

Birmingham Framework

An Adequate, Elastic and Accessible Tool for the 21st century

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gastudio.com

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Introduction

This document began as a series of lectures, developed by GA Studio, as a public awareness effort on the topic of urban development. In developing these materials, the firm recognized a need for a toolset that allows the community to assess the challenges facing the Birmingham metropolitan area in a comprehensive way.

One of the ways we address this need is through the development of a descriptive document of the urban condition that can be widely accessed by the public. Geographic Information System (GIS) data was used to create large scale, easy to understand base maps of the Birmingham area. These maps document the urban system in all of its myriad conditions, from infrastructure to environment to politics. The ultimate intent is to foster an awareness of the present condition of the city as a means to build consensus and promote collective action.

The document effort itself is only a part of a much larger project, The Birmingham Frameworks: an Adequate, Elastic and Accessible tool for the 21st Century. While this particular document deals with issues of the representation of the urban condition, the Framework provides a much larger template for action. Where this document deals with the specific

conditions of the city of Birmingham, Alabama- the Framework addresses the general problems of the urban condition itself. A problem statement for the framework is found on the next page.

The framework envisions a process that can address urban and metropolitan issues comprehensively. While by no means linear, the process can best be understood as functioning in four sequential steps: Definition, Measurement, Assessment and Action. Documents such as this one, whereby urban systems are comprehensively inventoried are a part of the Definition and Measurement phase of the process. A graphic description of this process can be seen on the next page.

An effective Definition and Measurement process must satisfy two criteria. The first is that the definition of the elements of the urban realm be systematic. These elements not only consist of the myriad economic, environmental, social and human forces that come to bear in a metropolitan environment, they also must describe the spatial and geographic distribution of these forces. The second criteria is that the information must be represented in a way that is consistent and accessible. While there are many agencies and groups that collect

publicly funded data, much of the data is consolidated into discrete silos. These silos make it difficult for the public to form an understanding of the totality of the urban sphere. Our intent is not to create new data, it is rather to aggregate data that is available (and in most cases publicly funded) and disseminate it in a format that is legible and accessible. While the first two steps are systematic, the last two steps of the process, Assessment and Action, are pluralistic. The goal of the framework is to provide a technology platform that provides the community at large a means to understand and improve urban conditions based on the best available information. The project envisions citizen and stakeholder networks, organized and mobilized around urban issues through social networks that leverage communication technology.

Problem Statement



Cities are the composite of interrelated systems that encompass economic, human, natural, and political resources. The condition of a city lies somewhere on a continuum between a state of decline and one of sustainability. The trajectory between the two is affected by how well a city optimizes its systems; one that fails to optimize trends toward decline while the one that optimizes trends towards sustainability. Optimization is not an easy process. Compounding this difficulty is the fact that in the last hundred years, the complexity of city systems has increased faster than our ability to understand them. Worse, there is no entity, public or private, tasked to construct a comprehensive solution for cities.

Making optimal use of systems must begin with an understanding of each system in relation to the others. Yet, all too often the data describing each system is collected, stored and studied in a discrete silo using metrics that make it difficult to determine the impact of one system on another. This fragmentation limits our ability to develop a comprehensive understanding of the relationship between systems and thus limits our ability to optimize our resources.

Understanding the degree of optimization a city has achieved requires

uniform data collection, standard scales of measurement, the benchmarking of standards, and an accepted methodology to assess a system relative to those benchmarks. Today, these standards do not exist.

Relevant solutions will address problems at systemic levels while being implementable. To the extent they exist, today's solutions are derived from government agencies and large corporations - unharvested is the intellectual, organizational and financial capacity of the public. Large scale optimization will need to capture this disengaged capacity.

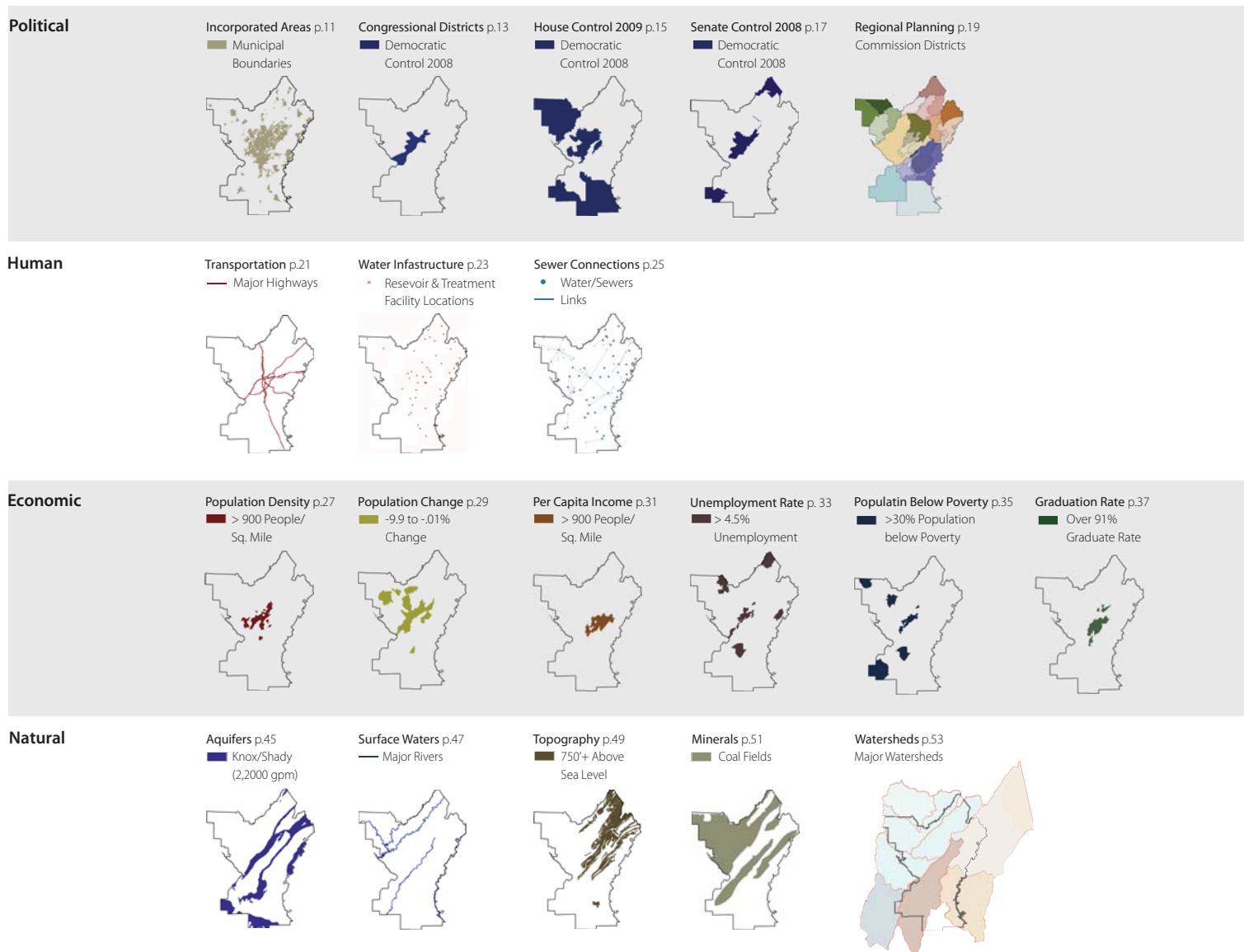
To increase the probability of city optimization, GA Studio proposes a framework that 1) clearly defines the minimum systems of a city and establishes a uniform protocol to collect and document them; 2) objectively defines benchmark standards at component and system levels; 3) assess a city's trajectory relative to those benchmarks; 4) establishes a multi-disciplinary effort to create specific, and comprehensive solutions for optimization; 5) provides a dynamic tool to effect necessary change; 5) measures results and adjusts the framework accordingly. The objective of this study is to establish this framework to guide the work of many

towards the actions required to optimize our cities.

Imagine a framework adopted by cities that collected information in template form which could be aggregated to form a comprehensive data base of the many variant urban conditions that with a strategy derived from a comprehension objective, cross-referencable, comprehensive data.

A framework of decentralized, and interrelated data that leverages technology to connect intellectual capital, objectively models a solution's efficacy, and provides a meaningful, inclusive tool for strategic change.

Map Index



Using this Document

This book is intended to be used as a guide to understanding the Birmingham Metro region. The Basemaps included have been sorted into four basic categories: Human, Natural, Political and Economic. Each category is intended to bring an aspect of the urban realm to light. The maps are generated from publicly available data and include a short description.

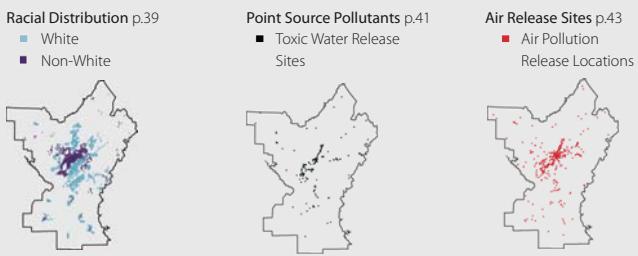
While each map gives us an understanding of one aspect of the

metropolitan realm, the benefit of the tool is in the ability to overlay disparate maps in order to understand linkages and relationships across different pieces of information.

For example, in order to understand population density, you might overlay the population density map (pp 27) over a map of transportation network (pp 21). In order to understand income distribution patterns, you might want to look at the racial distribution maps (pp 39) overlaid

with the topography (pp 49) and income (pp 31).

This can be done in a number of ways. One way is to print the maps on a transparency sheet and overlay the maps on a light table.* Another way is to use a simple application we have developed that allows the user to adjust the relative transparency of each map using a simple slider interface. This application is embedded within the .pdf version of this document and is also available via the

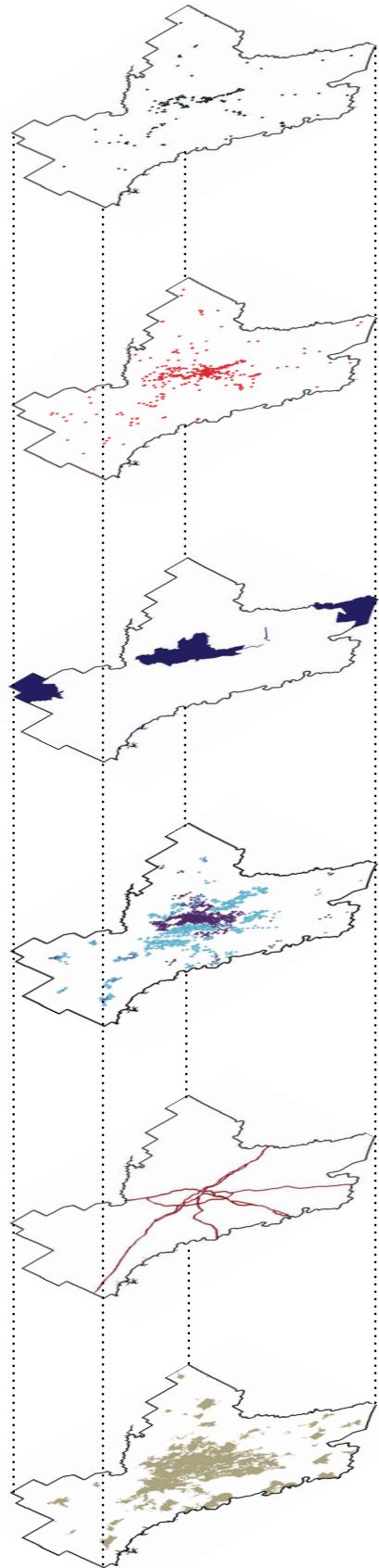


web at www.gastudio.com/labs.

The index above illustrates a snapshot guide of each map along with the most prominent information conveyed in each. This index can be used as a starting point for exploring the detailed information in the subsequent pages as well as the interactive application.

*A hardcopy of the transparencies is available through our office

Application, page 56-57
www.gastudio.com/labs
 The ability to overlap individual sectors of the Birmingham Metro Area is crucial in analyzing locational linkages between the data. This allows for an amount of interpretation which may have been otherwise overlooked had the maps been studied individually or separately.



The Birmingham Hoover Metropolitan Statistical Area

The Federal Office of Management and Budget (OMB) designate metropolitan statistical areas (MSA) as the standard units for statistical data for Federal offices. The Birmingham MSA is one of eight MSA's in the state, includes seven counties, and spans 5,332 square miles across north central Alabama.

The criteria that determine MSA's grew out of a need for standardized definitions of metropolitan centers for statistical analysis by government agencies.

The typical MSA is delineated by a central urban area with a population of at least 50,000 inhabitants that has a total metropolitan population of least 100,000.

In this case, the cities of Birmingham in Jefferson County, and Hoover located in Shelby County create the urban center for a region that has a population of more than 1.1 million.

An MSA may include areas from contiguous counties if they meet certain criteria such as commuting time to the central counties, population density and prevalence of urban population. At least 25 percent of the employed residents

of the county must work in the central county, or 25 percent of the employment within the outlying county must be accounted for by workers residing from within the central county.



Metropolitan Statistical Areas

Alabama

Legend

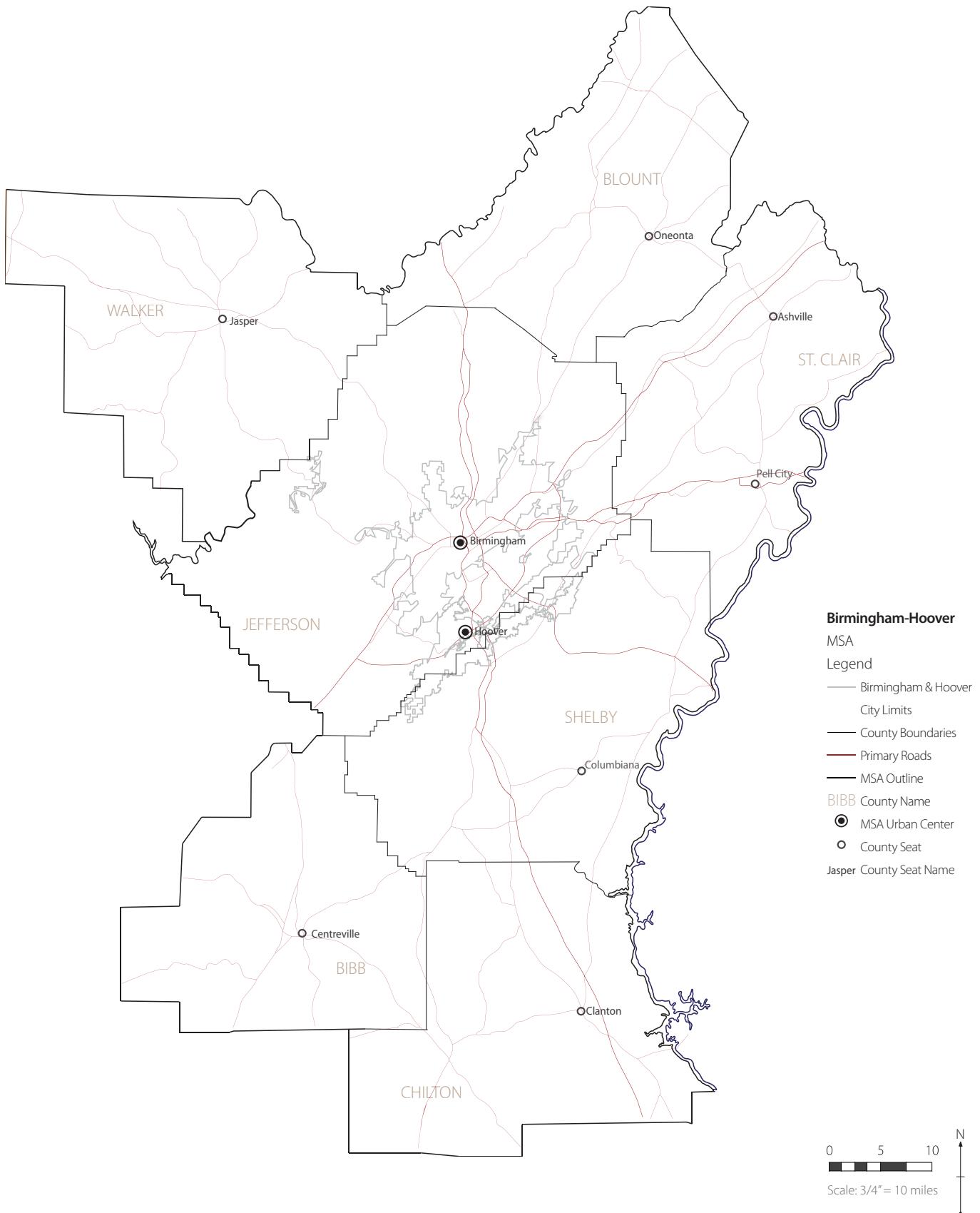
— Birmingham MSA

— MSA Boundaries

— County Boundaries

MSAs

- 01. Birmingham-Hoover
- 02. Mobile
- 03. Huntsville
- 04. Montgomery
- 05. Tuscaloosa
- 06. Decatur
- 07. Florence-Muscle Shoals
- 08. Dothan
- 09. Auburn-Opelika
- 10. Anniston
- 11. Gadsden



Political Political Boundaries

As a unit, an MSA has no political authority; however, the land area it represents consists of a myriad of federal, state, county, sub-county, and special district entities.

The Birmingham MSA includes seven adjacent counties: Walker, Blount, Jefferson, St. Clair, Shelby, Bibb, and Chilton Counties.

Counties are governed by county commissions usually consisting of three to seven commissioners, elected by district. Due to restraints placed in the Alabama Constitution, only seven of the 67 state counties, Jefferson and Shelby included, have home rule - in which the county has increased self-governing power. The remaining counties must lobby the Local Legislation Committee of the state legislature to pass simple policies.

Municipalities, which are organized below counties correspond to "incorporated areas" recognized in U.S. Census reporting of population and housing statistics.

The Birmingham MSA includes 88 such registered municipalities.

Jefferson County consists of 36 municipalities and each are separated further. The city of Birmingham itself is a compilation of 99 communities composing 23 culturally distinct neighborhoods.



Metropolitan Statistical Areas

Alabama

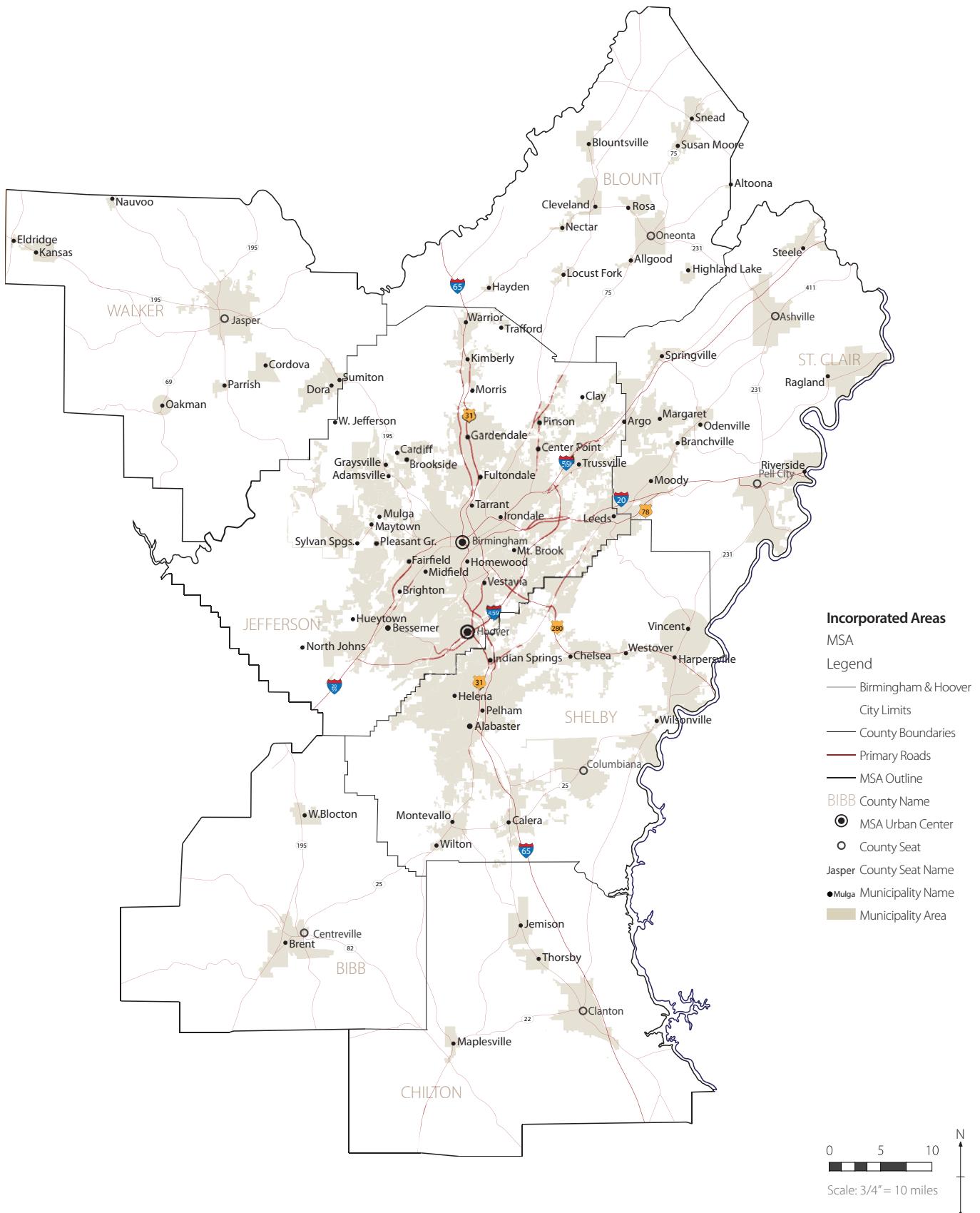
Legend

— Birmingham MSA

— MSA Boundaries

— County Boundaries

● MSA Urban Center



Political Congressional Districts

Alabama's representation at the federal level consists of its nine-member Congressional Delegation, composed of two U. S. Senators and seven members of the U. S. House of Representatives. Each state's electoral vote is determined by its representation in Congress. Thus, Alabama currently has nine electoral votes.

A congressional district is an electoral constituency that elects a single member of congress. In Alabama, each member represents approximately 600,000 citizens. The Birmingham MSA is served by the Alabama 4th, 6th, and 7th Congressional districts.

Alabama's 4th Congressional district is a collection of smaller towns and cities north of Birmingham, the largest of these being Gadsden and Decatur. This mass of lightly populated rural areas creates a district with the lowest percentage of black population in the state.

The 6th district has seen numerous recent redistricting efforts. Having been localized around mostly upper middle class white-collar families, this district is

becoming one of the most Republican districts in the country. Within our MSA, the 7th district represents the predominantly black western section of Jefferson county and Birmingham's inner-neighborhoods.



Congressional Districts

Alabama

Legend

— Birmingham MSA

— District Boundaries

— County Boundaries

● MSA Urban Center

2 District Number

Representatives

1 - Jo Bonner (R)

2 - Terry Everett (R)

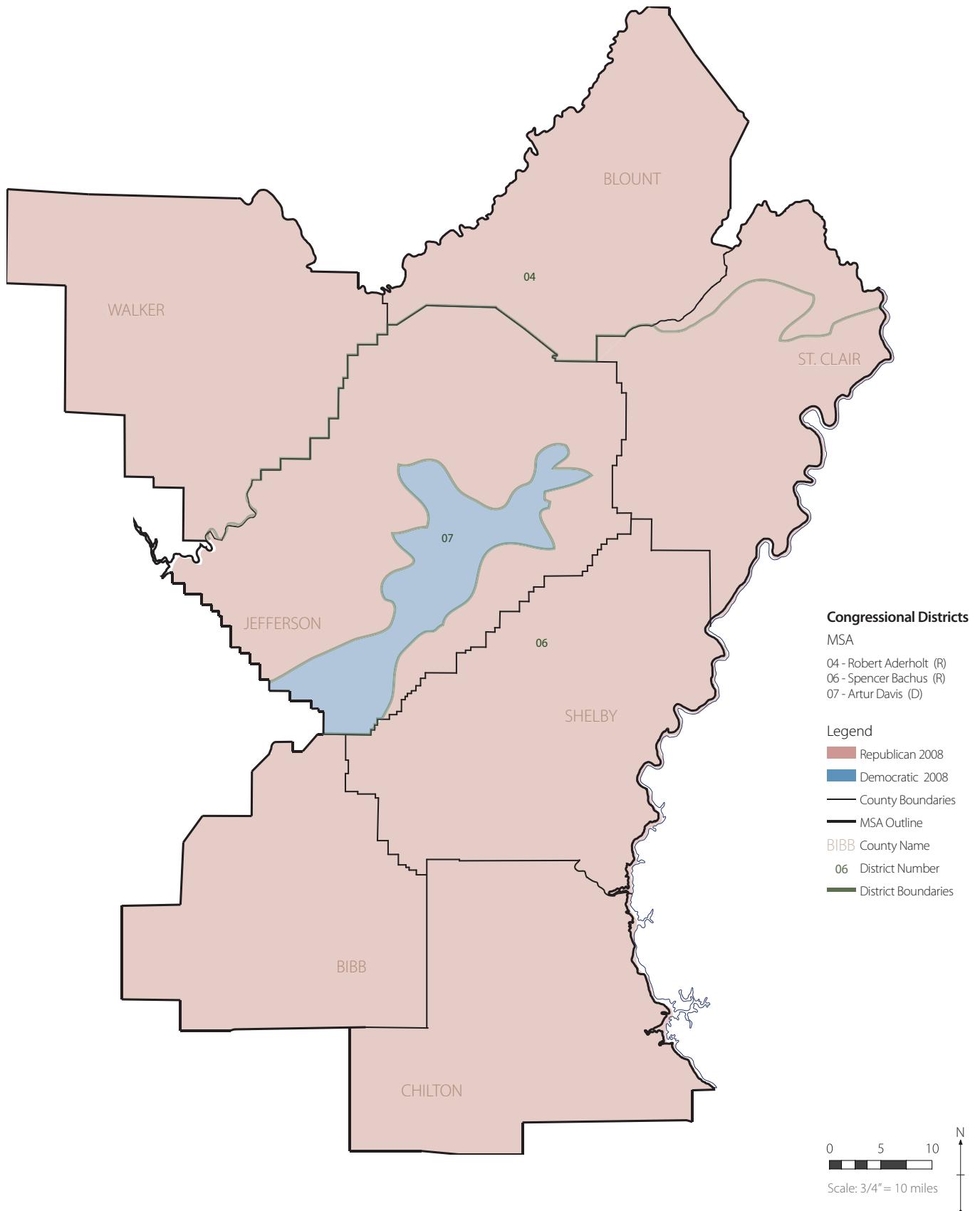
3 - Mike Rogers (R)

4 - Robert Aderholt (R)

5 - Bud Cramer (D)

6 - Spencer Bachus (R)

7 - Artur Davis (D)



Political State House Districts

The Alabama State Legislature is a bicameral assembly composed of the Alabama House of Representatives and the Alabama Senate.

The Alabama House of Representatives, the lower House of the state's legislature, has 105 members each representing a district of approximately 42,000 citizens. The House District map is a snapshot of current political party district holdings.



State House of Representative Districts

Alabama

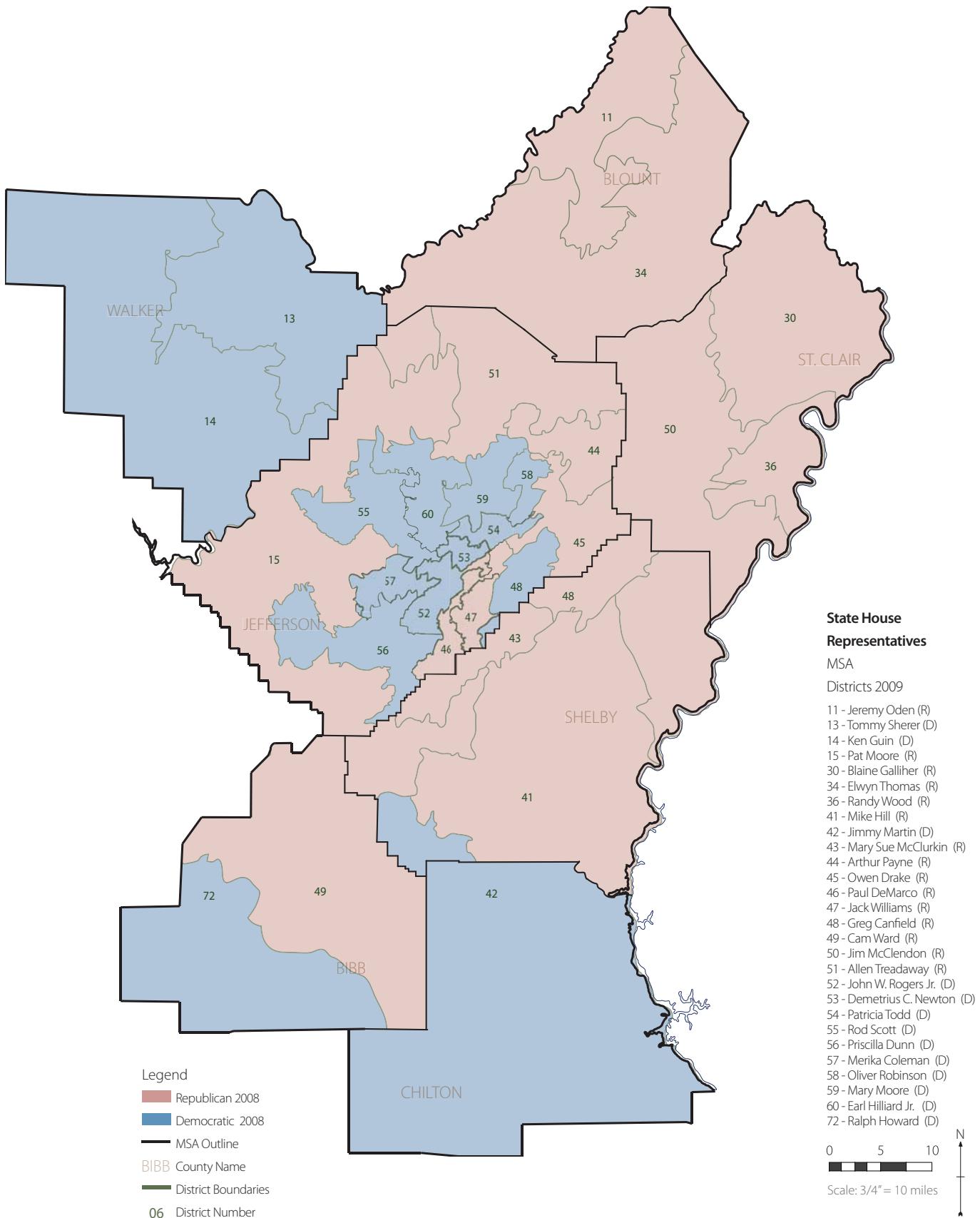
Legend

— Birmingham MSA

— District Boundaries

— County Boundaries

● MSA Urban Center



Political State Senate Districts

The Alabama State Senate is the upper house of the state legislature. The body is composed of 35 members each representing approximately 125,000 citizens.



State Senate Districts

Alabama

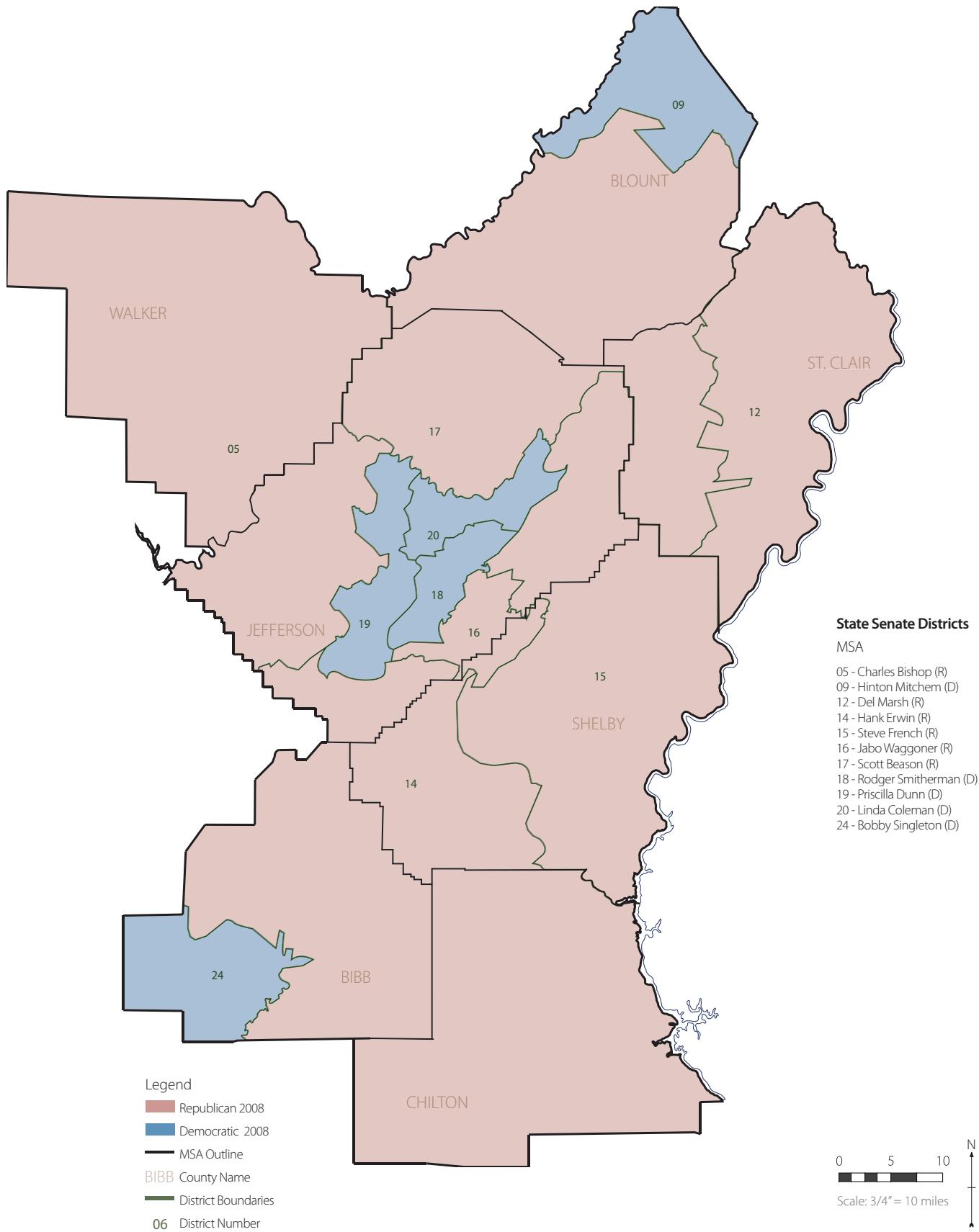
Legend

— Birmingham MSA

— District Boundaries

— County Boundaries

● MSA Urban Center



Political Regional Planning Organizations

Regional Councils are public organizations which facilitate the collaboration of different political jurisdictions within a region. Alabama has 12 Regional Councils organized under the Alabama Association of Regional Councils (AARC). Each of these councils is directly tied to local governments through local and/or state laws and agreements. They serve their respective citizens through communication, planning, policymaking, coordination, advocacy and technical assistance dealing with needs in which it is necessary to cross political boundaries. The regions are divided based on communities which are connected economically, socially, and geographically. The Birmingham Regional Planning Commission encompasses the counties of Jefferson, Walker, Chilton, St. Clair, and Blount. In 2009 the Commission was governed by a Board of 24 Directors. Its funding sources include federal matching grants, member government dues, annual appropriations from the state, and contract fees. As a result the Birmingham Regional Planning Commission provides

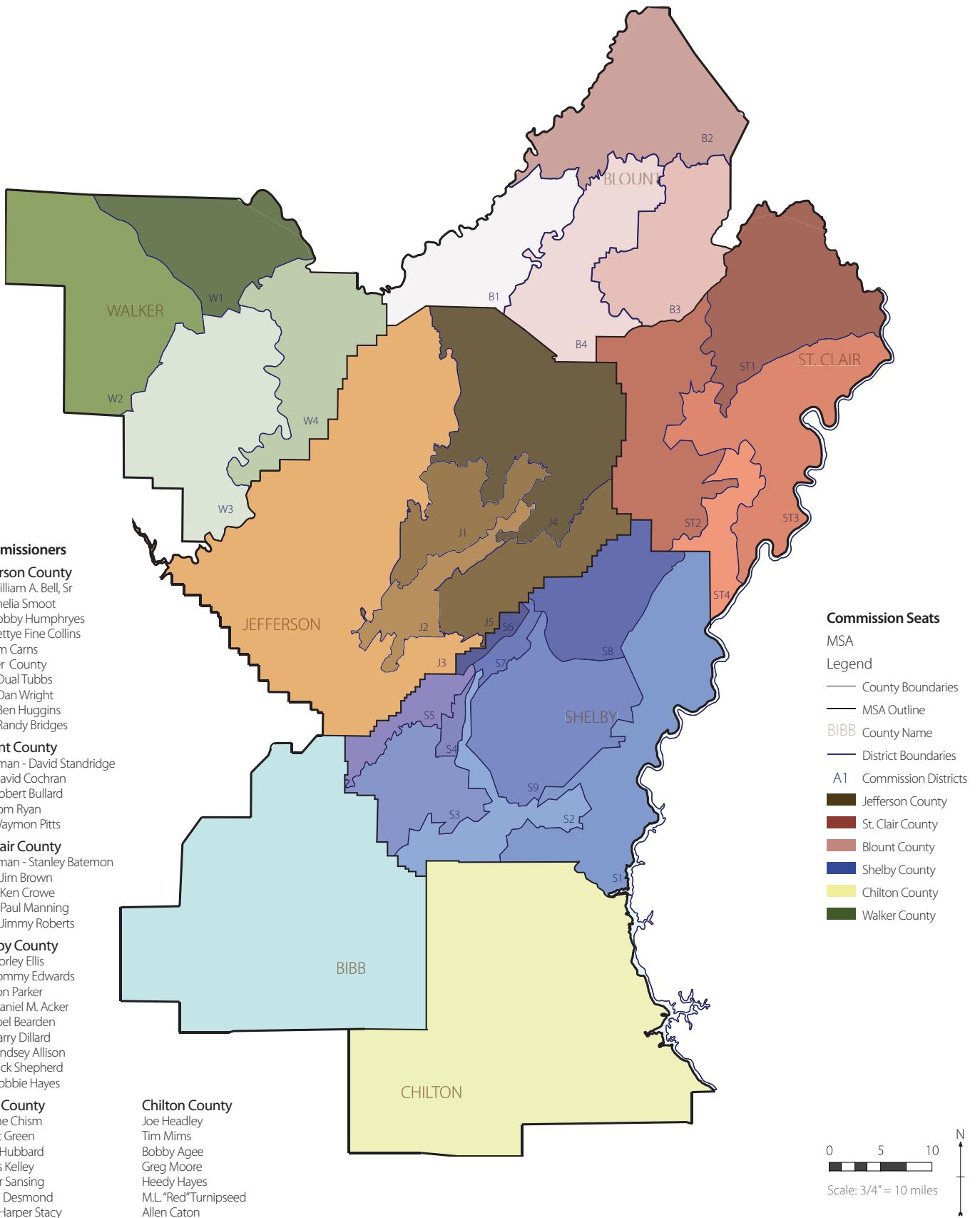
the following services: Intergovernmental Cooperation, Transportation and Transit Planning, Community Planning, Community and Economic Development, Information Management/GIS, and Human Resource Services.



Regional Councils

Alabama

- | | |
|--|--|
| 01. N.W. Alabama Council | 08. South Alabama Regional Planning Commission |
| 02. W. Alabama Planning & Development | 09. Central Alabama Planning & Development |
| 03. Birmingham Regional Planning Commission | 10. Lee-Russell Council |
| 04. E. Alabama Planning & Development | 11. N. Central Alabama Regional Council |
| 05. S. Central Alabama Development Commission | 12. Top of Alabama Regional Council |
| 06. Alabama - Tombigbee Regional Commission | |
| 07. SE Alabama Regional Planning & Development | |



Economic Transportation Connectivity

Among the largest 49 MSAs in the country, the Birmingham MSA ranks in the top five for length of commute to work by its employees and in miles spent driving per capita. It is networked by an extensive highway system including three U.S. Highways, (US 31, US 78, and US 280) which meet in downtown Birmingham, and four interstate highways (Interstates 20, 59, 65, and 459) providing links to the cities of Montgomery, Atlanta, New Orleans, Chattanooga, and Nashville. U.S. 280 highway provides an important link between downtown Birmingham and the rapidly growing suburbs in southeastern Jefferson County and northern Shelby County. A proposal has been made to construct elevated lanes above the median of 280.

The completion of the new I-22 (\$1 billion project) linking Birmingham to Memphis, TN will rank Birmingham among the Southeast's top three interstate transportation hubs (tied with Atlanta and Nashville).

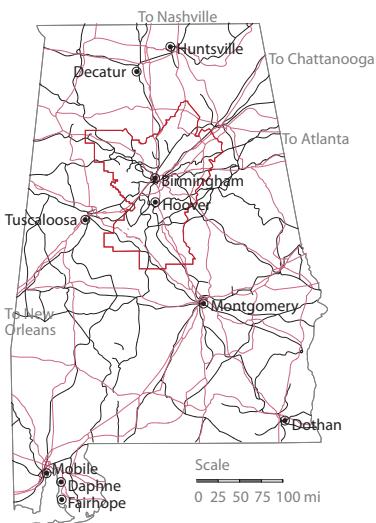
I-65 is being widened to an eight lane highway in order to accommodate the

I-22 expansion.

The Northern Beltline project will complete the perimeter around Birmingham that was begun in the early 1980s with the construction of Interstate 459.

The Birmingham International Airport is the largest airport in Alabama, Mississippi and the Florida Panhandle, and is among the top 75 largest U.S. airports with 160 arrivals and departures to major cities throughout the nation.

Birmingham is also served by four interstate rail carriers, more than any other southeastern city, and Port Birmingham, which is the largest inland shipping center of general commodities on the Tennessee – Warrior – Tombigbee river systems.

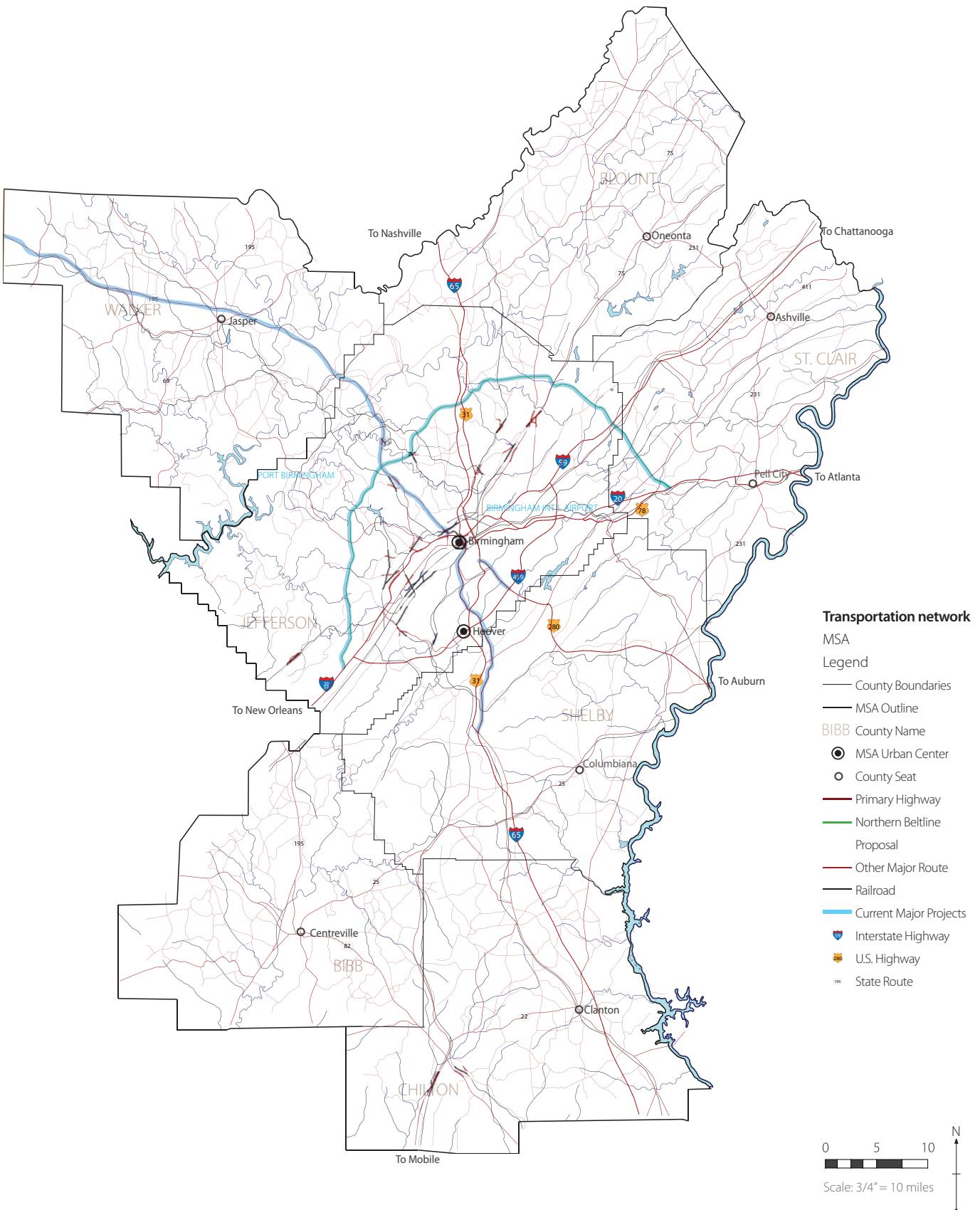


Transportation

Alabama

Legend

- Birmingham MSA Boundary
- Major Highway
- Railway
- MSA Urban Center



Economic Water Facility Locations

To facilitate distribution of water, the Birmingham MSA has 70 water works systems. Of these, 32 systems use ground water, six use surface water and the remaining 32 systems purchase their supply from another system. Ground water supplying cities are generally located over the Ridge and Valley aquifer formation because of their much higher yields. Four hydroelectric dams exist in the MSA area providing 6% of Alabama Power's power generation. Alabama Power Company also owns four reservoirs in the Coosa River drainage basin - Neely Henry, Logan Martin, Lay, and Mitchell Lakes. The Water Works and Sewer Board for the city of Birmingham has the Little Cahaba River dammed to create Lake Purdy which services the Shades Mountain filter plant for the city. The city's drinking water comes from upstream on the main channel of the Cahaba River.

Water Boards

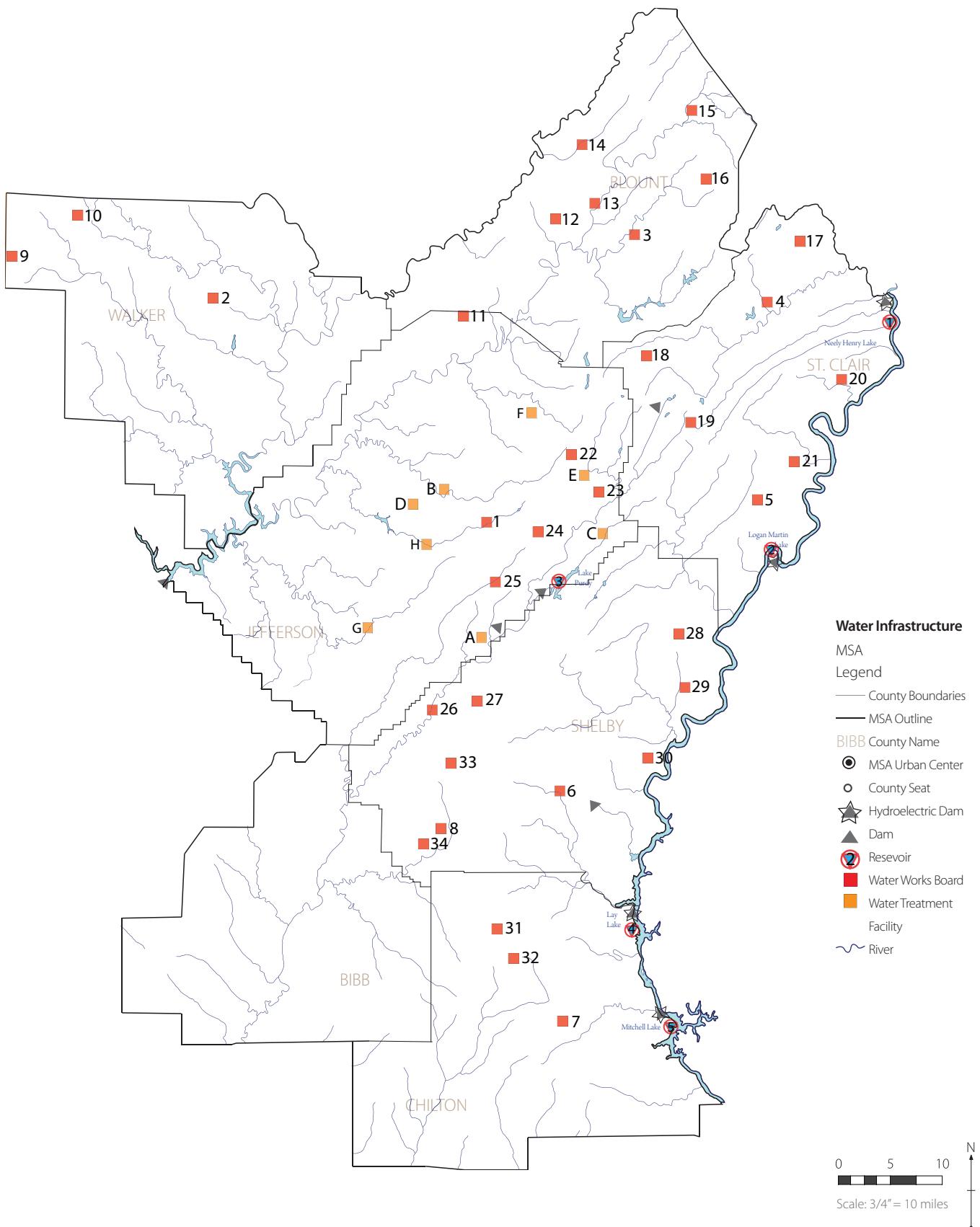
1. BIRMINGHAM WATER WORKS
2. JASPER UTILITIES BOARD
3. ONEONTA UTILITIES BOARD
4. ASHVILLE WATER AND SEWER
5. PELL CITY WATER WORKS
6. COLUMBIANA WATER WORKS
7. CLANTON WATER DEPARTMENT
8. MONTEVALLO WATER WORKS
9. ELDRIDGE WATER SYSTEM
10. NAUVOO WATER WORKS
11. WARRIOR WATER BOARD
12. NECTAR WATER WORKS
13. BLOUNT COUNTY WATER WORKS
14. BLOUNTSVILLE UTILITIES
15. SNEAD WATER WORKS
16. ALTOONA WATER AND SEWER
17. STEELE WATER WORKS BOARD
18. SPRINGVILLE WATER WORKS
19. OADENVILLE WATER WORKS
20. RAGLAND WATER WORKS
21. RIVERSIDE UTILITY BOARD
22. TRUSSVILLE UTILITIES
23. LEEDS WATER BOARD
24. IRONDALE WATER AND SEWER
25. SHELBY COUNTY WATER WORKS
26. HELENA WATER WORKS
27. PELHAM UTILITIES
28. VINCENT WATER WORKS
29. HARPERSVILLE WATER WORKS
30. WILSONVILLE WATER WORKS
31. JEMISON WATER BOARD
32. THORSBY WATER WORKS
34. WILTON UTILITIES

Water Treatment Plants

- a. cahaba river treatment facility
- b. five mile creek treatment plant
- c. leeds treatment plant
- d. prudes creek plant
- e. trussville treatment plant
- f. turkey creek treatment plant
- g. valley creek treatment plant
- h. village creek treatment plant

Reservoirs

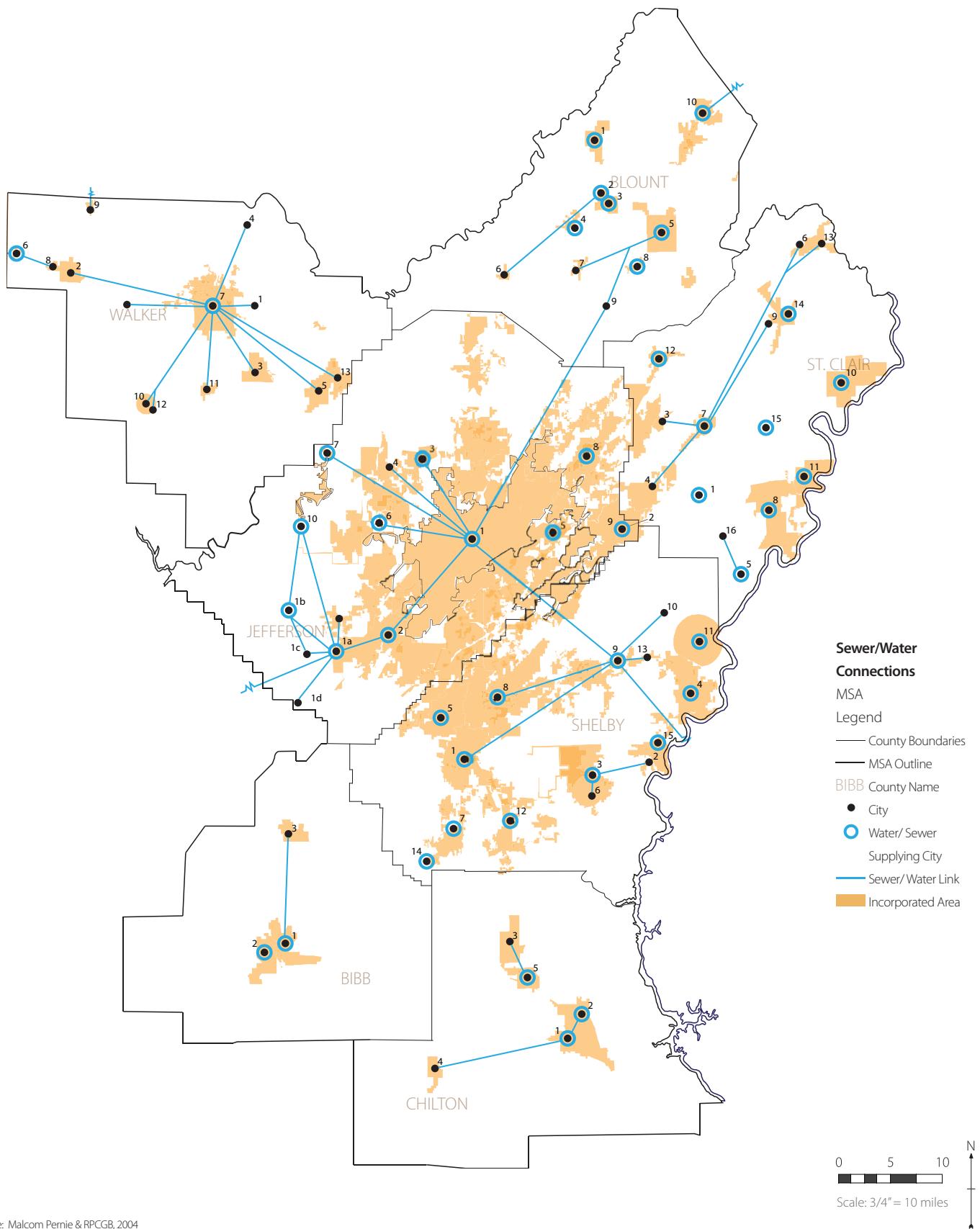
1. Neely Henry Lake & Dam (Alabama Power) 1966 - Hydroelectric pwr
2. Logan Martin Lake & Dam (Alabama Power) 1965 - Hydroelectric pwr
3. Lake Purdy (Birmingham Water Works & Sewer) 1911 raw water to Shades Mtn. Filter Plant
4. Lay Lake & Dam (Alabama Power) 1967 - Hydroelectric pwr
5. Mitchell Lake & Dam (Alabama Power) 1968 - Hydroelectric pwr



Economic Water Sewer & Water Connections

This map is a general illustration of the sewer and water links between cities. It specifies which cities are supplying water and sewer services and which cities depend on supplying cities. Another key illustration is the lack of connectivity within the region. Many communities are without adequate backup plans for water demand and sewer treatment capacity.

- | | | |
|---|---|--|
| Jefferson County Water Boards
1. Birmingham Water Works & Sewer Board
a. Roupes Valley Water Authority
b. Oak Groves Service Area
c. North Johns Town Hall
d. City of Lake View
2. Bessemer Water Service
3. Brookside Water Works
4. Graysville Water Board
5. Irondale Water System
6. Mulga Water Works & Gas Dept.
7. Town of Jefferson Water Works
8. Trussville Utilities
9. Water Works Board of the City of Leeds
10. Warrior River Water Authority
Shelby County Water Boards
1. Alabaster Water Board
2. Bethel Water Systems, Inc.
3. Columbiania Water Works
4. Harpersville Water System
5. Helena Utility Board
6. Little Dixie Water Authority
7. Montevallo Water & Sewer
8. Pelham Water Works
9. Shelby County Water & Sewer
10. Sterrett-Vadiver Water Sys., Inc.
11. Town of Vincent Water System
12. City of Calera Water Works
13. Westover Water Authority
14. Wilton Water & Gas
15. Wilsonville Water Works
Bibb County Water Boards
1. Centreville Water & Sewer
2. Brent Utilities Board
3. West Blocton Town Hall | Blount County Water Boards
1. Blountsville Utilities
2. Cleveland Water Works
3. Blount County Water Authority
4. Nectar Water Department
5. Oneonta Utilities Board
6. Hayden Water Works
7. Pine Bluff Water Works
8. Allgood Town Hall
9. Remlap Pine Mtn. Water Auth.
10. Snead Water Works
Walker County Water Boards
1. Boldo Water & Fire Protection
2. City of Carbon Hill Utilities Board
3. Cordova Water Works & Gas Board
4. Curry Water Authority
5. Dora Water & Gas Board
6. Eldridge Water System
7. Jasper Water Works & Sewer Board
8. Kansas Water System
9. Nauvoo Water Works
10. Water Works Board of the City of Oakman
11. Parish Water & Sewer Board
12. Providence Water Authority
13. Sumiton Water Works Board
14. Townley Water Authority
St. Clair County Water Boards
1. Cooks Spring
2. Water Works Board of City of Leeds
3. Margaret Water Works
4. Moody Water Works
5. New London Water & Sewer
6. Northwest St. Clair Water System | 7. Odenville Utilities /Board
8. Pell City Water Works
9. Pinedale Shores P.O.A.
10. Ragland Gas & Water Board
11. Riverside Utility Board
12. Springville Water Works
13. Steele Water Works Board
14. Town of Ashville Water & Sewer
15. Wattsville Water Authority
16. Worlf Creek Water Authority |
|---|---|--|



Economic 2006 Population Density

Population density is a measure of people per unit of space.

The map delineates population density by census tract, which provide for a higher level of detail.

Generally, the highest densities are centralized around the Birmingham urban center; however, other pockets of high density occur along major transportation corridors and at county seat locations.



Population Density (2006)

Alabama

Legend

— Birmingham MSA Boundary

● MSA Urban Centers

— County Boundaries

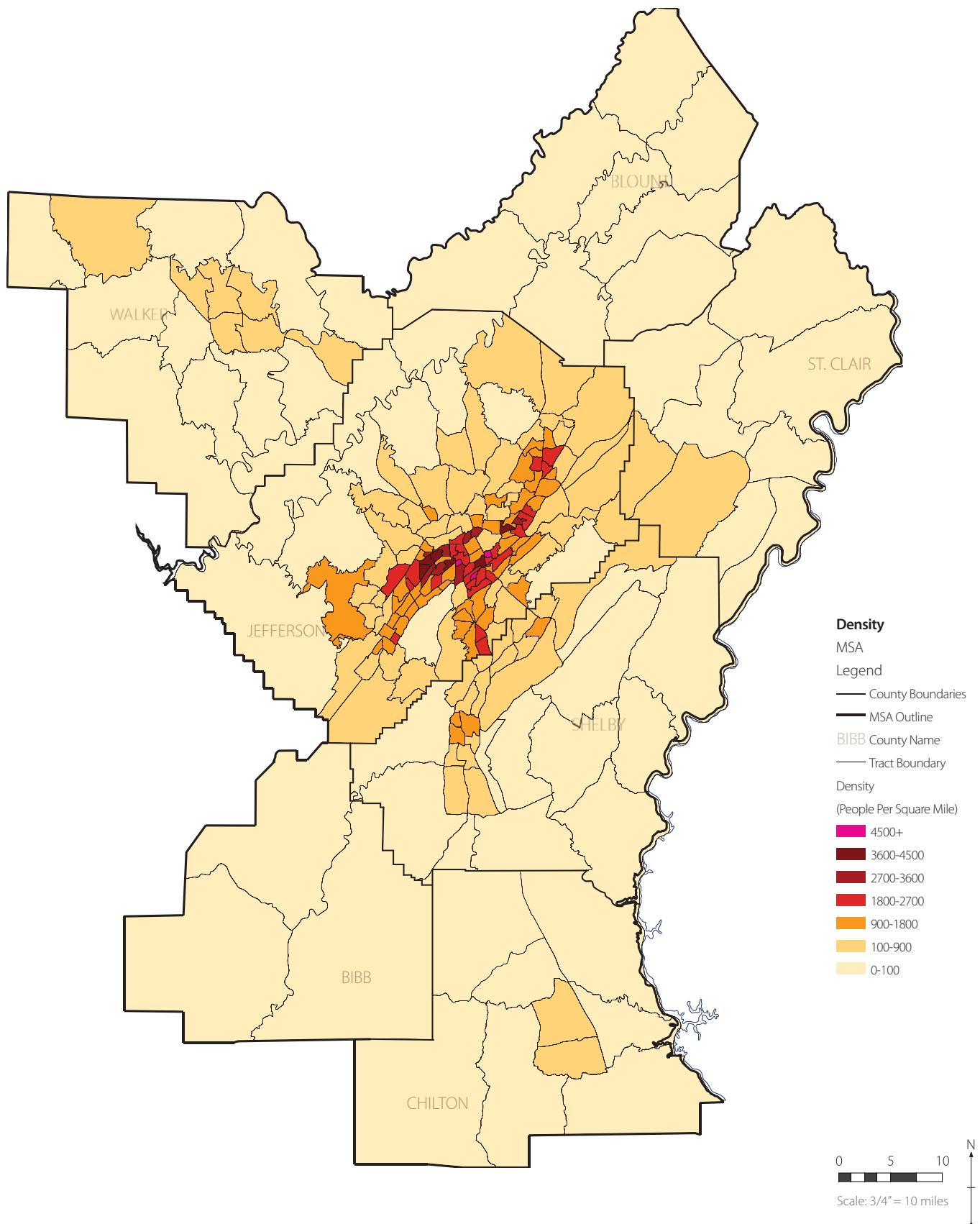
Density (People Per Square Mile)

U.S. Avg - 80/sq. mi.

450+

100 - 449

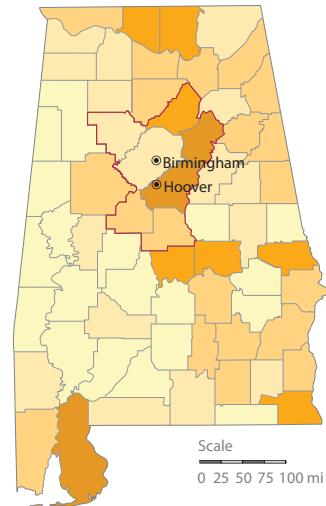
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Economic Population Change (1980 to 2008)

The last 30 years have witnessed dramatic population declines within the inner core of the MSA. High decline areas run along an axis that runs from the Southwest corner of Jefferson County to the Northeast edge. Significant declines have also occurred in the north center portion of Jefferson County and in central Walker County.

Areas south of Red Mountain and sections of St. Clair, Blount, Bibb, and Chilton Counties have, by contrast, seen relatively good growth over this period, particularly in comparison to the rest of the state.

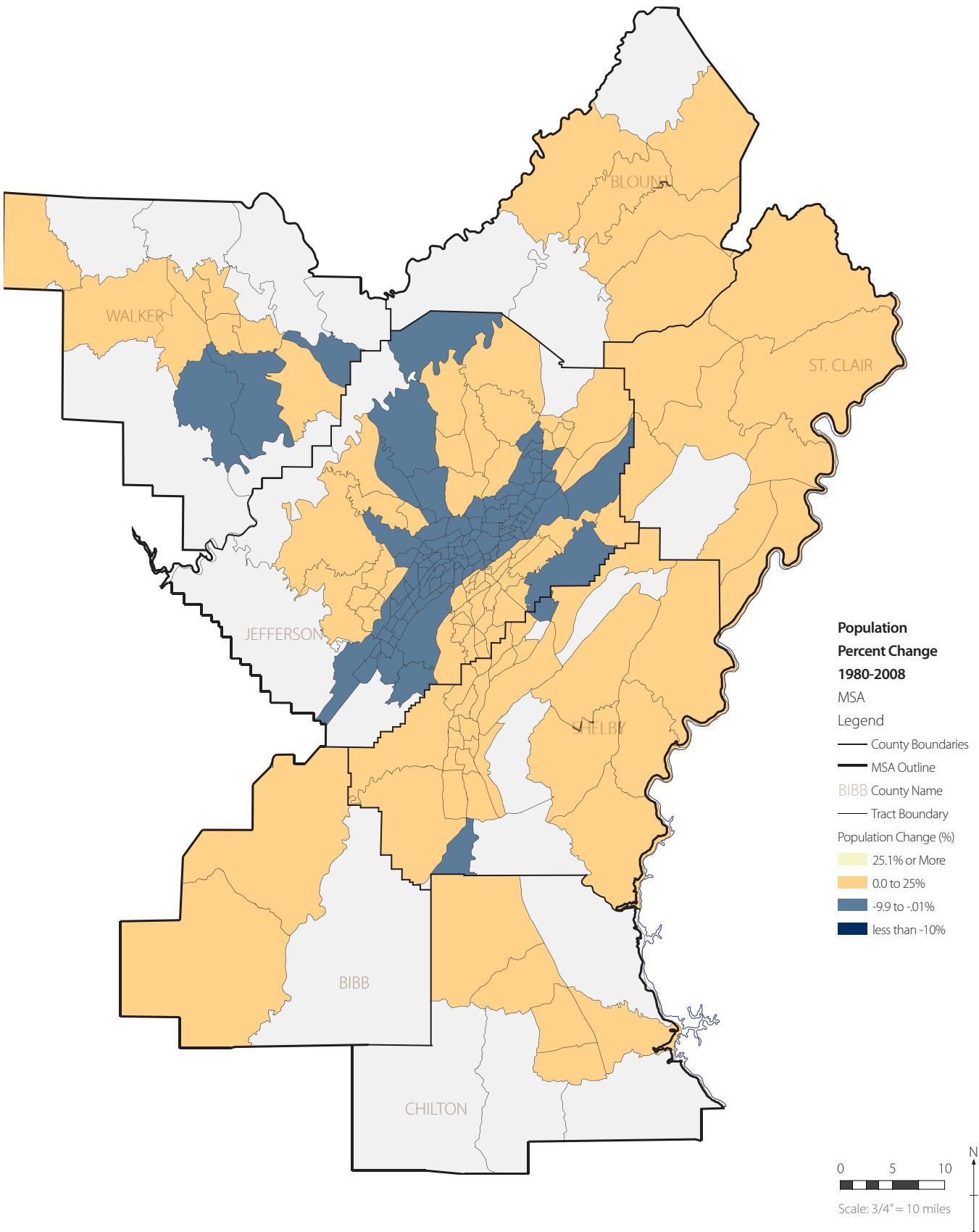


Population Change (1980 - 2008)

Alabama

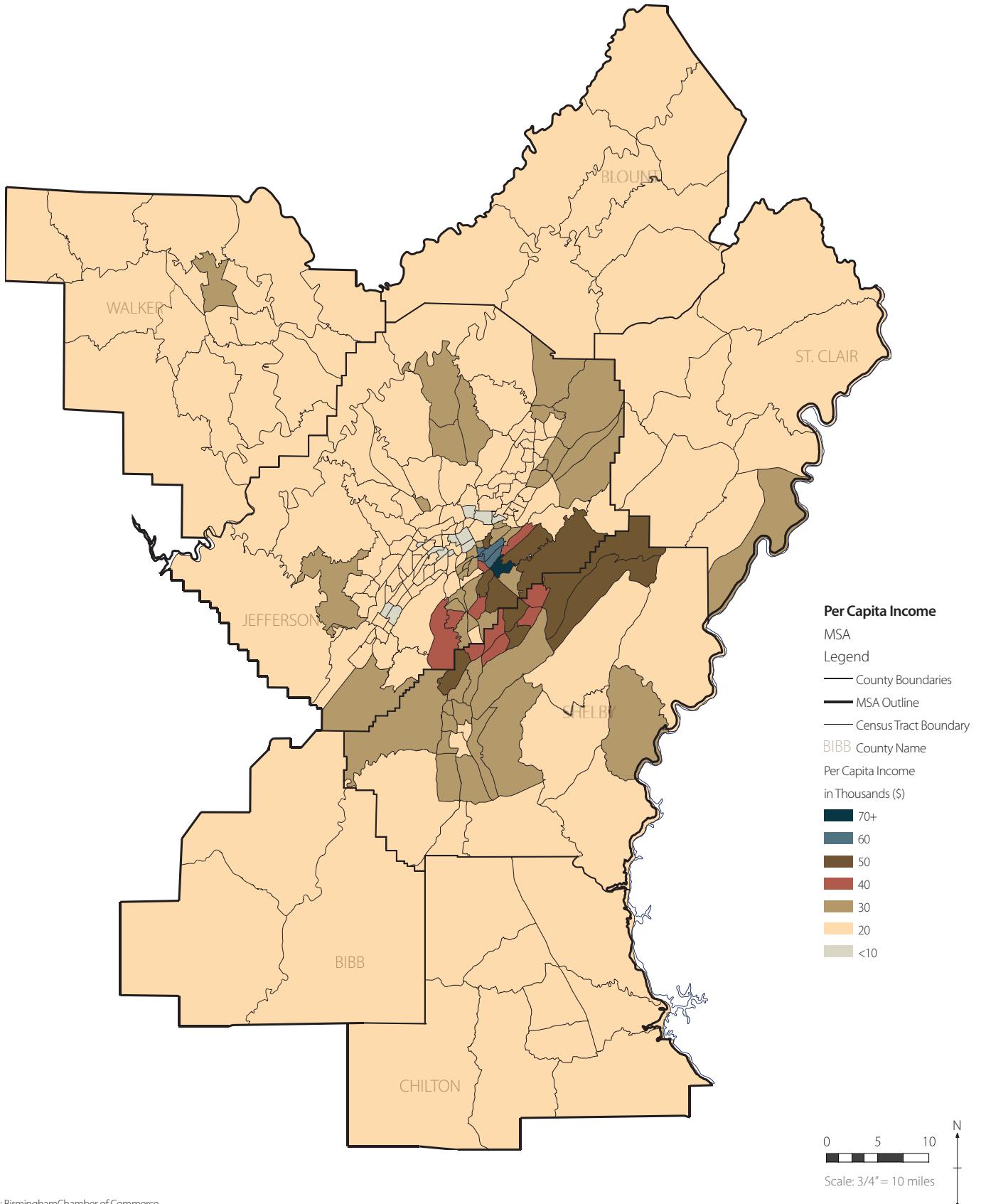
Legend

	Population Change (%)
—	-11% to -5.1%
—	-5% to .1%
—	0% to 9.9%
—	10% to 19.9%
—	20% to 32%
(●)	MSA Urban Centers
—	County Boundaries
—	Birmingham MSA
Alabama Avg: 4.8%	



Economic 2008 Personal Income

While personal income for the majority of the MSA falls below the U.S. median annual income of \$50,300, a band of higher income bisects the middle of the MSA running from Southwest to Northwest. Enclaves of very high income areas occur to the immediate East of the urban core. While the poorest areas occur at the city center.

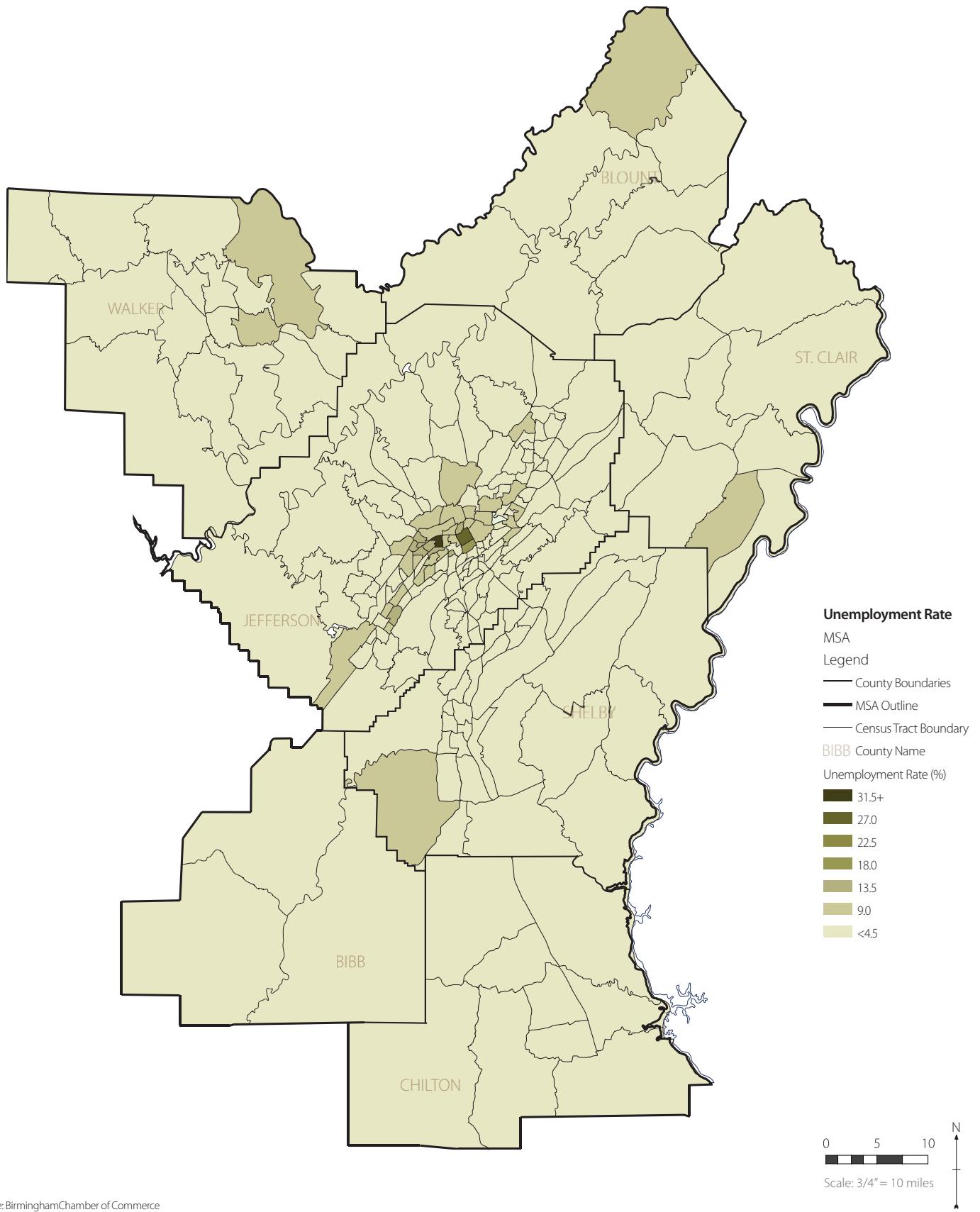


Source: Birmingham Chamber of Commerce

Economic 2008 Unemployment Rate

Of the 2,000,000 jobs in Alabama, more than one fourth exist within the Birmingham MSA. The region has the sixth lowest unemployment rate among the 50 largest metropolitan areas.

Birmingham's areas of highest unemployment generally occur in a band that follows the north side of the system of mountains bisecting the MSA, from southwest to northeast. This band of unemployment consists of areas with rates nearly four times higher than the national average of 7.9%, while some of the surrounding areas have rates at less than 4%.

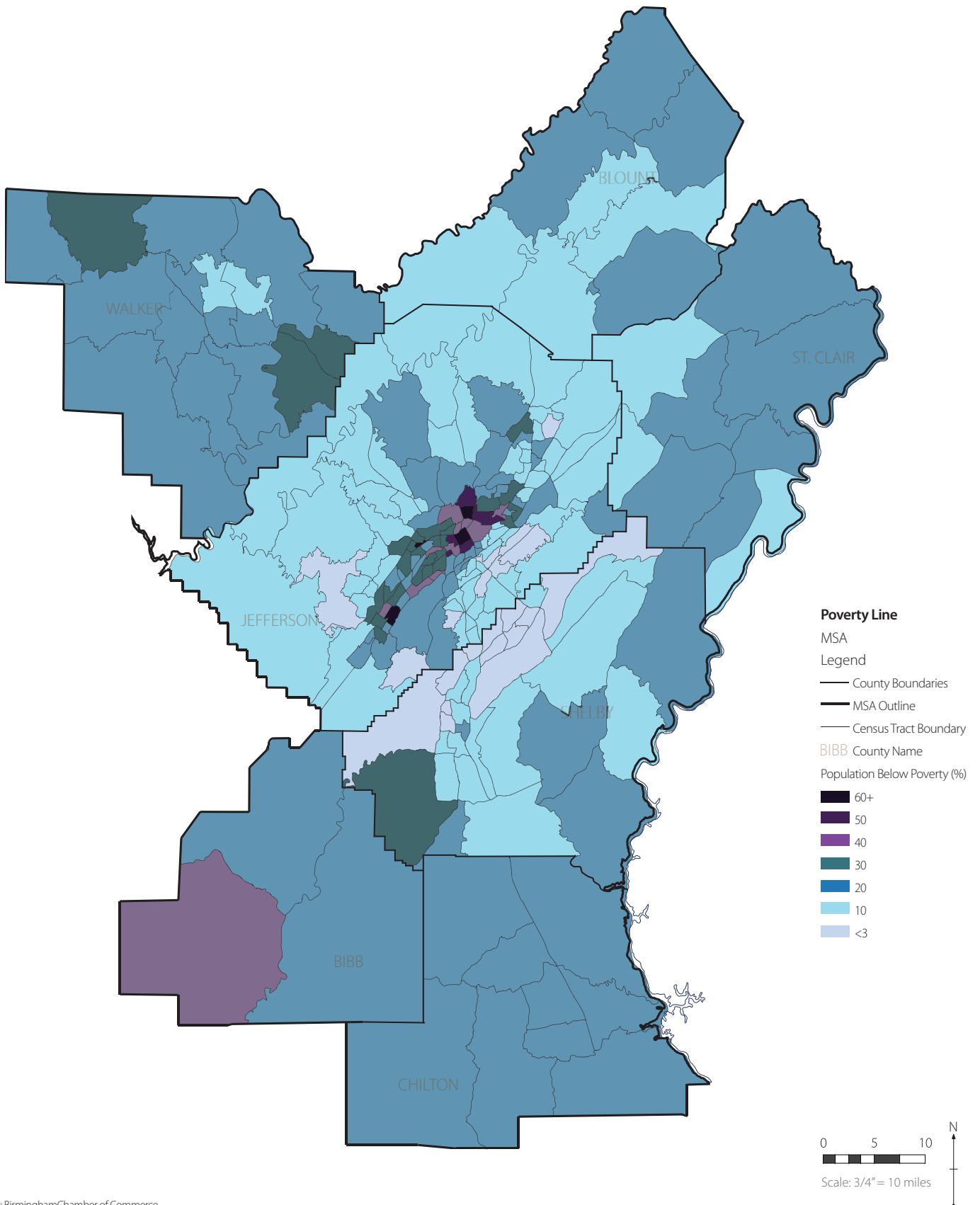


Source: Birmingham Chamber of Commerce

Economic 2008 Poverty

The 2009 U.S. poverty guidelines for a typical family of four is household earnings of \$25,360 and just over 12 thousand for a single person household. The national poverty rate as of 2008 was 13.2%.

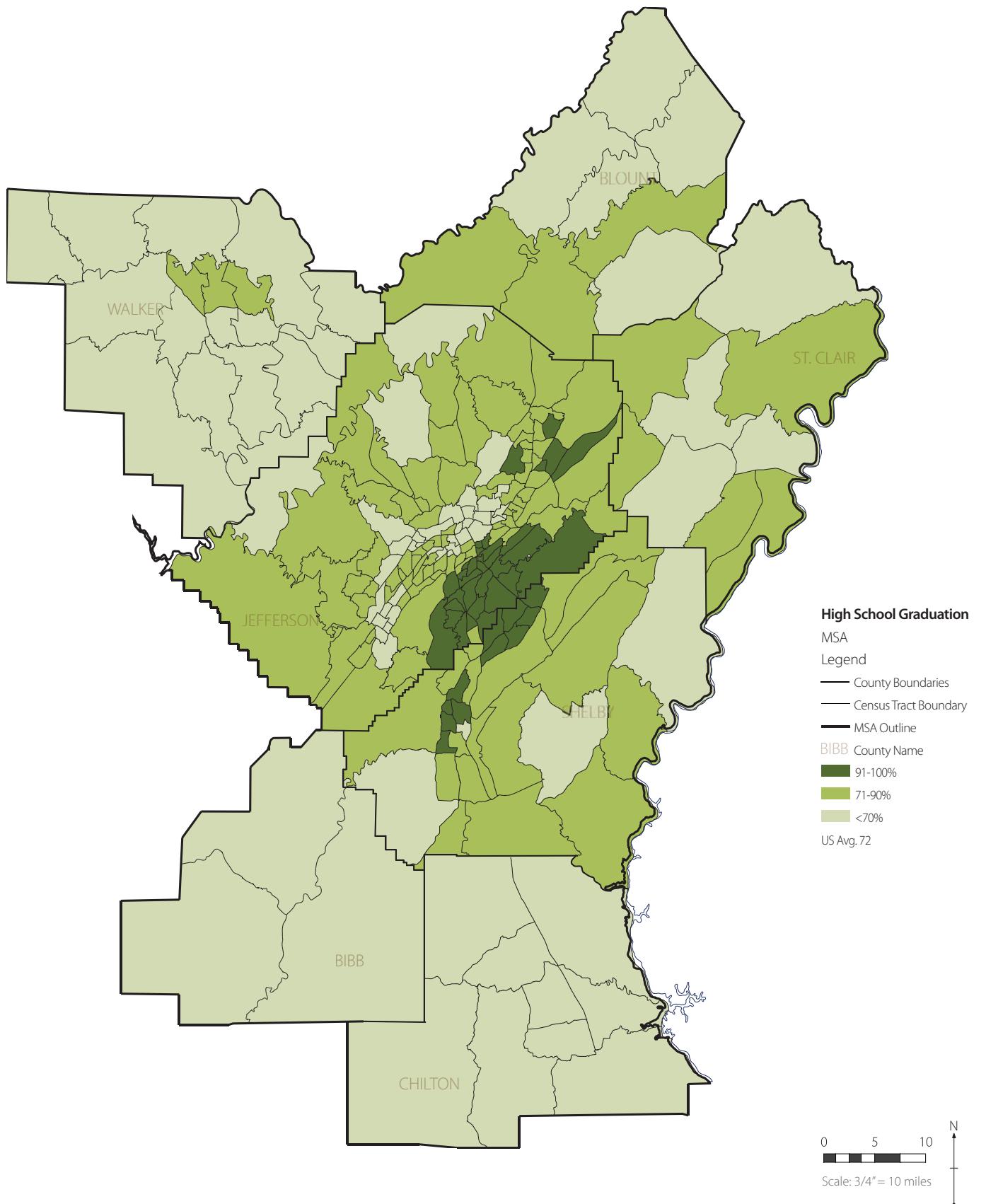
The pattern of poverty within the MSA consists of concentrated areas of higher poverty at the urban core, surrounded by a dognut-shaped band of relatively low poverty. This pattern extends outward from the urban center of the MSA for roughly 15-20 miles before higher rates of poverty are again encountered.



Source: Birmingham Chamber of Commerce

Human High School Graduation Rate

Graduation patterns in the MSA follow the typical distributions seen in the outer measures of wealth, population, and race. Higher graduation rates tend to concentrate south of Red Mountain, from the Southwest to the Northeast, while a parallel axis immediately to the north shows evidence of much lower graduation rates. These two polarized areas are surrounded by a band roughly 20 miles deep of relatively higher graduation rates. At the edge of the MSA area graduation rates greatly decline.

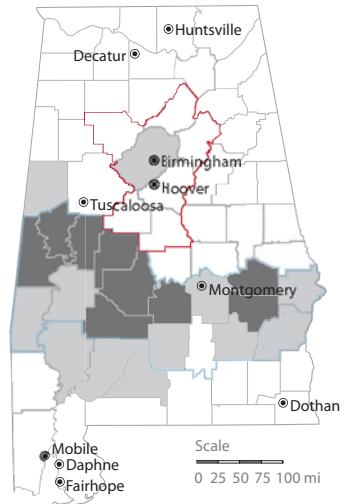


Human Racial Distribution

Isolations and classifications of people groups within a larger population allow economic and social data to identify patterns and opportunities at large and local scales. Another such breakdown of population is its racial distribution.

Neighborhoods within the Birmingham urban center house predominately minority residents, in contrast to suburban satellite communities to the south which are mostly white.

White residents occupy nearly 95% of the used residential land area in the region and dominate population numbers in Walker, Blount, and Chilton counties.

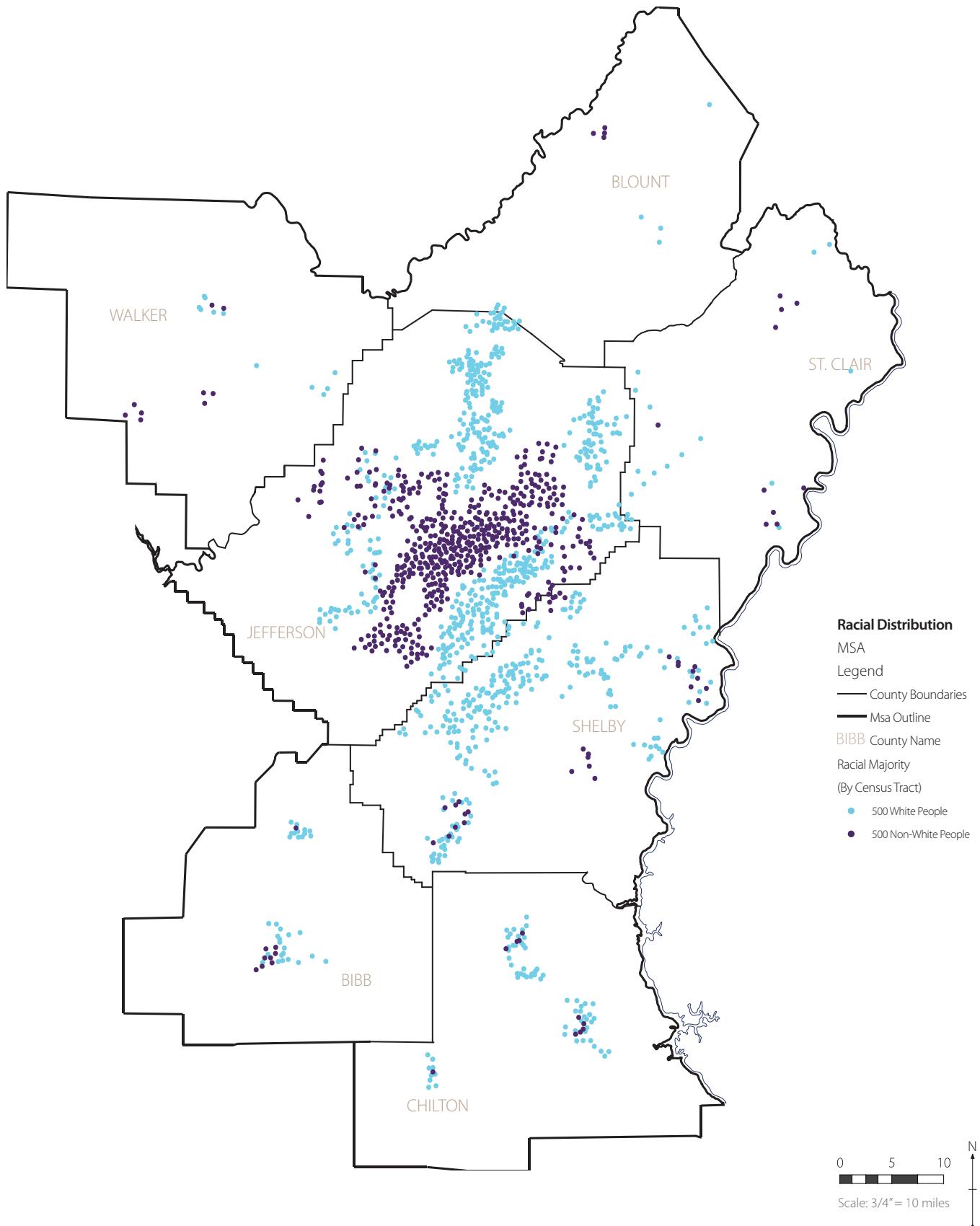


Racial Distribution

Alabama

Legend

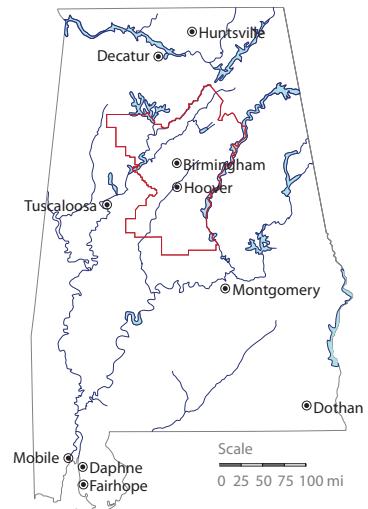
- Birmingham MSA Boundary
- County Boundaries
- MSA Urban Centers
- >60% White Populated County
- Closely Integrated Populated County
- >60% African American Populated
- Traditional "Black Belt" Region



Economic Point Source Water Pollutant Locations

Water quality is influenced by chemical wasting into the groundwater and air alike. The toxic groundwater release sites represent specific locations of chemical dumping in the MSA, by permit, directly into the ground - many in close proximity to drinking water sources.

Superfund sites are the most serious uncontrolled or abandoned waste sites in the country. The Birmingham MSA has two such locations within its boundary and six more in watersheds which impact the MSA.



Surface Water

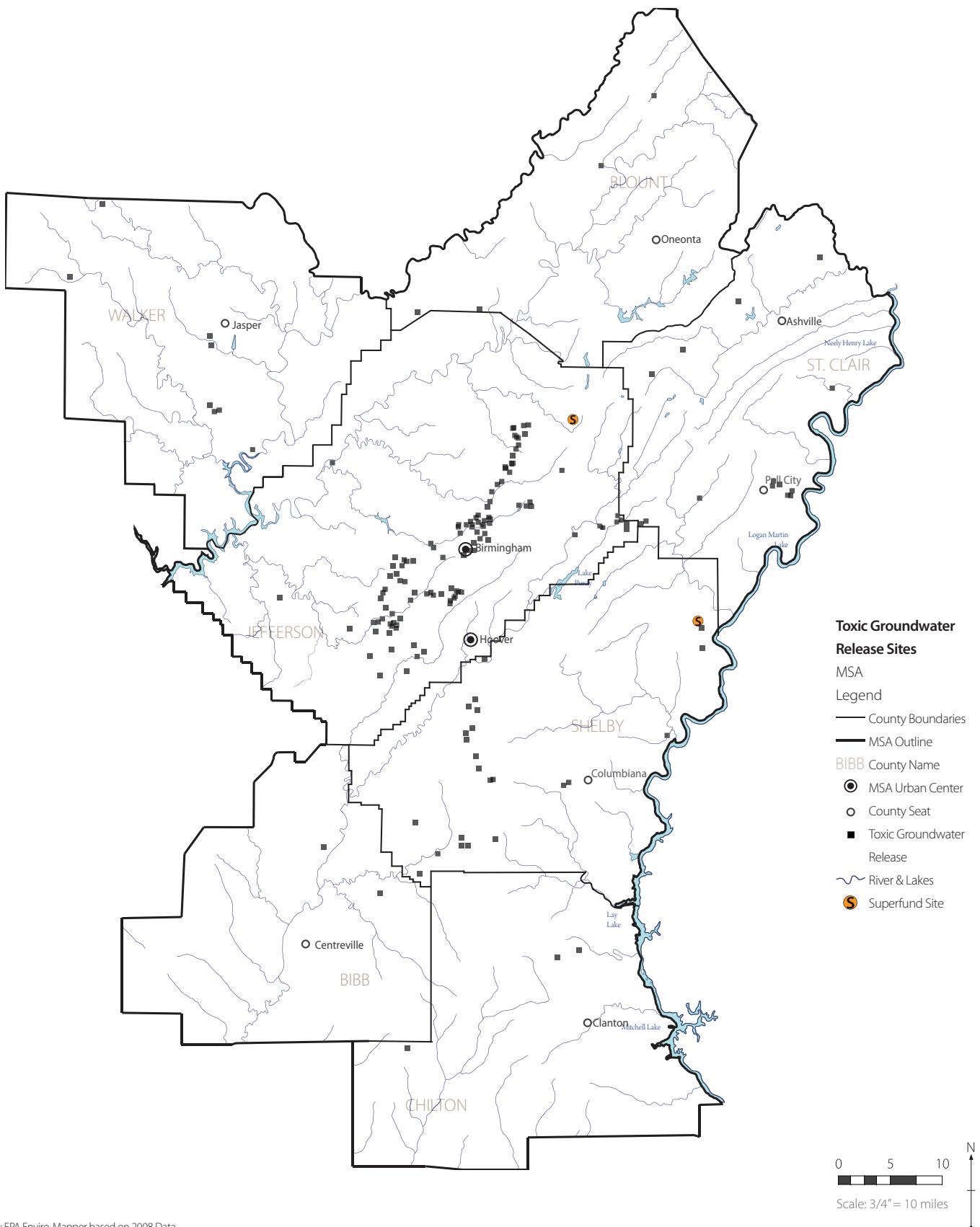
Alabama

Legend

— Birmingham MSA Boundary

~~ Rivers & Lakes

◎ MSA Urban Centers

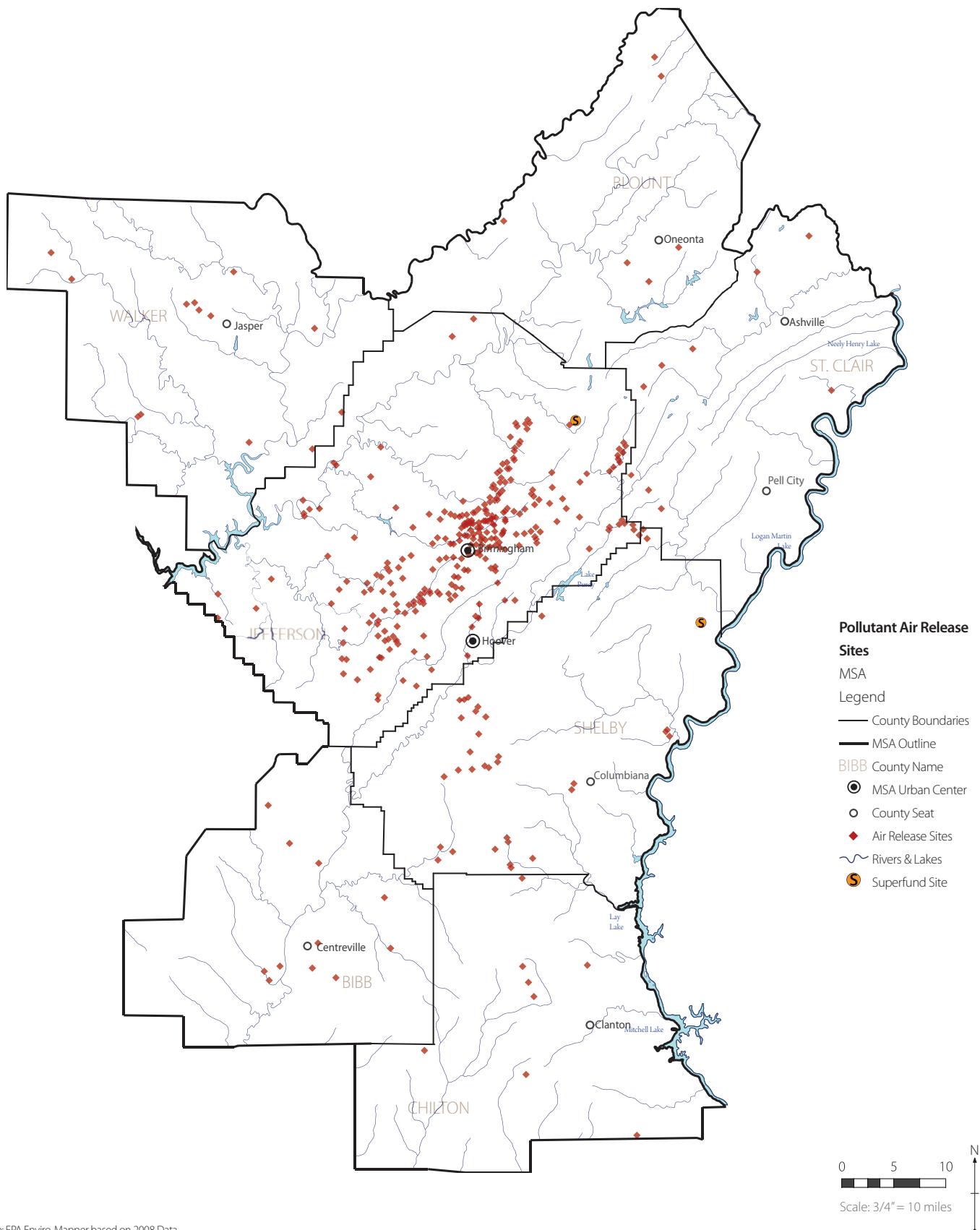


Source: EPA Enviro-Mapper based on 2008 Data

Economic Point Source Air Release Sites

Air releases are sites where pollutants are released into the atmosphere from stationary sources, such as smokestacks and other vents at commercial or industrial facilities. This map layer illustrates a collection of emissions information for six common air pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide.

Superfund sites are the most serious uncontrolled or abandoned waste sites in the country. The Birmingham MSA has two such locations within its boundary and six more in watersheds which impact the MSA.

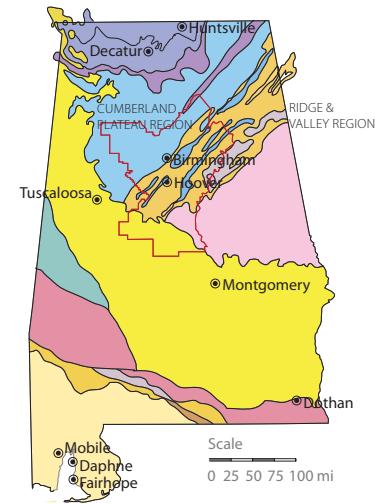


Source: EPA Enviro-Mapper based on 2008 Data

Natural Groundwater/ Aquifers

Underground is the aquifer system, a layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt, or clay) from which groundwater can be usefully extracted using a well. The Birmingham MSA lies above the Cumberland Plateau and Valley & Ridge aquifer regions. Water wells of the Cumberland region typically have low yields of around 10 to 25 gallons per minute (gpm). The gallons per minute measurement is determined by counting the gallons drawn down and the time between cut in and cut off cycle of the well pump. Due to the Cumberland region aquifers' particularly low output, they are suitable for limited use for large-scale municipal water demand. The Knox/ Shady and the Tuscumbia/ Fort Payne are the primary aquifers in the Valley & Ridge region. Reported yields for the Tuscumbia/ Ft. Payne aquifers can exceed 1,500 gpm and 2,200 gpm in the Knox/ Shady aquifer system. These aquifers are ideal for dense populations, heavy industrial use, and large-scale groundwater sale.

Although most of the more densely populated areas of the Birmingham MSA are located above this Ridge & Valley region, many of the region's industry lie in the Cumberland region, where groundwater supply is limited. These areas of limited groundwater rely heavily on connections to Ridge & Valley cities to tap into a groundwater system that has approximately eight million gallons of water entering and five million gallons exiting the MSA each day.



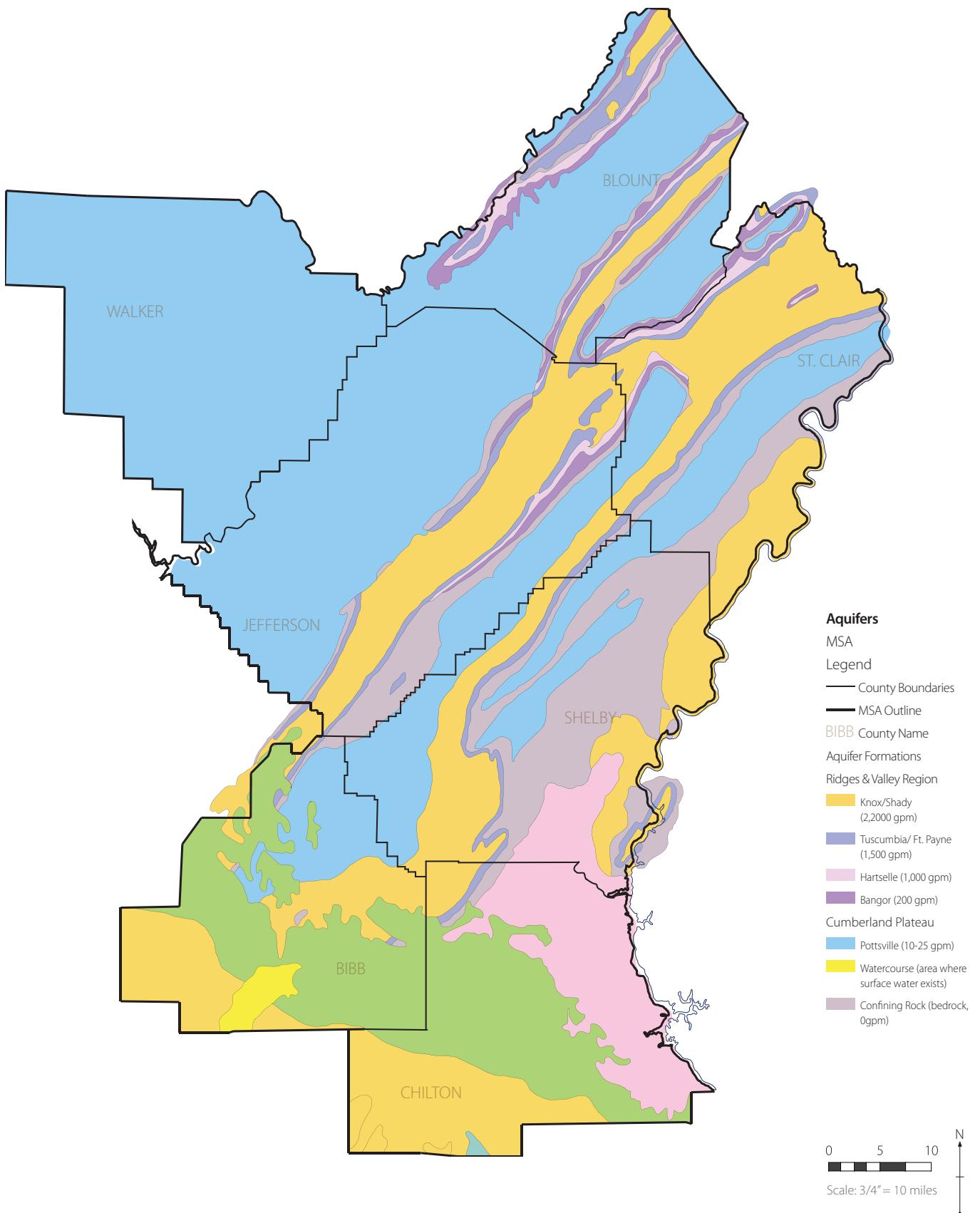
Aquifers

Alabama

Legend

— Birmingham MSA Boundary

● MSA Urban Centers



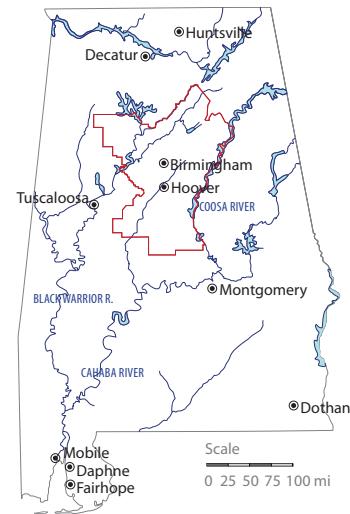
Natural Surface Water

Approximately eight percent of water in the continental U.S. originates or flows through Alabama - which has more navigable rivers than any other state. Of the 10 major stream systems in the state, three lie within the Birmingham MSA land area. These three systems are the Black Warrior, Cahaba, and Coosa rivers.

The Black Warrior, fueled by three in-state sources, the Sipsey, Locust, and Mulberry Forks, has the largest drainage area entirely within the state's borders. The Cahaba River's source lies just northeast of the city of Birmingham; this system is the longest free-flowing river in the state and serves as the public water supply for the city of Birmingham.

Since both the Black Warrior and the Cahaba Rivers flow southeasterly before emptying into the Gulf of Mexico via the Mississippi Drainage Basin, their shipping route capabilities are significant to development in this region. Many of these main river systems tributaries pass directly through major urban communities such as the Shades Creek

of the Cahaba system which meanders through six of the most heavily populated urban areas in the Birmingham MSA including the city of Birmingham - connecting the city to ports in Mobile.



Surface Water

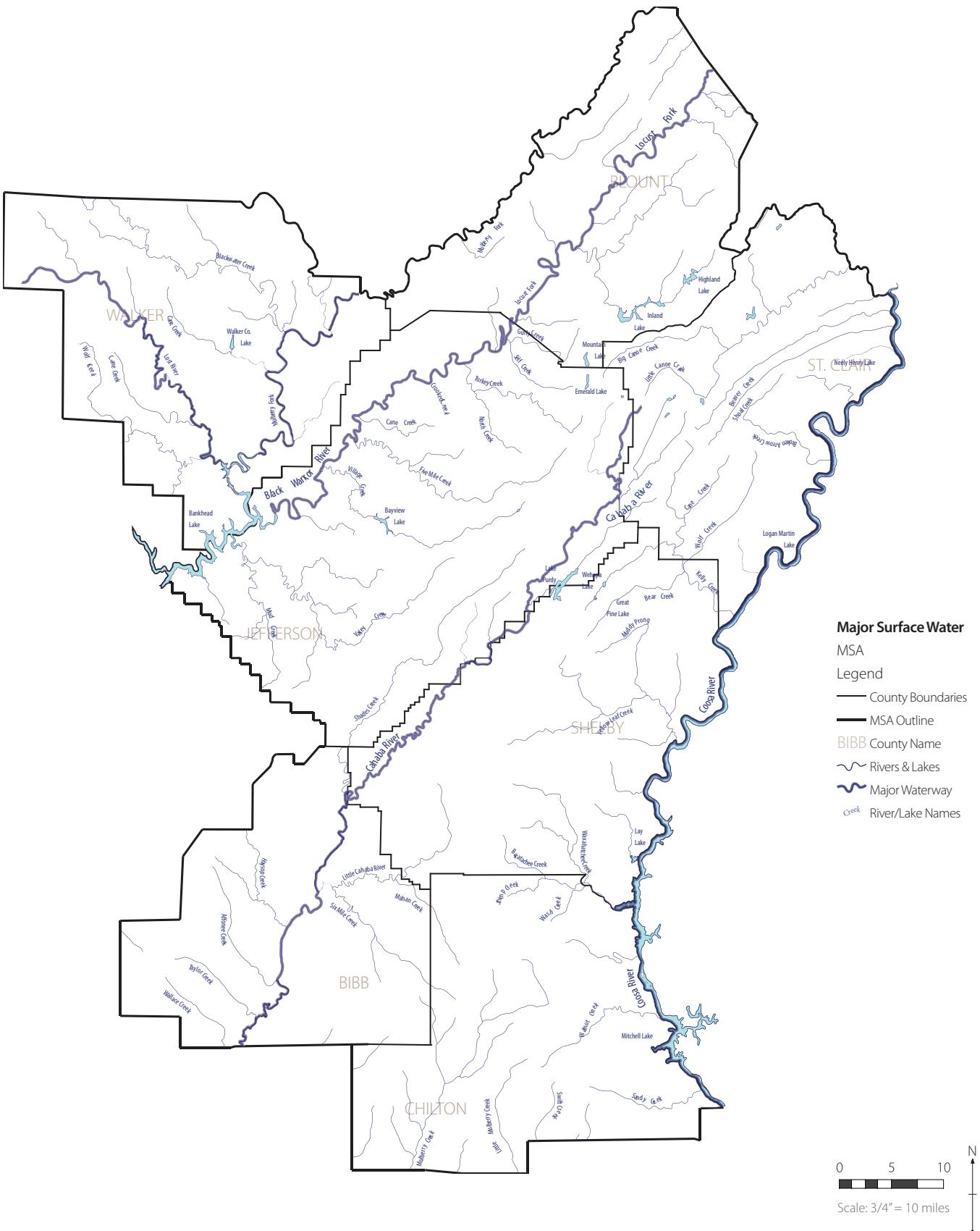
Alabama

Legend

Rivers & Lakes

MSA Urban Centers

Birmingham MSA



Natural Topography

The dynamic topography of the Birmingham MSA affects the regions' groundwater, drainage, weather, atmospheric processes, transportation, community development patterns, and more.

This MSA marks the conclusion of the Appalachian Mountain chain which was created 420 million years ago when the two land masses of Larussian and Acatlan complex collided to form the supercontinent of Pangaea. Today, very little seismic or tectonic activity occurs in the region. Minor earthquakes can be felt along hidden faults located in the Tennessee Valley, however, few have registered significant damage.

The city of Birmingham itself lays at a fall-line, which is an area where an upland region (Appalachian Ridges & Valleys) and a coastal plain (Southern Coastal Plain) meet. This convergence area between uplands and coastal plains creates a diverse Birmingham topography that includes three major watersheds and dramatic elevation changes within the MSA. From the lowest (Harrisburg)

to highest point (Chandler Mtn.), this area sees an elevation change of more than 1,299 feet sloping for northeast to southwest.



Topography

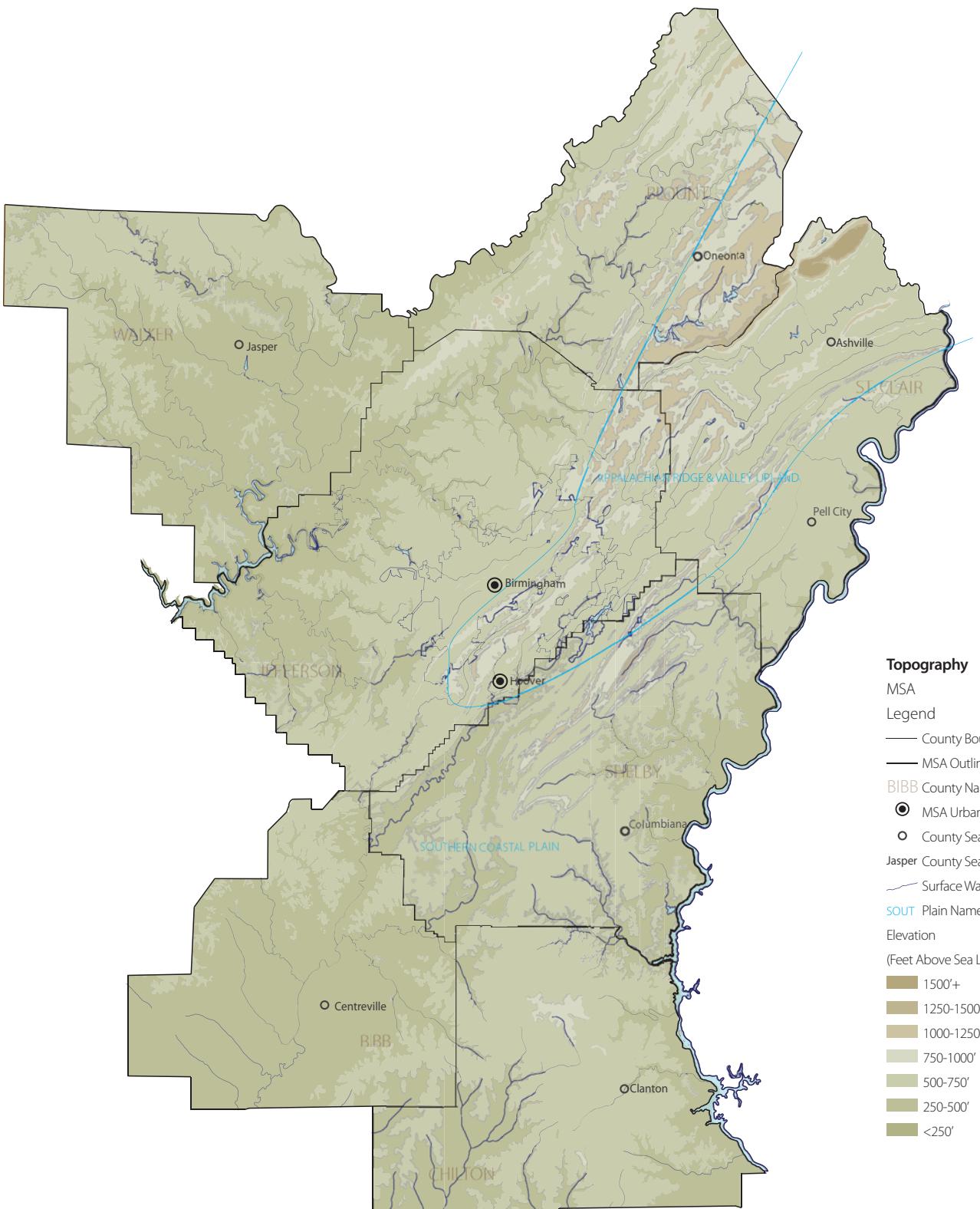
Alabama

Legend

— Birmingham MSA Boundary

● MSA Urban Centers

~~ Rivers & Lakes



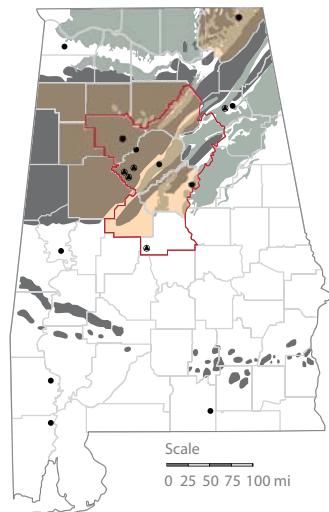
Natural Minerals

Coal and limestone were huge factors in the placement of Birmingham geographically. One called, "the Pittsburg of the South," Birmingham sits in a mineral hotbed primed for steelmaking. Alabama as a state is one of the nation's leading producers of sand, rock and gravel as a result of coal mining in the north central counties. It is third in the country for limestone production, and is among the top five masonry cement-producing states.

Coal has been mined in this region of Alabama for 150 years. Ranking 14th in the United States, the state produces 20 million tons of coal each year. Primarily, coal is produced in Alabama to generate power; 70 percent of all electricity generated in the state is produced at coal-fueled steam plants. Coal is also used to make coke which is part of the steel-making process. Annually, the total value of coal produced in Alabama exceeds \$1 billion.

Steelmaking resources paired with an extensive railway network makes Birmingham's geographic location a

valuable asset.



State Coal & Limestone

Alabama

Legend

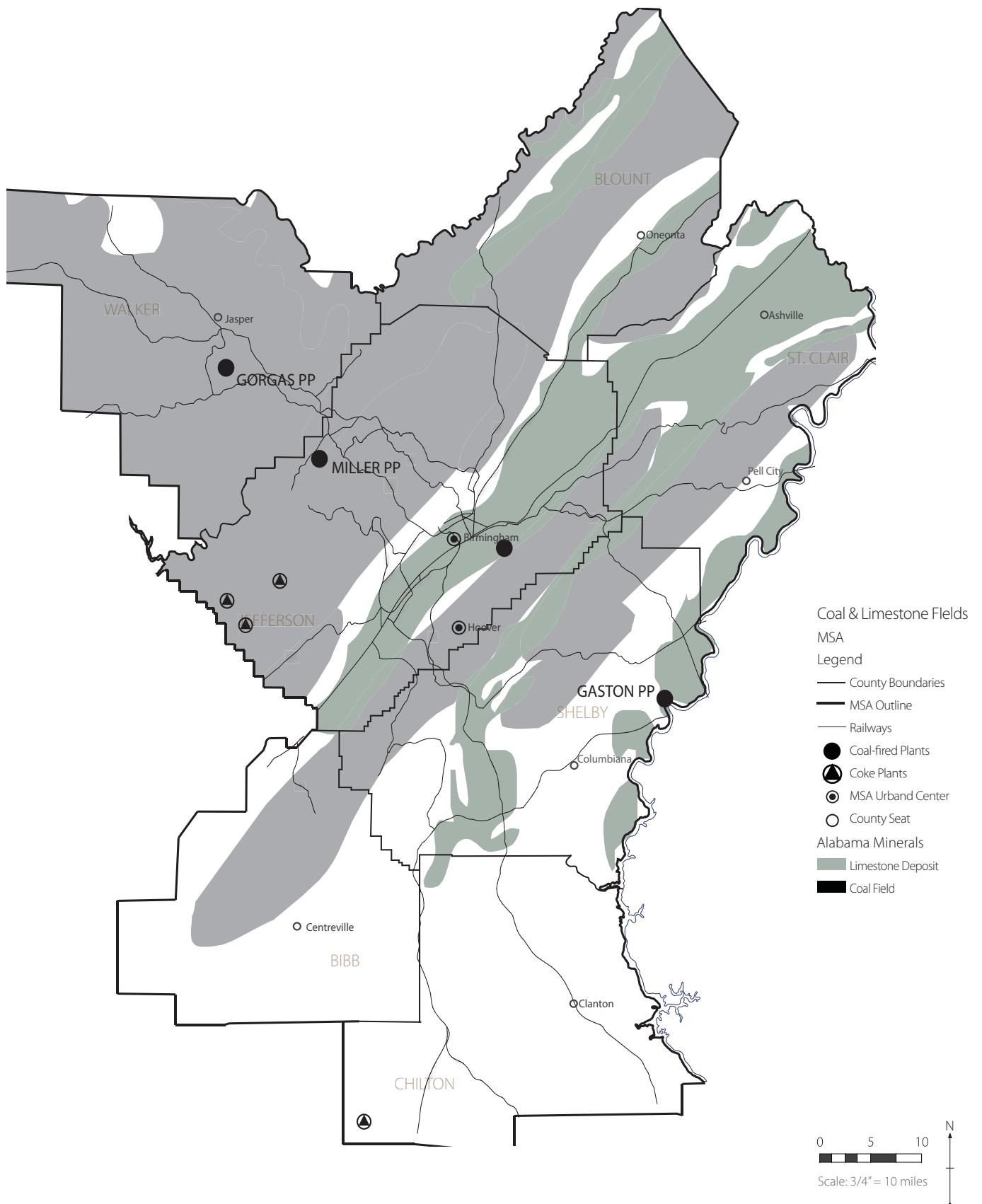
County Boundary

Coal-producing County

Birmingham MSA Boundary

Coal-fired Power Plant

Coke Plant



Natural Geographic Boundaries Meet Political Boundaries

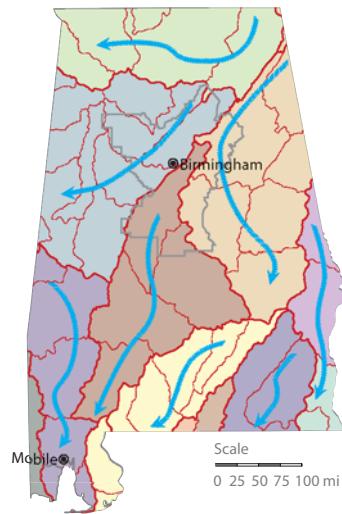
Thinking regionally when dealing with water issues requires taking a broader perspective. Understanding how an urban area affects water quality in an area requires knowledge of local watersheds and their working components which include surface waters.

A watershed is an area of land that drains to a lake, reservoir, river, wetland, or other waterway. The Birmingham MSA sits on a ridge separating three major watersheds: the Sipsey/Warrior, Alabama/Cahaba, and the Coosa/Tallapoosa. Also, the region consists of all or parts of seven subwatersheds, and approximately 40 minor watersheds.

A southwesterly flow of surface and ground water dominates the state; some of the waters make their way to the Mississippi Delta, while others empty into the Gulf of Mexico.

Watersheds act as a filter for runoff that occurs from precipitation, providing clean water for drinking, irrigation, recreation, and industry. All 70 of the municipal water systems in the Birmingham MSA area either draw water from watershed

systems directly or purchase from municipalities that do.



Surface Water

Alabama

Legend

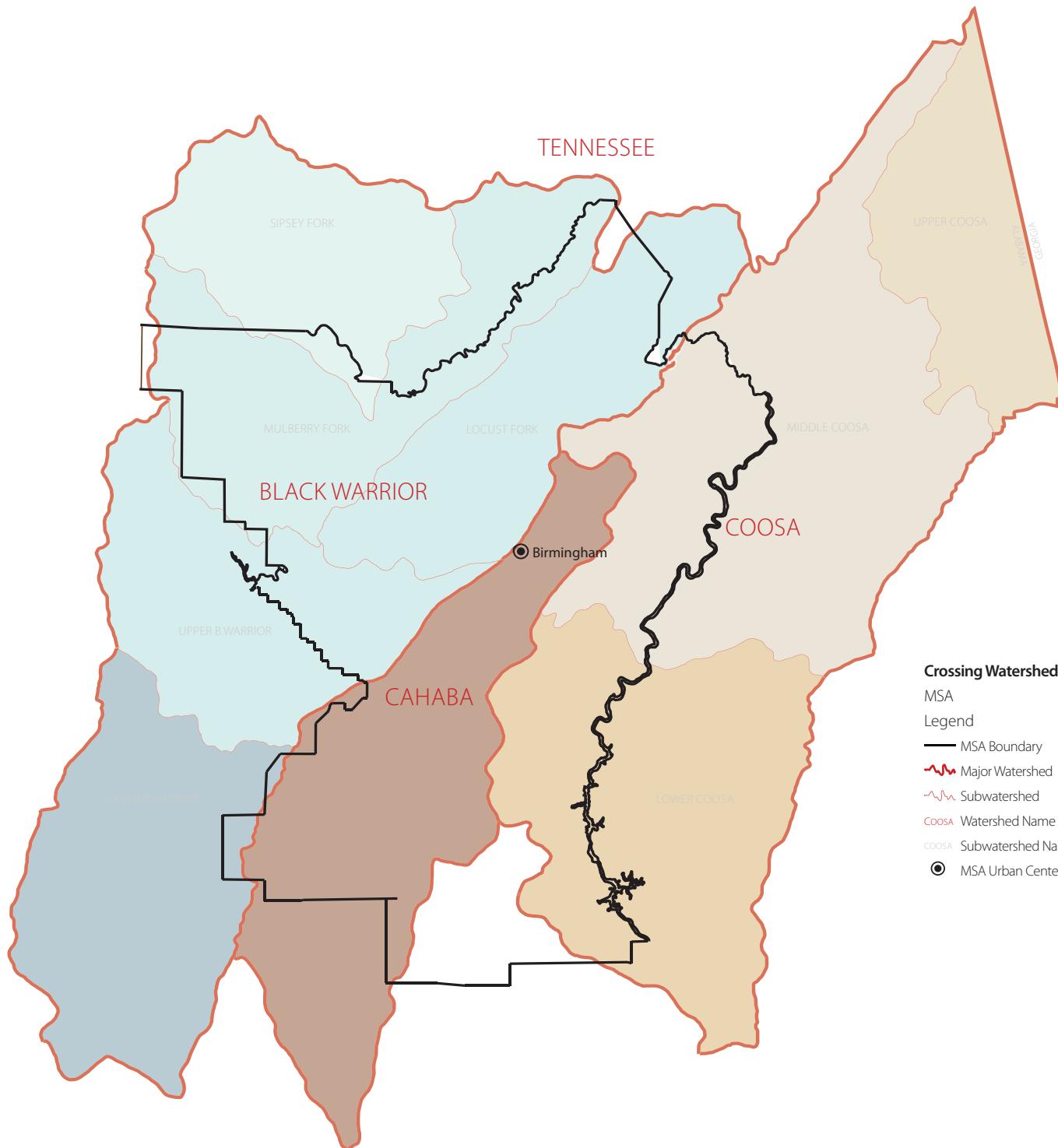
General Waterflow Direction

Major Watershed Boundary

Subwatershed Boundary

MSA Urban Centers

Birmingham MSA Boundary



Crossing Watersheds

MSA

Legend

— MSA Boundary

~~~~ Major Watershed

~ Subwatershed

**Coosa** Watershed Name

**COOSA** Subwatershed Name

◎ MSA Urban Center

0 5 10

Scale:  $3/4'' = 10$  miles





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