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Strom Thurmond Institute

Urban Growth Along The I-85 Corridor: Predictions From Two Development Models

Jeffery Allen, Ph.D.

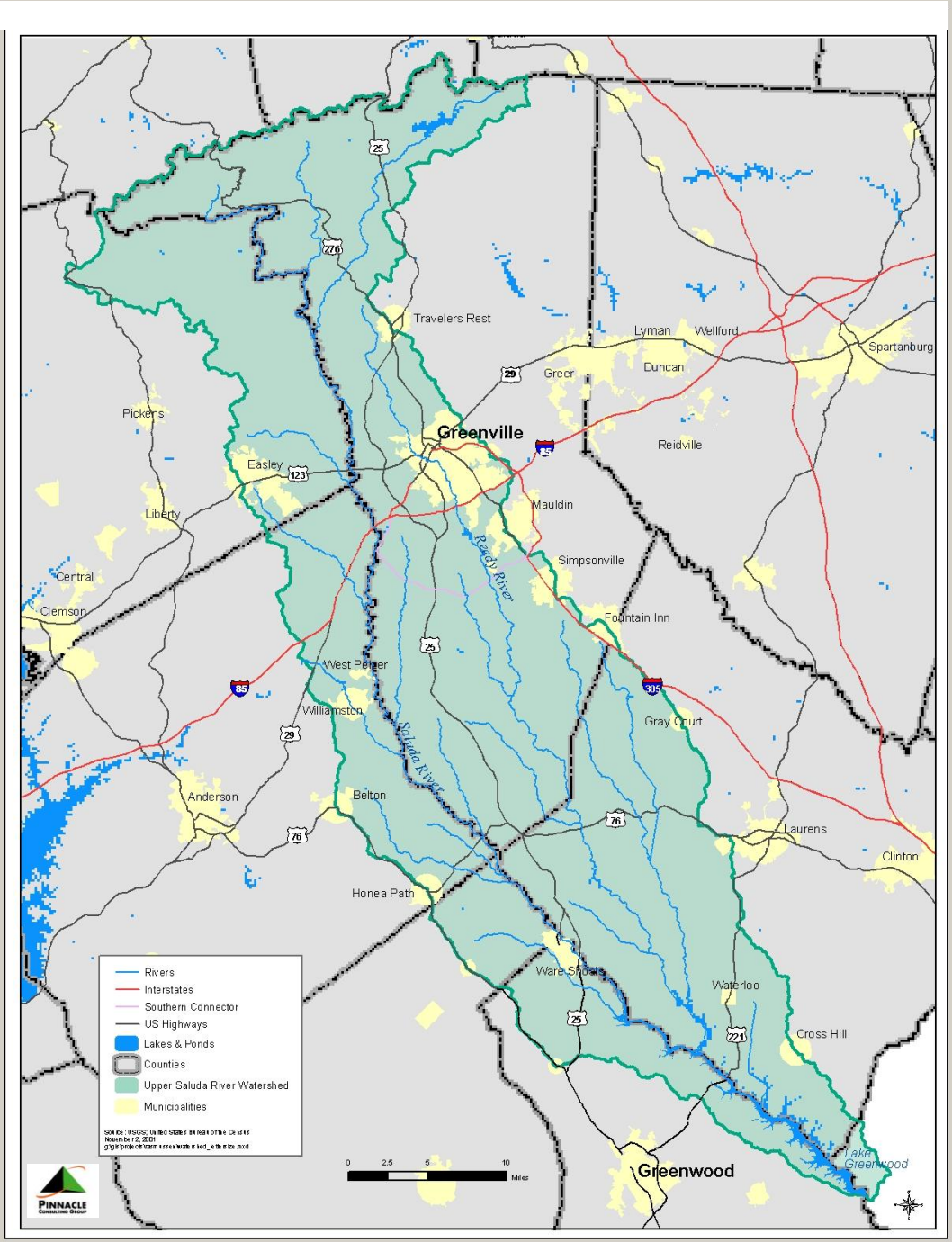
Click

WATER RESOURCES CENTER
SC

Saluda – Reedy Watershed

1165 sq. mi.

- 1439 stream miles
- *An interbasin transfer from the Savannah of 140 mgd*
- 6 counties
- 15 towns



Photograph: copyright 2006 Joseph B

Lake Conestee Rehabilitation Project

1943

1999

1999 NAPP

Legacy Contamination Issues

Contained Within Lake Conestee

Cadmium	16,500
Chromium	1,330,000
Copper	330,000
Lead	690,000
Zinc	1,270,000
Polynuclear Aromatic Hydrocarbons	3,120,000
Volatile Organics	79,100
PCBs	1,740
Pesticides	1,370

Unit - pounds

Lake Greenwood - 1994

The basics to model urban growth:

1) Population Change
2) Land Conversion
3) Predictor Forces/Variables

Population Changes

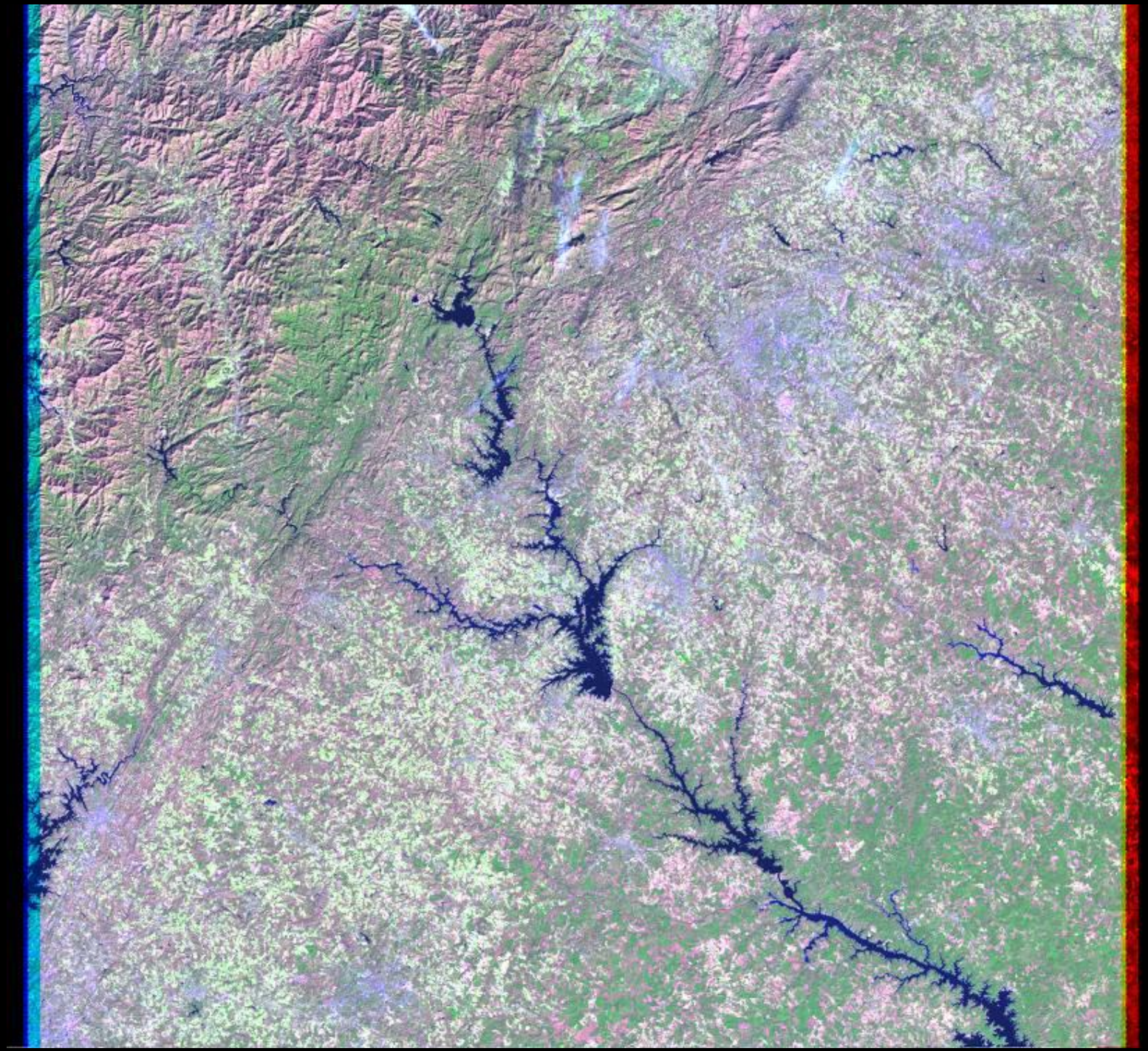
Population Change in South Carolina from 1950 - 2010.

Population 1950	Population 1960	%Inc.
2,117,027	2,382,594	12
Population 1960	Population 1970	
2,382,594	2,590,713	9
Population 1970	Population 1980	
2,590,713	3,121,820	20
Population 1980	Population 1990	
3,121,820	3,486,703	12
Population 1990	Population 2000	
3,486,703	4,012,012	15
Population 2000	Population 2010	
4,012,012	4,625,364	15

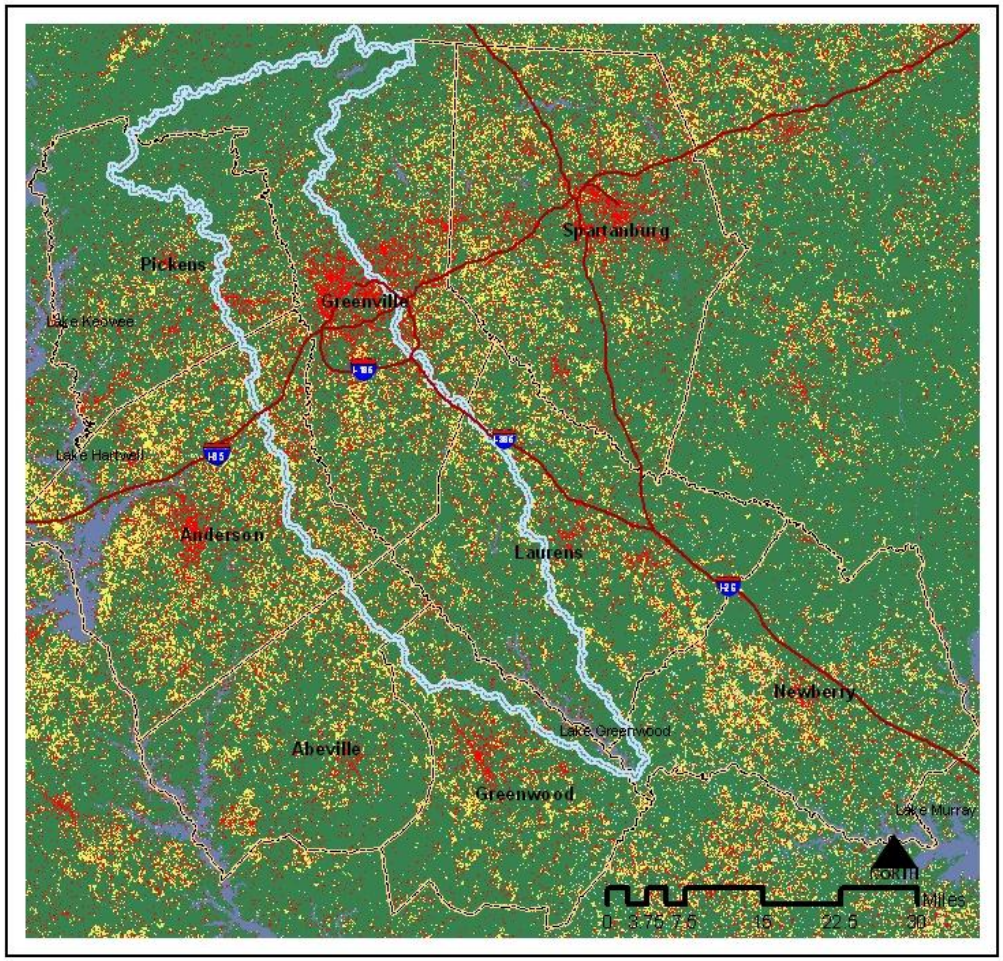
Population Projection 2030
5,148,569

Projected Growth in the Upstate

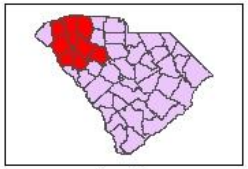
	POP90	POP2000	**PopChg %**	POP2030	PopChg%
Greenville	320,167	379,616	18.57	521,990	37.50
Spartanburg	226,800	253,791	11.90	332,450	30.99
Pickens	93,894	110,757	17.96	154,610	39.59
Anderson	145,196	165,740	14.15	215,380	29.95
Laurens	58,092	69,567	19.75	92,310	32.69
Newberry	33,172	36,108	8.85	43,580	20.69
Abbeville	23,862	26,167	9.66	30,790	17.67
Greenwood	59,567	66,271	11.25	81,160	22.47
Sum 8 Counties	960,750	1,108,017	15.33	1,472,270	32.87



Saluda Reedy Watershed Consortium
Land Cover Classification -Year 1990



Interstate High ways
Saluda Reedy Watershed
Study County
No Data
Open Water
Developed
Transitional or Barren
Forest
Pasture or Cultivated
Wetlands



Key Map

Areas in Square Miles

Class	Class Name	Greenville	Spartanburg	Pickens	Anderson	Laurens	Newberry	Abbeville	Greenwood	Total
1	Open Water	6.1	7.0	15.3	40.6	11.4	16.2	20.0	5.5	122
2	Developed	117.2	111.5	486	115.9	62.2	40.1	44.9	43.0	583.3
3	Transitional or Barren	0.9	1.2	1.2	2.3	1.8	7.8	1.4	0.9	17.7
4	Forest	584.7	584.8	403.3	460.1	560.0	501.3	387.5	363.7	3035.5
5	Pasture or Cultivated	83.6	111.0	386	146.0	82.6	70.2	56.0	47.8	635.8
6	Wetlands	4.5	3.1	4.5	2.4	4.6	11.1	1.1	2.0	34
	Total	796.9	819.1	811.4	757.4	722.6	647.3	511.1	462.9	3228

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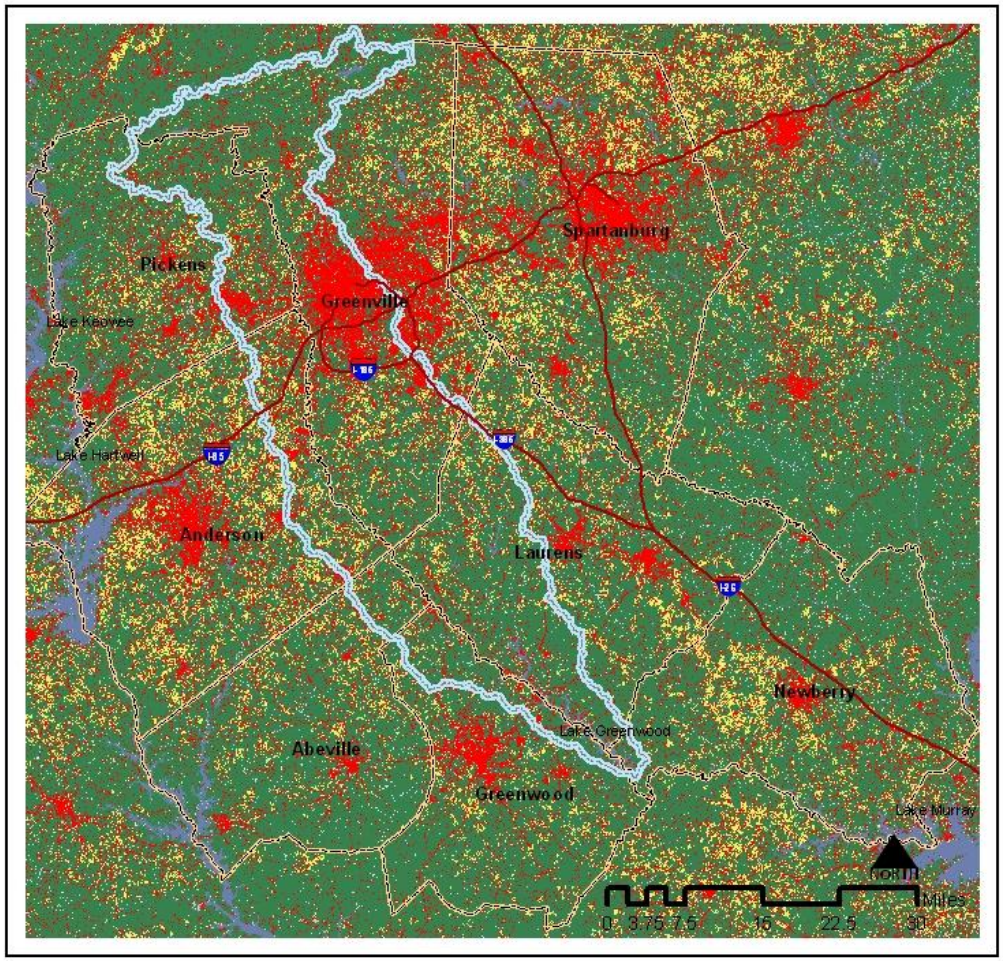
Saluda Reedy Watershed Consortium
Land Cover Classification -Year 2000



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Saluda Reedy Watershed
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No Data
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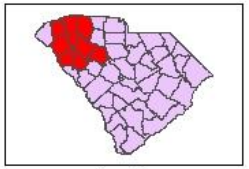

Key Map

Areas in Square Miles

Class	Class Name	Greenville	Spartanburg	Pickens	Anderson	Laurens	Newberry	Abbeville	Greenwood	Total
1	Open Water	6.1	6.8	155	31.9	11.2	20.9	18.1	6.3	123.9
2	Developed	236.5	222.5	98.3	168.5	102.5	19.6	59.1	13.0	1040.3
3	Transitional or Barren	13.2	19.9	1.5	19.5	10.5	5.5	6.5	6.3	88.6
4	Forest	512.6	565.6	351.6	511.0	526.8	518.3	381.8	356.5	3555.9
5	Pasture or Cultivated	65.1	102.1	36.6	110.6	63.6	55.3	32.6	21.9	593.8
6	Wetlands	2.9	3.5	2.0	5.0	1.1	1.1	5.9	3.1	36.1
	Total	1969	819.1	511.5	151.5	122.0	651.3	511.1	562.9	6218.1

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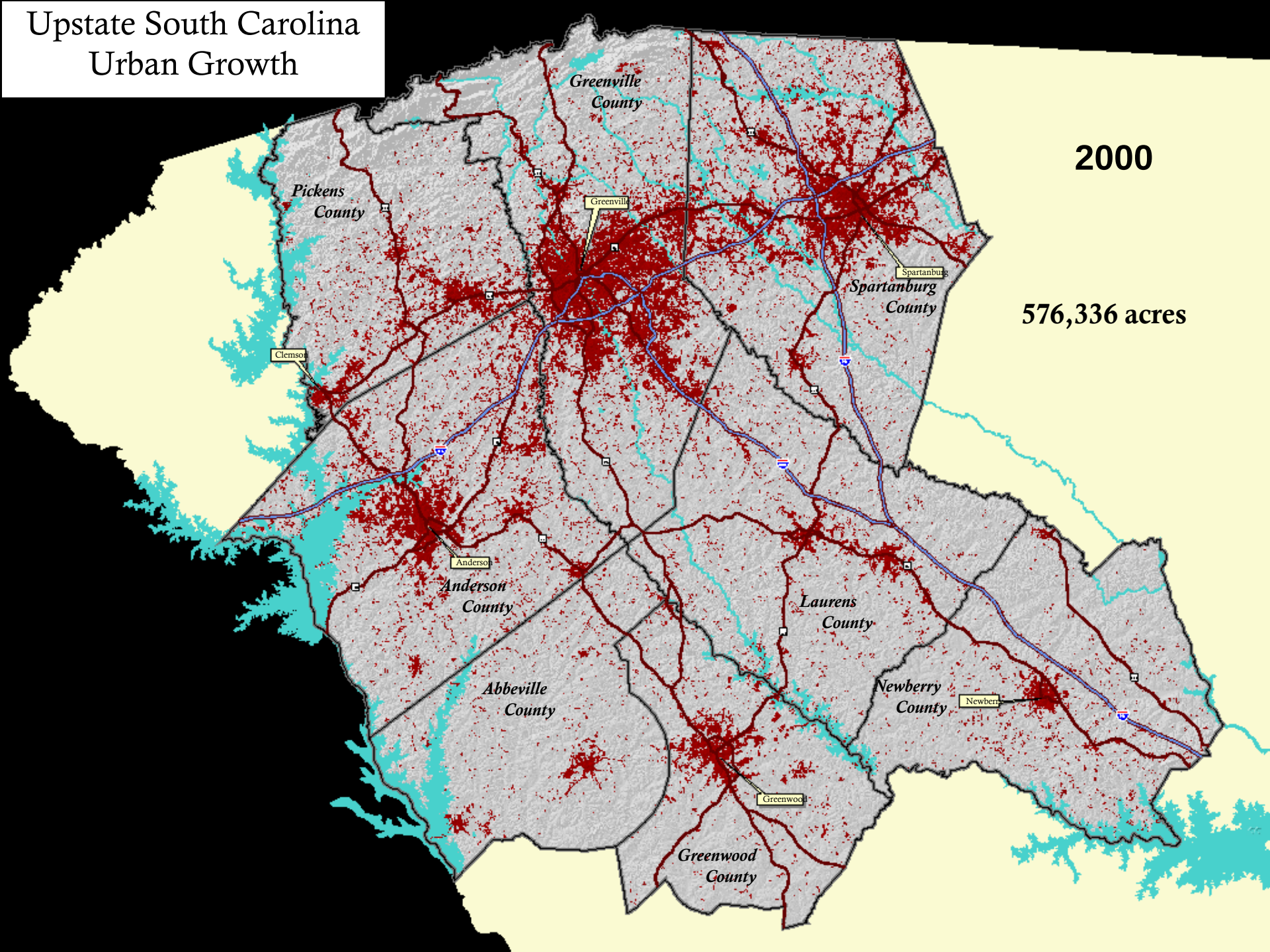
Upstate South Carolina Urban Growth

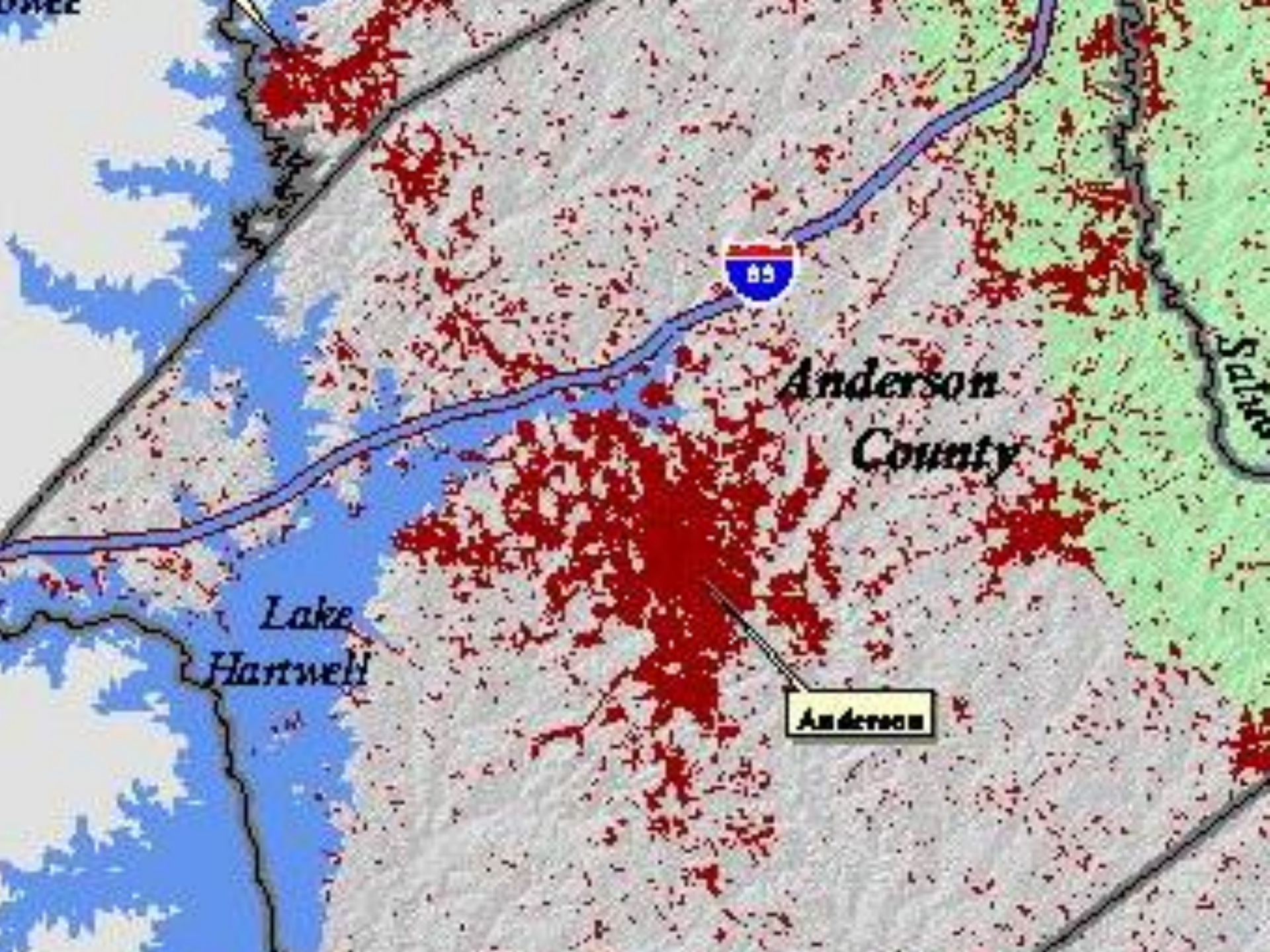
1990 - 2000 Urban Area Increase 78%
1990 - 2000 Population Increase 15%

Growth Ratio 5:1

Greenville	5.5:1
Spartanburg	8.4:1
Pickens	5.8:1
Anderson	3.2:1
Laurens	3.3:1
Newberry	11.1:1
Abbeville	3.4:1
Greenwood	6.2:1

Upstate South Carolina Urban Growth

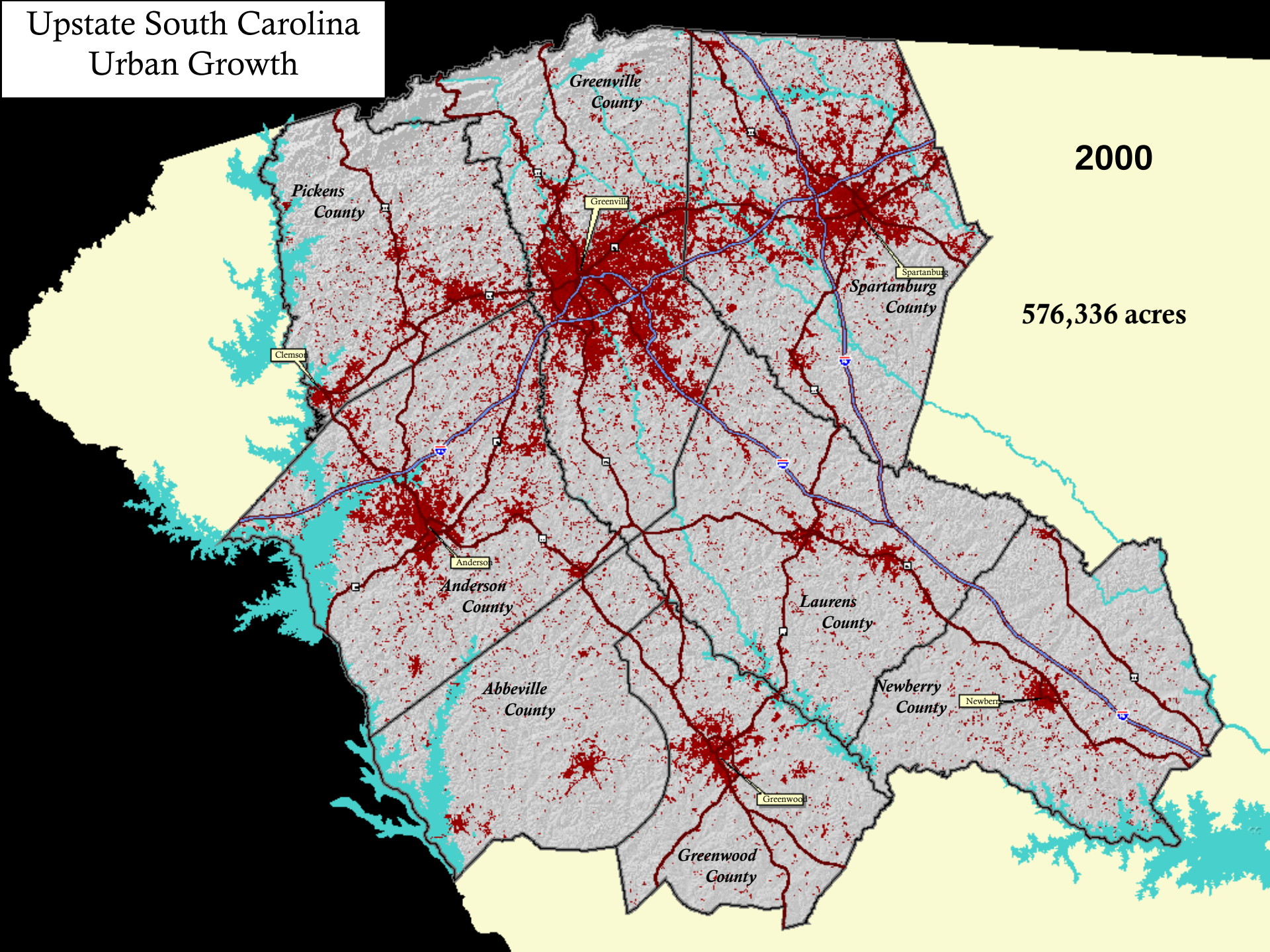


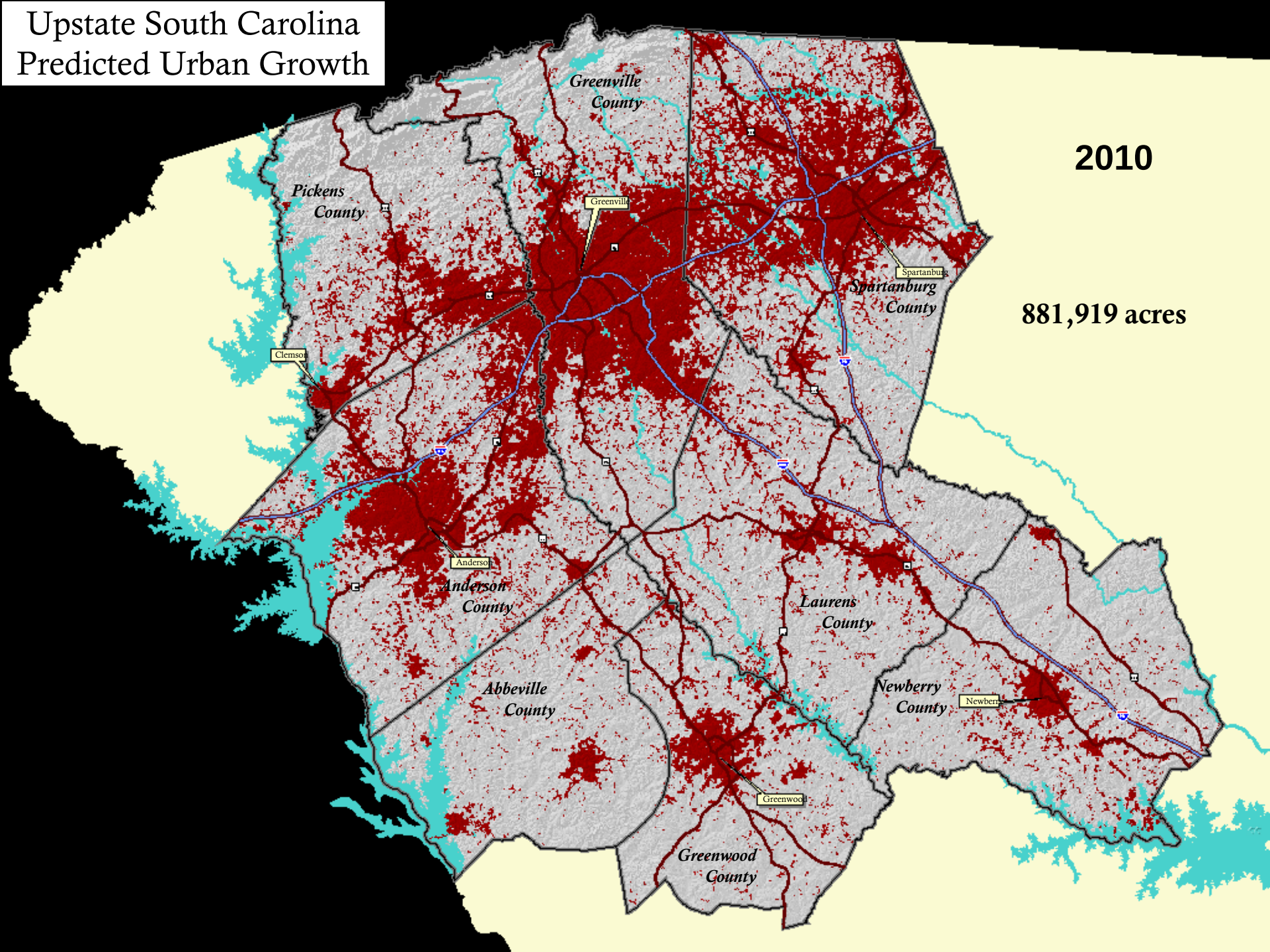

85
Anderson
County
Lake
Hartwell
Anderson

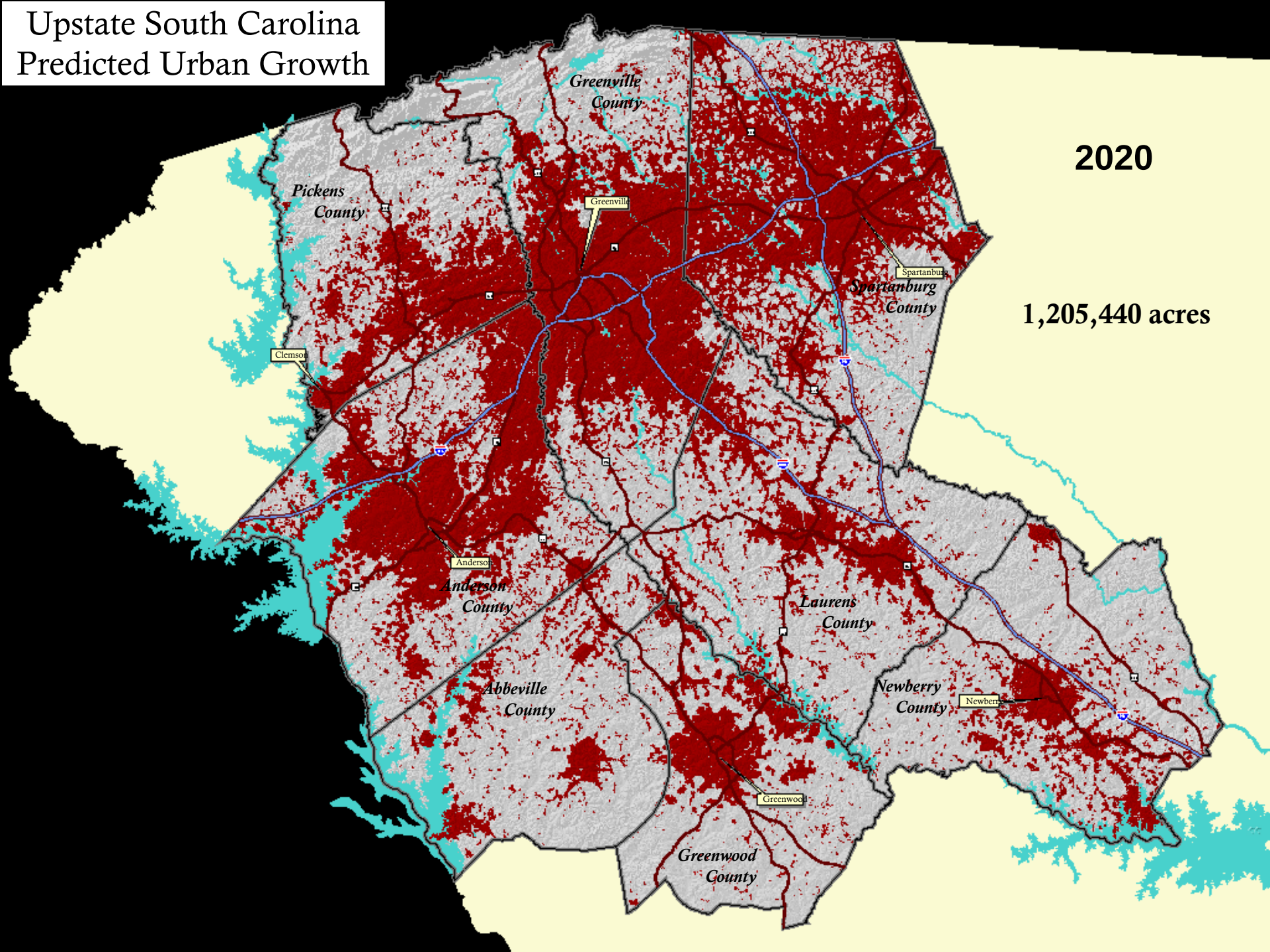
Ideal Predictor Variables

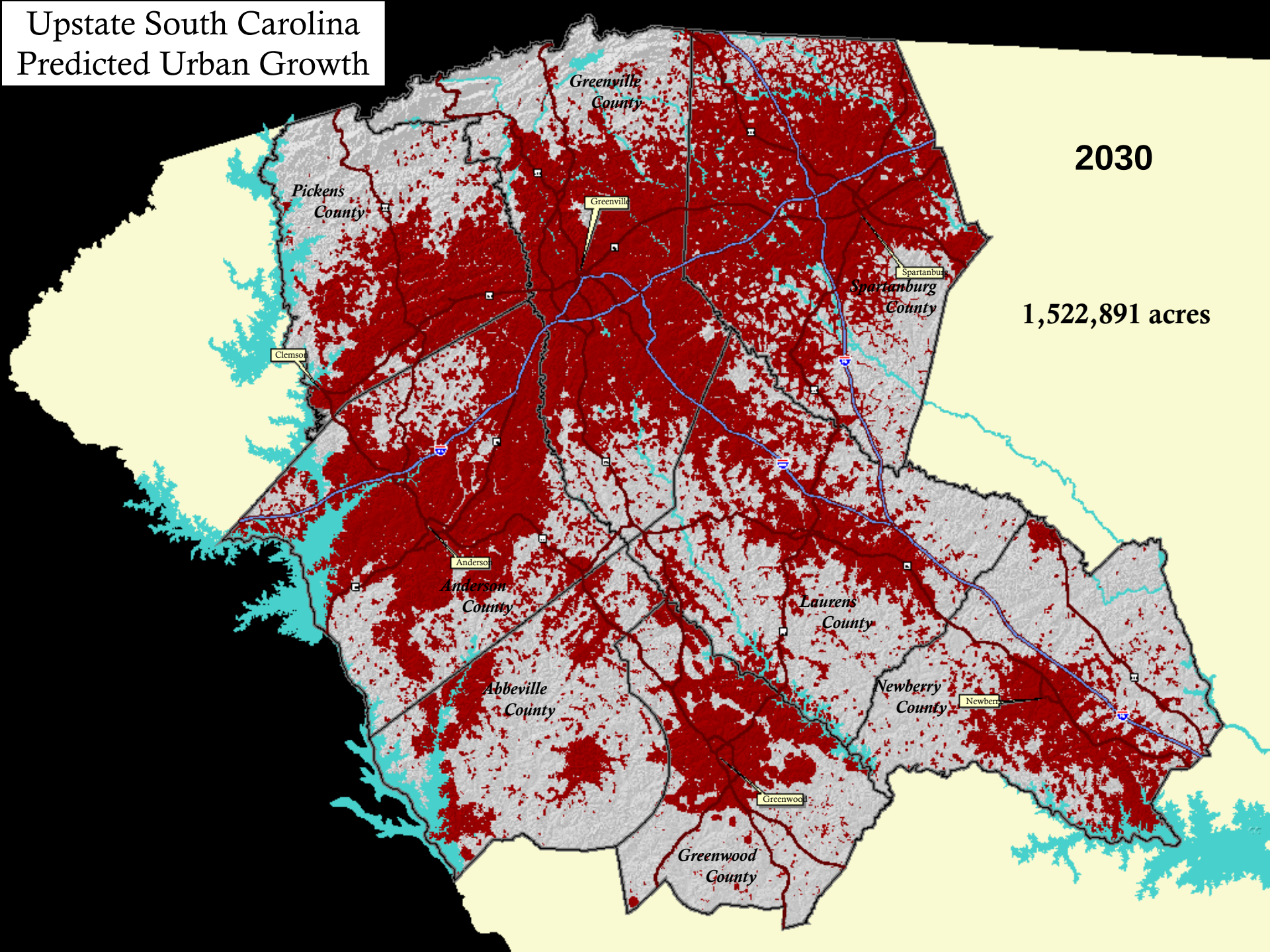
	Variable Name	Description and Units of Measurement	Type
Physical Suitability			
1	WATERBDY	Water body	Dichotomous
2	PRXWATFT	Proximity to waterfront (km)	Continuous
3	WETLAND2	Wetland (saltwater and freshwater)	Discrete
4	ELEVATIN	Elevation (in meters)	Dichotomous
5	SLOPPCNT	Slope in %	Continuous
6	FORESTLD	Forestland (Upland, Freshwater, Saltwater)	Discrete
7	SOILSUIT	Soil Suitability (suitable/unsuitable)	Dichotomous
8	HEZADOUS	Hazardous area (yes/no)	Dichotomous
Service Accessibility			
9	PRXPRMRD	Proximity to major roads (km)	Continuous
10	RDDENSTY	Road density (Length in km per km ^{2})	Continuous
11	PRXNODES	Proximity to nodes (km)	Continuous
12	PRXAIRPT	Proximity to airport (km)	Continuous
13	PRXSEAPT	Proximity to seaport (km)	Continuous
14	PRXBRIDG	Proximity to bridge	Continuous
15	ADJWATLN	Adjacency to water line (km)	Continuous
16	ADJSWRLN	Adjacency to sewer line (km)	Continuous
17	ADJSCHOL	Adjacency to school (km)	Continuous
18	COSTDIST	Cost distance from downtown or CBD (km)	Continuous
Initial Conditions			
19	OLDURBAN	Existing urban	Dichotomous
20	ADJURBAN	Adjacency to existing urban (km)	Continuous
21	INFLVACT	Vacant (infillable) area	Dichotomous
22	PRIMLAND	Prime land	Dichotomous
23	GRTHMMTM	Growth momentum (Previous trend)	Continuous
Policy Constraints			
24	PRTCTLND	Protected land (Federal, State, County, Private)	Dichotomous
25	ZONINGRG	Zoning Regulation (Urban zoning districts)	Dichotomous
26	CORPAREA	Corporate area (or Growth Boundary)	Dichotomous
27	BUFRAREA	Buffered area (Special Protection Zones)	Dichotomous
28	OWNERSHP	Landownership (Public/semipublic/private)	Discrete
Market Factors			
29	MHUVALUE	Mean housing unit value (Census Block)	Discrete
30	HUDENSTY	Housing unit density (Census Block)	Discrete
31	HUGRTHMM	Housing unit growth momentum (Census Block)	Discrete
32	POPDNSTY	Population density (persons /mi ^{2},Census Block)	Discrete
33	POPGRTHM	Population growth momentum (Change in D)	Discrete

Upstate South Carolina Urban Growth

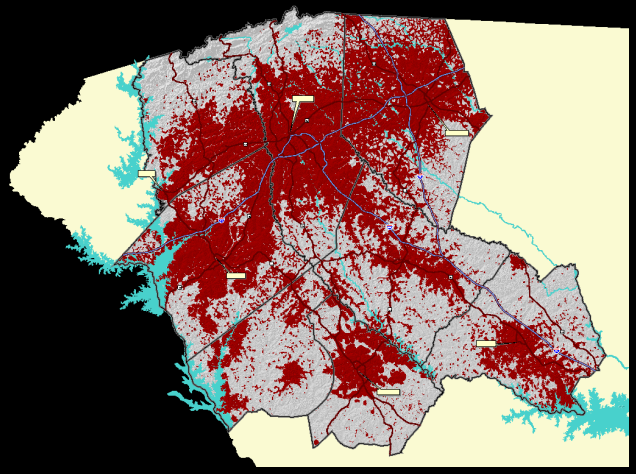



Upstate South Carolina
Predicted Urban Growth
2010
881,919 acres
Greenville County
Pickens County
Greenville
Spartanburg
Spartanburg County
Clemson
Anderson
Anderson County
Laurens County
Abbeville County
Newberry County
Newberry
Greenwood
Greenwood County

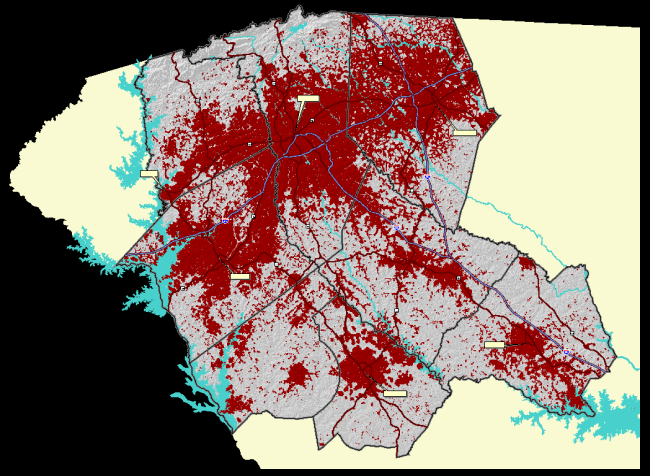

Upstate South Carolina
Predicted Urban Growth
2020
1,205,440 acres
Greenville County
Pickens County
Greenville
Spartanburg
Spartanburg County
Clemson
Anderson
Anderson County
Laurens County
Abbeville County
Newberry County
Newberry
Greenwood
Greenwood County


Upstate South Carolina
Predicted Urban Growth
2030
1,522,891 acres
Greenville County
Pickens County
Greenville
Spartanburg
Spartanburg County
Clemson
Anderson
Anderson County
Laurens County
Abbeville County
Newberry County
Newberry
Greenwood
Greenwood County

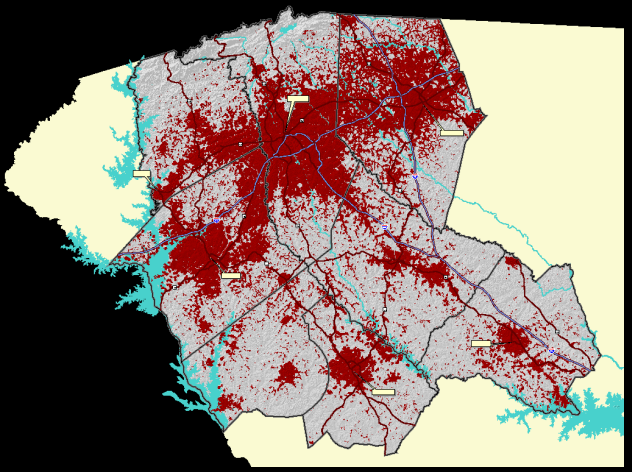
Alternative Growth Ratios



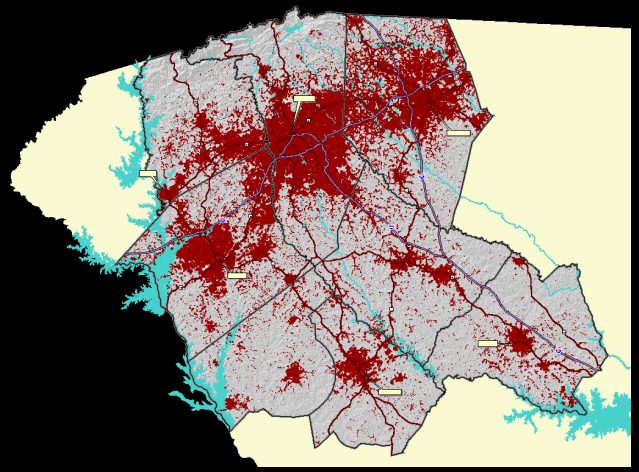
5:1 Ratio



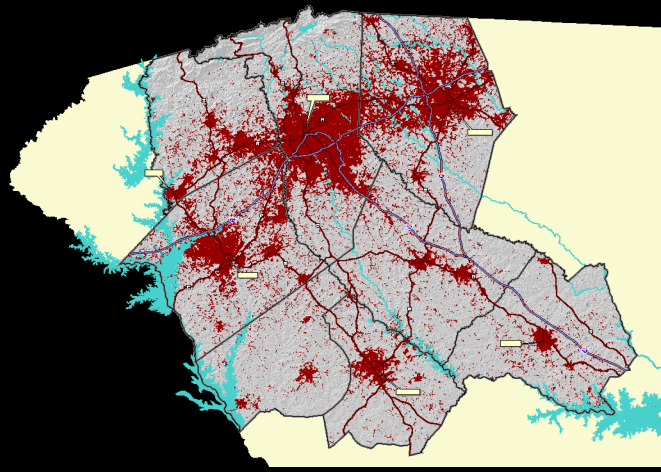
4:1 Ratio



3:1 Ratio

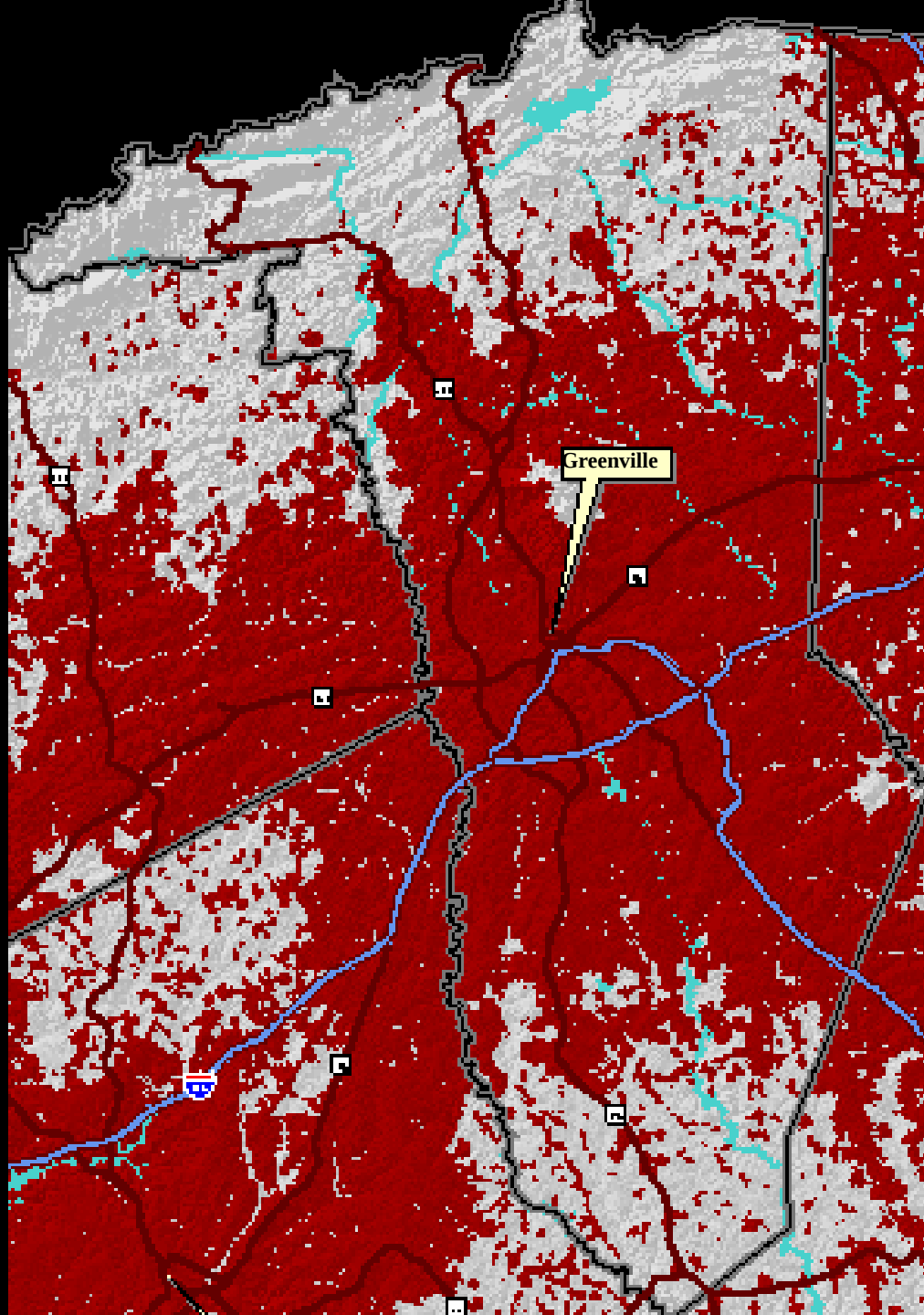


2:1 Ratio



1:1 Ratio

County comprehensive plans have actually accommodated the sprawling 5:1 growth ratio



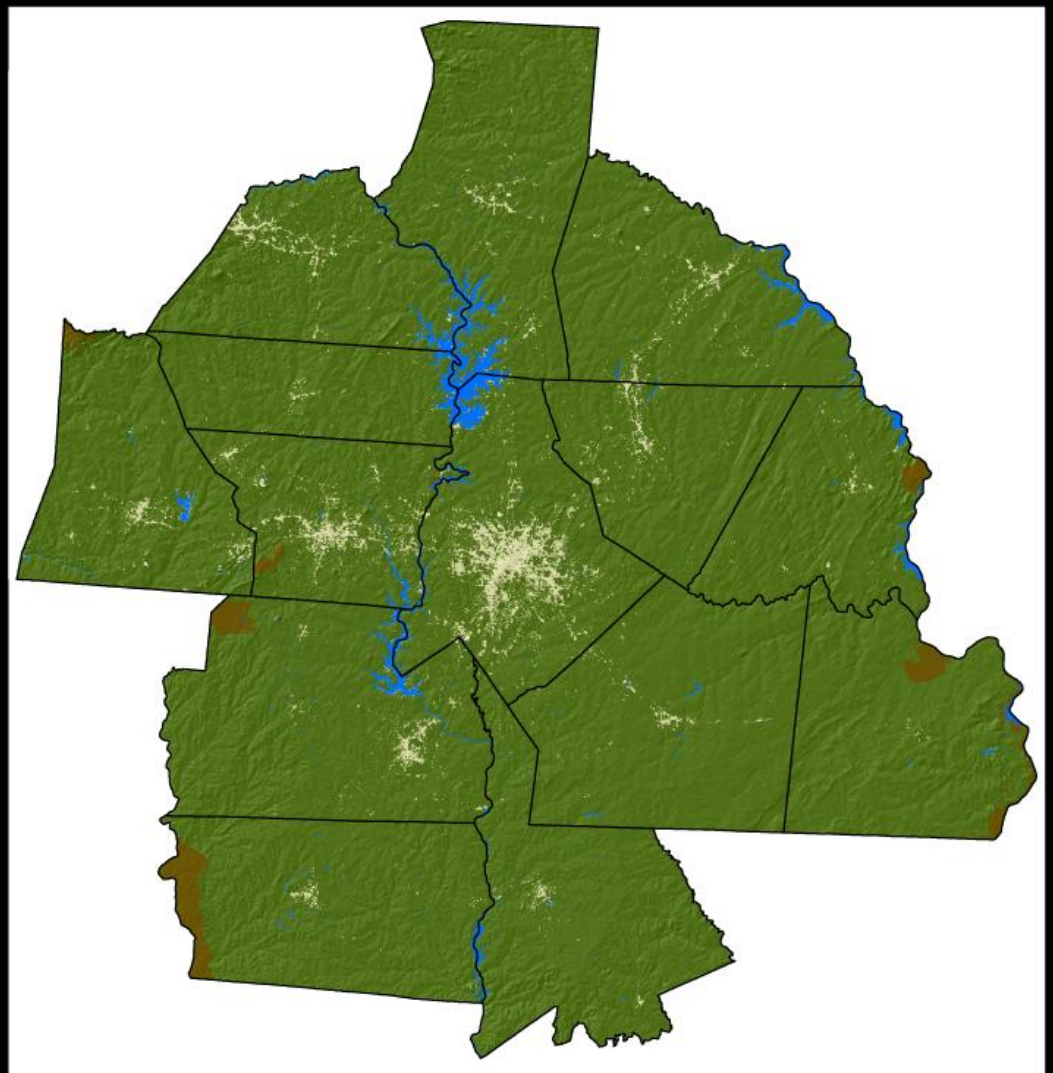
Renaissance Computing Institute (RENCI) at UNCC

Urban Growth Mapping & Forecasting: 1976-2030

Southern Piedmont Region – County Profile Data

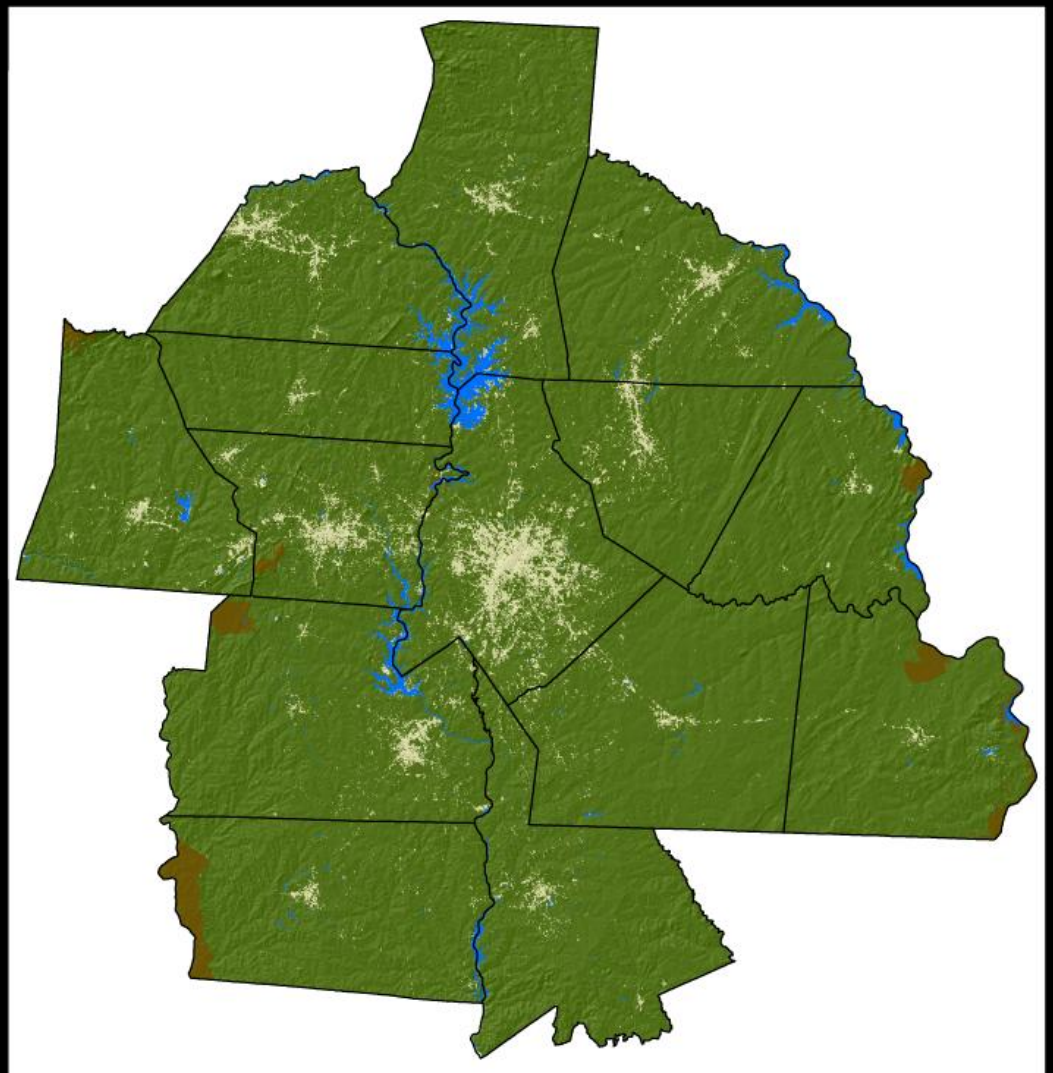
Charlotte Metro Area Growth 1976

RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS



Charlotte Metro Area Growth 1985

RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS



Charlotte Metro Area Growth 1996

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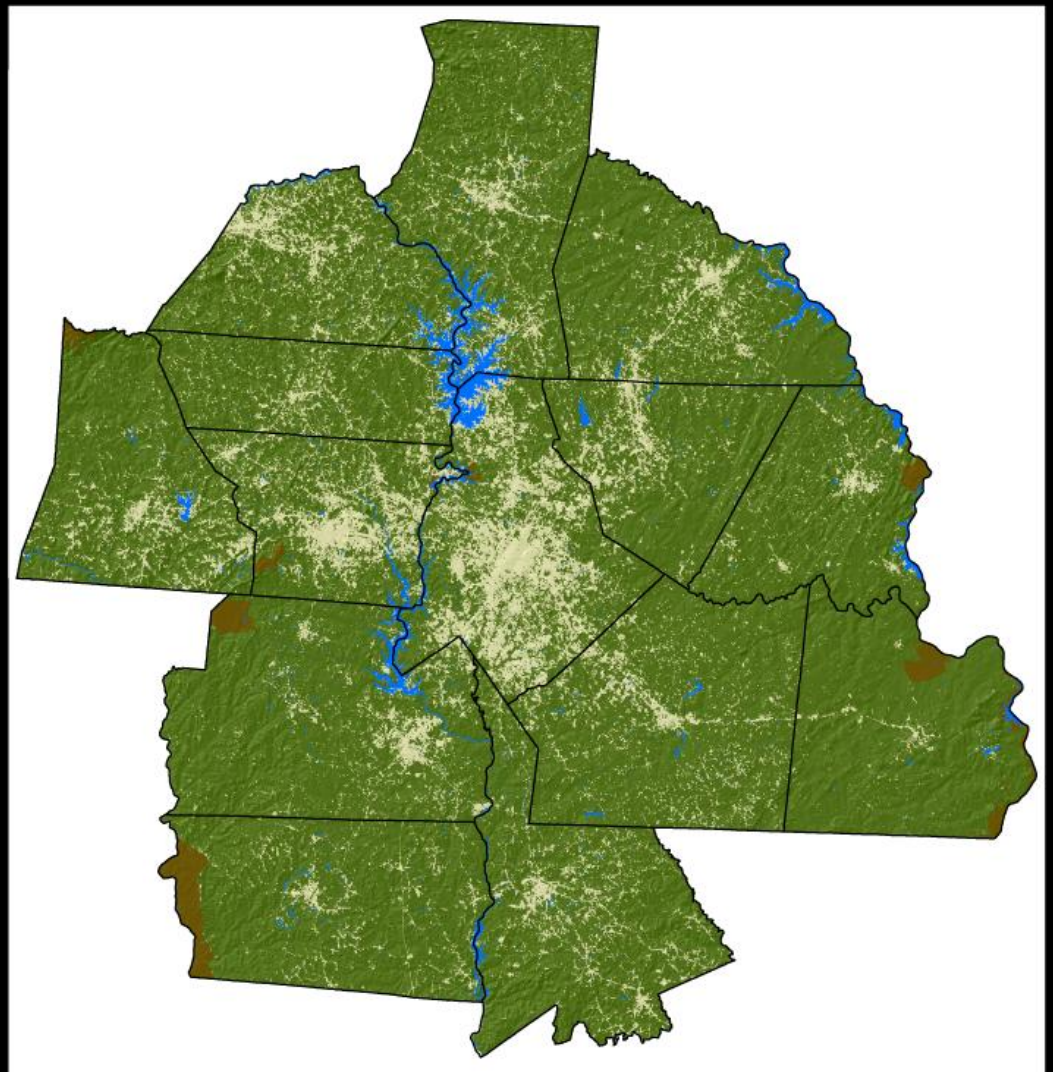

Charlotte Metro Area Growth 2006

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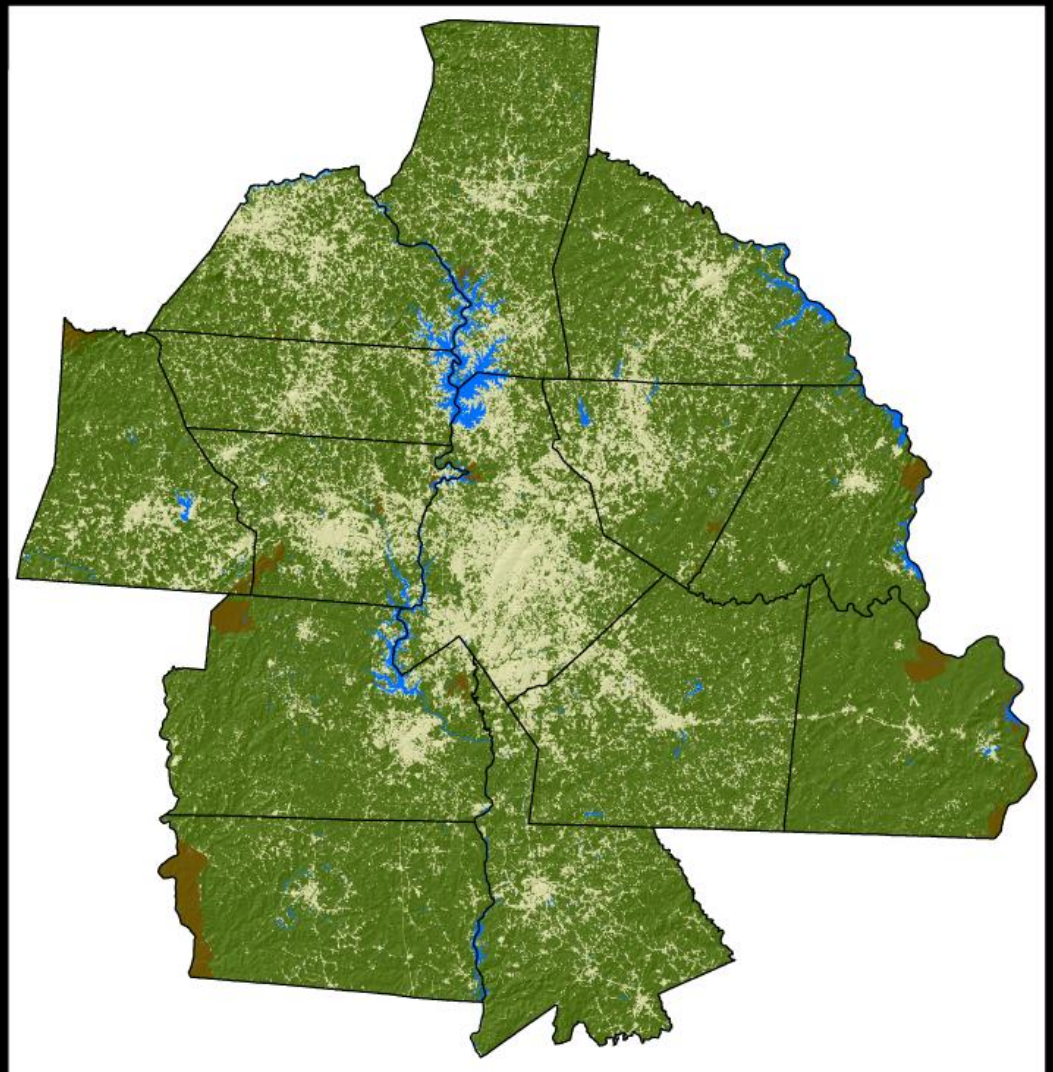

Charlotte Metro Area Growth 2010

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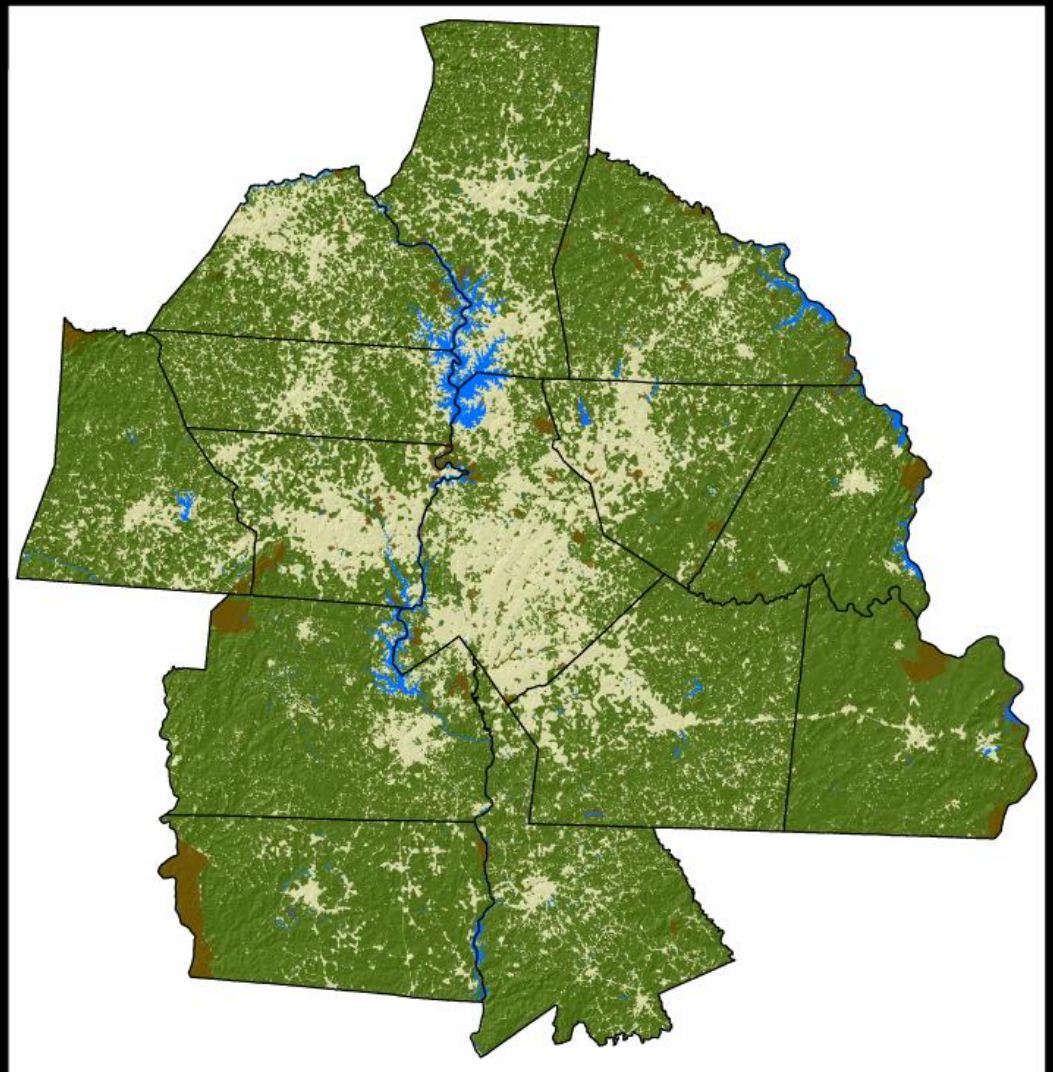

Charlotte Metro Area Growth 2015

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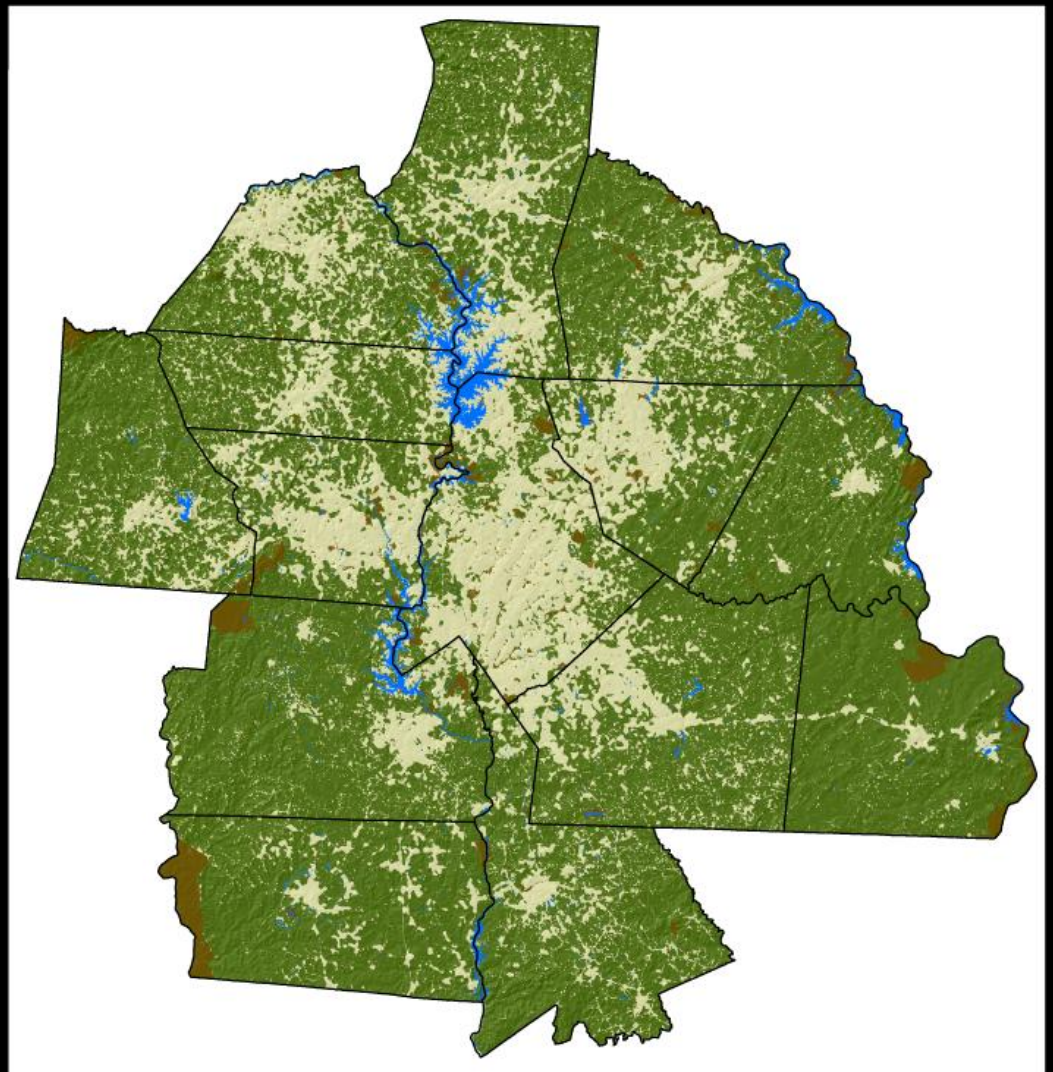

Charlotte Metro Area Growth 2020

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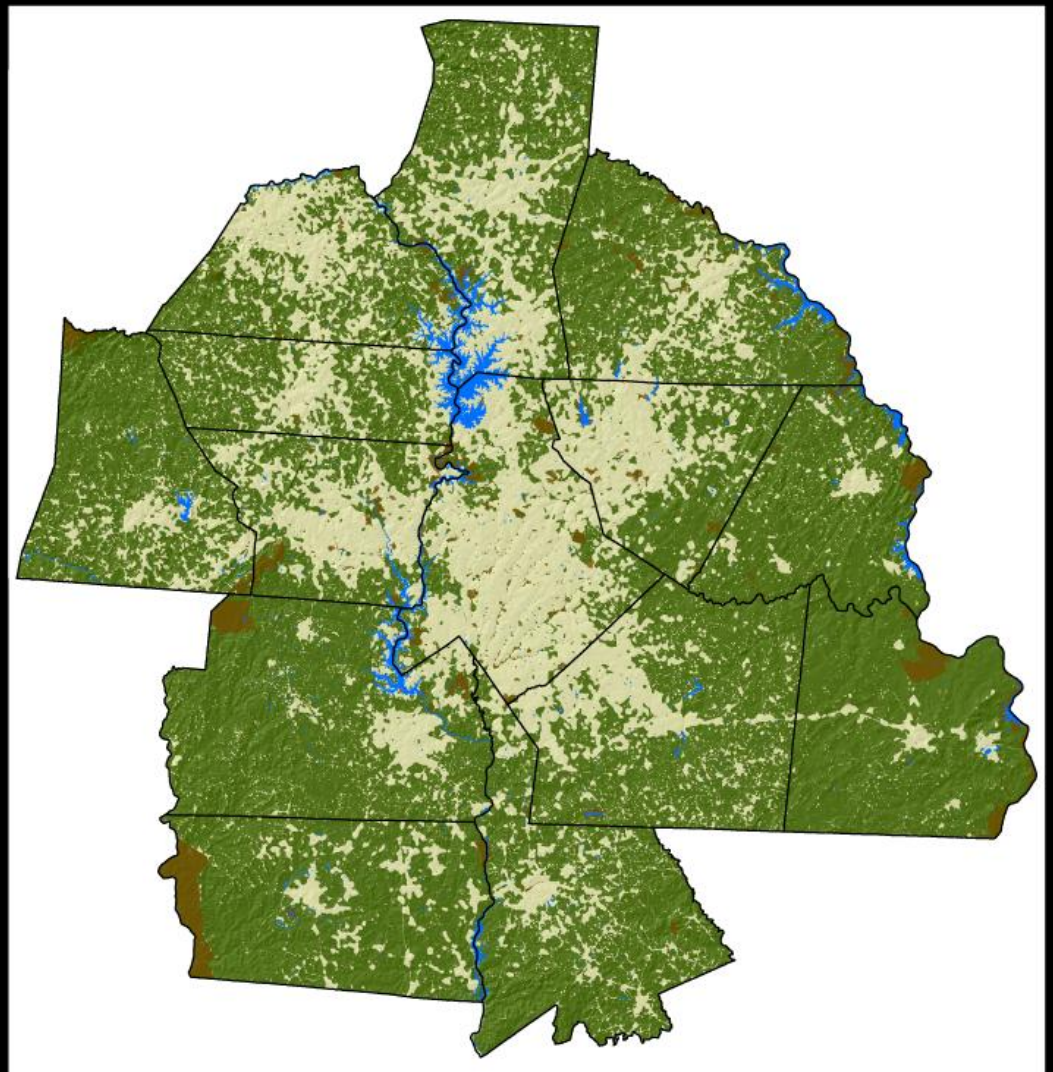

Charlotte Metro Area Growth 2025

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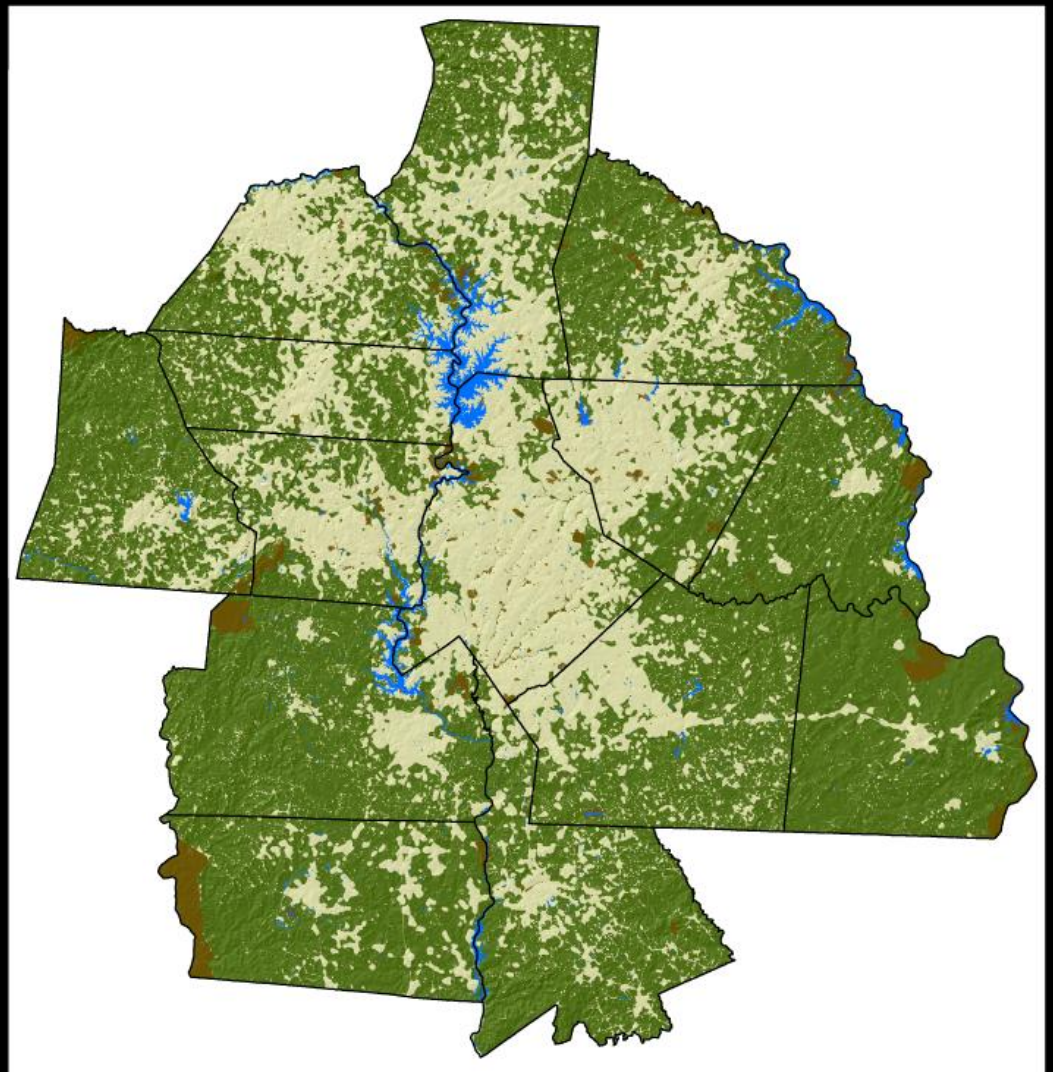

Charlotte Metro Area Growth 2030

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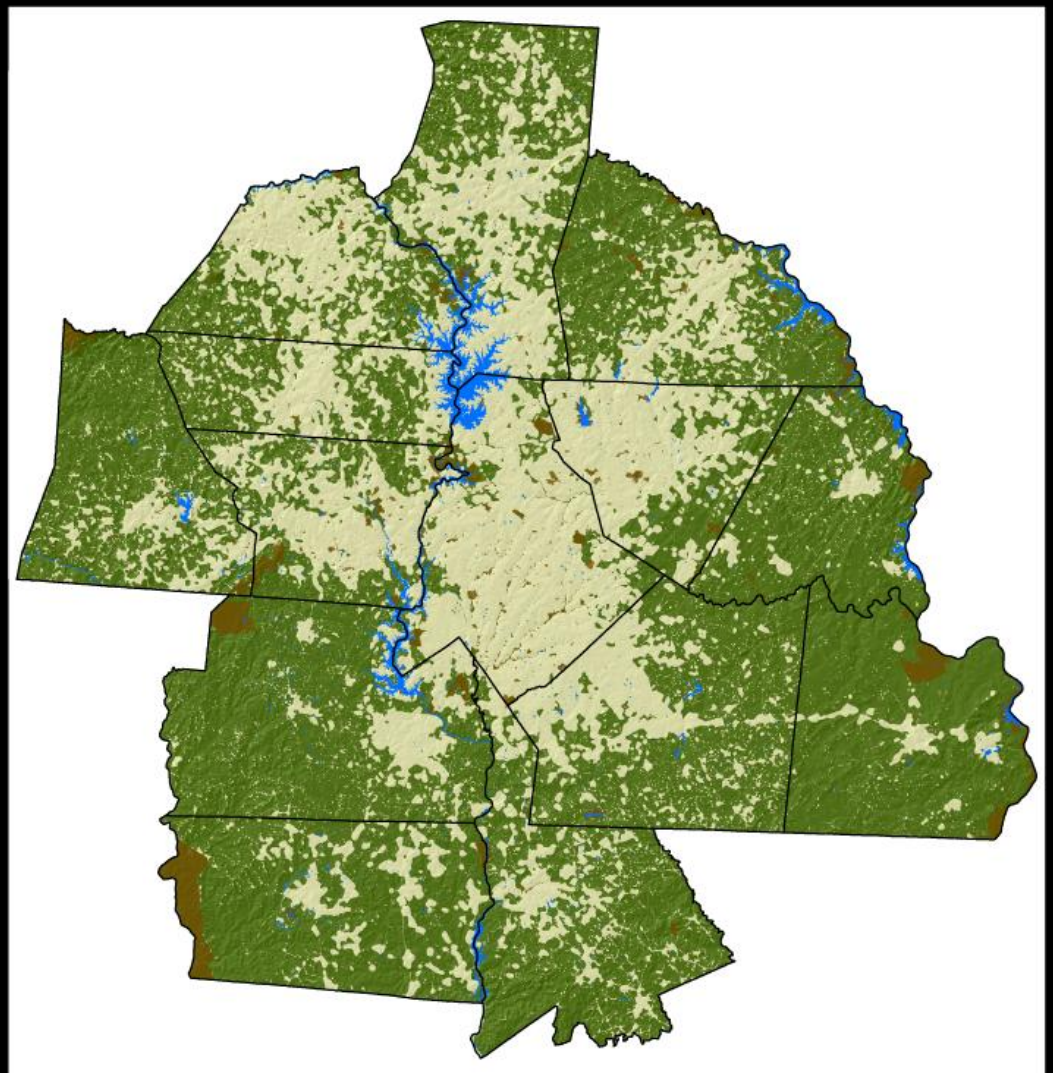


Charlotte Metro Area Growth

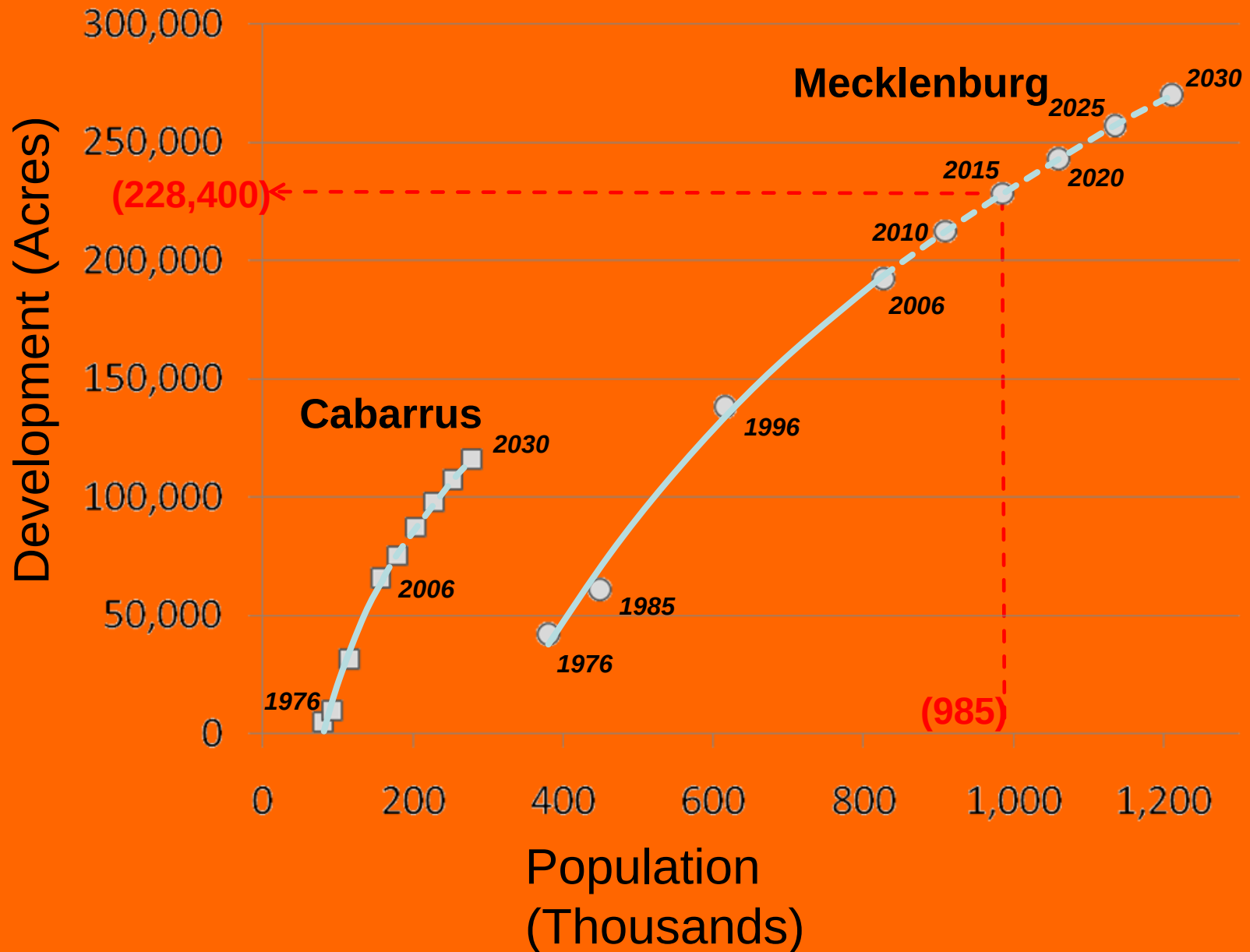
RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS

- According to the North Carolina Office of State Budget and Management and the South Carolina Budget and Control Board, the population in the 24-county region increased 66 percent between 1976 and 2006, from 1,833,500 to 3,051,389 people, respectively; the estimated 2010 population of the region is 3,287,750 people.
- Development, or the number of acres converted from natural / rural land to developed land, increased nearly 857 percent between 1976 and 2006, at an average rate of 105 acres per day.
- Total developed acres increased from 134,176 acres in 1976 to 1,283,804 acres in 2006.
- Development in the 24-county region outpaced population growth nearly 13-to-one between 1976 and 2006.

Charlotte Metro Area Growth

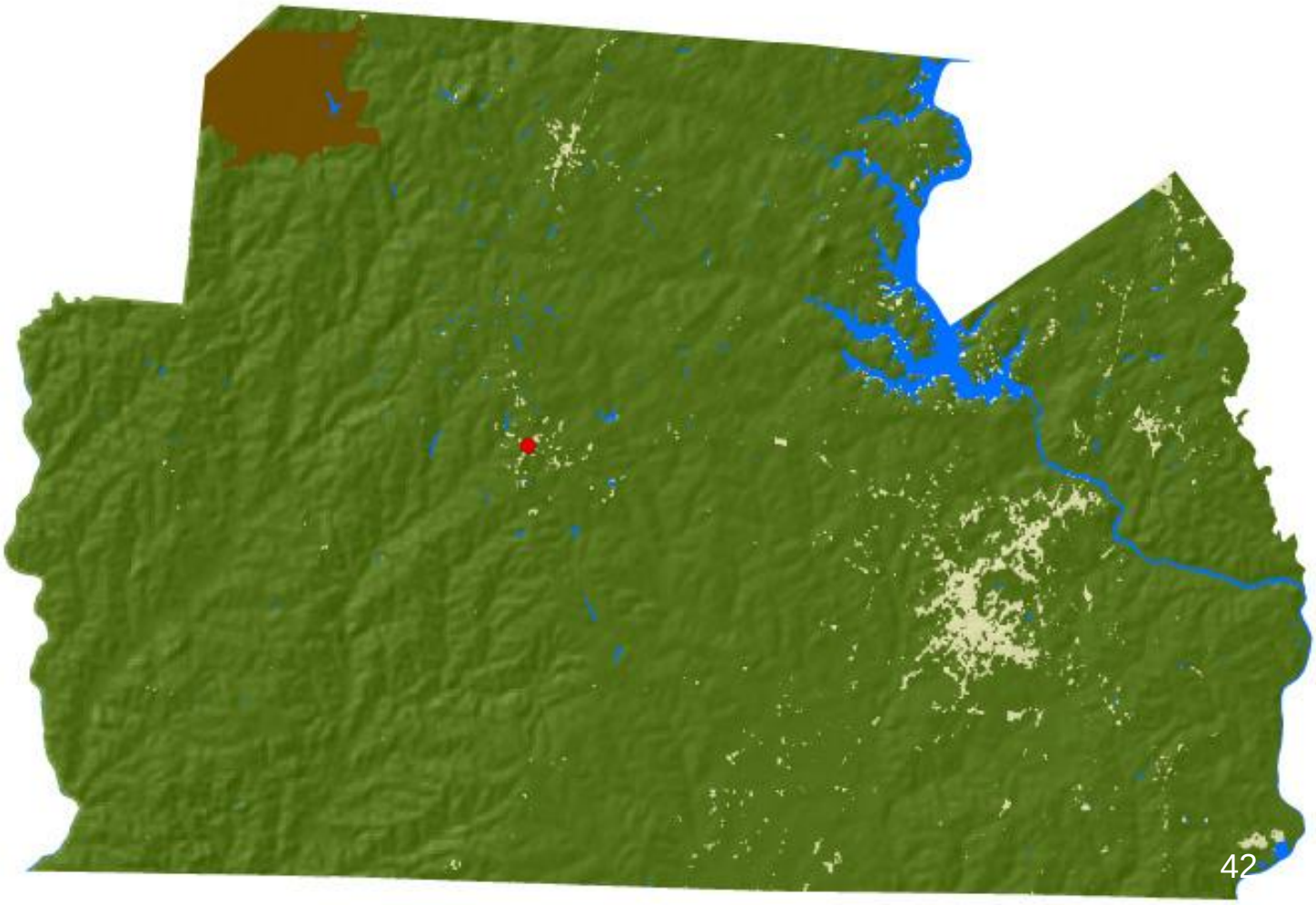
RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS

- Researchers forecast an additional 914,254 acres of development will take place in the 24-county region between 2006 and 2030, a 71 percent increase in developed acres, at an average rate of 104 acres per day.
- Total developed land in the 24-county region is expected to increase from 17.2 percent of the region in 2006 to 29.7 percent in 2030, an increase of 12.5 percent of region.
- By 2030, 29.7 percent of the land in the 24-county region is expected to be developed and 70.3 percent is expected to remain undeveloped.
- The population of the 24-county region is projected to increase from 3,051,389 to 4,374,012, a 43 percent increase, between 2006 and 2030.


Development (Acres)
300,000
250,000
200,000
150,000
100,000
50,000
0
(228,400)
Mecklenburg
2030
2025
2020
2015
2010
2006
1996
1985
1976
Cabarrus
2030
2006
1976
(985)
0
200
400
600
800
1,000
1,200
Population
(Thousands)

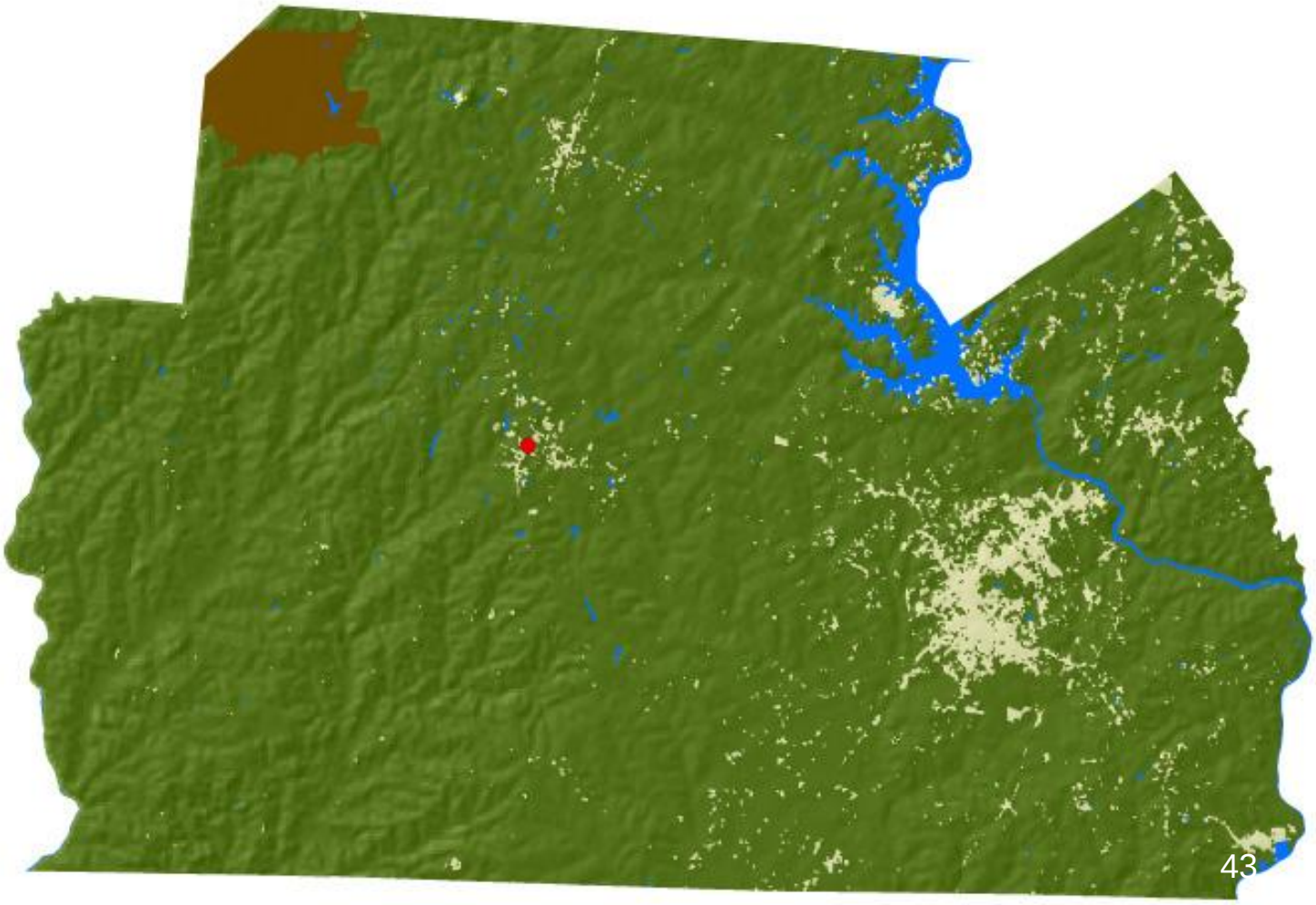
Charlotte Metro Area - York County Growth 1976

RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS



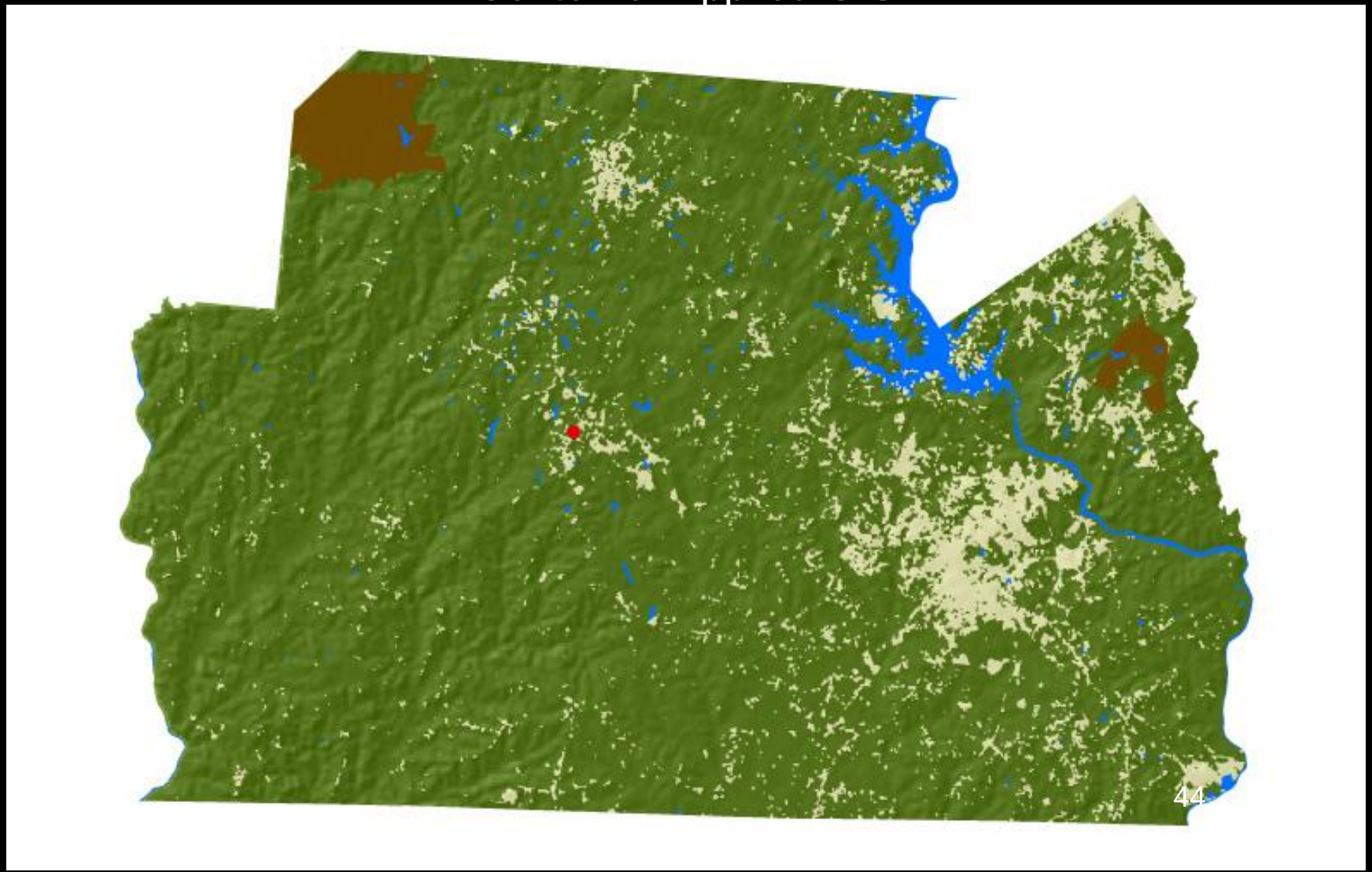
Charlotte Metro Area – York County Growth 1985

RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS



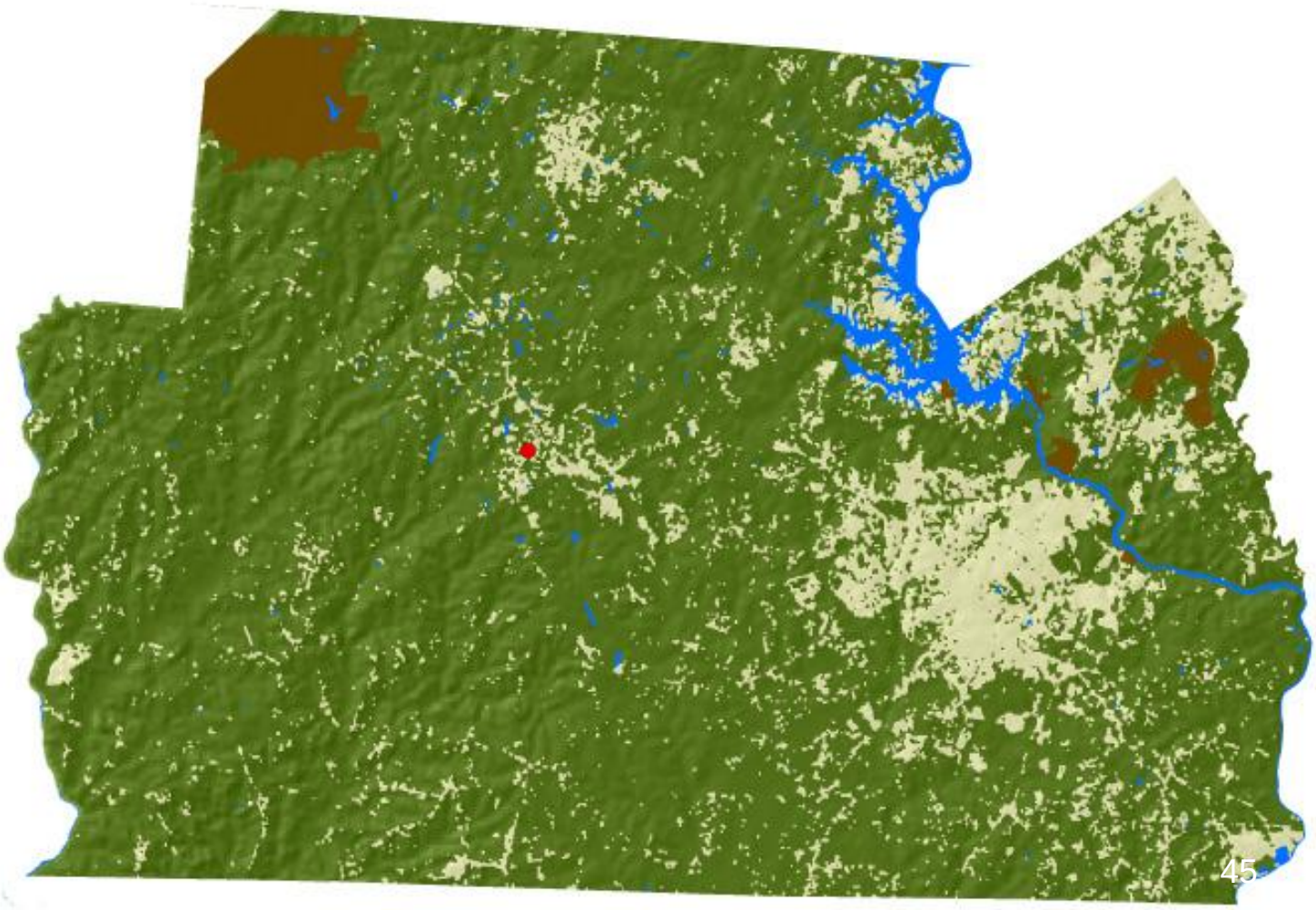
Charlotte Metro Area – York County Growth 1996

RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS



Charlotte Metro Area – York County Growth 2006

RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS



Charlotte Metro Area – York County Growth 2010

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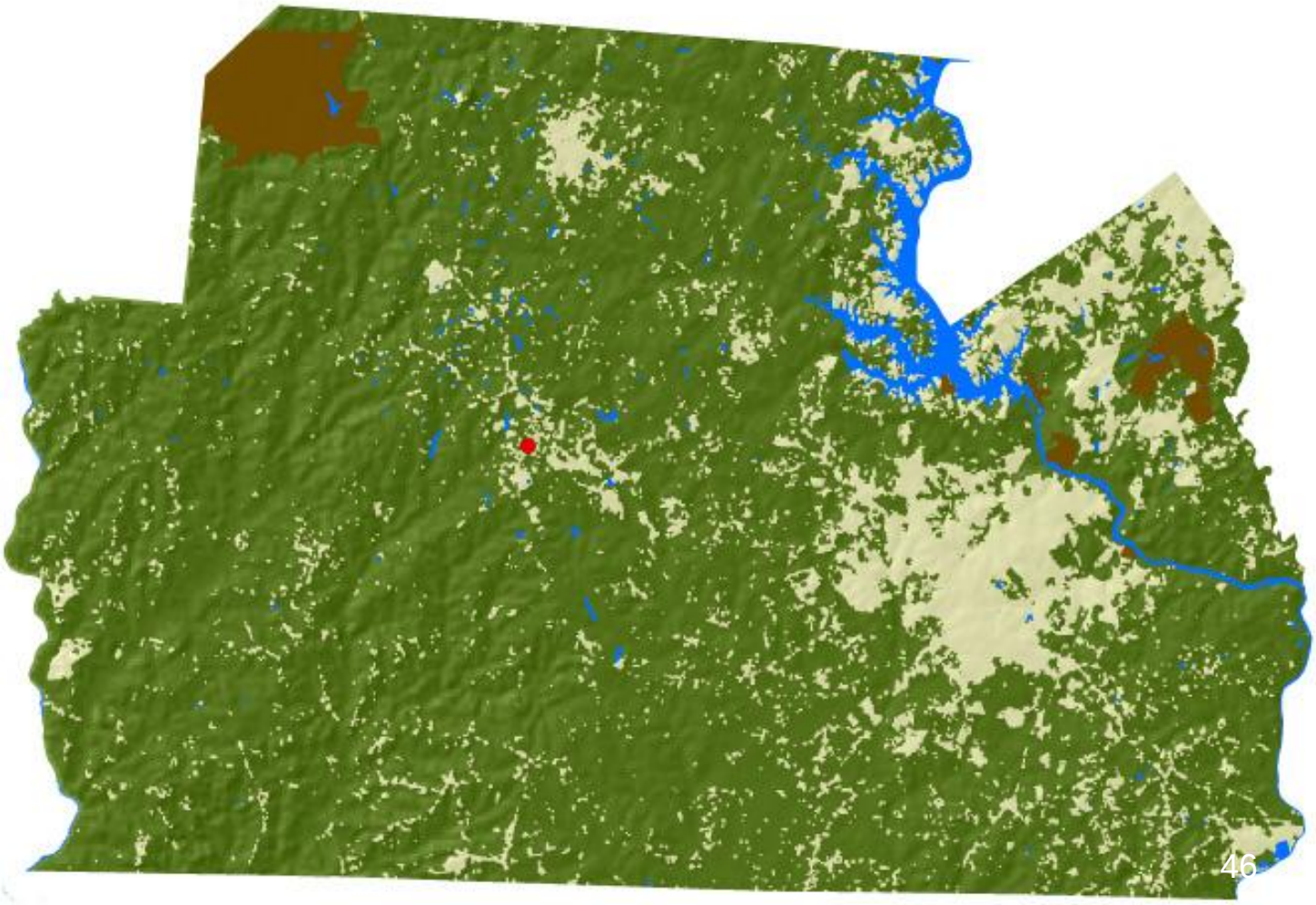

Charlotte Metro Area – York County Growth 2015

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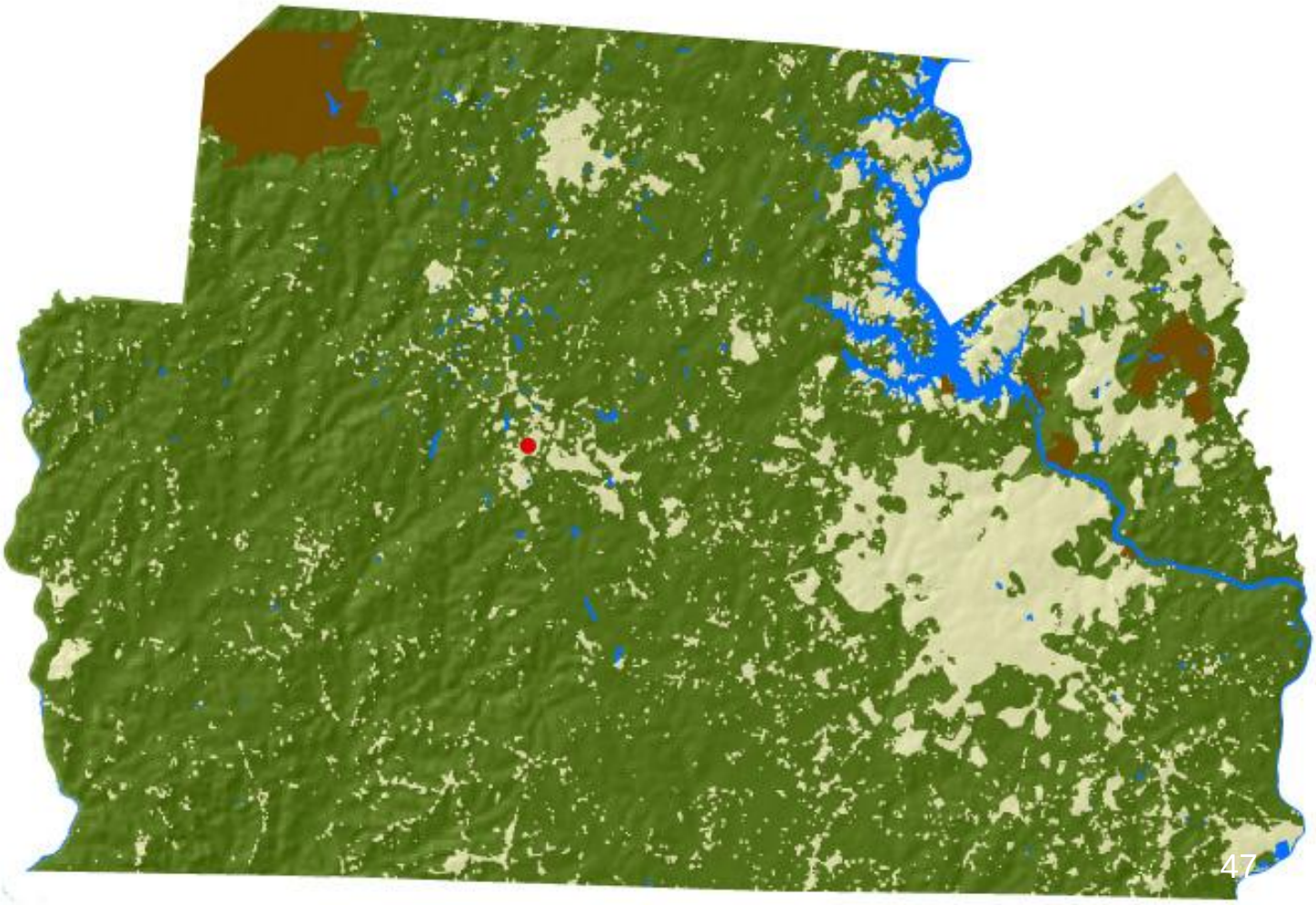

Charlotte Metro Area – York County Growth 2020

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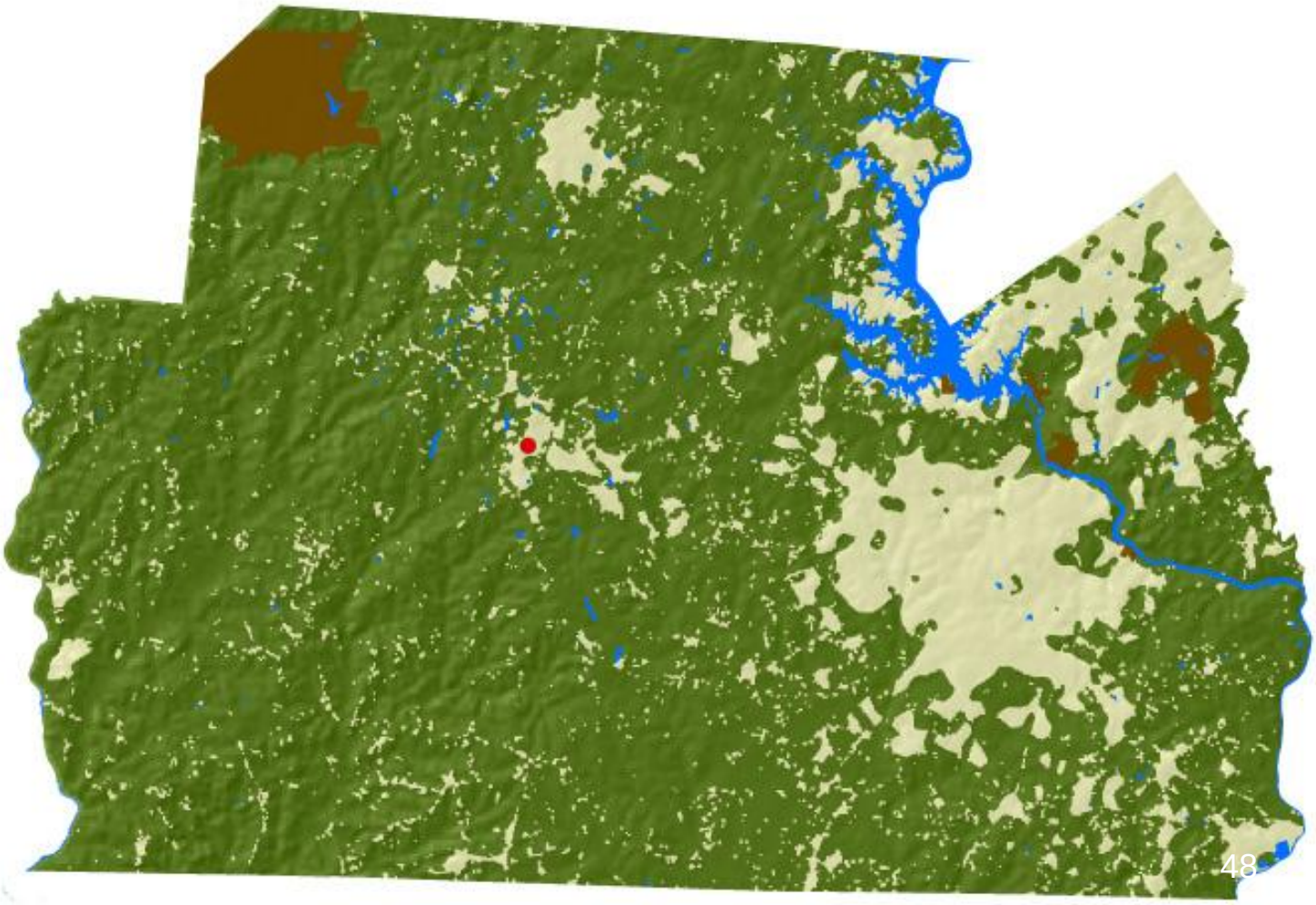
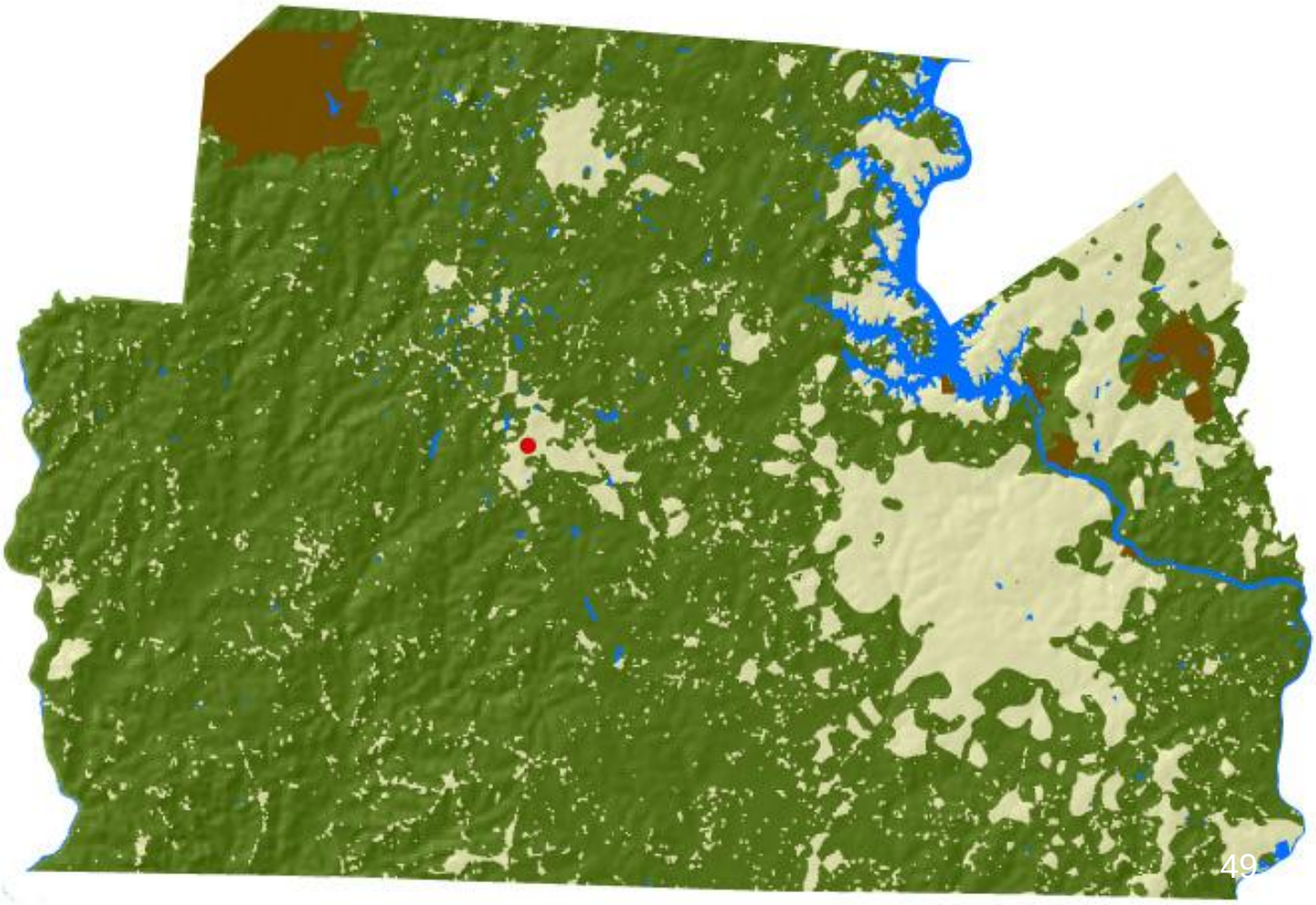


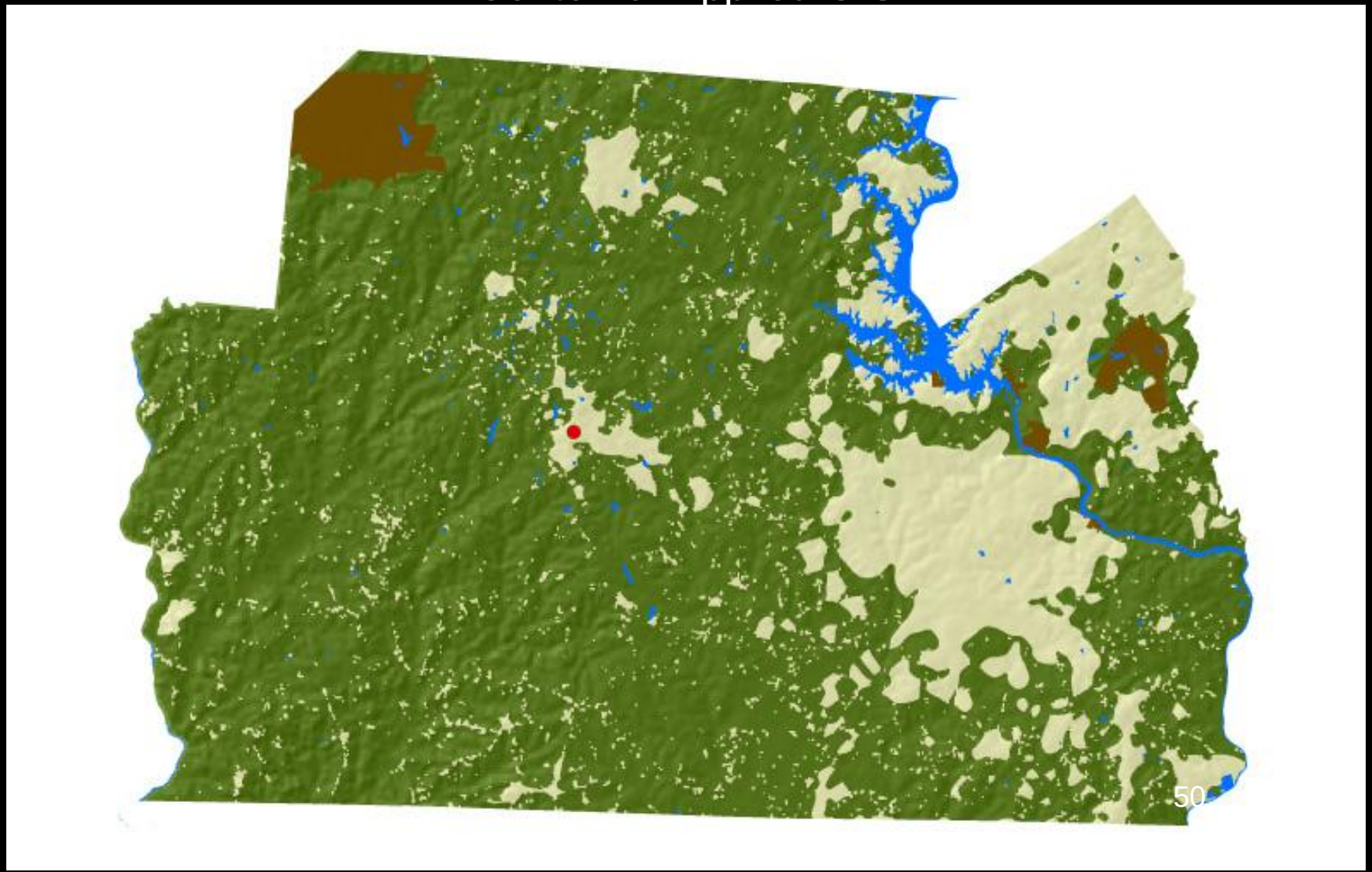
Charlotte Metro Area – York County Growth 2025

RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS



Charlotte Metro Area – York County Growth 2030

RENCI@UNC Charlotte Engagement Center and UNC Charlotte's Center for Applied GIS



Charlotte Metro Area – York County Growth

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- According to the South Carolina Budget and Control Board, the population in York County increased 105 percent between 1976 and 2006, from 96,900 to 199,035 people; the estimated 2010 population of York County is 205,980 people.
- Development, or the number of acres converted from natural / rural land to developed land, increased 741 percent between 1976 and 2006, at an average rate of 5.32 acres per day.
- Total developed acres increased from 7,864 acres in 1976 to 66,154 acres in 2006.
- Development in York County outpaced population growth 7-to-one between 1976 and 2006.

Charlotte Metro Area – York County Growth

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- Researchers forecast an additional 24,695 acres of development will take place in York County between 2006 and 2030, a 37 percent increase in developed acres, at an average rate of 2.82 acres per day.
- Total developed land in York County is expected to increase from 15.2 percent of the county in 2006 to 20.9 percent in 2030, an increase of 5.7 percent of the county.
- By 2030, 20.9 percent of the land in York County is expected to be developed and 79.1 percent is expected to remain undeveloped.
- The population of York County is projected to increase from 199,035 to 270,860, a 36 percent increase, between 2006 and 2030.

Benefits of Urban/Suburban Growth

- ➔ Increased standard of living
- ➔ Generation of wealth
- ➔ Increase in amenities
- ➔ Production of affordable housing
- ➔ Increase in tax base
- ➔ New business opportunities
- ➔ New job opportunities
- ➔ Increased “freedom” with the automobile
- ➔ It is what we desire - “Freedom of Choice”

Urban Growth Trends

The pattern often follows paths of subsidy:

- **Undervalued infrastructure**
- **Discounted resources**
- **Reductions for individual risk**
- **Unintended consequences of past policies**

Issues

- Continued growth in the metro area, along interstates, bedroom communities.
- Can we stop people from coming?
- Determining rights for water supply.
- Determining rights for assimilative capacity.
- How do we balance the roles of fed, state, local gov’ts with private interests?
- Can we find better solutions for sharing – river compacts vs lawsuits?

QUESTIONS?

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