones within the FLUSA showed various trends in household size, with most (Zones W1, W4, and W6) increasing while others (Zones W3 and W8) decreased.

Figure 8: FLUSA Changes in Average Household Size

Complete 540 Demographics Household Size Change



Employment

Regional Trends

Historical employment data collected by the North Carolina Department of Commerce shows that the number of people employed in the CSA increased from 1990 to 2015 (see Table 10 and Figure 9). Between 1990 and 2015, regional employment grew by 72 percent, or about 422,158 jobs. This growth was most dramatic between 1990 and 2000, with 33 percent employment growth during this period. Growth between 2000 and 2010 was more modest at 14 percent. However, this slower employment growth may be attributed, in part, to the 2008 economic downturn. During the five-year period between 2010 and 2015, employment grew by 12 percent, a 2 percent annual average.

Table 10: Average Annual Employment

Employment (number of employed workers)							
County	1990	2000	2010	2015	1990-2015 Growth	% Growth 1990 - 2015	1990-2015 County Employment Growth as % of CSA Employment Growth
FLUSA Counties							
Harnett	30,179	40,831	43,253	46,788	16,609	55	4
Johnston	42,787	62,432	73,576	83,732	40,945	96	10
Wake	248,082	358,674	440,623	514,344	266,262	107	63
Remaining CSA Counties							
Chatham	21,445	26,179	28,033	31,336	9,891	46	2
Durham	99,302	119,017	131,566	148,179	48,877	49	12
Franklin	17,945	23,709	24,903	27,344	9,399	52	2
Granville	18,746	21,599	24,716	27,132	8,386	45	2
Lee	20,162	23,723	23,633	24,115	3,953	20	1
Orange	52,026	63,423	65,332	70,757	18,731	36	4
Person	15,653	17,430	16,383	16,911	1,153	8	0
Vance	18,701	18,933	16,332	16,548	-2,153	-12	-1
Regional Total	585,028	775,950	888,350	1,007,186	422,158	72	-

Source: North Carolina Department of Commerce, Labor & Economic Analysis Division

Notes: 1) Raleigh-Durham-Chapel Hill, NC CSA Counties, 1990-2010, 2) County percentages have been subject to rounding

Generally, areas with job growth tend to also experience population growth. Historic employment data in the CSA follows similar patterns to both population and population density. Wake County captured 63 percent of regional employment growth from 1990 to 2015 and experienced 107 percent employment growth during that time. As shown in Table 10, this is much higher than any other county in the region. This growth was steady throughout the period analyzed. Between 1990 and 2000, employment in Wake County grew by 45 percent. Growth continued at a more modest rate (23 percent) between 2000 and 2010. This growth continued, and employment grew by 15 percent between 2010 and 2015. Historic employment data shows that Wake County continues to be a place of employment growth and these trends suggest that this will continue in the future.

Other counties in the CSA experienced high employment growth during this period. In addition to Wake, Franklin, Harnett, and Johnston counties also experienced employment growth of 50 percent or more between 1990 and 2015.

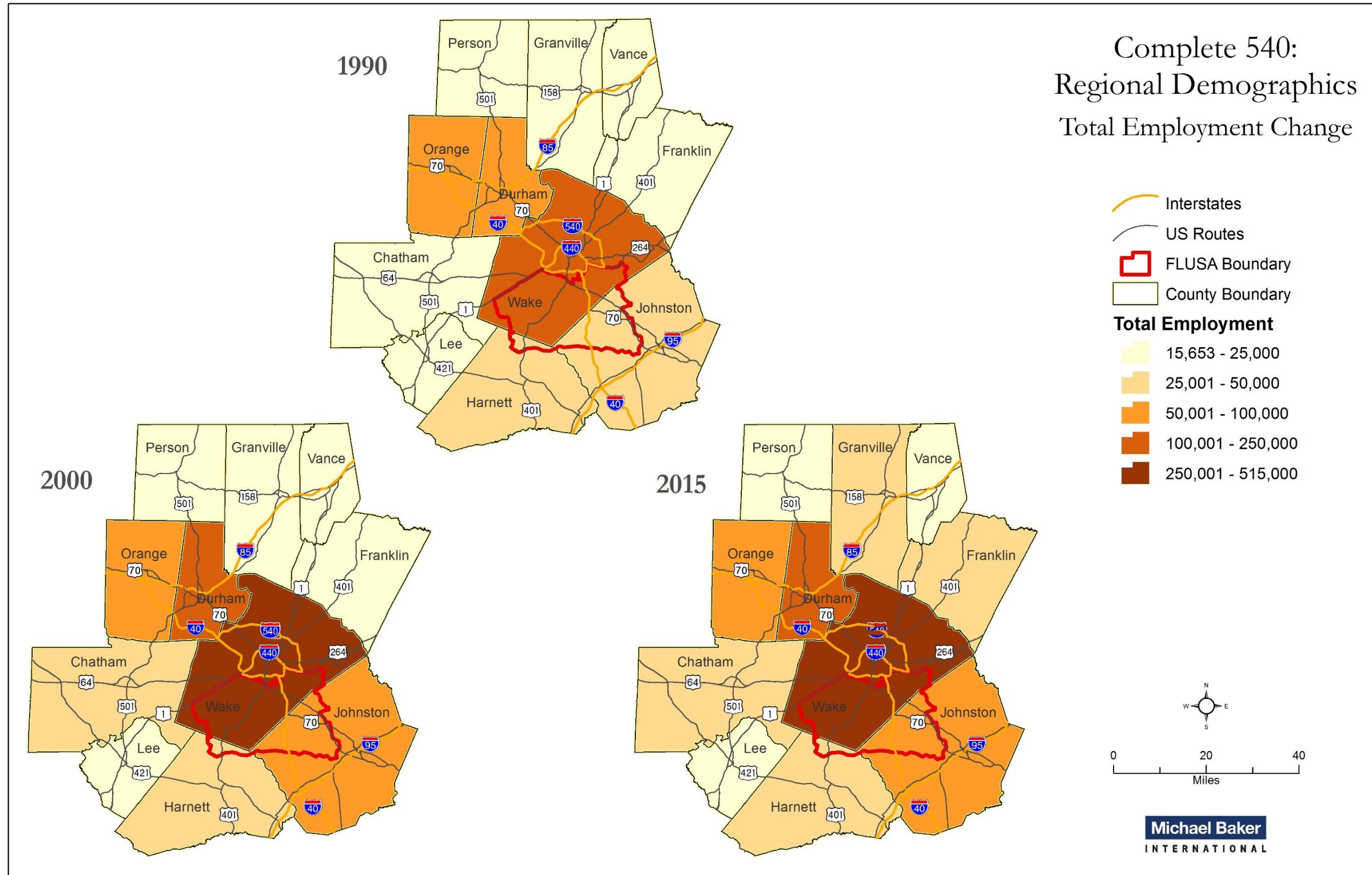
Vance County is the only county in the CSA region to experience a decline in employment. Lee and Person counties experienced comparatively low growth, 20 percent and 8 percent, respectively.

If past employment trends continue, many of the counties in the CSA will continue to experience employment growth. Historic data shows a pattern of employment growth in the CSA region between 1990 and 2015. Historic trends concentrate employment growth in Wake County. Other counties with sustained employment growth include Harnett, Johnston, and Franklin. These trends have continued over 25 years and there is no evidence indicating these trends will change.

FLUSA Trends

The North Carolina Department of Commerce releases employment data at the county level, therefore the employment data cannot be aggregated for the Census regions created for this memo. However, the three FLUSA counties, Harnett, Johnston, and Wake, had the highest percent job growth within the CSA between 1990 and 2015. This suggests continued population growth in the region.

Figure 9: Regional Average Annual Employment



Educational Attainment

Regional Trends

Educational attainment is a notable feature in the region as a whole, and particularly in those counties where major universities are located. The measure of educational attainment is the percentage of the population aged 25 or over with a Bachelor’s degree or higher. North Carolina’s statewide average for this statistic was 28 percent in 2014. Within the CSA, in Chatham, Durham and Wake counties, 56 percent, 46 percent, and 48 percent of their respective populations met this benchmark of educational attainment in 2014. While the major universities in the CSA are the University of North Carolina at Chapel Hill, Duke University, and North Carolina State University, other universities in the CSA include North Carolina Central University, Shaw University, Meredith University, Saint Augustine’s University, William Peace University, Barton College, Campbell University, and North Carolina Wesleyan College.

FLUSA Trends

Within the FLUSA counties, Harnett and Johnston Counties fall below the statewide average, while Wake County is well above the statewide and regional averages. All of the CSA counties have seen improvement in Educational Attainment since 1990, again, with the highest results in the three counties that host major universities. A more granular look at educational attainment for the FLUSA area shows that it falls below the overall Wake County average, but well above the Harnett and Johnston County averages, based on data from the 2014 American Communities Survey.

Table 11: Educational Attainment Trends

County	Educational Attainment Percentage of Population Age 25+ with Bachelor’s Degree or Higher			
	1990	2000	2014	Change 1990-2014
FLUSA Counties				
Harnett	10	13	19	+9
Johnston	11	16	20	+9
Wake	35	44	48	+13
FLUSA			36	N/A
Remaining CSA Counties				
Chatham	20	28	36	+16
Durham	33	40	46	+13
Franklin	9	13	18	+9
Granville	10	13	18	+8
Lee	14	17	20	+6
Orange	46	52	56	+10
Person	8	10	14	+6
Vance	9	11	13	+4
All CSA Counties	27	34	40	+ 13
North Carolina	17	22	28	+11

Sources: US Decennial Census, 1990, 2000, Summary Table 3; US Census 2014 American Community Survey, Five Year, Table S1501

Median Income

Regional Trends

Median income varies greatly throughout the region. However, most counties in the CSA experienced high growth in median household income between 1990 and 2014, correlating with the population growth during this time. During the 2010 Decennial Census, the Census Bureau shifted median income data from the Decennial Census to the American Community Survey. Therefore, the period for median income changed from 1990-2010 to 1990-2014.

As shown in Table 12, Wake, Orange, and Chatham counties had the highest median household incomes in 2014, while Vance County had the lowest median household income of any CSA county (Table 12). Over 24 years, the Harnett County median income grew by 104 percent. However, Wake County had the highest median household income in the CSA during each reporting period.

Table 12: Median Income Growth

County	Median Household Income				
	1990 ¹	2000 ²	2014 ³	1990-2014 Growth	% Increase 1990-2014
FLUSA Counties					
Harnett	\$21,743	\$35,105	\$44,417	\$22,674	104
Johnston	\$25,169	\$40,872	\$49,799	\$24,630	98
Wake	\$36,222	\$54,988	\$66,579	\$30,357	84
Remaining CSA Counties					
Chatham	\$28,539	\$42,851	\$57,140	\$28,601	100
Durham	\$30,526	\$43,337	\$52,038	\$21,512	70
Franklin	\$25,049	\$38,968	\$42,763	\$17,714	71
Granville	\$26,488	\$39,965	\$49,655	\$23,167	87
Lee	\$26,419	\$38,900	\$46,309	\$19,890	75
Orange	\$29,968	\$42,372	\$57,261	\$27,293	91
Person	\$25,625	\$37,159	\$43,381	\$17,756	69
Vance	\$21,555	\$31,301	\$34,075	\$12,520	58

Source: US Decennial Census, 1990, 2000, Summary File 3; Table P053; US Census 2014 American Community Survey, Five Year, Table B19013
 Notes: Raleigh-Durham-Chapel Hill, NC CSA Counties, 1990-2010. 1) Measured in 1989 US dollars. 2) Measured in 1999 US Dollars. 3) Measured in 2014 inflation-adjusted dollars

FLUSA Trends

The US Census Bureau calculates median income by census tract. Since the sub-county regions are an aggregation of census block groups (a smaller geography within the census tract geography) and income is a median value, calculating an average is not possible. However, Harnett and Johnston counties, within the FLUSA, are among the top three counties in the CSA in median income growth between 1990 and 2014). In the CSA, Wake County had the largest median household income increase from 1990 to 2014 at \$30,357.

In addition to Median Income, it is useful to examine Median Earnings by Level of Education for further insight into the income trends affecting the FLUSA. These data, shown in Table 13, demonstrate that

residents of all the FLUSA jurisdictions who have a Bachelor’s degree have markedly higher incomes, with an additional earnings premium for those with graduate or professional degrees. This phenomenon is most pronounced in Wake County, where nearly 1 in 5 residents 25 or over have a graduate or professional degree, and the difference in earnings is over \$32,000 compared to those without a Bachelor’s degree, and over \$15,000 compared to those with a Bachelor’s degree.

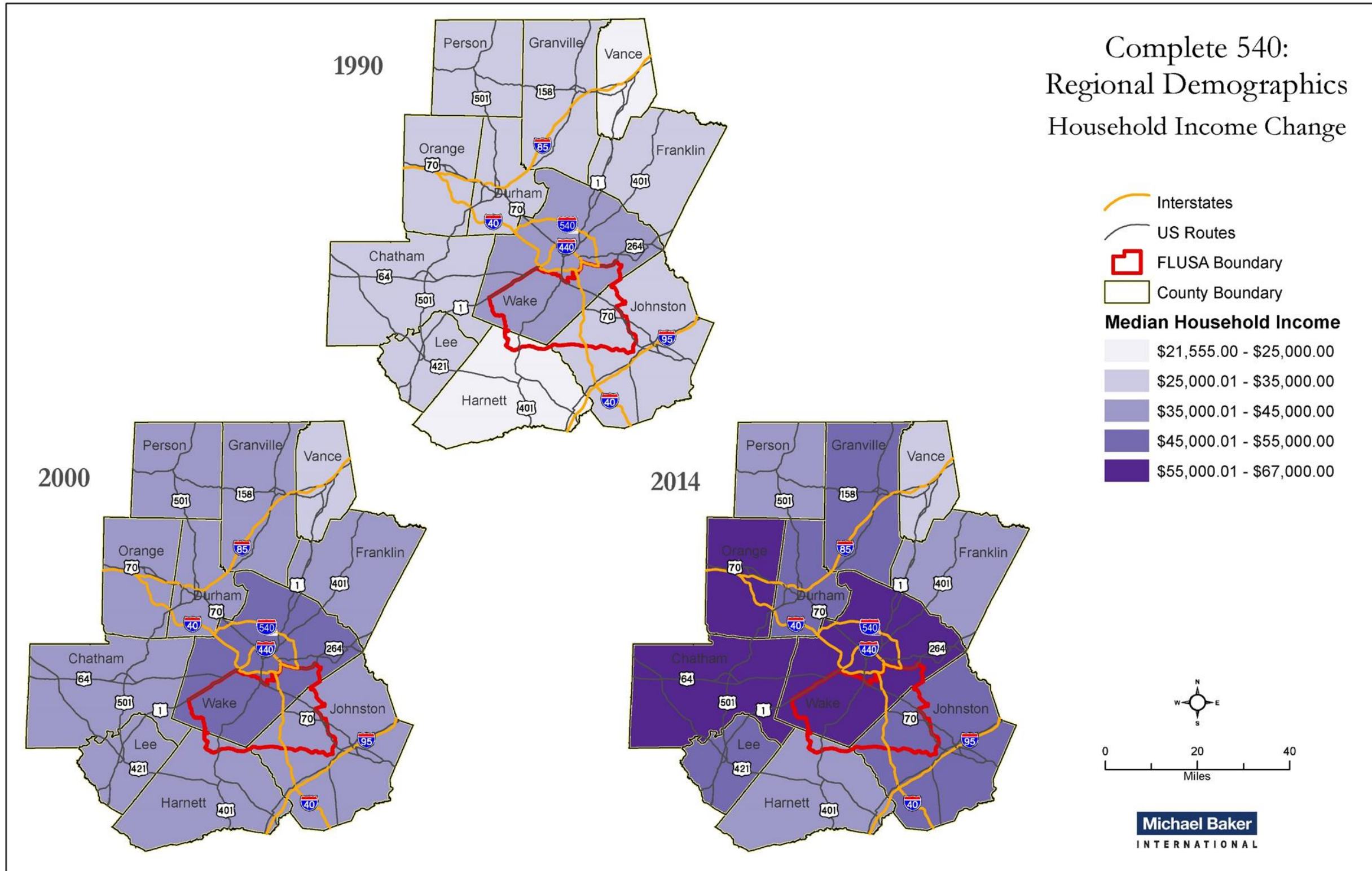
Table 13: Median Earnings by Educational Attainment, FLUSA Counties, 2014*

	Harnett		Johnston		Wake	
	Median Earnings	Percent of County Population 25+	Median Earnings	Percent of County Population 25+	Median Earnings	Percent of County Population 25+
Total for Adult Population 25 Years+:	\$31,348	100	\$32,965	100	\$40,821	100
Less than high school graduate	\$15,971	16	\$ 19,469	13	\$16,970	8
High school graduate/ equivalency	\$27,670	31	\$ 30,124	31	\$27,175	17
Some college or associate's degree	\$31,997	34	\$ 34,154	36	\$34,881	27
Bachelor's degree	\$36,439	12	\$46,450	15	\$51,365	31
Graduate or professional degree	\$56,415	7	\$51,073	5	\$66,976	18

US Census 2014 American Community Survey, One-Year Average, Table S1501

Note: Table results may not add up to 100 percent due to rounding

Figure 10: Regional Median Income



School Quality

The quality of a school district is an important factor driving household location decisions and an indicative factor of growth in a region. Jack Dougherty, an associate professor of Educational Studies at Trinity College in Hartford, Connecticut, researched how public school quality helps to drive suburban growth:

...“shopping for schools” clearly became an important family strategy for upward mobility, as higher-salary positions increasingly depended on educational credentials, which in turn relied on the status of one’s public school system. During the course of the twentieth century, suburban families became more conscious of this equation: buying a home in the “right” neighborhood in order to send their children to a “good” public school, would increase their odds of being accepted to a “top-ranked” college, and help them to land the “perfect” job.⁶

Other researchers have shown the strong correlation between school district quality and the value of housing. This is revealed in the high demand for housing in good school districts. Theodore Crone, an Economist with the Federal Reserve Bank of Philadelphia, noted, “Home buyers seem to evaluate the quality of public education at the district level.”⁷ Finally, other researchers have noted that “[i]n towns where it is easy to build more housing, better quality schools do not lead to higher property values. Instead, they lead to more real estate development.” Based on this assessment, areas that are perceived to have higher quality schools would be expected to have increased development as a result. Since most school districts in North Carolina conform to county boundaries, homebuyers with school-aged children are therefore likely to consider school quality by county when choosing a residence to rent or buy.⁸

Additional research indicates that higher test scores are a factor that affects housing prices and can increase housing costs in an area or make the area more desirable for future development. In her research, Sandra E. Black found that housing prices rise 2.5 percent for a 5 percent increase in test scores.⁹ A study looking at the relationship between test scores and residential housing prices in North Carolina determined that the housing market places higher values on property in school districts with higher test scores at an average of 3 percent to 4 percent higher than a property with average test scores. Test scores play a pivotal role in the perception of school quality and have a strong influence on housing value.¹⁰

Regional Trends

As with many of the factors discussed in this document, four-year graduation rates by school system vary throughout the region, as shown in Table 14. Lee County Schools had the highest graduation rate in the region, followed closely by Johnston, Orange, Chatham and Wake. School systems with the lowest four-year graduation rate are Person and Vance counties.

⁶ Dougherty, Jack. “Shopping for Schools: How Public Education and Private Housing Shaped Suburban Connecticut.” *Journal of Urban History* 28, no. 2 (March 2012): 205-224.

⁷ Crone, Theodore M. “Capitalization of the Quality of Local Public Schools: What Do Home Buyers Value?” Working Paper No. 06-15, Federal Reserve Bank of Philadelphia. August 2006.

⁸ Black, Sandra E. “Do Better Schools Matter? Parental Valuation of Elementary Education.” *The Quarterly Journal of Economics*, Vol. 114, No. 2 (May 1999): 577-599.

⁹ Martinez, Erika. “Do Housing Prices Account for School Accountability?” Duke University, November 2010.

¹⁰ NC Department of Public Instruction, Accountability Services Division. June 4, 2008.

Table 14: Four-Year Graduation Rate by School System

School System	Graduation Rate
FLUSA Counties	
Harnett County Schools	81.5
Johnston County Schools	88.8
Wake County Schools	86.1
Remaining CSA Counties	
Chatham County Schools	87.3
Durham Public Schools	80.7
Franklin County Schools	82.6
Granville County Schools	83.8
Lee County Schools	89.1
Orange County Schools	88.0
Person County Schools	78.9
Vance County Schools	77.5
Regional Average	84.0

Sources: North Carolina State Board of Education, Accountability Services Division, 2014-2015

Note: Raleigh-Durham-Chapel Hill, NC CSA Counties, 1990-2010

In North Carolina, state end-of-grade (EOG) tests are administered to students in third through eighth grade and measure proficiency in a variety of core subjects. Students must pass with a “proficient” or better to move to the next grade level. The percent of students scoring proficient or above on EOG exams is a cumulative score of English language arts (ELA), mathematics, and science. The State Board of Education defines proficient as a score of three or above on the EOG exams.

Table 15: Percentage Average Statewide Test Scores Proficient or Above

School District	% Scoring Proficient or above on End of Grade Exams ¹
Math and Reading Testing, Grades 3-8	
FLUSA Counties	
Harnett County Schools	45
Johnston County Schools	58
Wake County Schools	66
Remaining CSA Counties	
Chatham County Schools	46
Durham Public Schools	43
Franklin County Schools	49
Granville County Schools	43
Lee County Schools	51
Orange County Schools	60
Person County Schools	54
Vance County Schools	43
Regional Average	52

Sources: North Carolina State Board of Education, Accountability Services Division, 2014-2015

Note: Raleigh-Durham-Chapel Hill, NC CSA Counties, 1990-2010

Wake and Orange counties have comparatively higher test scores in the region for most subjects and age groups. Wake County scores were between 14 percent higher than the regional average across grade levels (see Table 15). Other school systems with comparatively high test scores are Johnston and Person counties.

Another educational metric that is commonly referenced as an influence on location decisions is the Scholastic Aptitude Test (SAT) composite score (combined scores of math, critical reading and writing). However, the SAT score only represents college bound students, so it is not a comprehensive score representative of all students in the district. As shown in Table 16 and Figure 11, among the 11 CSA counties, Wake County schools had the highest average SAT score in 2015. The average SAT score for schools in the region was 1,415 (a perfect score being 2400). SAT scores for the Wake County School District were 11 percent higher than the regional average. Other counties in the CSA with average scores higher than the CSA average were Orange and Johnston counties.

Table 16: Average SAT Scores for Major School Districts

School District	# Tested	% Tested	Math (M) Score	Critical Reading (CR) Score	Writing (W) Score	Math, Critical Reading and Writing Combined Score
FLUSA Counties						
Harnett County Schools	423	39	467	465	442	1374
Johnston County Schools	892	41	500	497	473	1470
Wake County Schools	6,400	67	540	525	504	1569
Remaining CSA Counties						
Chatham County Schools	337	65	481	474	457	1412
Durham Public Schools	1,177	60	469	476	453	1398
Franklin County Schools	212	40	476	477	457	1410
Granville County Schools	245	46	485	474	445	1404
Lee County Schools	223	37	482	474	449	1405
Orange County Schools	307	62	522	519	498	1539
Person County Schools	114	44	451	437	427	1315
Vance County Schools	234	57	427	424	410	1261
Regional Average	-	51	482	477	456	1415

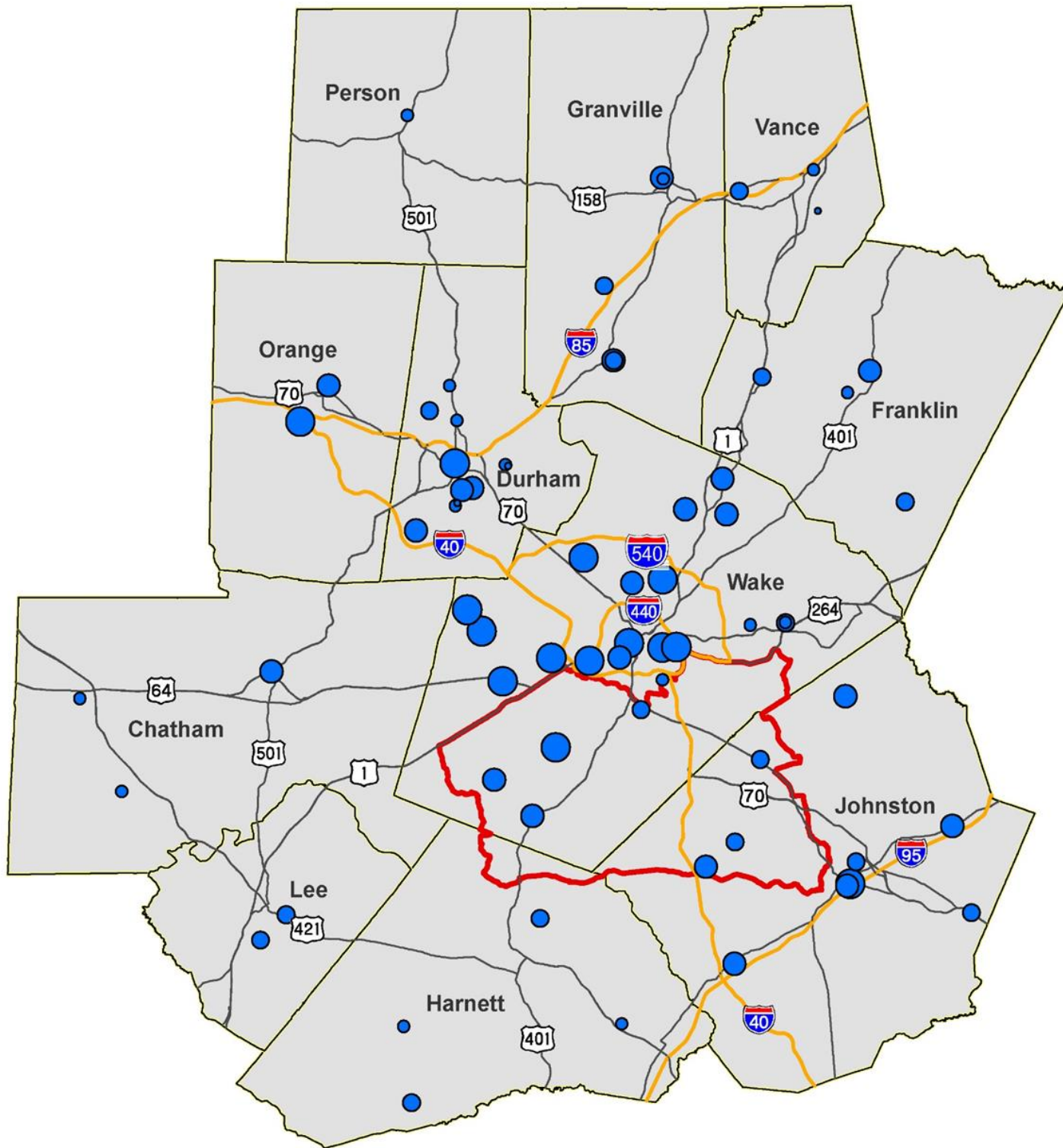
Sources: North Carolina State Board of Education, Accountability Services Division, SAT Report 2015
 Note: “% Tested” refers to the percentage of students in the school district that took the SAT in 2015

School quality is an important factor for households in making location decisions, particularly for households with children. Based on school quality indicators, such as four-year graduation rates, SAT scores, and state EOG test scores, the counties that would be most desirable for homebuyers are Wake, Orange, and Johnston. If these trends continue, these areas would be more likely to attract new households and new development, thus more likely to experience higher population growth than the other counties in the region.

Figure 11: Average Composite SAT Score by High School for CSA Region

Complete 540: Regional Demographics

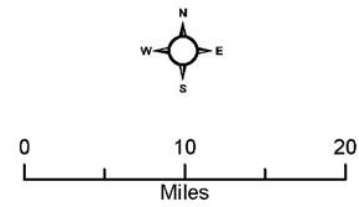
SAT Scores



School Level SAT Scores

- 1146 - 1230
- 1231 - 1350
- 1351 - 1450
- 1451 - 1550
- 1551 - 1719

- Interstates
- US Routes
- FLUSA Boundary
- County Boundary



Michael Baker
INTERNATIONAL

FLUSA Trends

As school systems in North Carolina are organized by county, the educational data is presented by county. Data on school quality is presented at the county or school district level or the individual school level, not at a Census geography level.

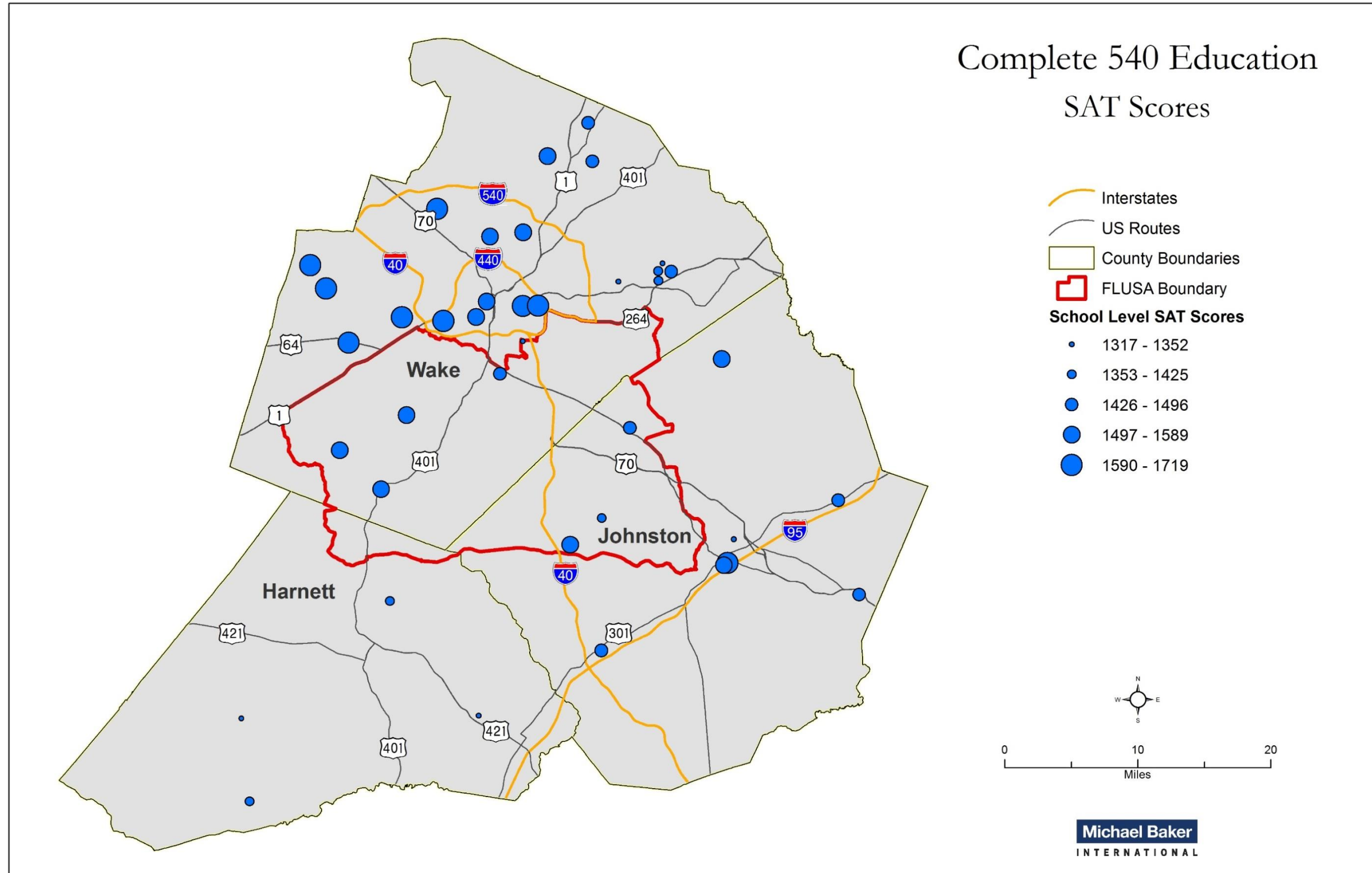
Harnett County Schools have the lowest four-year graduation rate, with almost 82 percent of students graduating high school in four years (see Table 14). Overall, Johnston County has the highest four-year high school graduation rate, at nearly 89 percent. Wake County Schools have the second highest graduation rate, with 86 percent of students graduating high school in four years.

EOG scores for school systems with boundaries that overlap the FLUSA are presented in Table 15. Harnett County ranks below the CSA average while Wake and Johnston are above the CSA average.

In Figure 12 average SAT test scores are depicted by high school location. The schools with the highest average SAT scores are in western and central Wake County. Scores are lowest in southern and eastern Wake County. Johnston County Schools had the second highest combined SAT score of the FLUSA counties (see Table 16). Scores are highest in central and western Johnston County. Harnett County Schools had the lowest average combined SAT score of the FLUSA. Average combined SAT scores in Harnett County are almost 200 points lower than Wake County Schools and 100 points lower than Johnston County schools. Scores at high schools in northern and southern Harnett County are the highest in that school system.

There are clear distinctions in school quality of the FLUSA counties. Wake County Schools SAT scores and state EOG test scores are the highest of the FLUSA counties. However, Johnston County Schools had the highest high school graduation rate in the FLUSA, with Wake County Schools and Harnett County Schools following behind. Within the FLUSA counties, the data suggests that Johnston and Wake counties have the more desirable school systems for potential homebuyers, which suggests these counties would be more likely for future development.

Figure 12: SAT Scores by High School in the FLUSA Counties



Average Commute

Regional Trends

Convenient access to jobs is another important factor in household location decisions within a region. Areas with shorter commutes may be more attractive for potential homebuyers, as workers will spend less time commuting. However, regional growth patterns in most metropolitan areas do not indicate that commute times are a primary driver of location decisions. While it may seem counter-intuitive that households would choose to live where commute times are longer, research suggests that within a reasonable range of commute time, households will choose locations based more on other preferences, such as school quality, neighborhood quality or other factors. In their summary of research on the impacts of transportation on land use, the National Research Council noted the following:

“Research on commuting patterns within the current distribution pattern of jobs and residences in the Los Angeles metropolitan area, however, indicates that commuting trips are two-thirds greater than would be required if workers were located in neighborhoods that minimized their commutes (Small and Song 1992). This indicates that a key assumption of location theory does not hold in practice. The excess commuting that occurs may be explained by preferences for neighborhoods with low crime rates or amenities such as schools; the difficulty of minimizing commutes for both workers in dual worker households; and other influences, such as racial discrimination (Giuliano and Small 1993; Mills 1994).¹¹”

The Census Bureau tracks a variety of information about trips to and from work. The comparisons among counties in the region are revealing. Due to changes in reporting for the 2010 Census, the Census Bureau began releasing commute information in the American Community Survey. Therefore, reporting years for commute times are 1990, 2000, and 2014.

Between 1990 and 2000, the average commute time for residents in CSA counties increased by 4.8 minutes, and remained relatively stable between 2000 and 2014 (see Table 17 and Figure 13).

Overall, between 1990 and 2014 commute times in the CSA increased by 19 percent. Commutes in every CSA county increased from 1990 to 2014. However, commute times decreased between 2000 and 2014 in Harnett, Johnston, Wake, Franklin and Lee Counties. Overall, Franklin County reported the smallest change in commute time between 1990 and 2014. Vance and Granville counties experienced the greatest increases in commute times during this period.

In 2014, commute times in five counties are below the regional average of 28.2 minutes. These counties are Durham, Lee, Orange, Vance, and Wake. Proximity to the Raleigh urban core and shorter commutes than the regional average could potentially increase the desirability of Wake County for potential homebuyers.

¹¹ National Research Council 1995

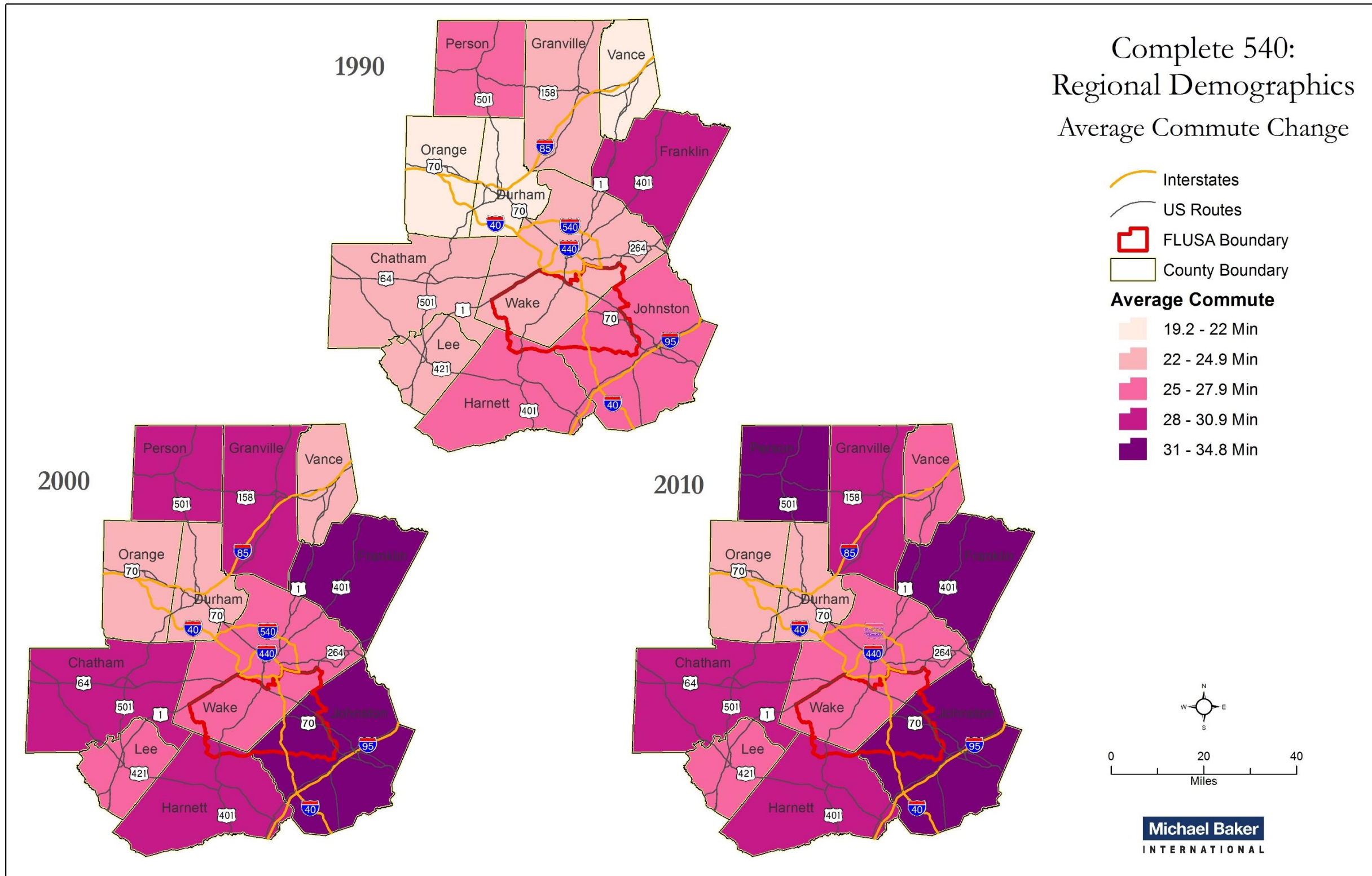
Table 17: Average Commute Times in Regional Counties

County	1990		2000		2014		% Change in Average Travel Time from 1990 - 2014
	Average Travel Time to Work (Min)	% Difference from 1990 Regional Average	Average Travel Time to Work (Min)	% Difference from 2000 Regional Average	Average Travel Time to Work (Min)	% Difference from 2014 Regional Average	
FLUSA Counties							
Harnett	25.3	7	30.8	10	30.2	7	25
Johnston	26.5	12	32.3	15	31.2	10	18
Wake	22.3	-6	26.4	-6	25.7	-9	15
Remaining CSA Counties							
Chatham	24.4	3	28.9	3	29.3	4	20
Durham	20.5	-14	23.0	-18	23.6	-16	15
Franklin	29.4	24	34.8	24	32.1	14	9
Granville	23.9	1	28.6	2	30.5	8	28
Lee	22.2	-7	25.8	-8	25.7	-9	16
Orange	21.2	-10	23.7	-16	24.3	-14	14
Person	26.0	11	30.9	10	32.6	16	26
Vance	19.2	-19	24.1	-14	25.0	-11	30
Regional Average	23.3	-	28.1	-	28.2	-	19

Source: US Decennial Census, 2000; US Census 2014 American Community Survey, Five-Year Average, Table B08303

Note: Raleigh-Durham-Chapel Hill, NC CSA Counties, 1990-2010. 2) Census data presented in terms of “mean” travel is referred to as “average” in this table.

Figure 13: Regional Changes in Average Commute Time



FLUSA Trends

Average commute time is an indicator of potential growth, as a short commute is often attractive to potential homebuyers. Commutes at the sub-county level may show the specific areas of potential growth within the FLUSA. Every Census region experienced an increase in average commute time between 1990 and 2014 (see Table 18 and Figure 14).

Of the three FLUSA counties, Harnett County had the second longest average commute. Overall, the average commute time in the county was 8 percent longer than the CSA commute in 2014. Within Harnett County, Zone H1 had the longest commute time from 2000 through 2014. In 2014, the average commute in Zone H1 was 16 percent longer than the regional average. Zone H2 had the shortest average commute in 2014, with a commute time five percent shorter than the regional average.

Johnston County had the longest average commute of the FLUSA counties, with an average commute that was 11 percent longer than the regional average in 2014. FLUSA Zones J1 and J5 had commutes that were consistently longer than the average regional commute in 1990, 2000, and 2014.

Average commute times in Wake County were the shortest within Zone W1. This is the urban core of Raleigh, therefore, commutes would be expected to be short when compared to other parts of the region. Commute times are also consistently short in Zone W2, Zone W3, and Zone W5, which surround the urban core. Census regions further from Zone W1 and the City of Raleigh urban core had commute times that are longer than the regional averages in 1990, 2000, and 2010. These zones, Zone W6, Zone W7, and Zone W8 had average commute times that were between 7 and 13 percent longer than the CSA average commute time. Zone 4, which is also in the FLUSA, had commute times that were longer than the CSA average in 1990 and 2000, but less than the CSA average in 2014.

Table 18: Average Commute Time in FLUSA Counties

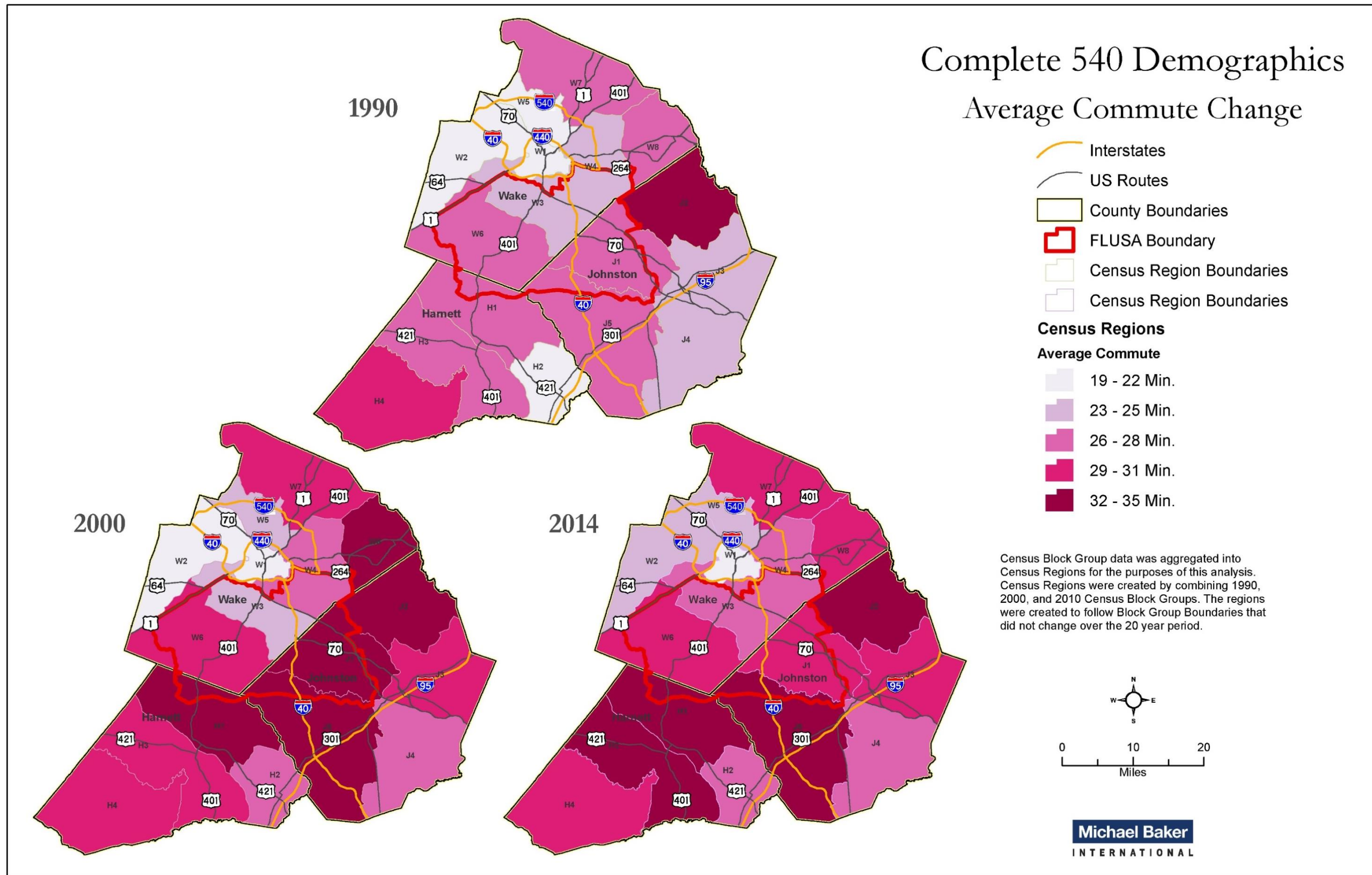
County/ Zone	1990		2000		2014		% Change in Commutes from 1990 - 2014
	Average Travel Time to Work (Min)	% Difference from 1990 Regional Average	Average Travel Time to Work (Min)	% Difference from 2000 Regional Average	Average Travel Time to Work (Min)	% Difference from 2014 Regional Average	
FLUSA Counties							
Harnett	25.3	9	30.8	10	30.2	8	19
Zone H1	27.1	16	32.7	16	32.6	16	21
Zone H2	22.0	-6	27.0	-4	26.7	-5	22
Zone H3	25.6	10	30.5	9	31.6	13	23
Zone H4	28.2	21	32.5	16	29.9	6	6
Johnston	26.5	14	32.3	15	31.2	11	18
Zone J1	25.8	11	32.8	17	30.8	10	20
Zone J2	31.3	34	36.4	30	35.0	24	12
Zone J3	24.9	7	29.2	4	28.8	3	16
Zone J4	24.8	6	28.5	<1	26.7	-5	8
Zone J5	27.6	19	33.0	17	32.0	14	16
Wake	22.3	-4	26.4	-6	25.7	-8	15
Zone W1	19.3	-17	21.7	-23	21.8	-22	13
Zone W2	21.1	-9	24.4	-13	23.5	-16	11
Zone W3	22.3	-4	25.6	-9	25.2	-10	13
Zone W4	23.8	2	29.1	4	26.7	-5	12
Zone W5	21.5	-8	24.5	-13	23.8	-15	10
Zone W6	26.0	12	31.2	11	30.4	8	17
Zone W7	26.6	14	30.5	9	28.8	3	8
Zone W8	26.3	13	34.0	21	30.1	7	14
CSA Regional	23.3		28.1		28.2		19

Source: US Decennial Census, 2000; US Census 2014 American Community Survey, Five-Year Average, Table B08303

Notes: 1) Raleigh-Durham-Chapel Hill, NC CSA Counties, 1990-2010. 2) FLUSA Census regions are shown in **bold**.

Average commute times have risen between 1990 and 2014 in every Census region in the FLUSA. While the average commute time for each zone rose, trends show longer commute times in Johnston and Harnett counties and shorter commute times in Wake. This suggests that Wake County may be a more desirable location for potential homebuyers.

Figure 14: Regional Changes in Average Commute Time



Regional Economic Drivers and Related Trends

A few specific trends that describe the region’s economic drivers and relate to additional growth dynamics add further insight into the growth history and outlook of the Research Triangle Region.

Research Triangle Park

Universities are a source of innovation. The focus in the Research Triangle Region on partnership between Universities, public sector research entities, and private sector innovators has led to, “... shared resources, groundbreaking research, and graduates working at the forefront of their fields.”¹² The idea of harnessing the opportunities presented by the three founding universities of RTP – NC State University, Duke University, and UNC-Chapel Hill – to attract private and public sector research jobs has been a key driver of regional economic growth and success. Results include high educational attainment of regional residents, higher earnings than state and national averages, and low unemployment (as documented elsewhere in this memo).

In Research Triangle Park, biotechnology and information technology are major industries within RTP tenants, along with business, financial and insurance services, and specialized firms in agricultural biotechnology, as well as instruments and advanced materials. Over 250 businesses employing over 50,000 people are located in RTP, the nation’s largest research park. These RTP businesses have received over 3,000 patents for their research and development work since 1970, and have generated 245 company start-ups.¹³

Looking at Research Triangle Park and Wake County together, the major employers include multiple healthcare systems, the State of North Carolina, IBM Corporation and Universities (Table 19).

Table 19: Employers with 2,000 or more Employees in Wake County and Research Triangle Park

Employers	# Employees
Duke University and Health System	36,004
State of North Carolina	24,083
Wake County Public School System	18,554
IBM Corporation	10,000
North Carolina State University	9,069
WakeMed Health & Hospitals	8,943
Rex Healthcare	5,700
SAS Institute, Inc.	5,616
GlaxoSmithKline	4,950
Lenovo	4,200
Fidelity Investments	4,000
North Carolina Department of Health & Human Services	3,800
Sensus	3,691
City of Raleigh	3,673
Conduent Inc.	3,300
Duke Energy	2,700
QuintilesIMS	2,600
Spectraforce Technologies Inc.	2,600

¹² The Research Triangle Park, 2017.

¹³ Ibid

Employers	# Employees
MetLife	2,600
Wake Technical Community College	2,547
Wells Fargo	2,300
RTI International	2,276
First Citizens Bank	2,026
Grifols	2,000
Pharmaceutical Product Development, Inc. (PPD)	2,000
Verizon Business	2,000

Source: Wake County Economic Development. 2017.

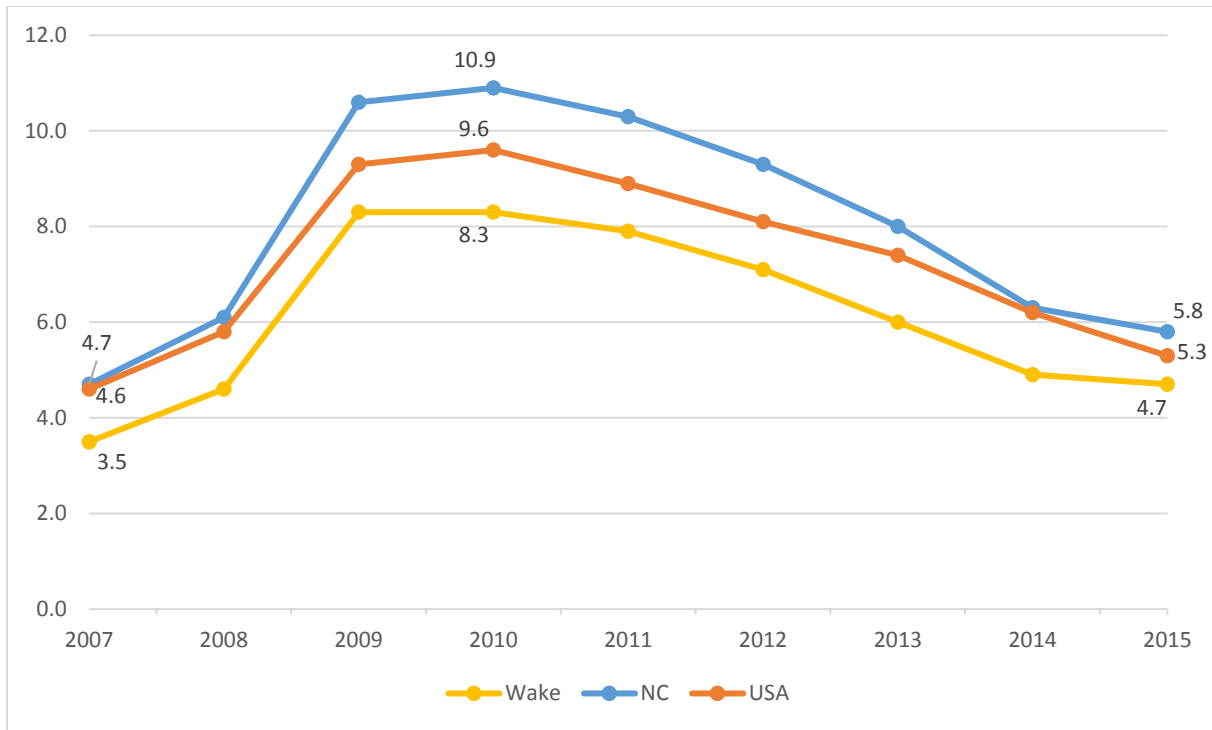
Wake County Trends

As the major source of employment in combination with RTP, and as the jurisdiction comprising most of the FLUSA, Wake County's growth trends provide indicators of both the impetus for growth and the regional growth pressures affecting the FLUSA. For example, a review of Wake County's 2016 report on Trends and Outlook¹⁴, based on US Census, other national, and county data, provides the following highlights:

- From 2010 to 2015, Wake County was the second fastest-growing county over 1 million in population in the US (14 percent), second to Travis County in the Austin, Texas region (15 percent), and ahead of Mecklenburg County, North Carolina (12 percent).
- After accounting for births and deaths, Wake County saw 43 net migrants daily, on average, from 2010 to 2015. Of these migrants to the county, on average, 32 arrived from other U.S. jurisdictions and 11 arrived from other countries.
- In 2014, the percentage of Wake County adult residents with a bachelor's degree or higher ranked 5th nationally among 36 peer counties with similar population size and growth rate.
- Unemployment among Wake County residents has been consistently below state and national averages (see Figure 15).
- In 2014, the top occupation in Wake County was educational services, health care and social assistance, accounting for 20.9 percent of employed residents. The second-highest occupation at 17.8 percent was professional, scientific, management and administrative.
- A heat map of 2015 residential and commercial building permits shows the major concentration of development activity in a band from RTP to Fuquay Varina in western and southern Wake County.
- Starting in 2012, there has been a surge in multifamily housing permits in Wake County. In 2016, 37 percent of Wake County households rented, and a substantially higher percentage of renters than homeowners spend more than 30 percent of their income on housing.

¹⁴ Wake County, 2016.

Figure 15: Wake County, State of North Carolina and U.S. Unemployment Rates, 2007 to 2015



Source: Bureau of Labor Statistics, Department of Labor

A final trend that has relevance to Complete 540 is the trend in daily Vehicle Miles Traveled (VMT) in Wake County. The VMT data show large increases from 2000 to 2007 at the county, state, and national levels (Table 20). However, between 2007 and 2014, North Carolina VMT increased by only 4 percent and national VMT actually decreased slightly. During the same time period however, Wake County saw a 25 percent increase in VMT, and a 65 percent increase from 2000-2014.

Table 20: Vehicle Miles Traveled Data for Wake County, North Carolina, and the U.S.

VMT (Millions)	2000	2007	2014	% Growth 2000-2007	% Growth 2007-2014	% Growth 2000-2014
Wake County	6,203	8,219	10,259	33	25	65
NC	89,504	103,598	108,012	16	4	21
USA	2,767,363	3,049,027	3,040,220	10	0	10

Sources: USDOT FHWA Highway Statistics Table VM-2; NCDOT North Carolina Traffic Crash Facts

Conclusion

Growth patterns and trends at both the CSA and FLUSA level show a pattern of sustained population and employment growth and increases in population density in addition to a concentration of recent growth within Wake County. The other FLUSA counties (Harnett and Johnston) also show strong growth (based on Census data) and are projected to increase in population through 2035. Growth indicators at the CSA level, namely employment, average household size, educational attainment, median income, and school

quality indicate that growth will very likely continue in the counties comprising the project FLUSA. Analysis of population, population density, average household size, school quality, and commute in the FLUSA counties at the sub-county level further indicates growth is likely within the FLUSA.

Based on population trends, employment, median income, school quality and commute times, Wake County will most likely continue to capture a high amount of growth in the future. Wake County leads in these indicators, and population forecasts suggest that past population trends and regional growth dynamics will continue into the future.

Within FLUSA counties, growth indicators suggest that much of the future population growth will occur within Wake County. Population densities are still relatively low outside of the urban core of the City of Raleigh, leaving ample room for additional growth in the suburban and rural portions of the county. With higher median household income and a greater perceived school quality than neighboring counties, many new residents and potential homebuyers would be attracted to Wake County. School quality appears to be highest in central, western and northern Wake.

Northern Harnett County and eastern Johnston County appear to have some positive growth factors, particularly the relatively low population densities and increases in employment and median income. Johnston County appears to have a higher quality school district, and would therefore be more likely to attract growth, relative to Harnett County.

Analysis of these growth patterns and trends indicates that the CSA region will continue to grow and that a sizeable portion of that growth is likely to occur within Wake County. The FLUSA area has both positive and negative indicators for growth compared to the other zones in the three-county study area. In particular, population density is relatively low in the FLUSA, suggesting that there may be land available for development. Indicators of school quality, however, is somewhat lower in the FLUSA than in other parts of Wake County suggesting that other parts of Wake may have higher relative growth pressures in the future. Additional housing trends in Wake County indicate that 37% of homeowners rent, substantially more renters pay more than a third of their income for housing, and there has been a surge in multifamily home construction since 2012. Together, these trends suggest there may be a market for higher-density housing in more affordable areas of the region such as portions of the FLUSA.

Underscoring the evident growth trends in the region, and in Wake County in particular, are a set of economic drivers that point to sustained growth. The unique regional partnership of universities and public- and private- sector research entities has fostered innovation, business growth, and hundreds of start-up companies. The RTP and the state government are key economic engines that steadily attract new residents to Wake County and the Research Triangle region.

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