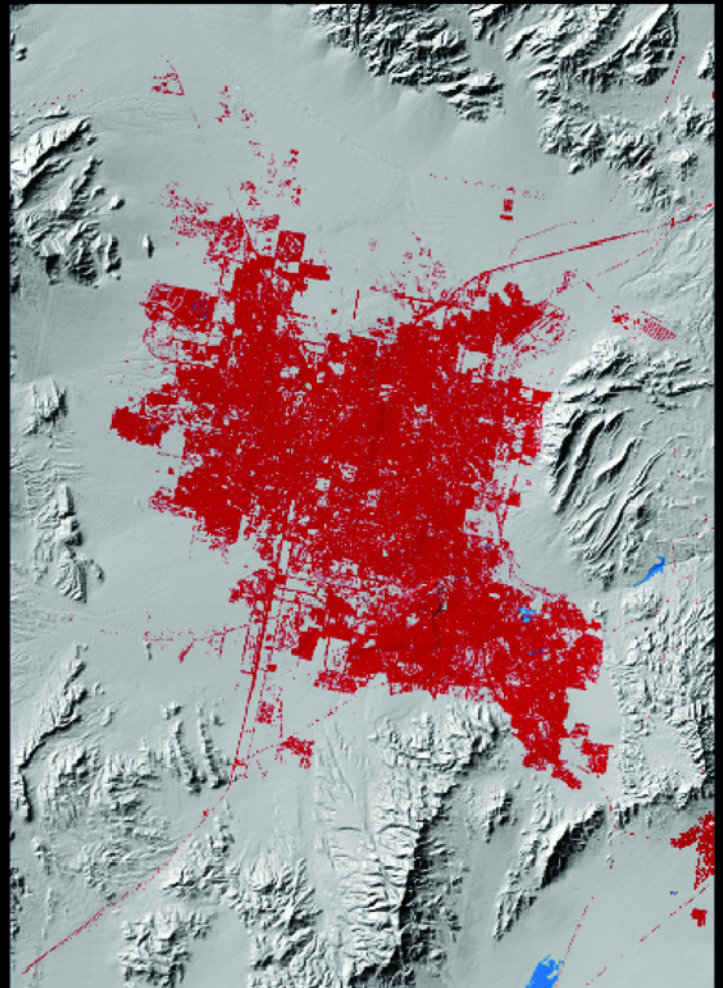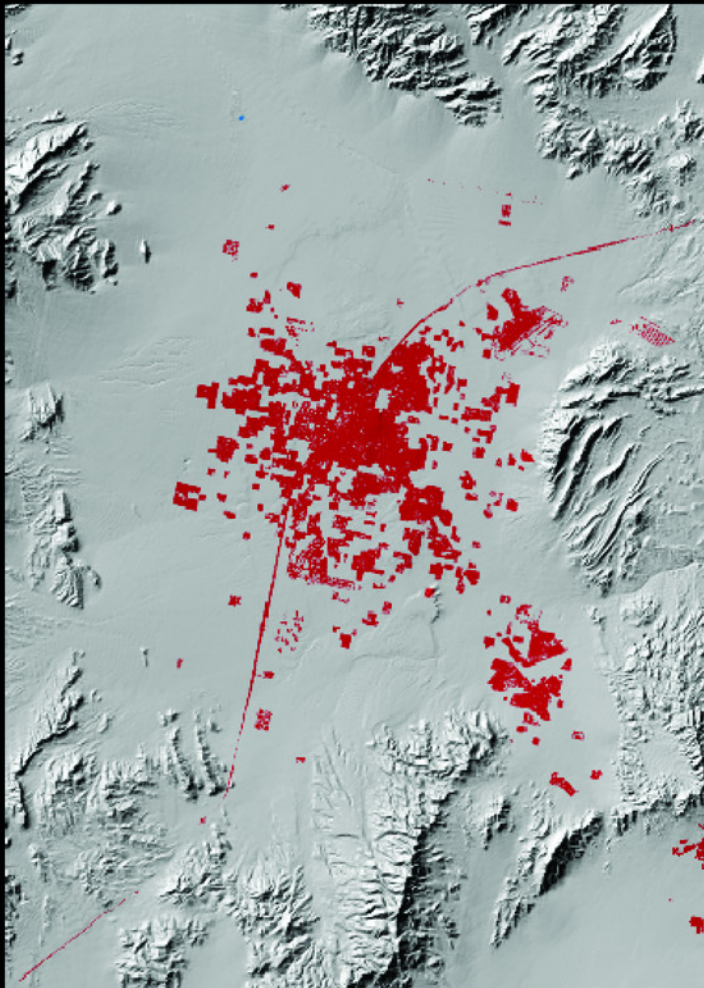**Geographic Analysis and Monitoring Program**

Urban Growth In American Cities
Glimpses of U.S. Urbanization

Circular 1252

About the cover:

These two images of Las Vegas, Nevada, show urban extent as it was in 1973 and 1992. Between these years, the urban area grew dramatically throughout the level basin. Visible in each image are local landforms, such as the surrounding mountain ranges and Lake Meade. Read more about the growth of Las Vegas on pages 20 and 21.

Urban Growth in American Cities
Glimpses of U.S. Urbanization

By Roger Auch[1], Janis Taylor[1], and William Acevedo[2]

January 2004

Circular 1252

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
Gale A. Norton, Secretary

U.S. Geological Survey
Charles G. Groat, Director

U.S. Geological Survey, EROS Data Center; 2003

Table of Contents

Urban Growth in American Cities
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by: Roger Auch, Janis Taylor, and William Acevedo

Purpose and Introduction

The Earth's surface is changing rapidly. Changes are local, regional, national, and even global in scope. Some changes have natural causes, such as earthquakes or drought. Other changes, such as urban expansion, agricultural intensification, resource extraction, and water resources development, are examples of human-induced change that have significant impact upon people, the economy, and resources. The consequences that result from these changes are often dramatic and widespread (Buchanan, Acevedo, and Zirbes, 2002)

It is the role of the U.S. Geological Survey (USGS) to provide useful and relevant scientific information both to the agencies within the Department of the Interior and to the Nation in general. In an effort to comply with this task, USGS scientists are assessing the status of, and the trends in, the Nation's land surface. This assessment provides useful information for regional and national land use decisionmaking. This knowledge can be used to deal with issues of significance to the Nation, such as quality-of-life, ecology of urban environments, ecosystem health, ecological integrity, water quality and quantity concerns, resource availability, vulnerability to natural hazards, safeguards to human health, air and land quality, and accessibility to scientific information. Results of these assessments can also be analyzed to reveal rates and trends in land use change. Results from urban growth studies provide a firm foundation for continuing research that explores the consequences of human modification of the landscape.

The USGS seeks to illustrate and explain the spatial history of urban growth and corresponding land use change. Scientists are studying urban environments from a regional perspective and a time scale of decades to measure the changes that have occurred in order to help understand the impact of anticipated changes in the future.

Within this booklet are pairs of images of selected urbanized regions from across the Nation. These image pairs illustrate the transformation that these areas have undergone over two decades. Specifically, they depict changes in the extent of urban land. Each change pair is composed of one image from the 1970s and one image from the 1990s. Accompanying each image pair is a brief historical geography

of factors that helped facilitate major changes that have occurred since the founding of the main city and the consequences and challenges of regional urban growth. The goal of this publication is to provide an illustration of urban change that is easily understood by a broad audience.

The images used throughout this booklet were generated from land cover data developed by the USGS. The data sources include the Geographic Information Retrieval and Analysis System (GIRAS) for the 1970s images and the National Land Cover Dataset (NLCD) for the 1990s images. GIRAS digital maps are based on photointerpretations completed in the mid-1970s. The NLCD is a land cover dataset for the conterminous United States based on 1992 Landsat thematic mapper (TM) satellite imagery and supplemental data (fig. 1a and fig. 1b). The USGS distributes both of these land use and land cover digital datasets.

The images were developed by using a geographic information system (GIS). The GIRAS and NLCD datasets were used to identify urban land within each region. In the final images all urban areas are shown in red. A shaded-relief map of each region was used to display the topographic context of the red polygon coverage. For all of these images, urban land is defined as areas transformed into a built-up environment for human use. It includes residential areas,
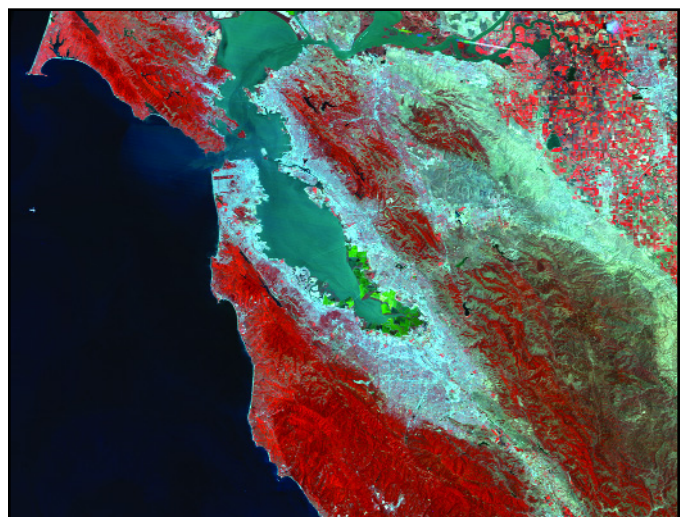

Figure 1a. Landsat 5 TM false-color satellite image of the San Francisco Bay region, 1992.
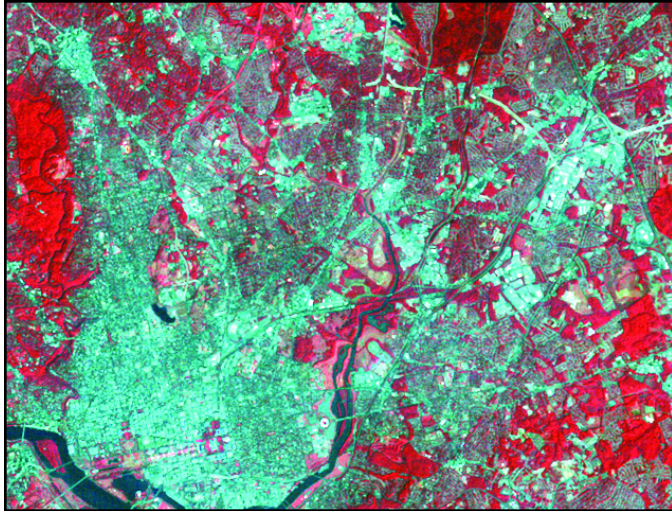
Figure 1b. Landsat 5 TM 1991 false-color satellite image showing part of the Washington, D.C., metropolitan area.

commercial and industrial developments, transportation features, and institutions.

For this booklet, 16 metropolitan regions were selected because they had a high rate of population growth between 1970-90, had a high rate of growth in urban land area between 1970-90, or provided a broader geographic balance across the Nation. Each region selected contains the city the image is named after. It also comprises all adjoining cities and suburbs that make up a surrounding metropolitan region. Producing image maps of urban extent in different time periods is a first step toward understanding how urban growth proceeds in different regions.

Because urban growth is often incremental, change may be overlooked in the short term, but the visual illustration of this growth can be quite dynamic over several decades. The rates of change can also vary over time and from one geographic region to another. This can be seen, for example, in a comparison of urban growth in the Orlando and Pittsburgh regions (see pages 26-27 and 30-31). In Orlando, urban change was dramatic over a very short time period, while in Pittsburgh, urban change occurred much more slowly over the same interval.

The image pairs shown in this booklet are meant to provide the general public, as well as the decisionmaker, with information about urban changes that have occurred over the past three decades. They can be helpful in understanding future urban growth patterns. Also, they can yield insights into the consequences of landscape change that result in serious economic and environmental issues.

Growth of Urban Areas

The growth of urban areas throughout the history of the United States has been dramatic. Various circumstances and driving forces have interacted over 225 years to reach a point where 80 percent of the Nation's population now lives in metropolitan areas that occupy less than 20 percent of the land area. The amount of intensively urbanized land within these metropolitan areas is even less (Platt, 1996, 22-24). Urban population growth started slowly, accelerated in the second half of the 19th century, and then continued steadily throughout the next hundred years (fig. 2). The form of, and reasons for, urbanization have, however, changed considerably over time.
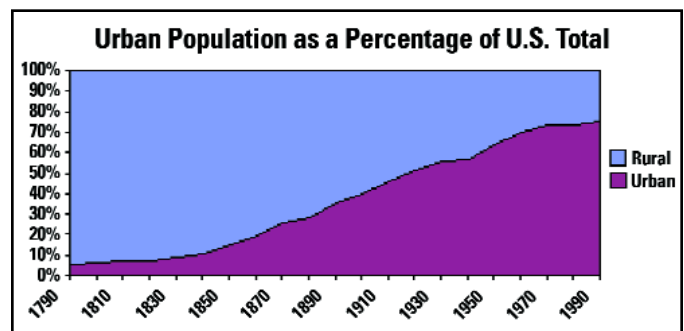

Figure 2. Source: Historical Statistics of the United States Colonial Times to 1970, Part 1, p. 11-12; Statistical Abstract of the United States 2000, p. 38.

American cities grew steadily throughout the first 75 years of nationhood but remained relatively small in geographic area and population. Most were located along transportation access points: at seaports, along navigable tidal and major inland rivers, along canals, and around the Great Lakes. The regional hinterlands beyond the cities produced raw commodities as a part of rural-based economies. Those commodities were then processed into durable goods in urban centers and redistributed in the area or transported to other regions where they were refined or even exported (Borchert, 1967). By the eve of the Civil War, however, the nature of urban development had begun to change. Cities were becoming centers of industry as access to local and regional natural resources improved and these resources were exploited. In addition, European social unrest led to a steady stream of immigrants arriving in the United States. These conditions were especially marked in New England and the Middle Atlantic States. The South and Midwest, by contrast, remained predominantly rural, although regional economies were linked to urban markets (Goldfield and Brownell, 1990, 95-102, 104-109). A few Western cities also appeared at this time, although few were significant on the national scene. In general, their economies tended to be based either on localized mineral wealth or on agriculture; a handful were Hispanic cultural centers (Starrs, 1995, 271-285).

The pace of urbanization quickened following the Civil War. Trains became the dominant transportation mode throughout the country, especially after 1870, when an economical way to mass-produce steel was introduced, allowing the construction of a vast rail network. Many cities were created as a result of railroad expansion, while others grew in size after becoming rail hubs. Industrialization also gained prominence, and by 1890 a national economy had been created. Natural resources from all parts of the country were used to fuel a rapidly expanding industrial Nation (Meyer, 1987, 321-345). Immigration, mostly from Europe, continued to bolster the burgeoning population. Drawn by factory jobs, many immigrants settled in cities. At this time, the majority of the Nation's urban population was still located in the Northeast and the Midwest (Goldfield and Brownell, 1990, 185-212). Cities in the South and West continued to grow but remained smaller in comparison. For example, in 1896, Miami had a mere 500 registered voters (Proctor, 1996, 269-270).

Changes in agricultural production increased the flow of people to the cities by the turn of the century. Regional specialization of specific commodities as a result of environmental conditions gave agricultural producers in some places an advantage over producers elsewhere. Farmers in areas where land was of marginal quality many times had to abandon agriculture and seek other sources of employment (Meyer, 1987, 326-334; Borchert, 1987, 103, 107). In the South, many African-Americans migrated to northern industrial cities to escape the growing failure of the postslavery sharecropping system that relied on monoculture cotton production (Clark, 1984, 145-146; Spinney, 2000, 167-170). Hispanic workers came to California and other Western States in increasing numbers as new irrigation projects made it possible to raise high-value but labor-intensive fruits and vegetables. Migrant field workers and their families often ended up living in small but growing urban areas throughout the region (Haverluk, 2000).

The old "downtown" city in America reached its zenith by the end of the First World War. The inner core of the city was the center of industrial management, production, and distribution. Such cities were predominantly densely populated, because most workers lived in multifamily dwellings near their sites of employment. Downtown landscapes were also being transformed as rising land prices and new technologies fostered the construction of high-rise buildings, or "skyscrapers." Suburbanization was initially limited to neighboring communities linked to city centers by railroads and electric streetcars. Modern highways were just making their first appearance (Muller, 1986). The U.S. Census of 1920 revealed that, for the first time, more Americans lived in urban than rural settings (Platt, 1996, 215).

Between 1929 and 1945, the United States underwent both the Great Depression and the Second World War. These events ultimately formed a watershed that separated an old form of urban dynamics from a new one that has evolved over the past 50 years. Some of the seeds of this change had already been sown, however, during the previous few decades. These included the rapid increase in automobile ownership in the 1920s and the creation of the modern mortgage loan in the 1930s. Consumer spending also was severely curtailed as a result of the Depression and World War II, first from hardship and then by forced austerity. This led to a buildup of personal savings that helped create the Nation's booming postwar economy into which the "baby boom" generation was born. Another factor that influenced this change in urban growth dynamics was the involvement by the Federal Government, in both the national economy and those of local communities, in committing massive amounts of money to fight the Depression and later, the war. Several metropolitan regions included in this booklet reflect growth stimulated by this World War II era activity. One noteworthy aspect of this involvement was the backing of long-term home mortgage loans by several agencies, such as the Federal Housing Administration and the Veterans Administration, following the war. Most of the housing units financed in this manner were built on the edge of the existing cities (Jackson, 1985, 190-218). In time, the selective funding of major public works and the creation of a military-industrial complex would come to favor some urban areas over others (Goldfield and Brownell, 1990, 323-341; Markusen and others, 1991, 8-25, 51-81). Examples in the booklet include the Boston, Orlando, Seattle, and Denver areas. A third significant influence on urban growth in the postwar era was the exposure that millions of Americans had gained to other parts of the country. During the 1930s, many people abandoned regions fraught with economic and environmental problems for new places that were thought to offer better opportunities and living conditions (Gregory, 1989, 3-25; Lewis, 1987, 433-436). Others who had been involved in the armed services were exposed to parts of the country that had greater appeal as future places of residence than their former communities (Mohl and Mormino, 1996, 424-425; Lewis, 1987, 433-436; Abbott, 1981, 37-41, 98-119). Orlando, Tampa, Phoenix, Las Vegas, and Denver are all examples of cities that had new military bases during World War II and offered different but attractive natural amenities to potential new residents.

A new form of urban growth gained prominence after the war: mass suburbanization around the older cities. Several factors fostered its spread. First, the development of an improved highway system allowed people to commute to their jobs in the cities from outside municipal boundaries. This trend began in the 1920s but accelerated greatly after the 1940s. The passage of the Federal Interstate Highway Act in the 1950s set the stage for large-scale, multilane roads that became a reality over the next 20 years. Other driving forces behind suburbanization were subtler. The Nation's growing middle class, comprised of both blue- and white-collar workers, now had the financial resources to buy single-family residences away from the high-density city center and could maintain their suburban lifestyle by commuting (Jackson, 1985, 231-245). The suburbs also represented a refuge for a growing number of Americans who longed for quieter, less

hectic lives that were removed from the congestion, noise, pollution, multifamily residences, and high land prices typically found in the heart of the city. Many of the Nation's citizens were only a generation or two removed from farm or small-town living; the suburbs offered a means of bridging small-town and city life (Herbers, 1986, 91-101).

The Cold War era spurred the development of technology aimed at keeping the United States ahead of its perceived adversaries. Federal funding was channeled into research centers and the military-industrial complex. Communities that were home to major universities, aerospace and electronics industries, or defense installations benefited and grew as a result of these expenditures (Markusen and others, 1991, 32-50). Civic leaders sometimes pressured State officials to restructure existing universities — or to establish new ones, as happened in Las Vegas — in attempts to attract new industries to an area (Moehring, 2000, 223-227). Technological advancements, such as the widespread use of air conditioning, the growth of civil aviation, and increasingly inexpensive and plentiful electricity, encouraged the growth of cities in many parts of the country. Air conditioning, in particular, helped overcome environmental conditions in the Southeast and Southwest that were perceived drawbacks of year-round living in these regions (Mohl and Mormino, 1996, 433-435; Moehring, 2000, 22-23). Examples from the booklet include Orlando, Tampa-St. Petersburg, Phoenix, and Las Vegas.

The 1970 census revealed that, by this time, more of the Nation's urban population lived in the suburbs than in central cities. To a certain extent, suburbanization had been ongoing for nearly a century, but the trend had exploded during the post-World War II era. The suburbs had continued to grow during the 1960s, but by the end of the decade their relationship to the city centers had begun to change. The suburbs were no longer simply "bedroom communities" for commuting city workers. They were emerging as focal points for the retail and service sectors of the urban economy (Abbott, 1981, 57) (fig. 3).

The city centers remained strongholds of finance and corporate management. Manufacturing, on the other hand, was one of the leading segments of urban employment and was beginning to suffer major losses in the central cities. This was especially true for manufacturing's "heavy" industries. Numerous factors contributed to this decline, but perhaps the most influential was the fact that the city centers had lost their real or perceived competitive advantage. This deindustrialization accelerated throughout the next decade and continued into the 1980s. It left a changed urban landscape, both physically and functionally (Bluestone and Harrison, 1982, 25-48; Jakle and Wilson, 1992, 57-92). Pittsburgh is the most prominent example from the booklet.

Suburbanization did not strictly take the form of ever-widening concentric circles around a central city. Suburbs often developed along main highways in a linear fashion, linking pre-existing, outlying communities with the main city, as seen in the Boston and Sacramento pairs. In other cases,

suburbanization progressed in leapfrog fashion, bypassing certain areas because of environmental conditions, ownership status, or zoning ordinances. A dramatic example of these conditions is seen in the Phoenix area (pages 28-29), where development grew around but not into the Salt River Pima-Maricopa Indian Reservation. Changes in land cover and land use that resulted from suburbanization differed across the Nation, depending on local conditions (Stansfield, 1998, 265). In some places, agricultural land offered the best possibilities for development (Matlack, 1997) (fig. 4). Alternatively or in other areas, marginal or nonagricultural land was the preferred choice for development, especially as time passed and other options became limited (Abler, Adams, and Borchert, 1976, 55). Development around lakes and forested islands can be seen in the Minneapolis-St. Paul and Seattle-Tacoma pages. As a result of all the above factors, the periphery of most metropolitan areas became a jumbled mosaic of different land covers and uses (Hart, 1991).

The 1970s witnessed the spread of another form of urban growth. In the minds of many, the suburbs had become havens of conformity, the site of nearly identical, ranch-style subdivisions and strip malls. The suburbs also started to manifest the same negative urban aspects of the older cities,

Figure 3. This 1987 USGS National Aerial Photography Program color-infrared photograph shows the King of Prussia, Pa., area, approximately 18 miles northwest of downtown Philadelphia. The intersections of three major highways (I-76, U.S. 422, and U.S. 202), seen in the center of the picture, formed the ideal location for new commercial, retail, and industrial development within the expanding metropolitan region.

Figure 4. Former cropland, now residential "blanks", ready for new construction, Sioux Falls, S.Dak.

especially in those closest to them. Those people who wanted some of the urban advantages sought something other than the typical suburb. Many moved to large lots in surrounding rural areas and built single-family residences. These "ranchettes" or "acreages" typically ranged in size from 1 to 20 acres of land. The smaller ones were usually maintained as more traditional suburban house/yard/garden residences, while larger ones might have horses, ponds, woodlots, and even a few cattle. The latter did not function as farms, however, and actually fragmented surrounding land types, agricultural or otherwise. These "exurban" areas often had no recognized center, such as a major town, but instead were tied loosely to the region's primary metropolitan center (fig. 5)

(Herbers, 1986, 201-208, 28-38; Theobald, Gossnell, and Riebsame, 1996).

The desire for and cost of new housing were also factors driving the spreading out of development around metropolitan regions. Land costs for new housing construction tended to be less expensive on the periphery of a metropolitan region. The increasing suburbanization of employment allowed people who desired new housing to live farther out from the urban core but still maintain a similar commuting pattern of the suburbs to city center that had dominated several decades earlier. Increasingly strict land use regulations in many of the post-Second World War suburban counties affected the cost of new housing by limiting the area available for development and driving individual unit costs higher. Adjacent counties that lacked such restrictive zoning many times absorbed the "spillover" of new development from more densely settled places (Morrill, 1992; Levinson, 1997a, 1997b).

A socioeconomic change that affected urban areas in the post-World War II era involved the elderly middle-class segment of society. These "retirees" were living longer and enjoying greater geographic mobility because they could take transfer payments, such as Social Security, company pensions, and rental or investment money, away from their home communities and spend it elsewhere (Mohl and Mormino, 1996, 423-424). Examples of cities in the booklet that grew because of in-migration of retirees include Orlando, Tampa-St. Petersburg, Phoenix, and Las Vegas. A second group, people with transferable skills primarily in the service sector of the economy, also enjoyed the freedom to move to regions that were perceived to be more desirable places to live, such as Denver, Reno, and Orlando. Areas with natural amenities, such as mild winters, scenic vistas, and opportunities for water-related recreational activities, attracted many people from both of these relatively mobile groups (Herbers, 1986, 102-110, 113-115, 116-126; Power, 1996, 34-45, 50-55). As a result, the "Sunbelt" of the South and West gained in popula-

Figure 5. Exurban residences, (left) a rural subdivision in Culpeper County, Va. (right) a "hobby farm" in Chester County, Pa.

tion at the expense of the Northeast and Midwest. Many small- and medium-sized cities in the former regions were transformed by the influx of people and grew into major urban areas of national significance (fig. 6).
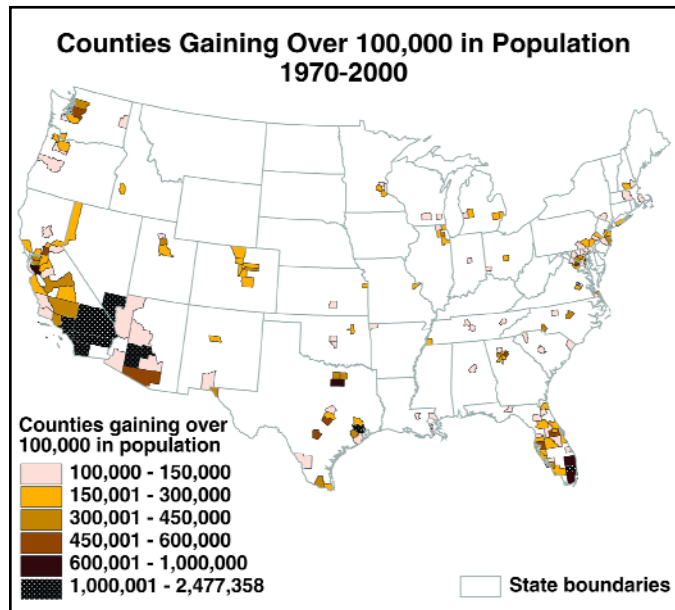

Figure 6.

The growth of many Sunbelt cities also benefited from *laissez-faire* attitudes of local governments in regard to urban planning. Civic boosterism had always been a means through which individual cities could gain status within regional and national urban hierarchies. But the explosive growth in the major Sunbelt metropolitan areas was greatly aided by "probusiness" and "progrowth" policies that were character-ized by few regulations. The "boom" atmosphere that ensued resulted in perceived societal gains and losses (Kirby and Lynch, 1987; Luckingham, 1989, 147-158, 177-188, 221-229; Payne, 1994, 197-207, 274-283, 286-294, 325-333, 351-363). Examples from the booklet include Houston, Phoenix, and Denver.

The spatial distribution of employment also changed over recent decades. Suburbs initially became retail centers. But over time, manufacturing — in terms of both production and management — has become a growing presence in suburban and exurban areas. Most industries in these areas are typically described as being "light" or 'high-tech," and are much less site specific than their older, "heavy" industrial counterparts. Light industries are often located near trans-portation or information-based access points, such as along interstate highway "corridors" or near research facilities and/or major universities (Fulton, 1986) (fig. 7). The Atlanta and Raleigh-Durham areas are examples of cities having these conditions.

Many high-tech industries often cater to the needs and desires of their specialized workforce and are located in

Figure 7.   Modern manufacturing is often located near the edge of a city and near convenient interstate highway access.

places with abundant natural amenities. To a certain extent, industry management has also left the city center in favor of "corporate campuses" located near interstate highway interchanges or major airports (Garreau, 1991, 3-15). The municipalities of Schaumburg and Oak Brook from the Chicago pages are examples of such locations. Even smaller cities have seen an increase in industrial activities as the result of being within a day's drive of larger manufacturing centers that can supply the new "just-in-time," inventory-limited production systems (Rubenstein, 1990) (fig. 8).

Figure 8. The Toyota car assembly plant, located near Lexington, Ky., and built in the 1980s, is within a day's drive of the traditional core region of U.S. automobile manufacturing. Source: Toyota Motor Manufacturing, Kentucky, Inc.

Many of the processes described above are still ongoing within urban areas. Some cities continue to grow signifi-cantly, while various factors have slowed the growth of others. One reason that some parts of metropolitan areas have appeared to stop growing is that they have reached certain physical limits of geography. In the last several decades, many cities in the United States have experienced "infilling" of areas that were initially bypassed during past periods of urbanization. Several metropolitan regions have little remain-ing land available for development within what has been
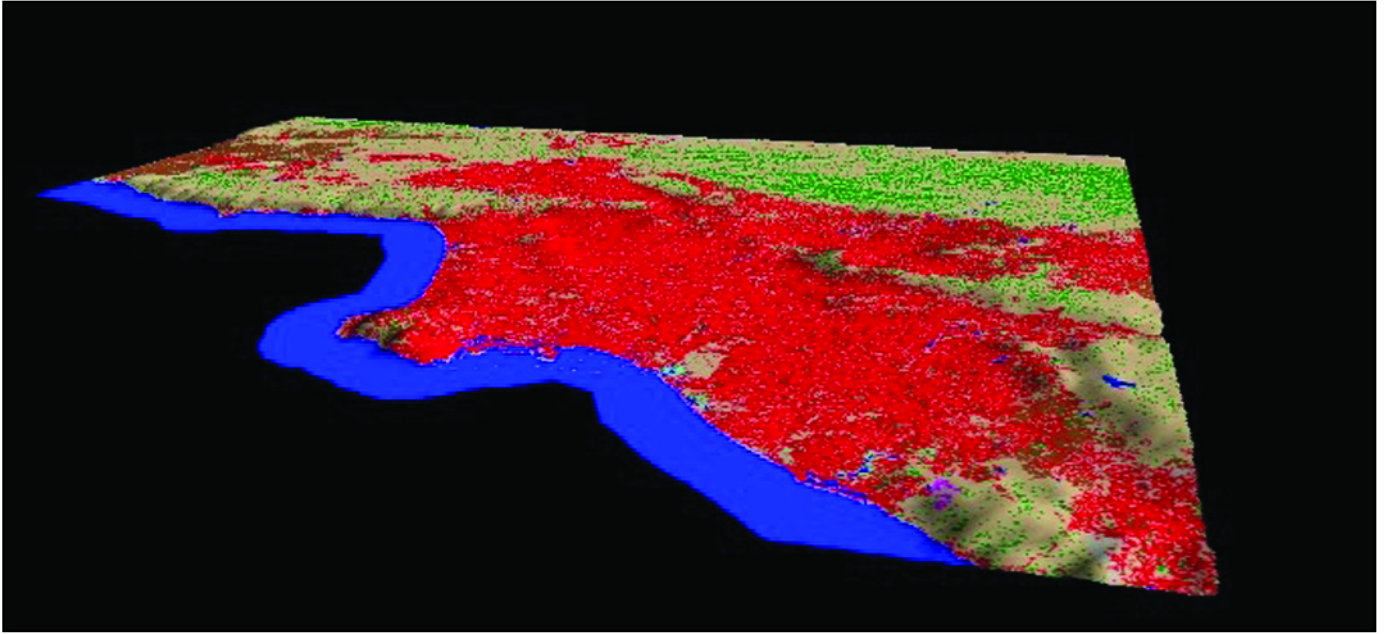
Figure 9. The Los Angeles basin was nearly fully urbanized by the early 1990s. This image was produced by combining the National Land Cover Dataset and the National Elevation Dataset for this area. Land cover classes have been collapsed into six categories: Red-developed, Tan-shrubland/grassland, Green-forest, Brown-agriculture, Magenta-transitional, and Blue-water. The elevation is exaggerated by a factor of 10, and the viewing position is at 6,000 meters above the Pacific Ocean to the south.

perceived as their traditional urban base, such as the Los Angeles basin or San Francisco Bay (Fishman, 1987, 178-181) (fig. 9).

The nonurbanized parts of these cities are preserved or restricted lands, such as regional parks, conservation or farmland trust areas, and military installations. Other nonurbanized lands are either prohibitively expensive or unsuitable for development, such as those with steep terrain or extensive wetlands. Suprametropolitan regions continue to expand, however, as greater Los Angeles spills out onto the Mojave Desert beyond the San Gabriel Mountains or San Francisco Bay urbanization pushes down numerous valleys in Contra Costa, Alameda, and Santa Clara Counties. The dynamics of American cities have not stopped; only their future evolution is yet to be determined.

Locator Map
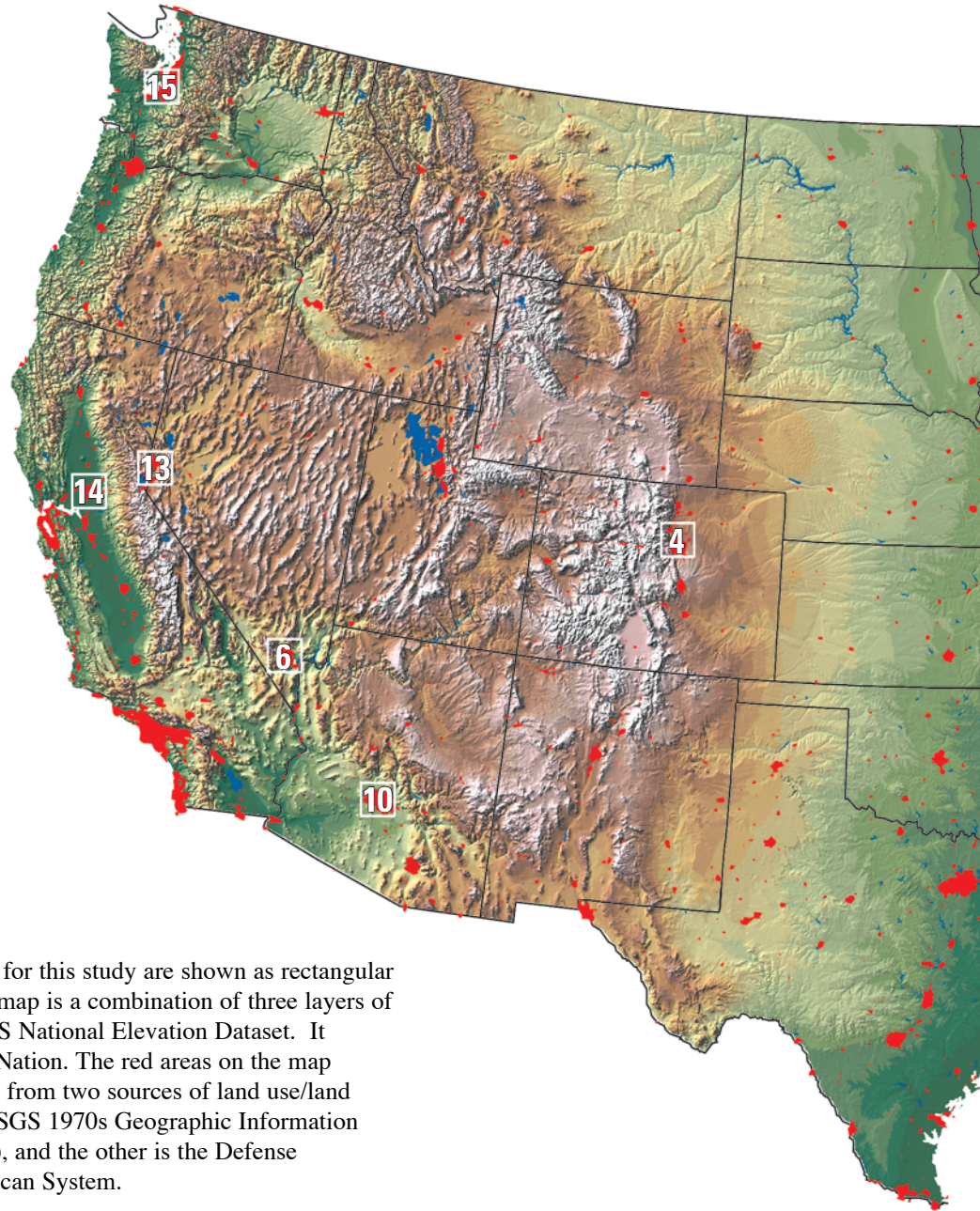
The 16 metropolitan areas selected for this study are shown as rectangular boxes on this locator map. The locator map is a combination of three layers of information. The base layer is the USGS National Elevation Dataset. It shows the topographic relief across the Nation. The red areas on the map represent urban places and were derived from two sources of land use/land cover information. One source is the USGS 1970s Geographic Information Retrieval and Analysis System (GIRAS), and the other is the Defense Meteorological Satellite Program- Linescan System.

1. Atlanta, Georgia

2. Boston, Massachusetts

3. Chicago, Illinois

4. Denver, Colorado

5. Houston, Texas

6. Las Vegas, Nevada

7. Memphis, Tennessee

8. Minneapolis-St. Paul, Minnesota

9. Orlando, Florida

10. Phoenix, Arizona

11. Pittsburgh, Pennsylvania

12. Raleigh-Durham, North Carolina

13. Reno-Sparks, Nevada

14. Sacramento, California

15. Seattle-Tacoma, Washington

16. Tampa-St. Petersburg, Florida
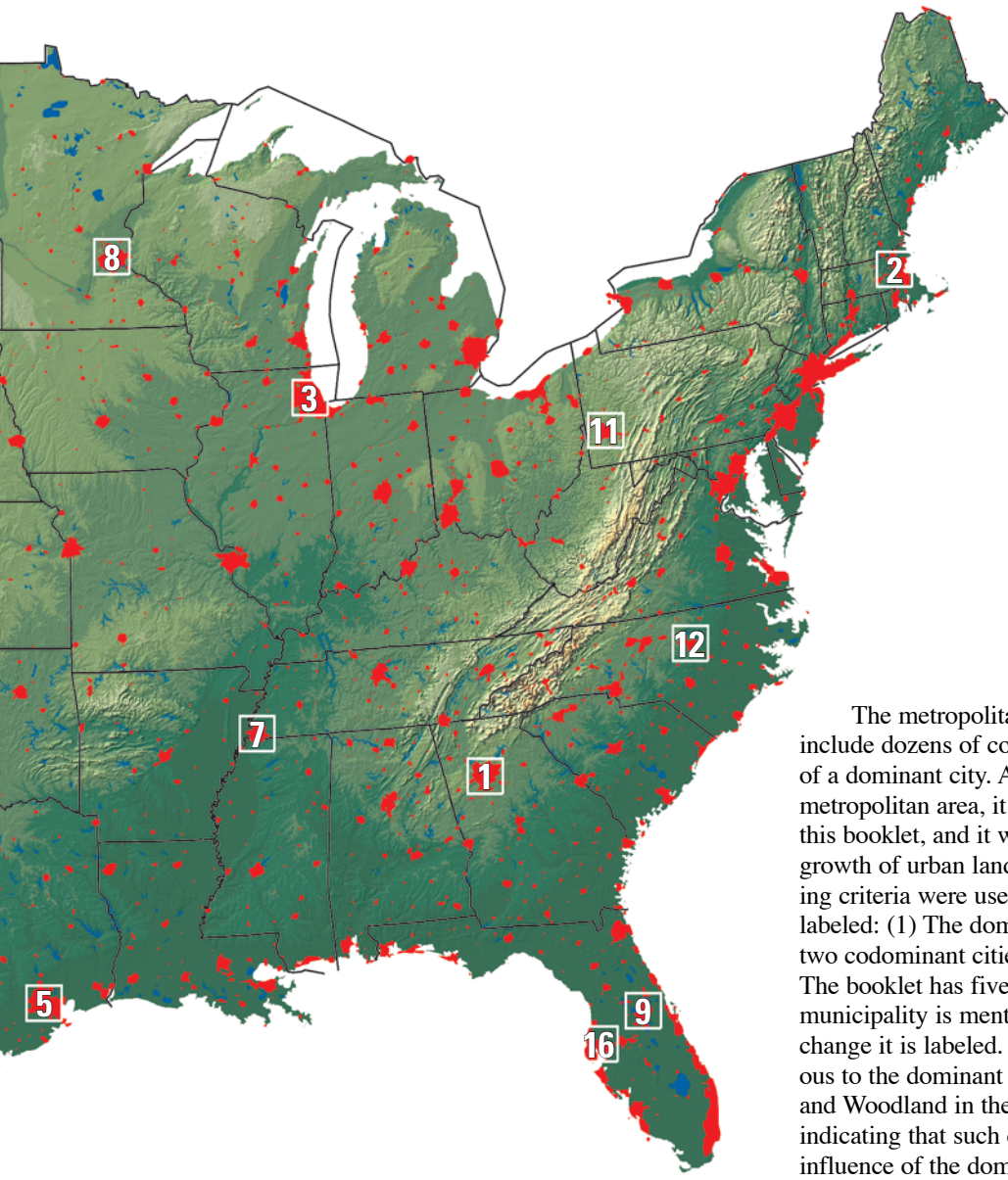
The metropolitan areas selected for this study usually include dozens of communities surrounding or in the general area of a dominant city. Although each is important to the entire metropolitan area, it would be impractical to label all of them for this booklet, and it would diminish the ability to visualize the growth of urban land between the two time periods. The following criteria were used for deciding what municipalities would be labeled: (1) The dominant city is not labeled unless there were two codominant cities involved, such as Minneapolis-St.Paul. The booklet has five regions where this is the case. (2) If a municipality is mentioned in the text as an example of urban change it is labeled. (3) Where an independent city noncontiguous to the dominant city is easily distinguishable, such as Davis and Woodland in the Sacramento pairs, it is labeled. This is not indicating that such cities are not within the urban hierarchical influence of the dominant city but that a substantial amount of undeveloped land is between them. (4) A municipality is labeled if it helps define the extent of the image map, such as Worcester, Mass., and Nashua, N. H., do for the Boston pairs. This helps give more of a geographical reference to the reader. Other information, such as county boundaries and water bodies, also help provide a needed reference.

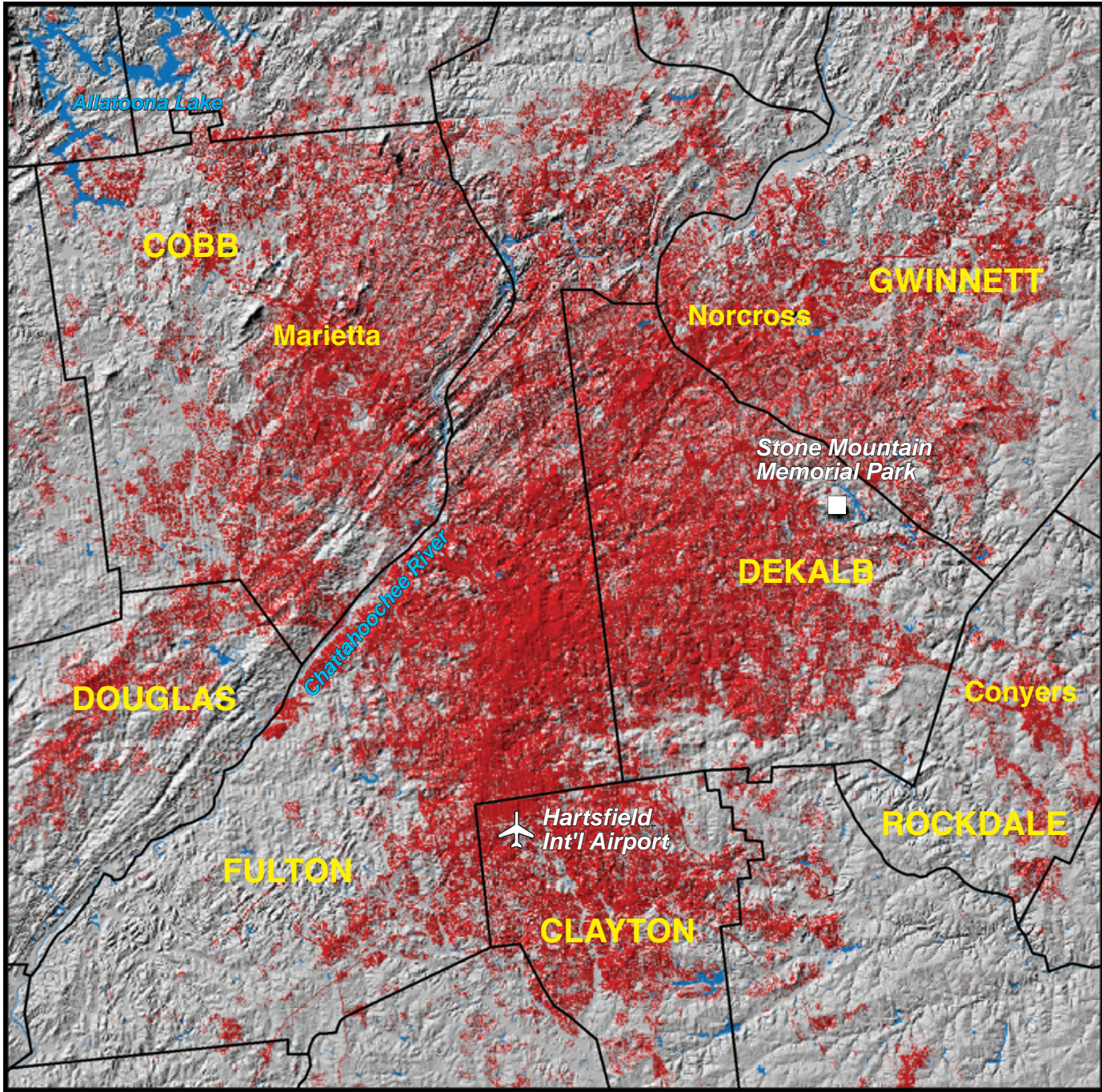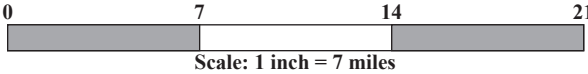| LEGEND FOR MAPS ON PAGES 10 - 41	
City Name	Water Bodies
COUNTY NAME	–·–·–·– State Boundary
Points of Interest	——— County Boundary

Atlanta, Georgia

1973
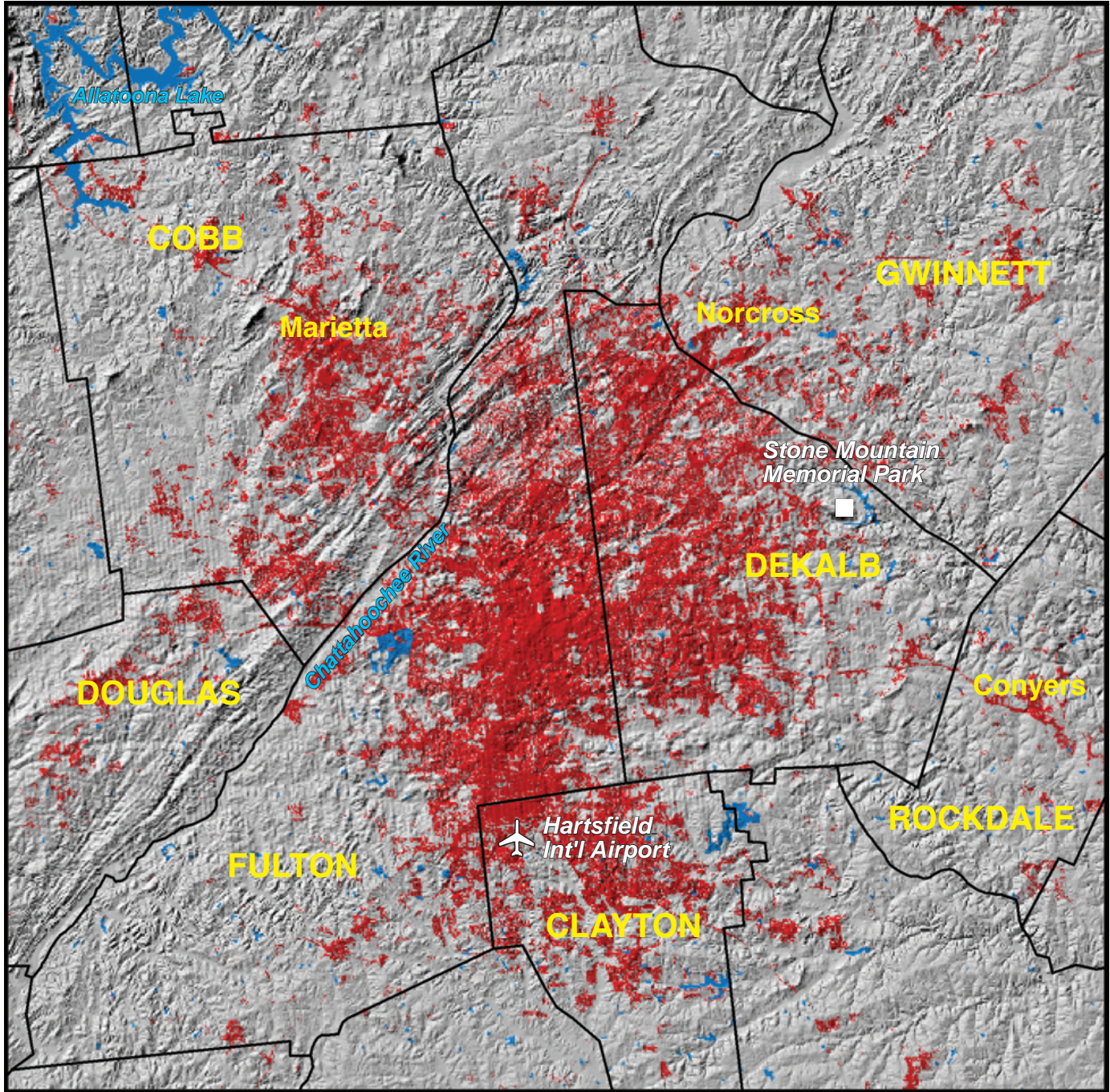
1970 Population - 1,434,676
Includes Cobb, Douglas, Fulton, Gwinnett, DeKalb, Clayton, and Rockdale Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 200,800 acres (314 square miles)

The city of Atlanta, Georgia, was established in the 1840s near the junction of several railroad lines. Its location on the southern Appalachian piedmont made faster transportation routes to other points in the Southeast possible via shorter "interior lines." Railroads remained the city's dominant industry into the 1920s. Before the end of World War I, Atlanta became a district Federal Reserve Bank site, fostering its growth as a regional financial center. City leaders also pursued the development of civilian air transportation. Over time, Atlanta grew from a regional to a national, and ultimately, an international aviation hub.

1992

Allatoona Lake

COBB

Marietta

GWINNETT

Norcross

Stone Mountain
Memorial Park

DEKALB

DOUGLAS

Chattahoochee River

Conyers

Hartsfield
Int'l Airport

ROCKDALE

FULTON

CLAYTON

Atlanta's prominence as both an intraregional and interregional urban center continued to draw in-migration during most of the 20th century. Recent growth has centered on the north side of the metropolitan area, where the natural amenities found in the foothills region are a major attraction. Rapid urban expansion has brought about the usual problems of increasing air pollution, traffic congestion, and socioeconomic division. This socioeconomic imbalance is noticeable not only within the metropolitan area, but when northern Georgia, dominated by Atlanta, is compared with the State's more rural south. Another issue has been greater Atlanta's expanding water needs. Interbasin transfers into the Chattahoochee system are altering regional hydrologic conditions and causing conflicts between Georgia, Alabama, and Florida.

1990 Population - 2,275,252
Includes Cobb, Douglas, Fulton, Gwinnett, DeKalb, Clayton, and Rockdale Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 375,000 acres (586 square miles)

Boston, Massachusetts
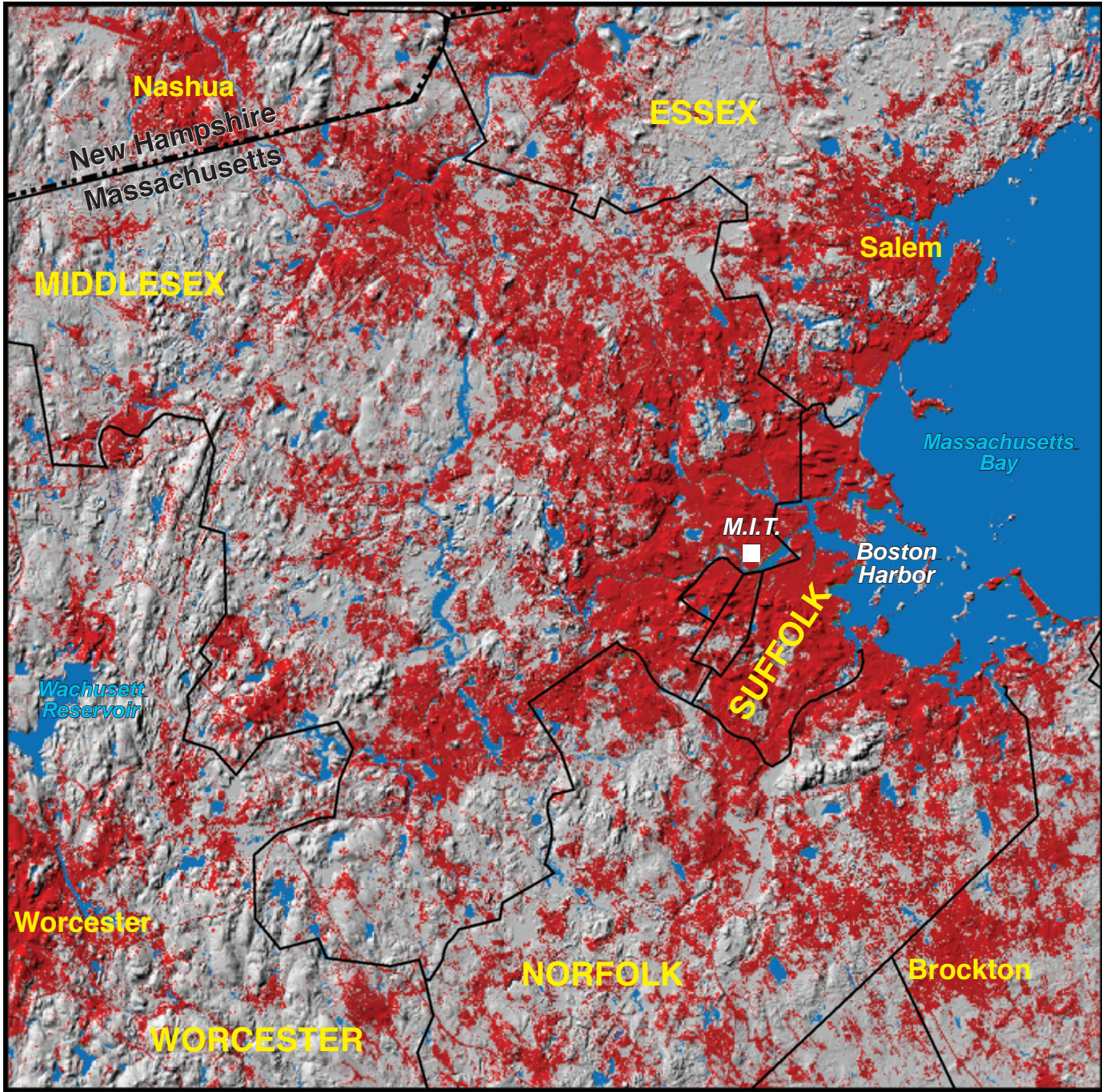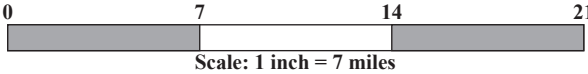
1973
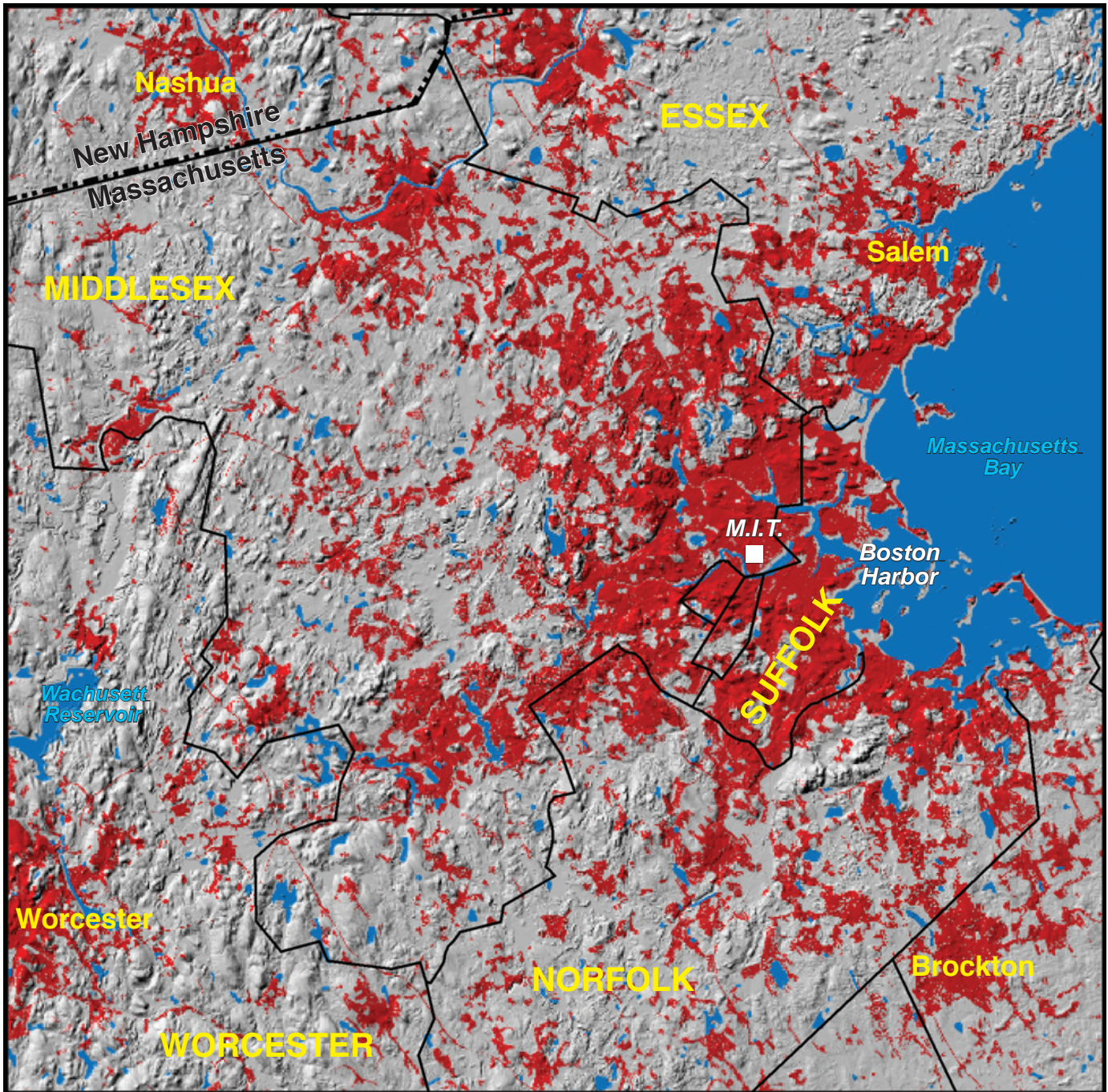
1970 Population - 4,013,365
Includes Essex, Suffolk, Norfolk,
Middlesex, and Worcester Counties.
NOTE: portions of the above listed
counties may not be visible on
the map

**Red areas shown as developed land
329,700 acres (515 square miles)**

Founded in 1630, Boston is the oldest major metropolitan area in the Nation. Because New England was not a prosperous agricultural region, many residents became merchants. By the early 1800s, Boston's ships were trading as far away as China. Irish immigration in the mid-19th century greatly added to the city's population. With the rise of industry, Boston came to specialize in textiles, leather goods, and publishing. Federal research funding to local universities, especially the Massachusetts Institute of Technology (MIT), during and after World War II helped spawn new enterprises. One of the Nation's first "high tech" corridors developed around Route 128, an early beltway

1992

0   7   14   21

Scale: 1 inch = 7 miles

Nashua

New Hampshire

Massachusetts

ESSEX

MIDDLESEX

Salem

Massachusetts Bay

M.I.T.

Boston Harbor

SUFFOLK

Wachusett Reservoir

Worcester

NORFOLK

Brockton

WORCESTER

highway. Computer and electronic industries flourished, bolstered by MIT graduates and capital from Boston's venerable financial institutions.

Urban growth has had extensive impacts on the entire region. High-tech industries tied to the Federal defense budget have experienced a boom and bust cycle that has greatly influenced housing costs. Land easily developed has become more limited for many reasons, including rising speculative costs, sites reserved for cultural and historic values, and the local physical conditions of slope and soil structure. Land use is strictly regulated in many places, especially around water reservoirs. To escape high taxes, many Boston-area residents and businesses have relocated to New Hampshire.

1990 Population - 4,058,246
Includes Essex, Suffolk, Norfolk, Middlesex, and Worcester Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 488,900 acres (764 square miles)

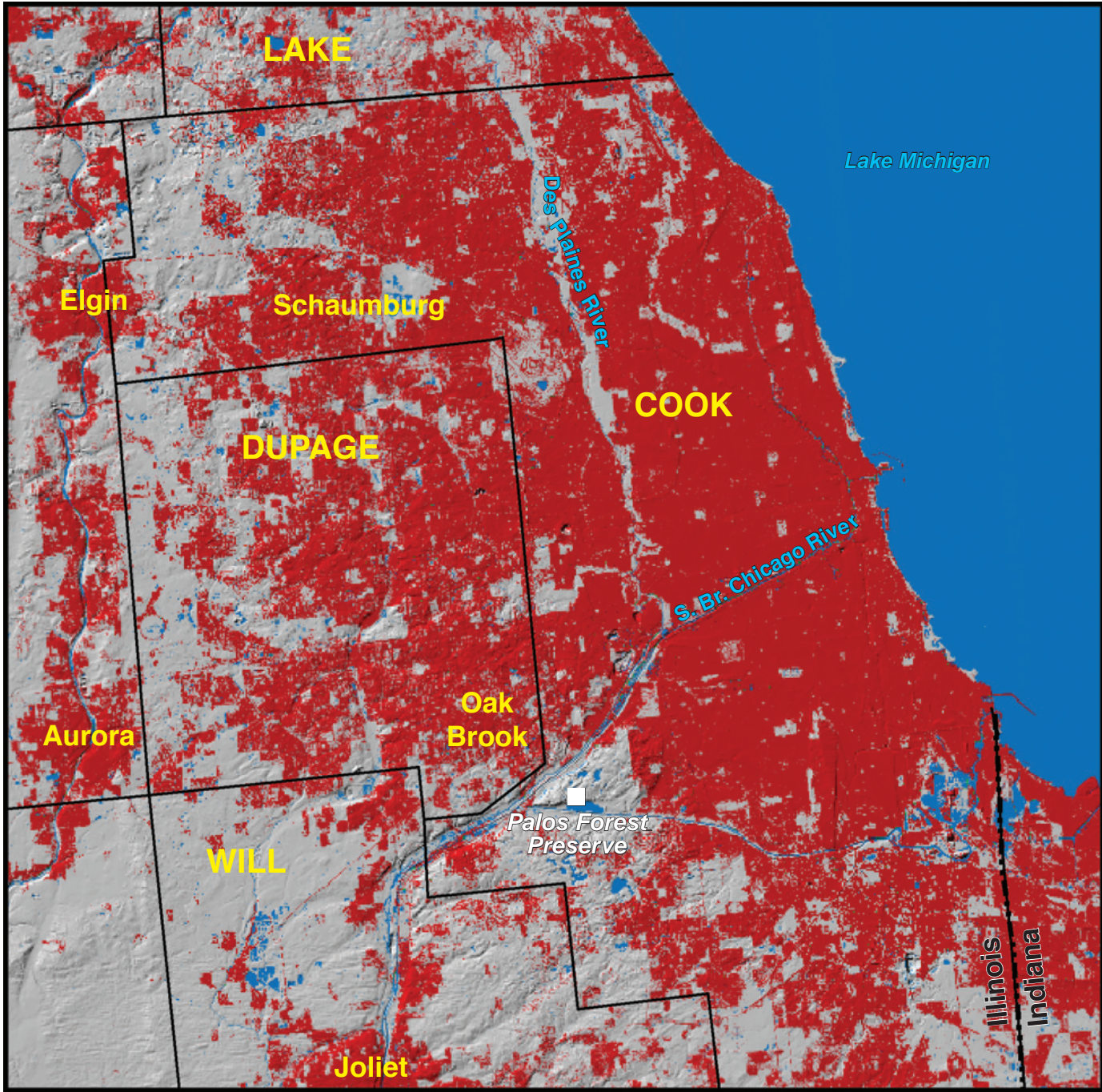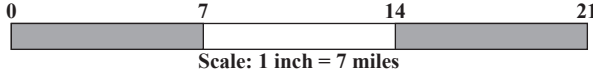# Chicago, Illinois   1973
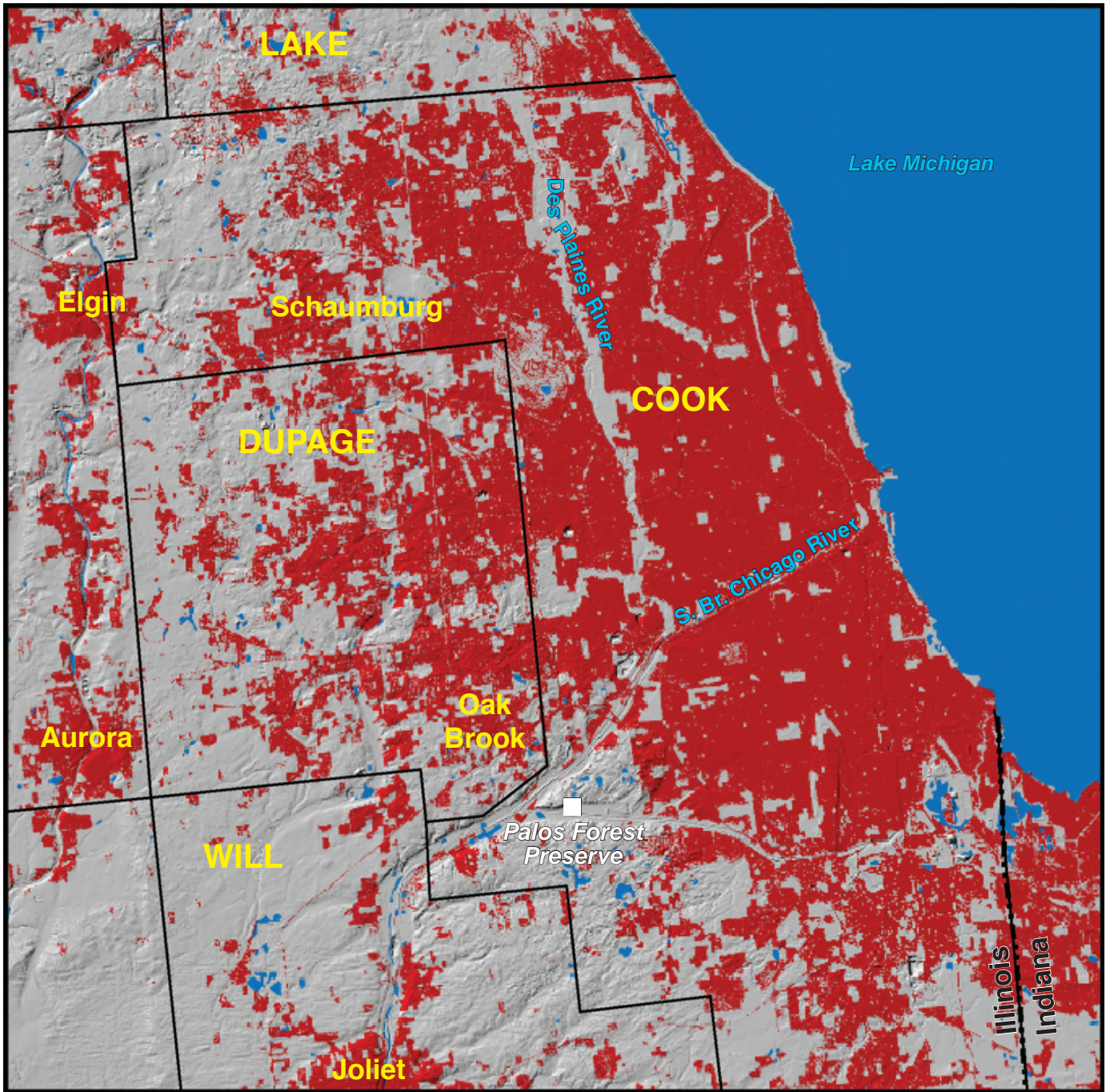
1970 Population - 6,612,195
Includes Lake, Cook, DuPage, and Will Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 519,300 acres (811 square miles)

Chicago was established in 1836 near a portage between Lake Michigan and the Illinois-Mississippi river system. The trade route via the Great Lakes and the Erie Canal helped residents secure Northeastern financial backing that transformed the city into a railroad hub after 1850. As a break-in-bulk point between eastern and western markets, Chicago grew into a metropolis by 1890. Thanks to distribution networks and an expanding workforce of first European immigrants and then southern African-American migrants, the city boomed as a manufacturing center. Later, a diversified economy helped the city make the transition from manufacturing to service-based industries. Suburban expansion continues, especially to the west and northwest.

1992

0   7   14   21

Scale: 1 inch = 7 miles

LAKE

Lake Michigan

Des Plaines River

Elgin

Schaumburg

COOK

DUPAGE

S. Br. Chicago River

Aurora

Oak Brook

Palos Forest Preserve

WILL

Illinois

Indiana

Joliet

Chicago's growth led to change. Wetland filling altered the local hydrology. Access to gently rolling farmland encouraged development. The relatively level land surface created little resistance to growth, but the area's urban development stayed close to transportation corridors, especially commuter rail lines, until recently. Urban infilling has occurred in recent decades, many times focusing on local aesthetically pleasing physical amenities. A desire to retain open spaces in an urban setting led to the creation of reserved land in forest preserves and riparian strips, such as the Palos Forest Preserve and those along the Des Plaines River.

1990 Population - 6,760,464
Includes Lake, Cook, DuPage, and Will Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 641,800 acres (1,003 square miles)

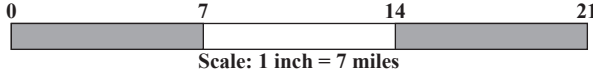# Denver, Colorado   1973
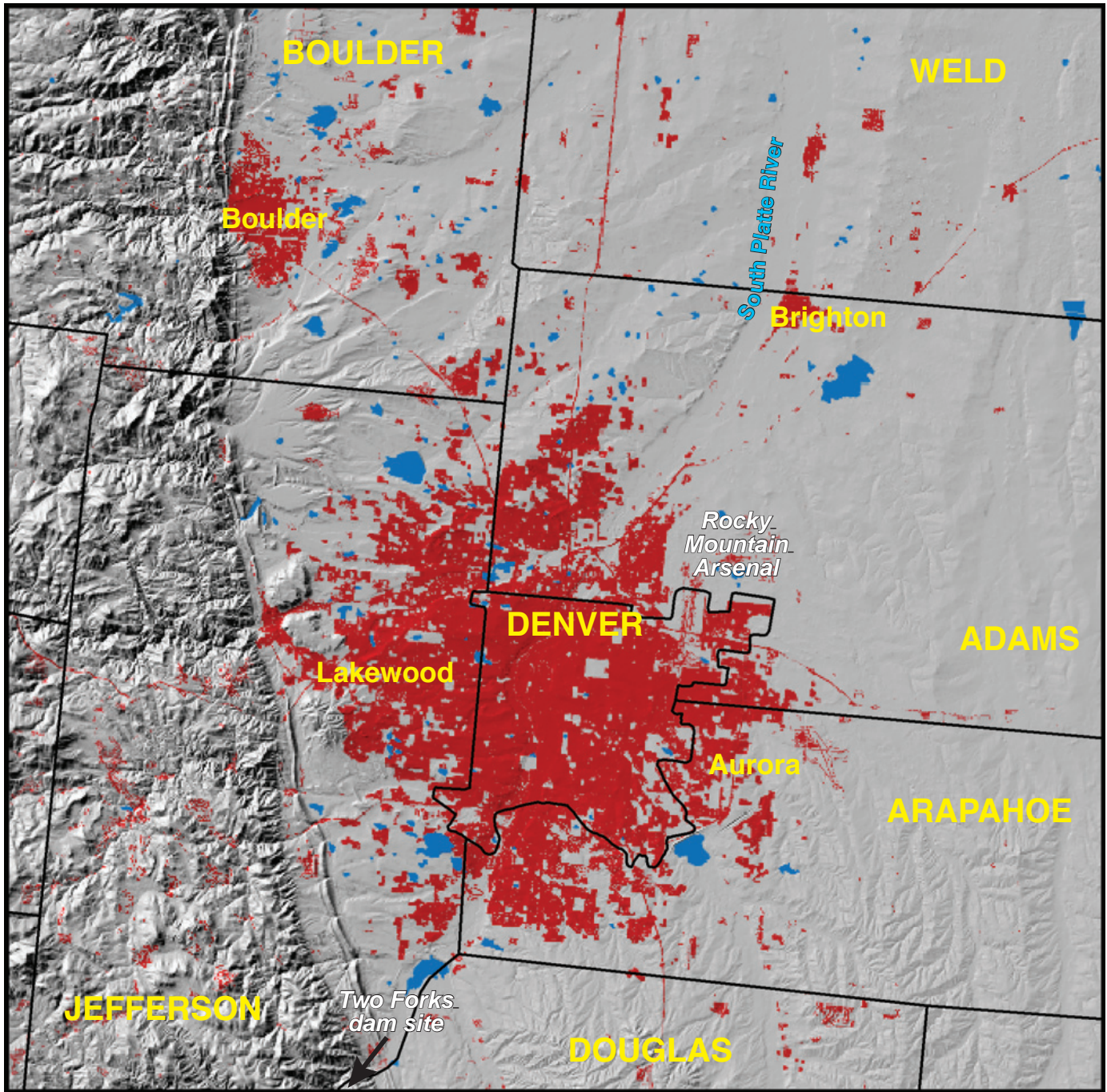
1970 Population - 1,327,570
Includes Denver, Adams, Arapahoe, Douglas, Jefferson, Boulder, and Weld Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 175,400 acres (274 square miles)

The Pike's Peak gold rush in 1859 resulted in a supply base along the South Platte River that became Denver. The new city grew by acquiring links to major railroads and evolving into a regional service center for agriculture and mining. The need for more water led to interbasin transfers from the West Slope by the early 1900s. The Federal Government helped spur growth during and after World War II by establishing defense facilities and a supraregional center for governmental agencies. Engineering-technology companies migrated to the area and fueled other industrial growth, including Denver becoming a regional oil business center. Other attractions for potential new residents were the moderate climate and the natural amenities of the Rocky Mountains.
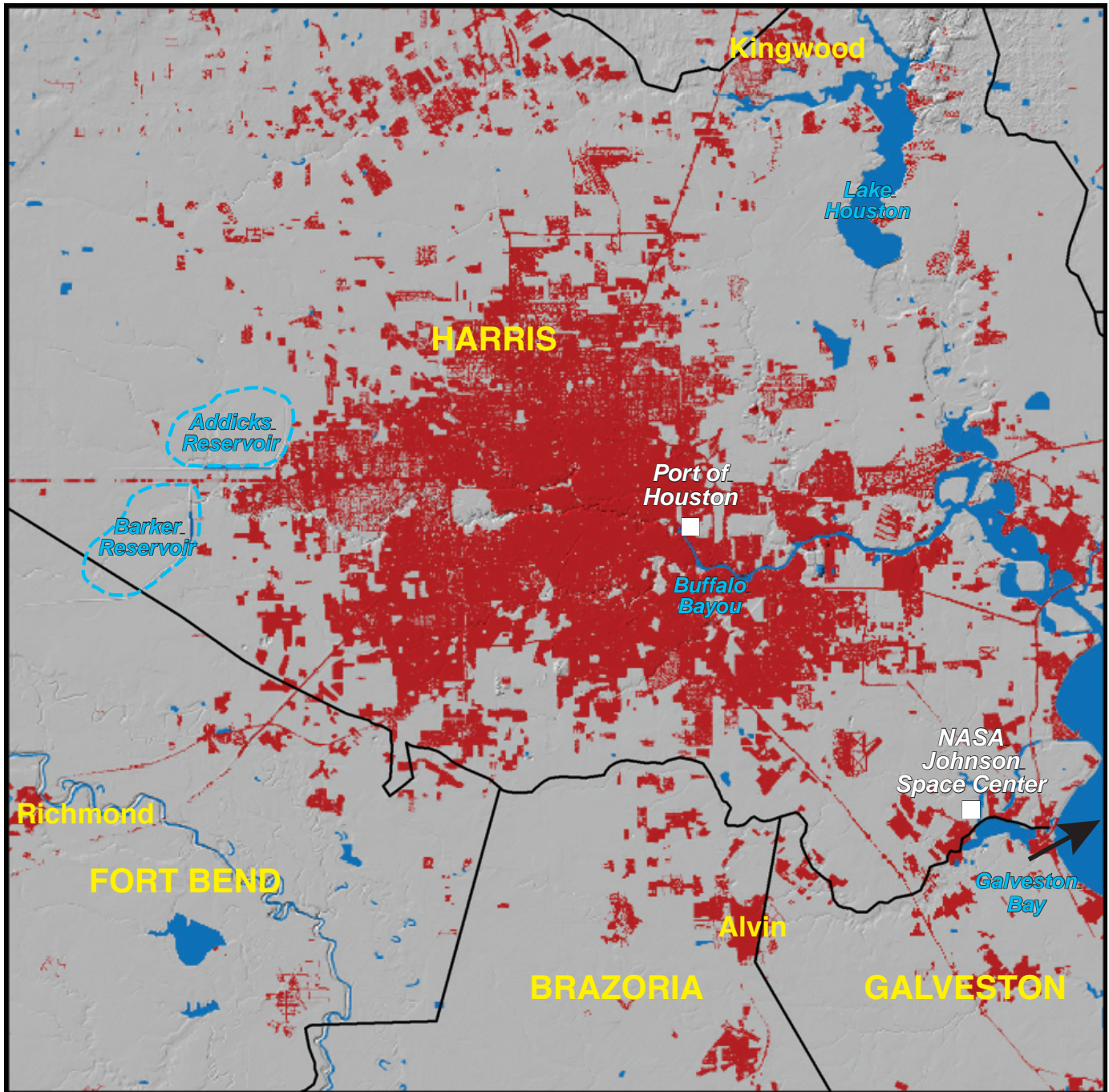
1992
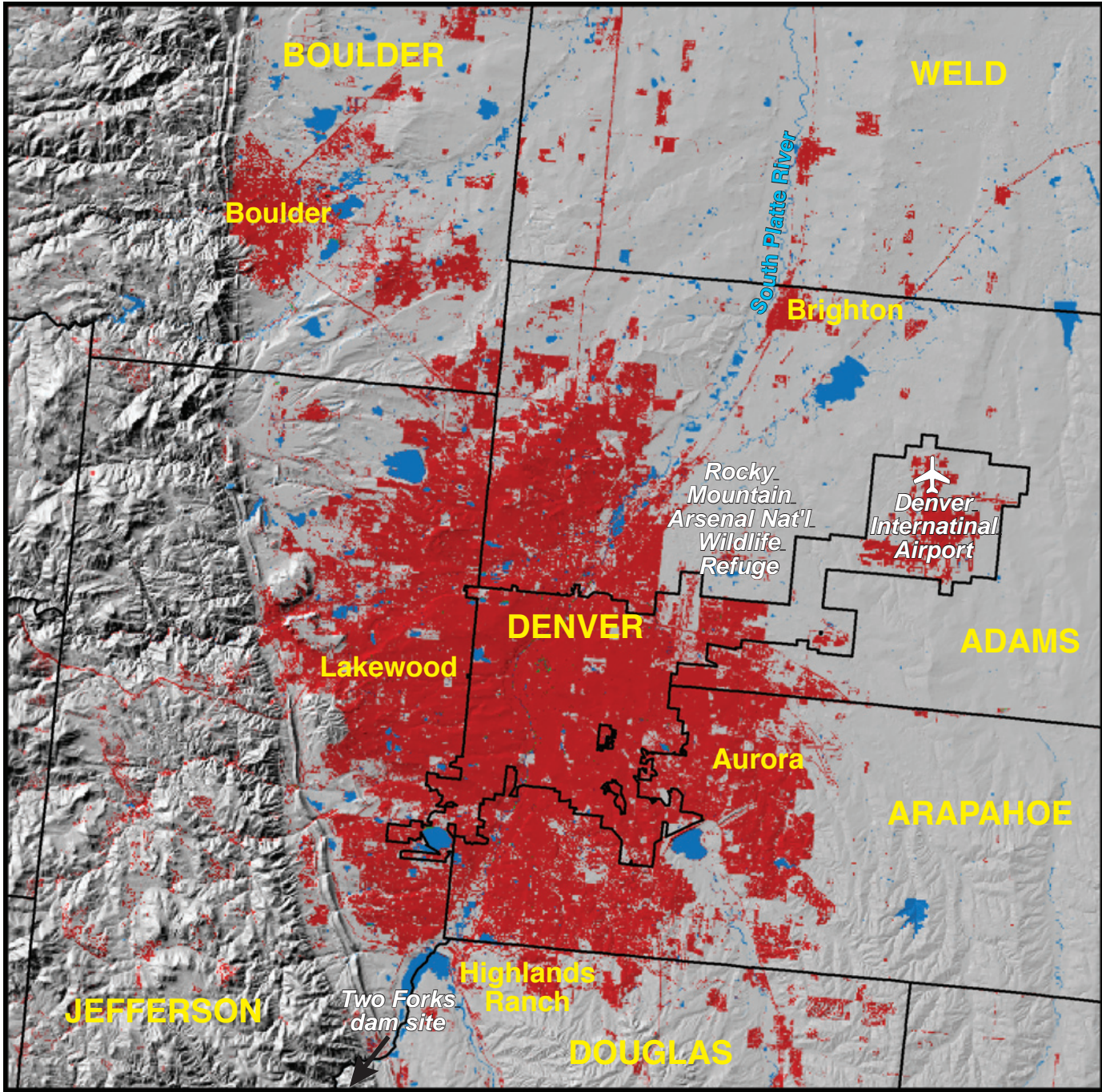
The continued urbanization has raised several quality-of-life issues. Denver was one of the cities most dependent on motor vehicles by the 1970s and because of its higher altitude battled air pollution. Clashes over water resources have been frequent, including the defeat of the proposal to build the controversial Two Forks dam southwest of Denver, and shifting alliances have pitted the Front Range versus the Western Slope, Denver and its suburbs, and the northern Front Range against metropolitan Denver. The slowing of the area's rampant growth was made more difficult in the 1990s with the building of a massive new airport, a 48-mile "outer" beltway highway, and large planned communities, such as Highlands Ranch in Douglas County.

1990 Population - 1,980,140
Includes Denver, Adams, Arapahoe, Douglas, Jefferson, Boulder, and Weld Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 283,200 acres (442 square miles)

Houston, Texas

1973

Kingwood

Lake
Houston

HARRIS

Addicks
Reservoir

Barker
Reservoir

Port of
Houston

Buffalo
Bayou

NASA
Johnson
Space Center

Richmond

FORT BEND
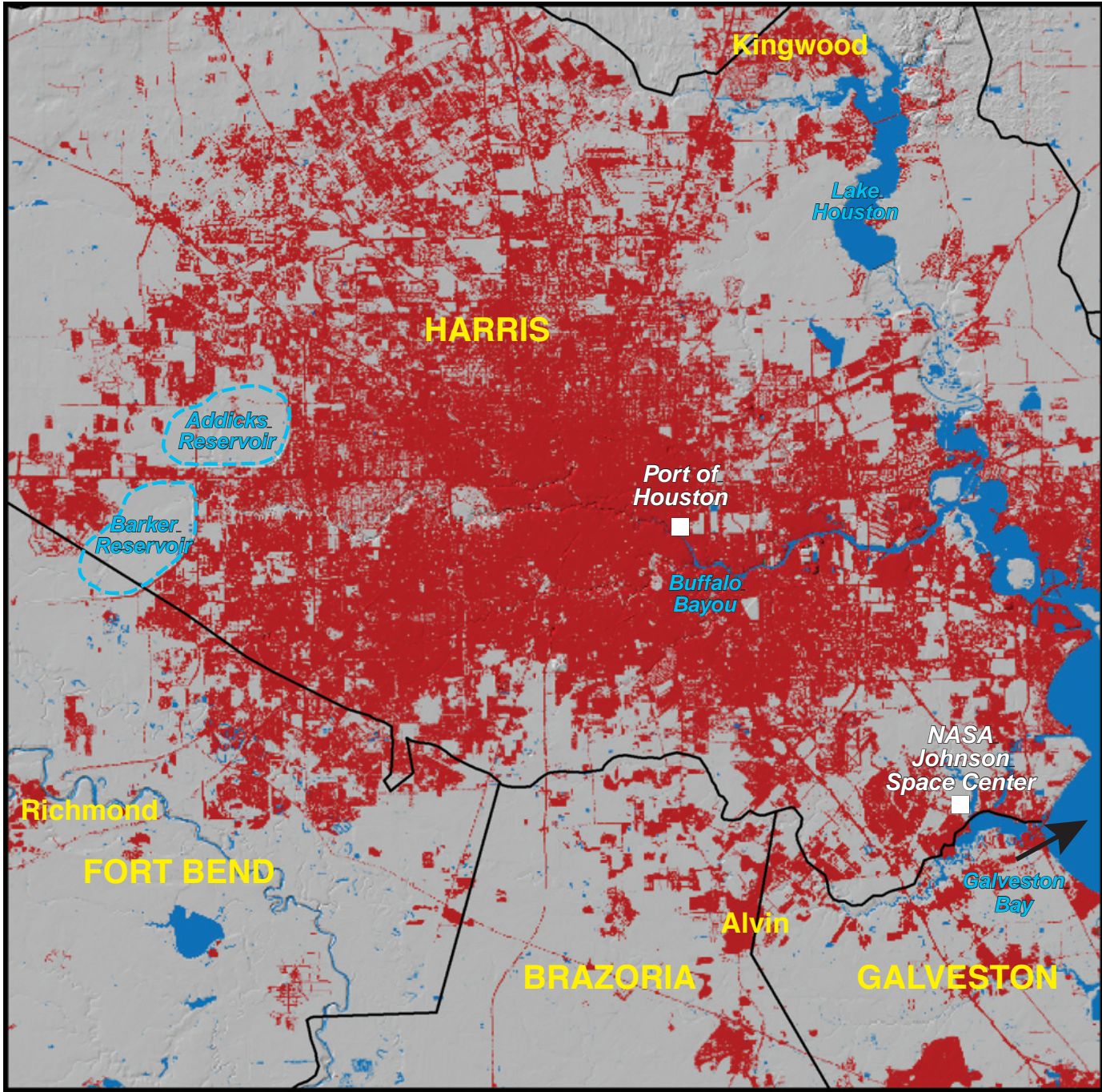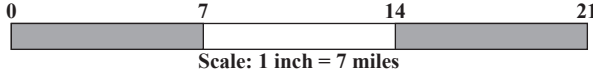
Galveston
Bay

Alvin

BRAZORIA

GALVESTON

1970 Population - 2,072,350
Includes Harris, Fort Bend, Brazoria, and Galveston Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 263,700 acres (412 square miles)

Houston was established in 1836 at the supposed "end of navigation" on the Buffalo Bayou. The city had access to the Gulf of Mexico via Galveston Bay, but 80 years would pass before a true seaport was created, primarily because of federally funded dredging. Houston grew as a commercial center, servicing hinterland activities that included forestry in east Texas and agriculture in the interior plains. By 1930, the city was an industrial center thanks to Gulf coast petroleum resources and the development of the port. Houston became a leader in the American oil industry, especially after the Federal Government helped establish petrochemical facilities there in the 1940s.

1992

0   7   14   21

Scale: 1 inch = 7 miles

Kingwood

Lake Houston

HARRIS

Addicks Reservoir

Barker Reservoir

Port of Houston

Buffalo Bayou

NASA Johnson Space Center

Richmond

FORT BEND

Galveston Bay

Alvin

BRAZORIA   GALVESTON

During the post-World War II era, Houston benefited from the expansion of the oil and petrochemical industries, the "progrowth, probusiness" philosophy of civic leadership, and national migration to the Sunbelt. The economic synergy helped foster facilities not related to oil, such as major medical complexes and the Johnson Space Center. The city's continued growth has, however, caused regional problems, including water and air pollution, waste disposal, ground subsidence from extensive ground water pumping, flooding because of increased runoff from urban surfaces, and traffic congestion.

1990 Population - 3,452,625
Includes Harris, Fort Bend, Brazoria, and Galveston Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 482,700 acres (754 square miles)

Las Vegas, Nevada

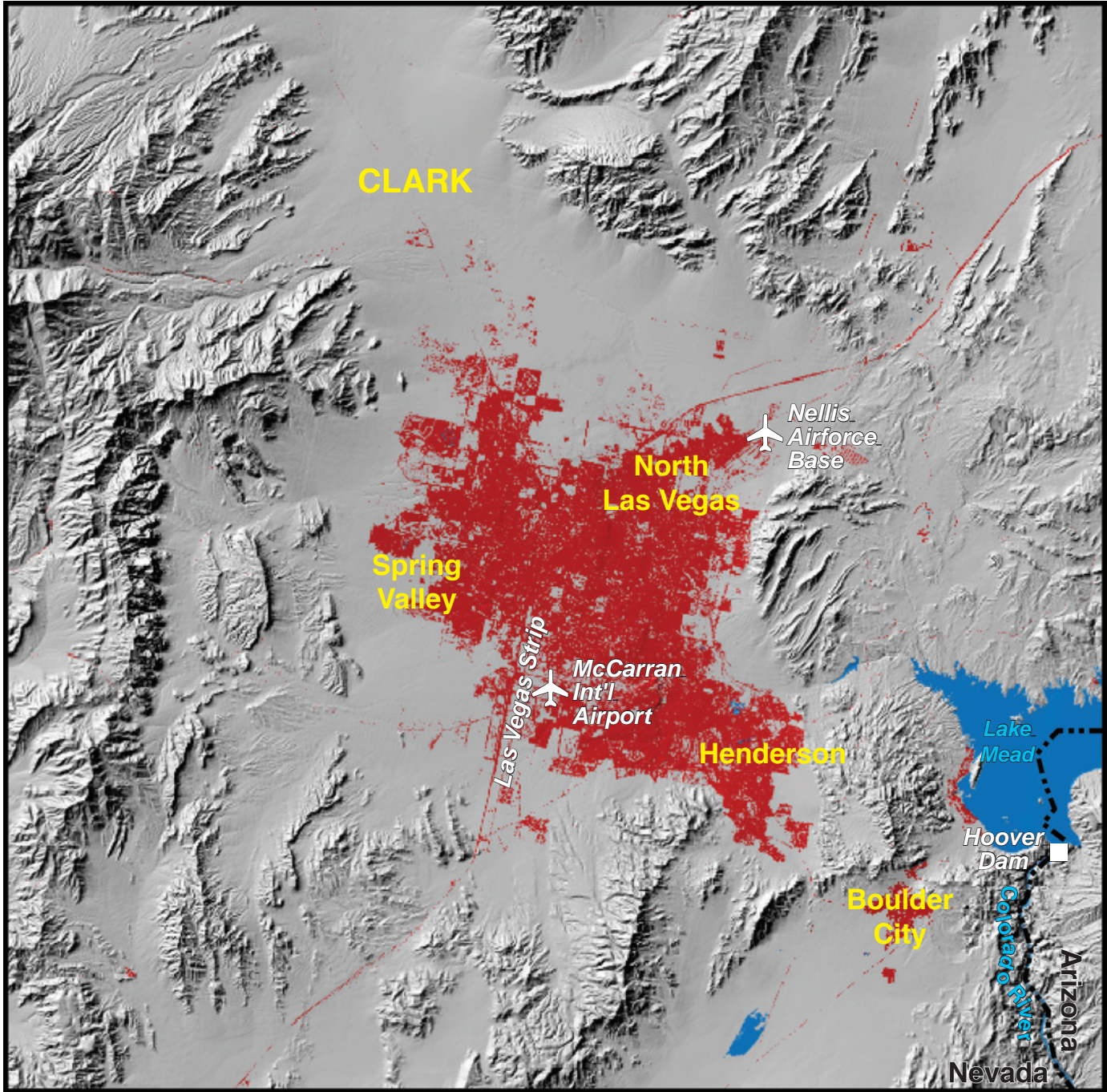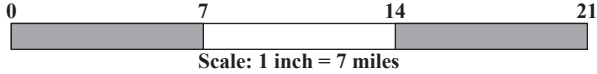# 1973
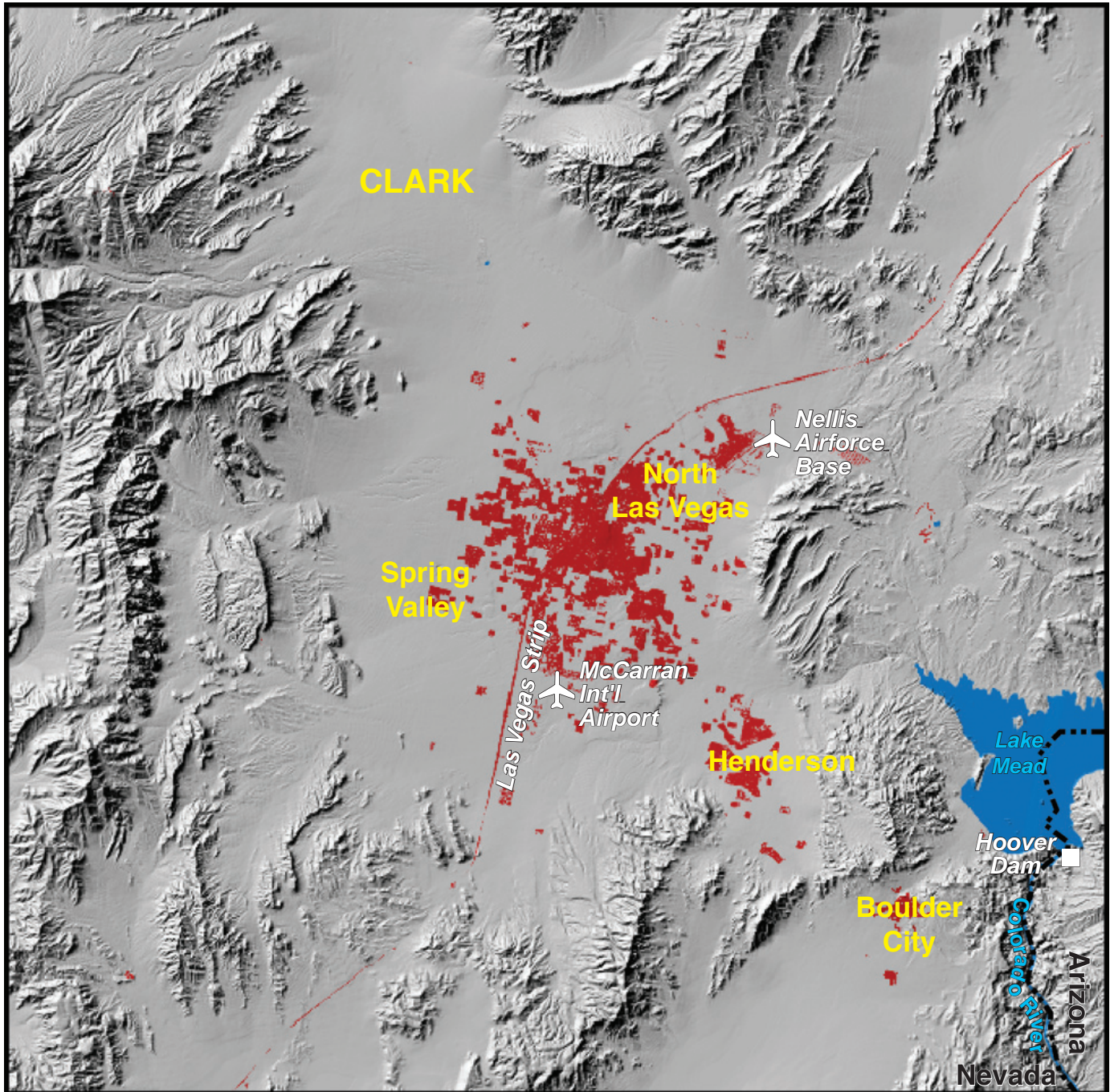
1970 Population - 273,288
Includes Clark County. *NOTE:* portions of the above listed county may not be visible on the map

Red areas shown as developed land 37,400 acres (58 square miles)

Known for its artesian wells, Nevada's Las Vegas Valley was first settled in the late 1800s when it became a stopping point between Salt Lake City and Los Angeles. The city of Las Vegas was founded in 1905 and developed into a regional center for railroad and mining activities. The construction of the Hoover Dam and Nellis Air Force Base by the Federal Government spurred growth between 1930 and 1945. Gambling, legalized in the 1930s, cheap electricity, and proximity to southern California's growing population fostered a glitzy resort economy. Gaming dominated the city's economic scene after 1960 as auto and air access improved. Corporate ownership of casinos later propelled the city into a world-class entertainment center.

1992

CLARK

Nellis
Airforce
Base

North
Las Vegas

Spring
Valley

Las Vegas Strip

McCarran
Int'l
Airport

Henderson

Lake
Mead

Hoover
Dam

Boulder
City

Colorado River

Arizona

Nevada

The synergistic growth of other service industries has made Las Vegas one of the Nation's fastest growing metropolitan areas. This rapid expansion has stressed urban infrastructure. New power sources to augment locally produced hydropower were needed to meet growing energy demands. The proliferation of roads and other water-impervious surfaces aggravates flooding during thunderstorms. Water use has lowered the region's aquifer. Las Vegas was allotted water from Lake Mead in the 1960s, but the Colorado River may prove to be an unreliable source because its use was already heavily committed to southern California, Arizona, and Mexico.

1990 Population - 741,368
Includes Clark County. *NOTE:* portions of the above listed county may not be visible on the map

Red areas shown as developed land 108,600 acres (170 square miles)

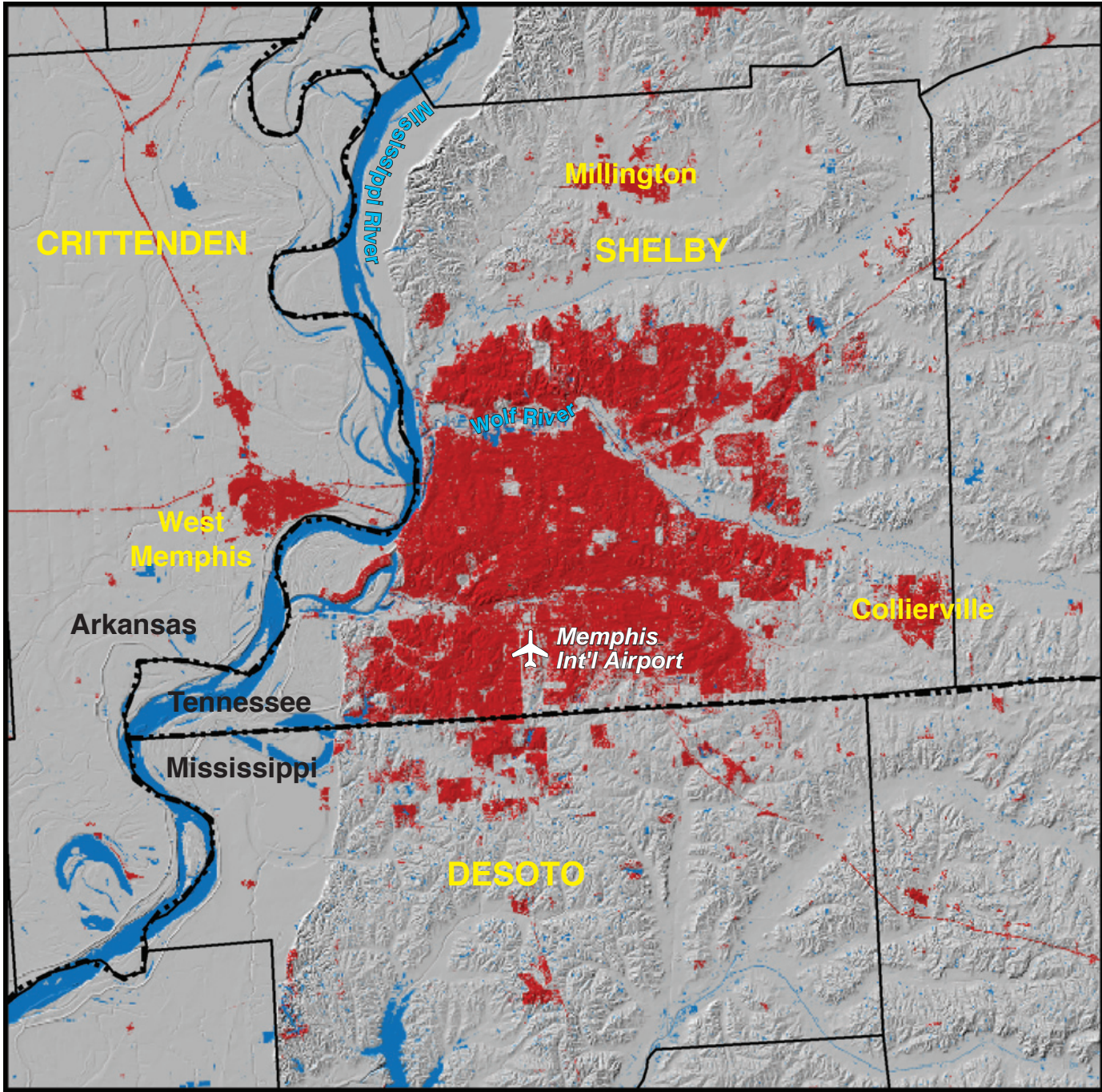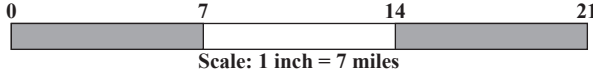# Memphis, Tennessee   1973
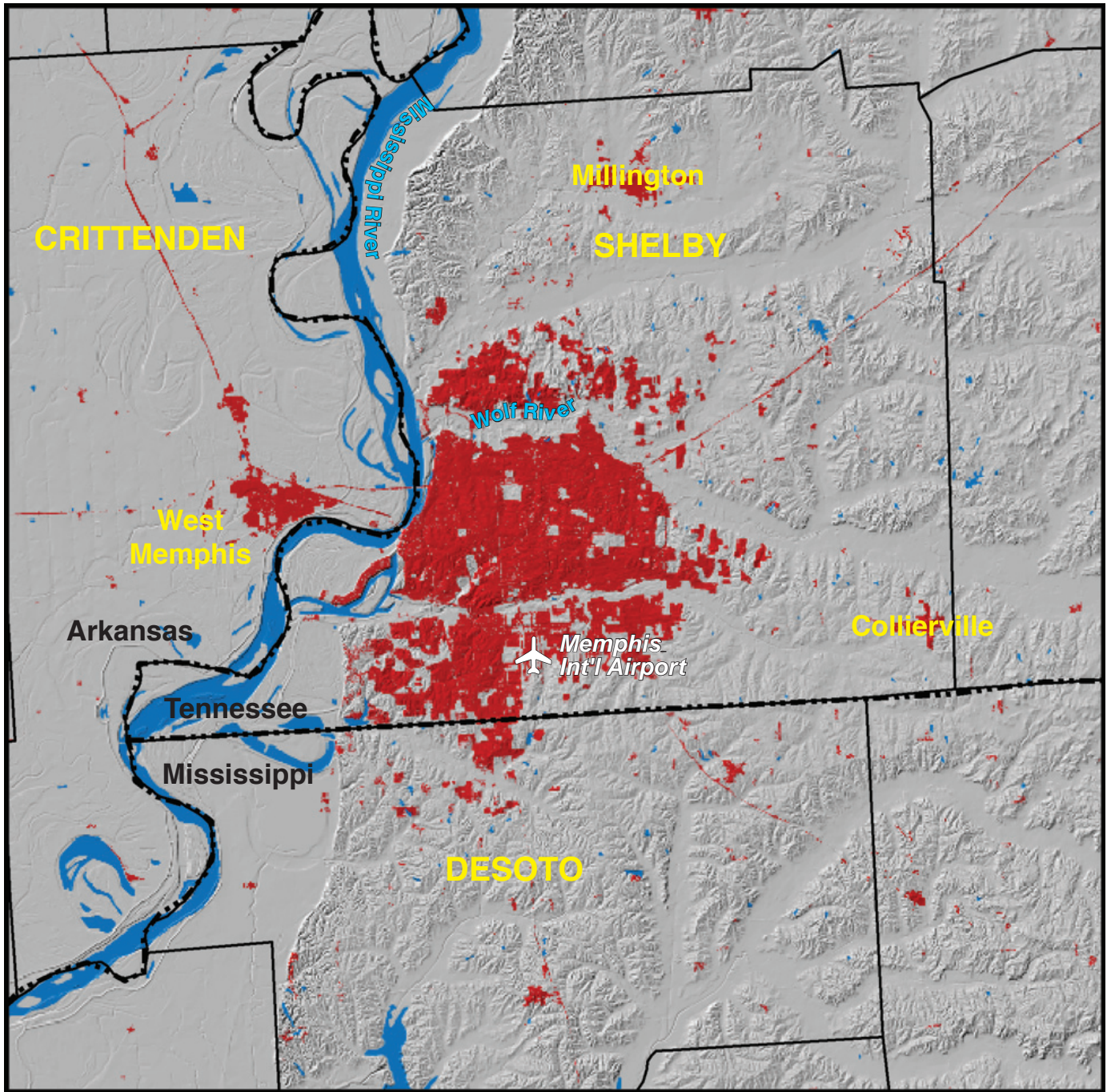
1970 Population - 806,102
Includes Shelby, Crittenden, and
DeSoto Counties. *NOTE:* portions of
the above listed counties may not be
visible on the map

**Red areas shown as developed land
99,100 acres (155 square miles)**

Tennessee's "Bluff City" was established in 1819 along the banks of the Mississippi
River. Initial growth was slow, but by the 1850s, thriving river commerce transformed it
into a fast-growing city. Following the Civil War, Memphis was devastated economically
by falling cotton and land prices, and socially by racial tension. The city rebounded, as
cotton and lumber industries grew and new railroad lines and bridges extended its trade
area. Memphis' population soared to 230,000 by 1930. World War II boosted the city's
economy through defense activities, and population growth continued. A construction
boom continued into the early 1970s, when overdevelopment caused a collapse in the real
estate market and decay of the city center.

1992

CRITTENDEN

Mississippi River

Millington

SHELBY

Wolf River

West
Memphis

Arkansas

Collierville

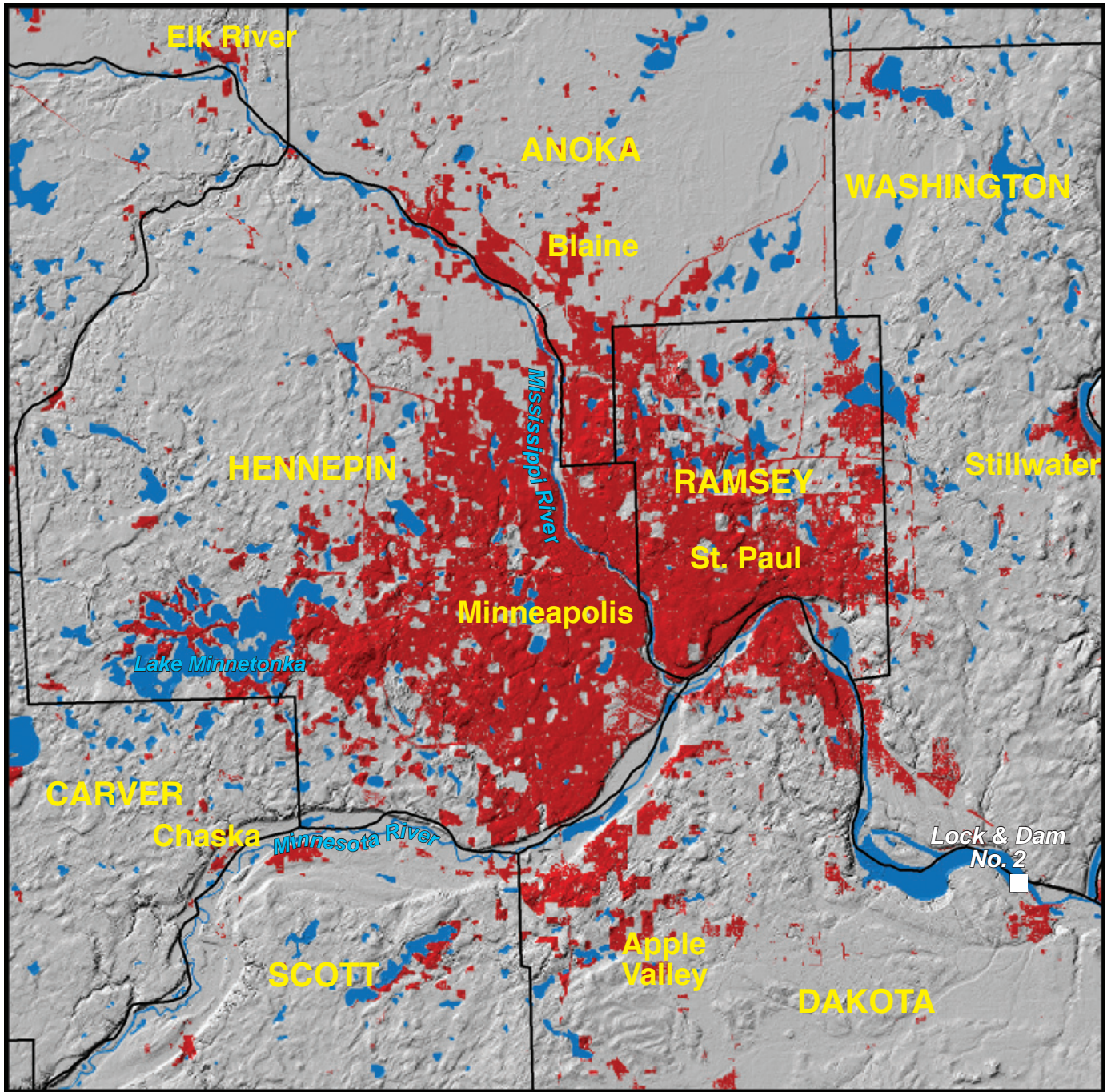Tennessee

✈ *Memphis
Int'l Airport*

Mississippi

DESOTO

Memphis recovered as its economy expanded with medical services, wholesaling, and transportation, especially the dramatic rise of the air shipping service Federal Express, which has become the area's largest employer. Memphis continues to experience low-density development, especially to the east and southeast, causing another highway beltway to be constructed. The Mississippi River presents obstacles to growth to the west, because its valley bottom is vulnerable to flooding and possible earthquake damage from the nearby New Madrid fault. Other problems include housing shortages, residential segregation, and strained city services. Innovative approaches to land use have alleviated some problems, but Memphians still face challenges to metropolitan growth.

1990 Population - 944,179
Includes Shelby, Crittenden, and DeSoto Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 164,600 acres (257 square miles)

Minneapolis-St. Paul, Minnesota   1973

Elk River

ANOKA

WASHINGTON

Blaine

Mississippi River

HENNEPIN

RAMSEY

Stillwater

St. Paul

Minneapolis

Lake Minnetonka

CARVER

Chaska *Minnesota River*

Lock & Dam No. 2

SCOTT

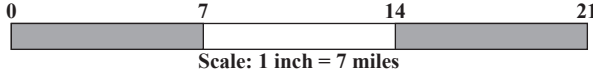**Apple Valley**

DAKOTA

1970 Population - 1,874,612
Includes Anoka, Washington, Dakota, Scott, Carver, Hennepin, and Ramsey Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 228,200 acres (356 square miles)

Minneapolis and St. Paul were founded approximately 10 miles apart along the upper reaches of the Mississippi River by the 1850s. St. Paul was at the end of navigation and Minneapolis at the site of significant waterpower. They became marketing centers for timber from the northern forests and agricultural commodities from the prairie. The Twin Cities developed into a regional railroad hub and a centralized source of wholesale goods and financial services for much of the Upper Midwest, including northern Montana. The metropolitan area flourished after World War II. Local entrepreneurs founded several corporations that rose to national prominence.

1992
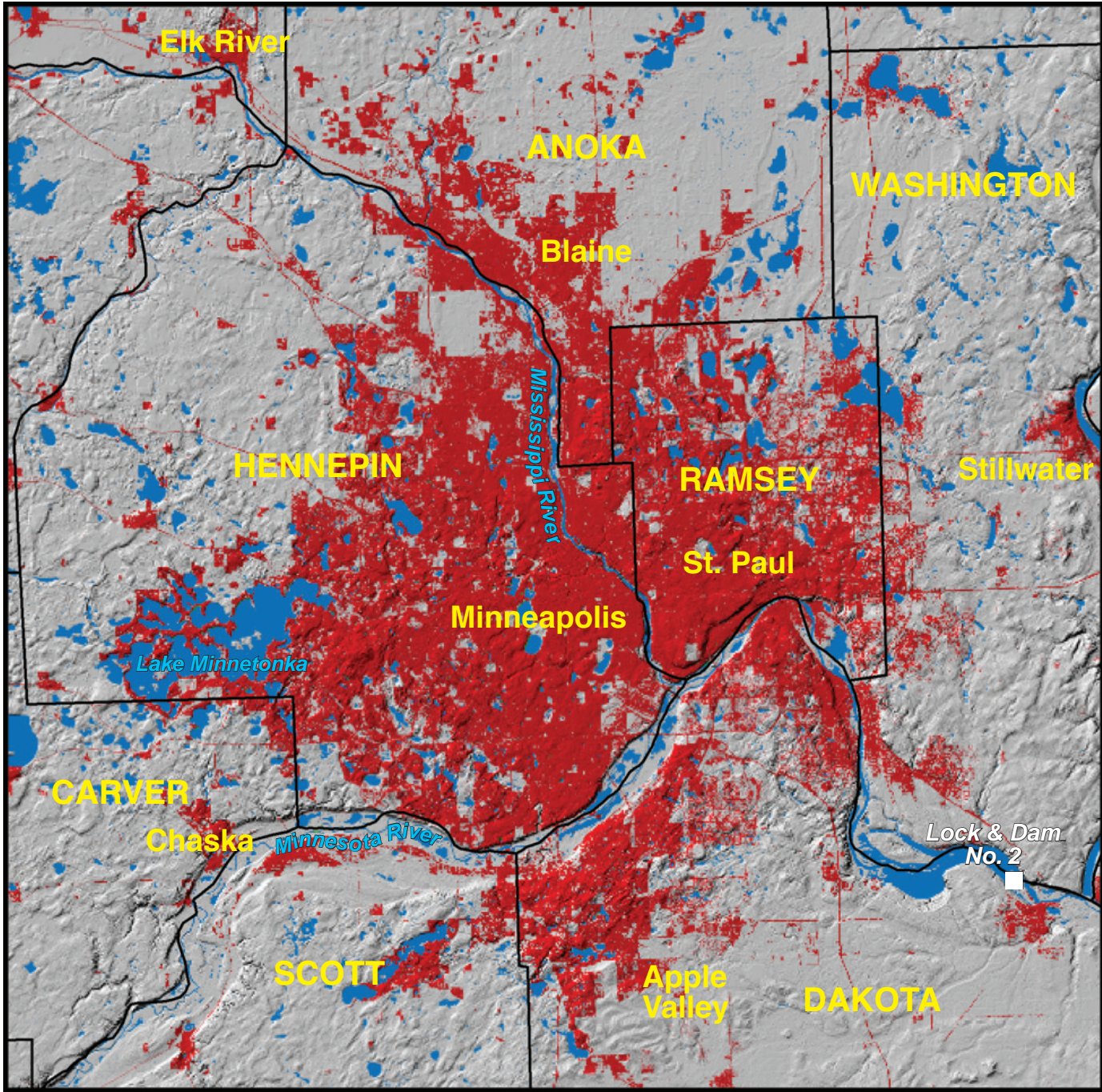
Throughout the second half of the 20th century, a diversified economy and perceived opportunities continued to attract new residents, many from the surrounding rural region, stimulating significant urban growth. The glacial lakes in the metropolitan area often attracted development because of their desired natural amenity. Now surrounded by a far-flung suburban periphery, the Twin Cities have been called one of the Nation's most "sprawling" urban areas. A progressive metropolitan farmland protection program was established but was vulnerable to voluntary, short-term (8-year) enrollments. An influential regional planning council has tried to channel growth, but some of the fastest growing communities are beyond its jurisdictional control.

1990 Population - 2,228,663
Includes Anoka, Washington, Dakota, Scott, Carver, Hennepin, and Ramsey Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 355,400 acres (555 square miles)

Orlando, Florida   1973
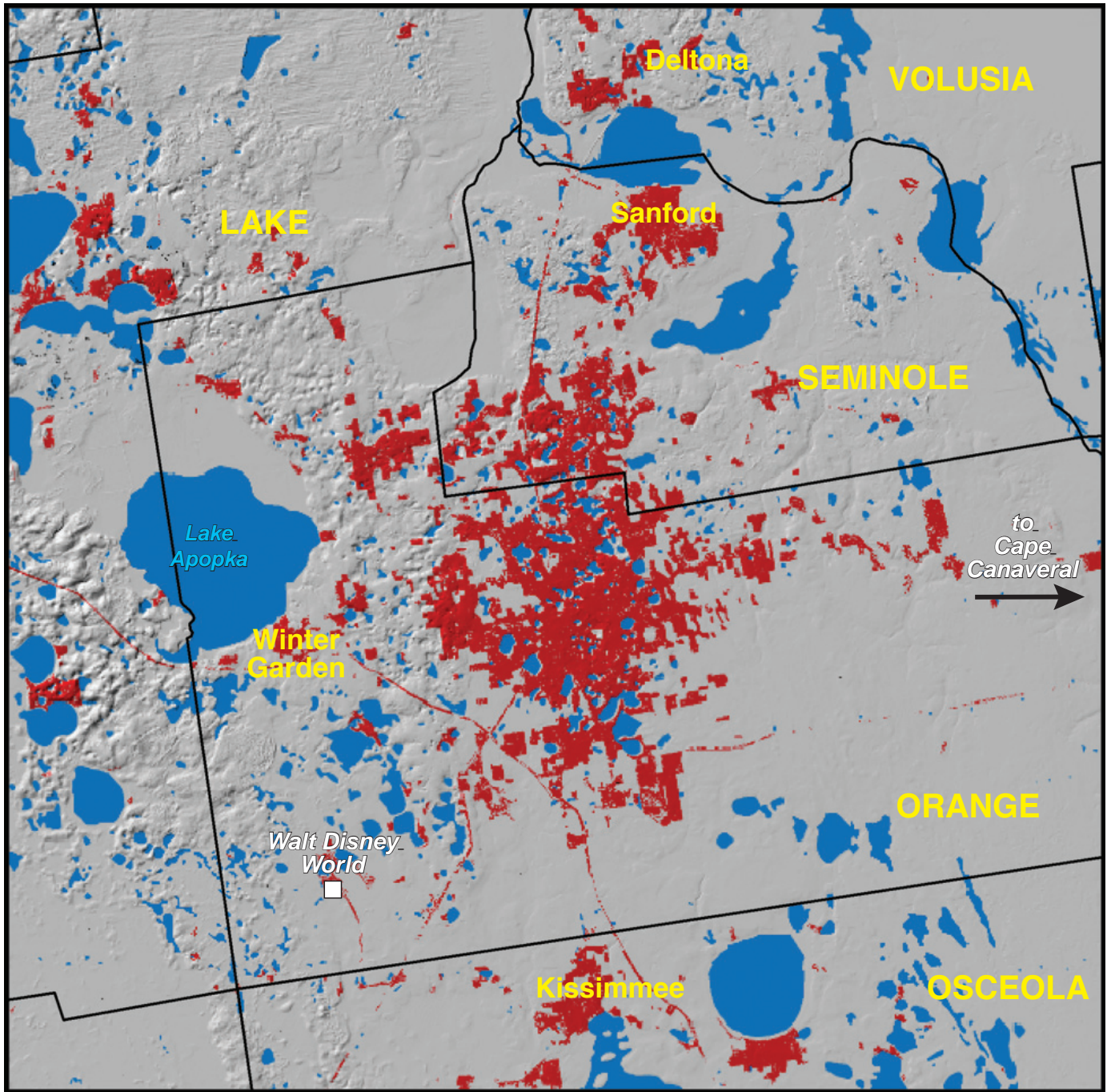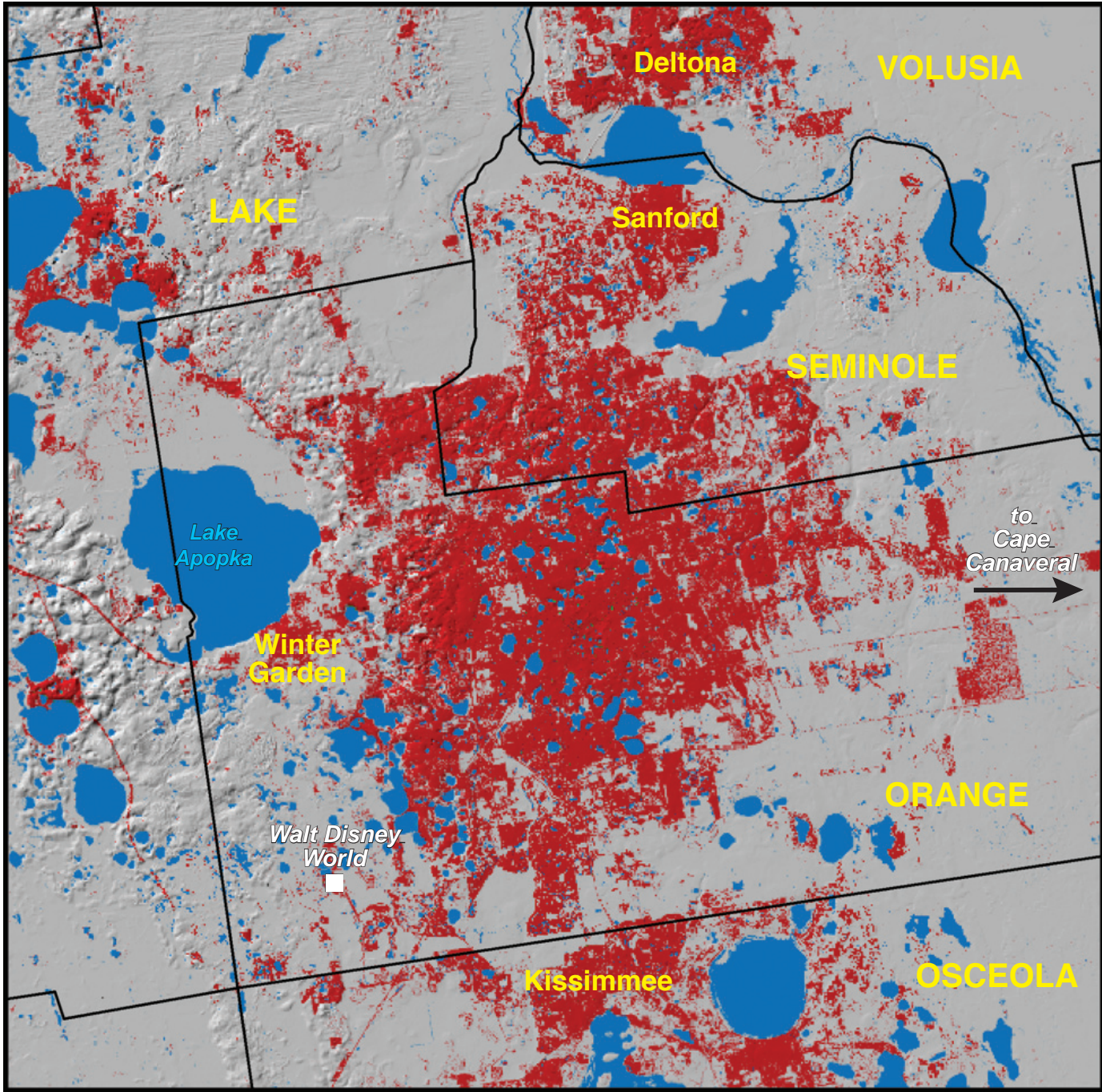

1970 Population - 692,062
Includes Volusia, Lake, Seminole, Orange, and Osceola Counties.
NOTE: portions of the above listed counties may not be visible on the map

Red areas shown as developed land 115,900 acres (181 square miles)

Orlando was founded in the 1870s amid the lakes and pines of central Florida. It became the trade center for a citrus-dominated agricultural region. Urban growth was stimulated during World War II by military training sites and defense production. This presence continued with the construction of the missile/space facility at nearby Cape Canaveral and the arrival of associated aerospace companies. An increasing number of retirees have also been attracted to the area since the 1950s. The Walt Disney World entertainment complex opened in 1971, and other theme parks followed. Orlando has been classified as a "tourist metropolis" and is a major destination for conventions and similar events.

1992

Deltona

VOLUSIA

LAKE

Sanford

SEMINOLE

to
Cape
Canaveral

Lake
Apopka

Winter
Garden

ORANGE

Walt Disney
World

Kissimmee

OSCEOLA

Orlando's rapid and sustained urban growth over the past several decades has resulted in a variety of problems. The surface water system of interconnected shallow lakes and slow-moving rivers is vulnerable to pollution. The metropolitan area has been characterized as a loose configuration of urban "bits" with no true urban core. The socioeconomic gulf between affluent professionals and lower paid workers appears to be widening, aggravating social concerns, such as a lack of affordable housing. Development in the region, however, has been channeled away from certain unique areas, such as extensive wetlands to the northwest and significant citrus farming to   the southwest.

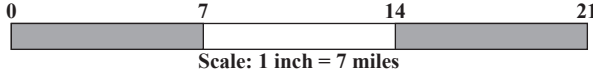**1990 Population - 1,595,581**
Includes Volusia, Lake, Seminole, Orange, and Osceola Counties.
NOTE: portions of the above listed counties may not be visible on the map

Red areas shown as developed land 297,600 acres (465 square miles)

Phoenix, Arizona   1973

MARICOPA

Sun City

Luke Air Force Base

Phoenix Mountains Preserves

Salt River Pima-Maricopa Indian Reservation

Salt River

Mesa

Phoenix South Mountain Park

Chandler

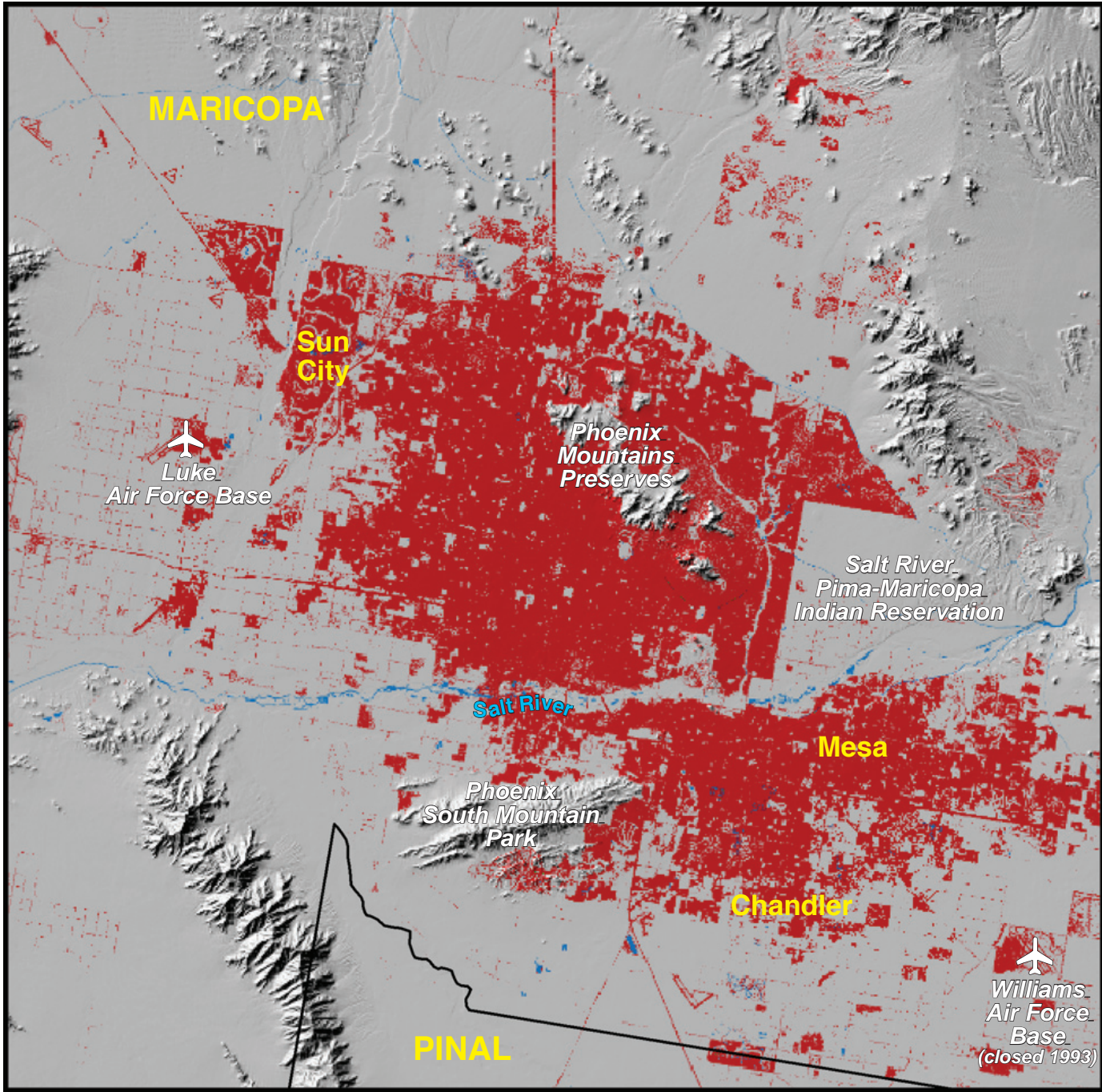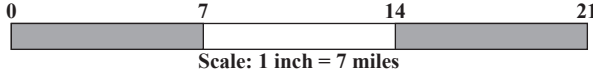*Williams Air Force Base*

PINAL
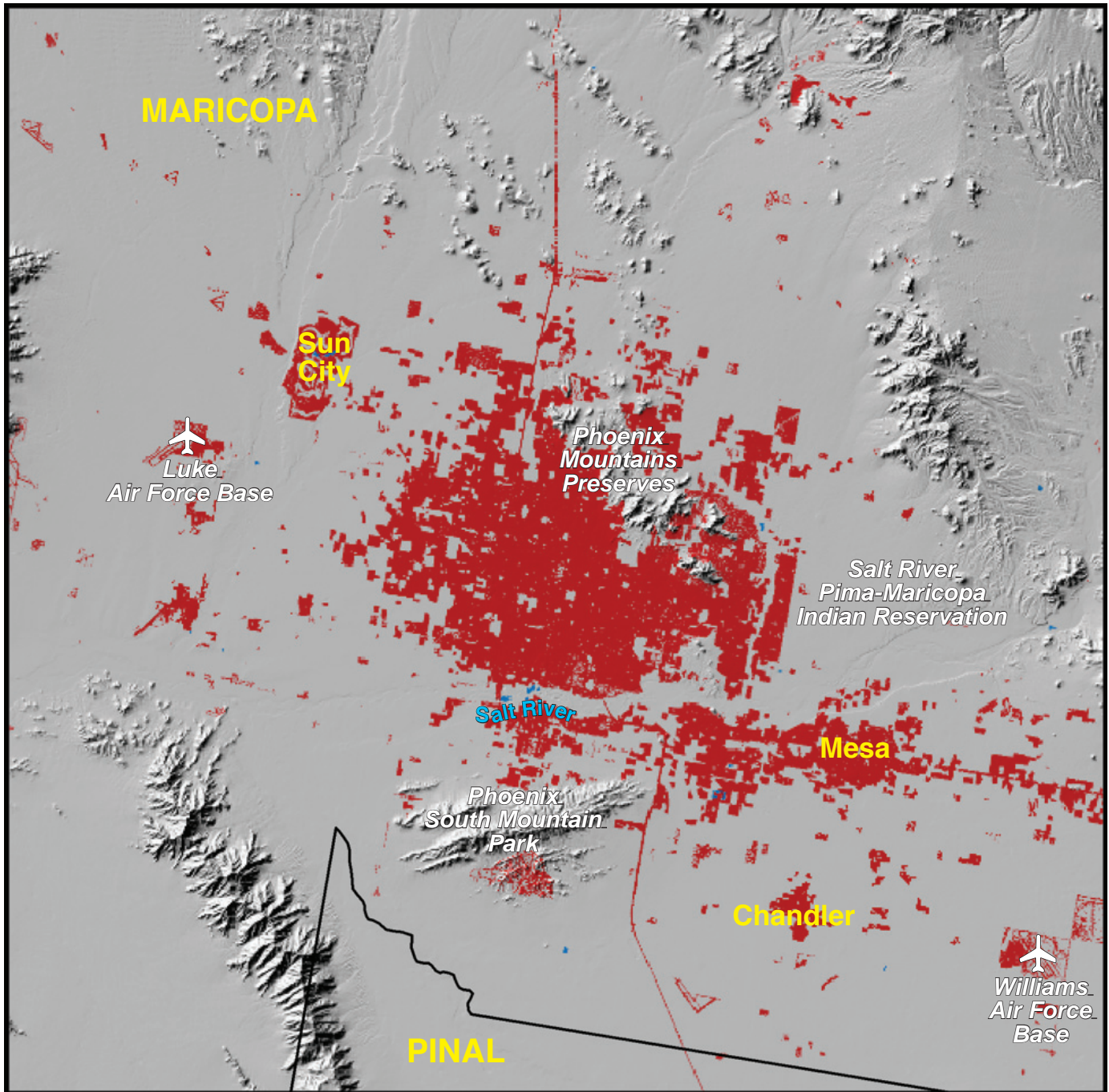
1970 Population - 971,228

Includes Maricopa County. *NOTE:* portions of the above listed county may not be visible on the map

Red areas shown as developed land 148,500 acres (232 square miles)

Phoenix was founded in the 1870s because of local access to water. The city prospered as the trade center for the Salt River Valley, an irrigated agricultural region. In the early 1900s, the Federal Government provided more water by building Roosevelt Reservoir in the nearby mountains. Phoenix's desert climate has always attracted new residents because of perceived health benefits and warm winters, but in-migration increased after World War II. Many were retirees, who settled in places such as Sun City and Mesa. So-called "light" industries, such as electronics and aerospace engineering, replaced agriculture as the city's primary economic activity. Tourism in the "Valley of the Sun", as the Phoenix area is commonly known, became its second leading industry.

1992

MARICOPA

Sun City

Luke Air Force Base

Phoenix Mountains Preserves

Salt River Pima-Maricopa Indian Reservation

Salt River

Mesa

Phoenix South Mountain Park

Chandler

*Williams Air Force Base (closed 1993)*

PINAL

Phoenix has maintained rapid and sustained growth. Its location in a wide valley allowed low-density urbanization with few limitations. Civic "progrowth" policies helped fuel an economy that, along with the area's natural amenities, attracted many new residents. Phoenix's growth has come at a price, however. Need for more water, much of it now coming from the Colorado River, has created regional and sectorial conflicts, such as between Arizona and its neighboring States and between agricultural and urban land uses. Demand for electricity, especially for air conditioning, continues to escalate. An abundance of motor vehicles, but few freeways, has led to increased air pollution and traffic congestion.

1990 Population - 2,122,101
Includes Maricopa County. *NOTE:* portions of the above listed county may not be visible on the map

Red areas shown as developed land 301,400 acres (471 square miles)

# Pittsburgh, Pennsylvania   1973
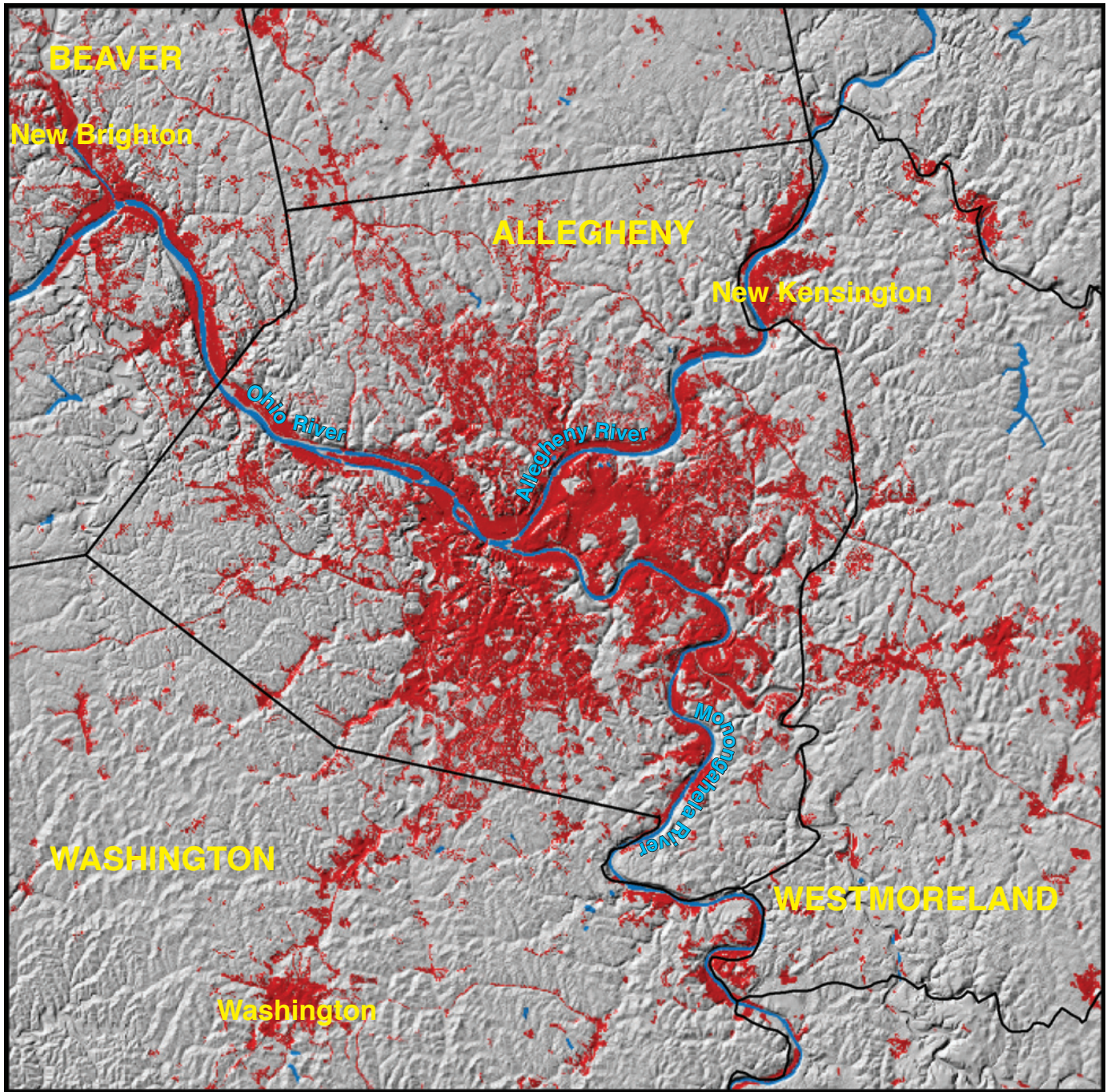
1970 Population - 2,401,362
Includes Allegheny, Beaver,
Westmoreland, and Washington
Counties. *NOTE:* portions of the
above listed counties may not be vis-
ible on the map

**Red areas shown as developed land
212,200 acres (331 square miles)**

Pittsburgh had its start during colonial times as a military outpost established to control
parts of the Allegheny, Monongahela, and Ohio Rivers. The city grew as an outfitting
center for Ohio Valley settlements, producing items not easily transported across the
mountains. An industrial economy grew as access to locally abundant coal and water
transportation was exploited. Manufacturing flourished after 1870 as the use of these
resources and a culture of industrial entrepreneurialism combined to make Pittsburgh a
leader in producing steel, glass, electrical equipment, and processed food. Industry and
urbanization spread along major and minor stream valleys within the region.

1992
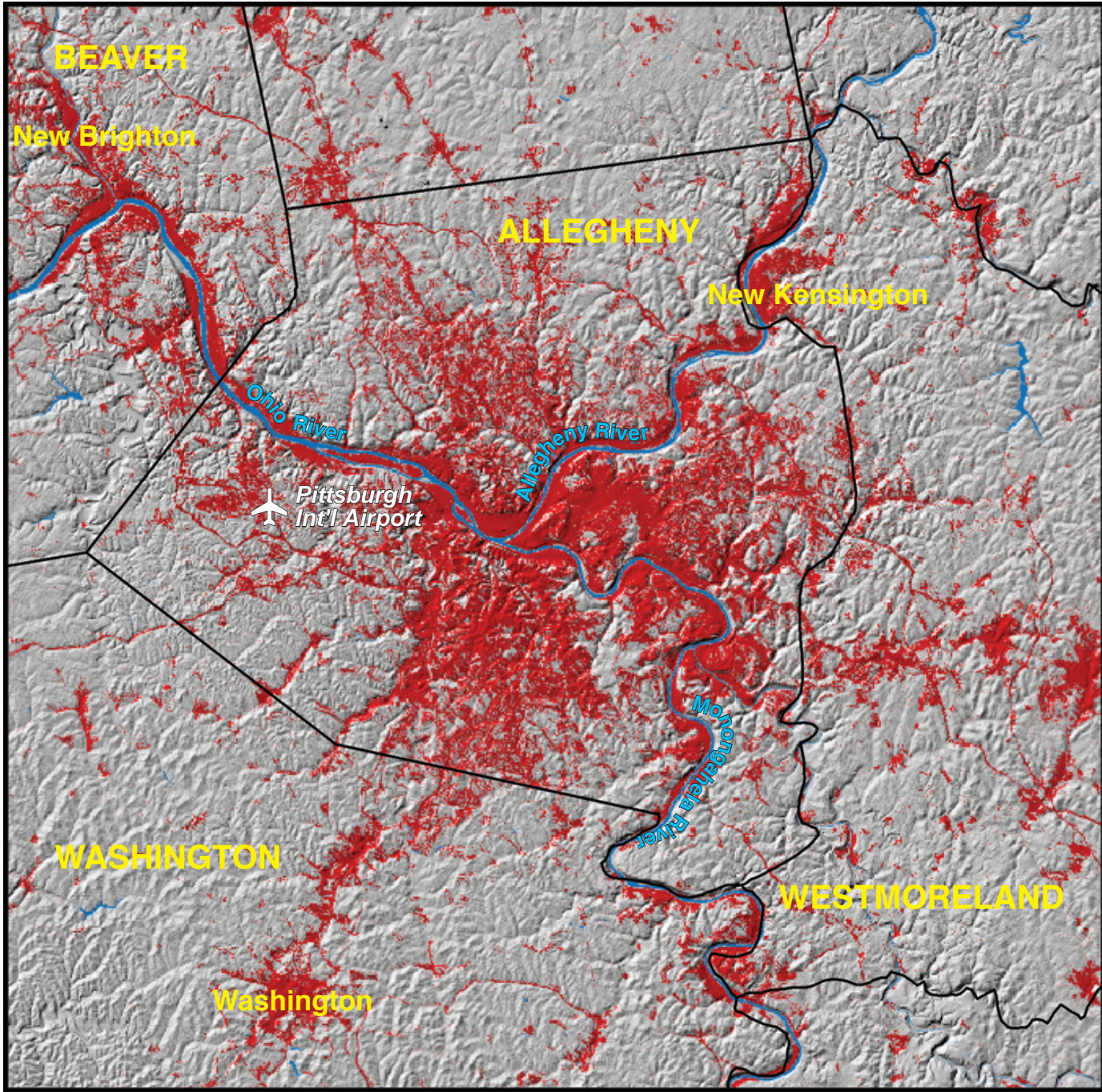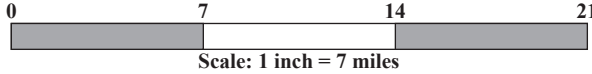
The city's reliance on manufacturing became evident in the 1970s, when deindustrialization led to several decades of industrial cutbacks, high unemployment, and out-migration. Pittsburgh's economy later shifted to rely more heavily on university-supported medical and technological centers and on being a site for numerous corporate headquarters, many established during the heyday of manufacturing. Today, Pittsburgh faces many challenges. The Monongahela Valley communities remain economically depressed after heavy industry's departure. The potential of the three rivers for recreation and postindustrial use has yet to be fully realized. Suburban growth nodes in Allegheny County, such as those near the new airport, continue to funnel development away from the city itself.
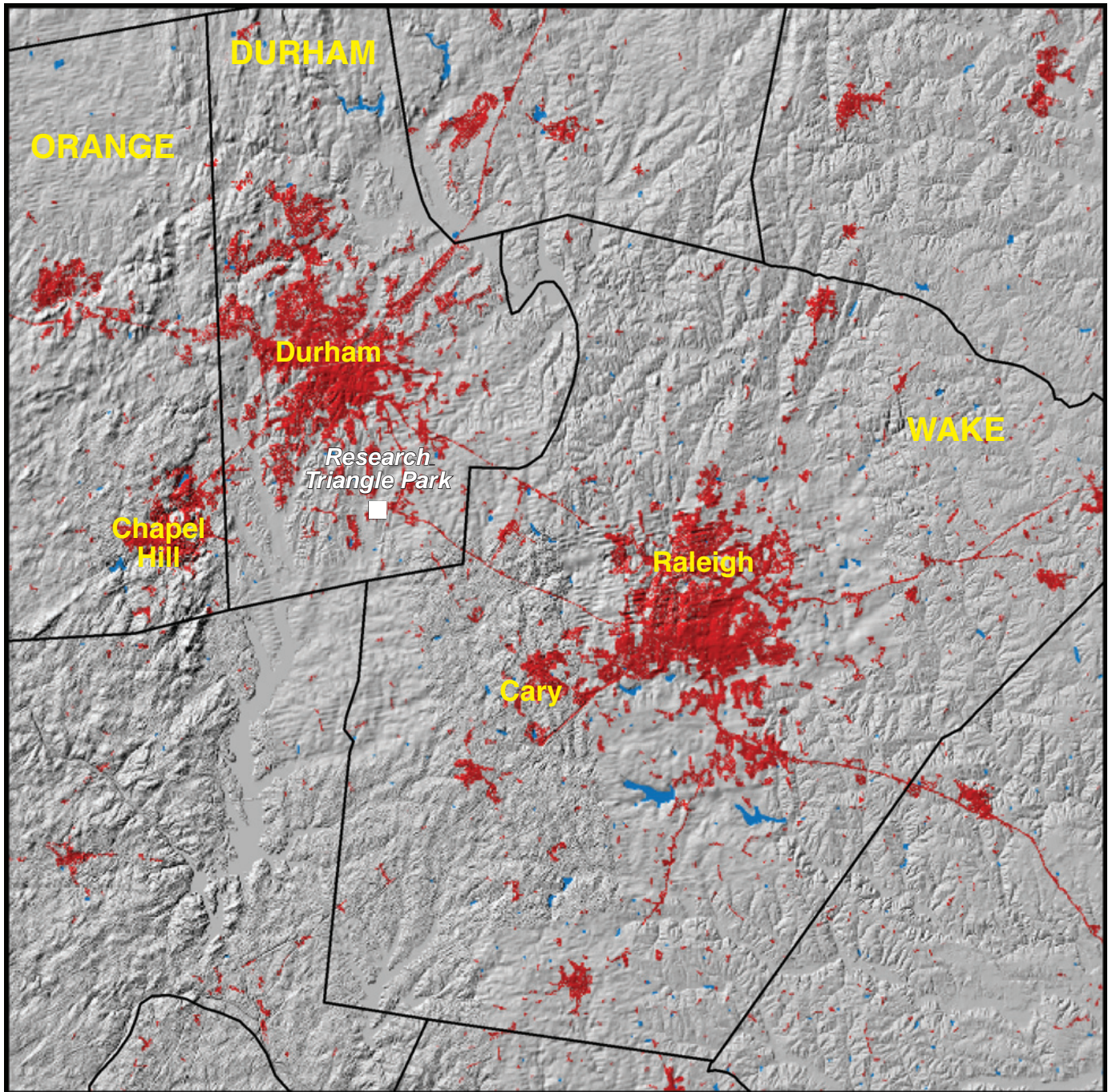
1990 Population - 2,097,447
Includes Allegheny, Beaver, Westmoreland, and Washington Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 249,100 acres (389 square miles)

Raleigh-Durham, North Carolina   1973

1970 Population - 419,254
Includes Wake, Durham, and Orange
Counties. *NOTE:* portions of the
above listed counties may not be vis-
ible on the map

**Red areas shown as developed land
92,000 acres (144 square miles)**

Raleigh was founded in 1792 as North Carolina's capital because of its centralized
location. Durham evolved from a railroad station in the 1850s. Raleigh grew after 1870
as a trade center. The founding of North Carolina State University in the city also
spurred growth. Durham developed as an industrial town, specializing in tobacco and
textiles. The Durham vicinity also had educational institutions, including Trinity College
(later Duke University) in the city itself and the University of North Carolina in nearby
Chapel Hill. The regional location of all these universities and State development
funding led to the creation of the Research Triangle Park in the 1950s.

1992

Located between the two cities, the Triangle became a magnet for technology-oriented corporations and government facilities. With urbanization have come growth-related problems. Raleigh has expanded mostly to the north, resulting in increasing traffic congestion. The hilly terrain around much of the city has influenced infrastructure development and thus an uneven concentration of growth. The local topography also enabled the creation of new reservoirs on local rivers for urban water supplies, but their construction raised concerns over the loss of riparian habitat in the area.
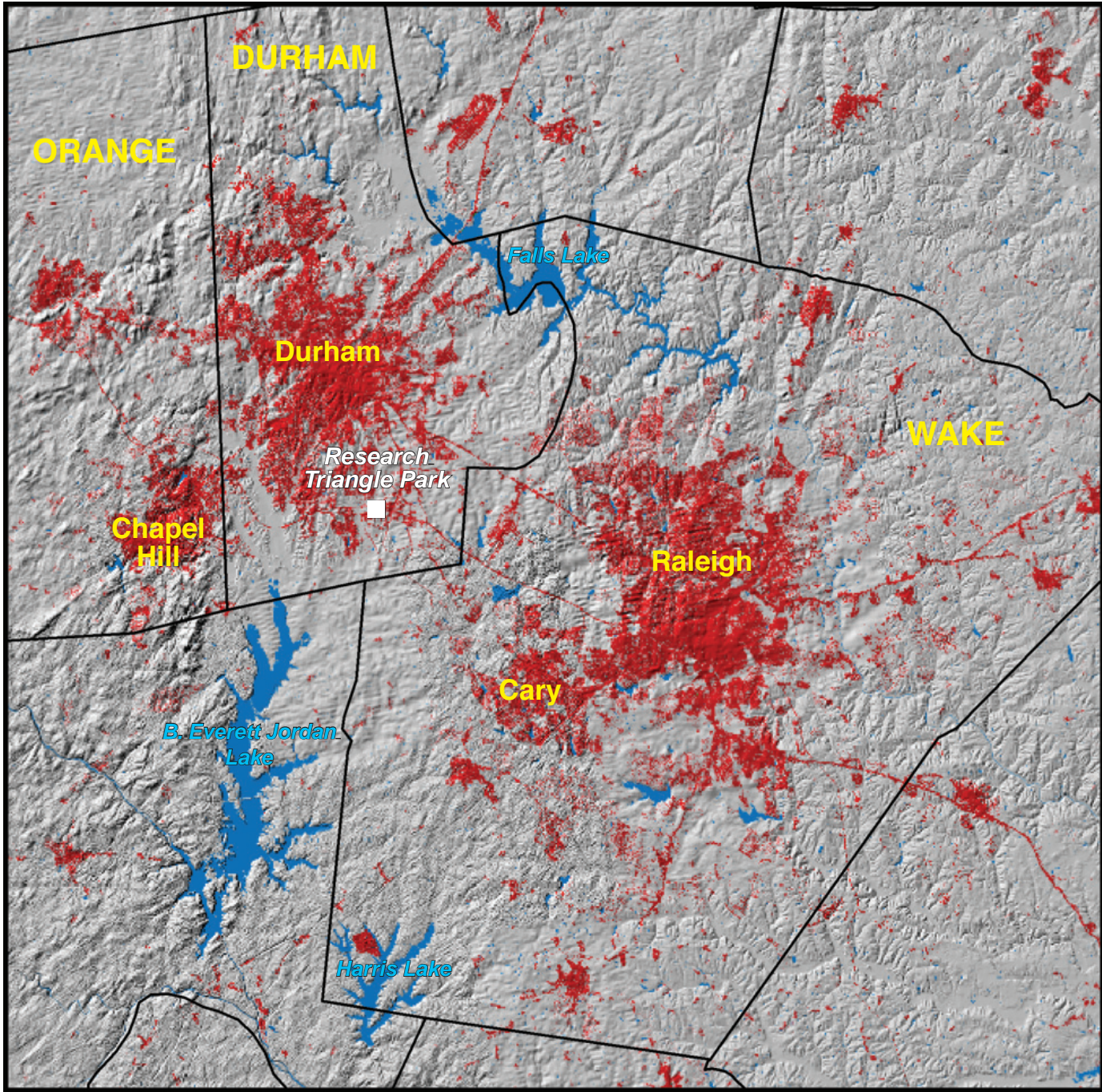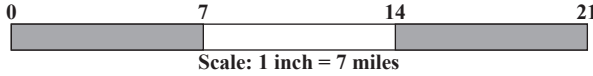
1990 Population - 702,006
Includes Wake, Durham, and Orange Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 142,000 acres (222 square miles)

Reno-Sparks, Nevada   **1973**

SIERRA

California

Nevada

WASHOE

Sun Valley

University of Nevada-Reno

Sparks

Reno

to Sacramento/ San Francisco

STOREY

PLACER

Lake Tahoe

LYON
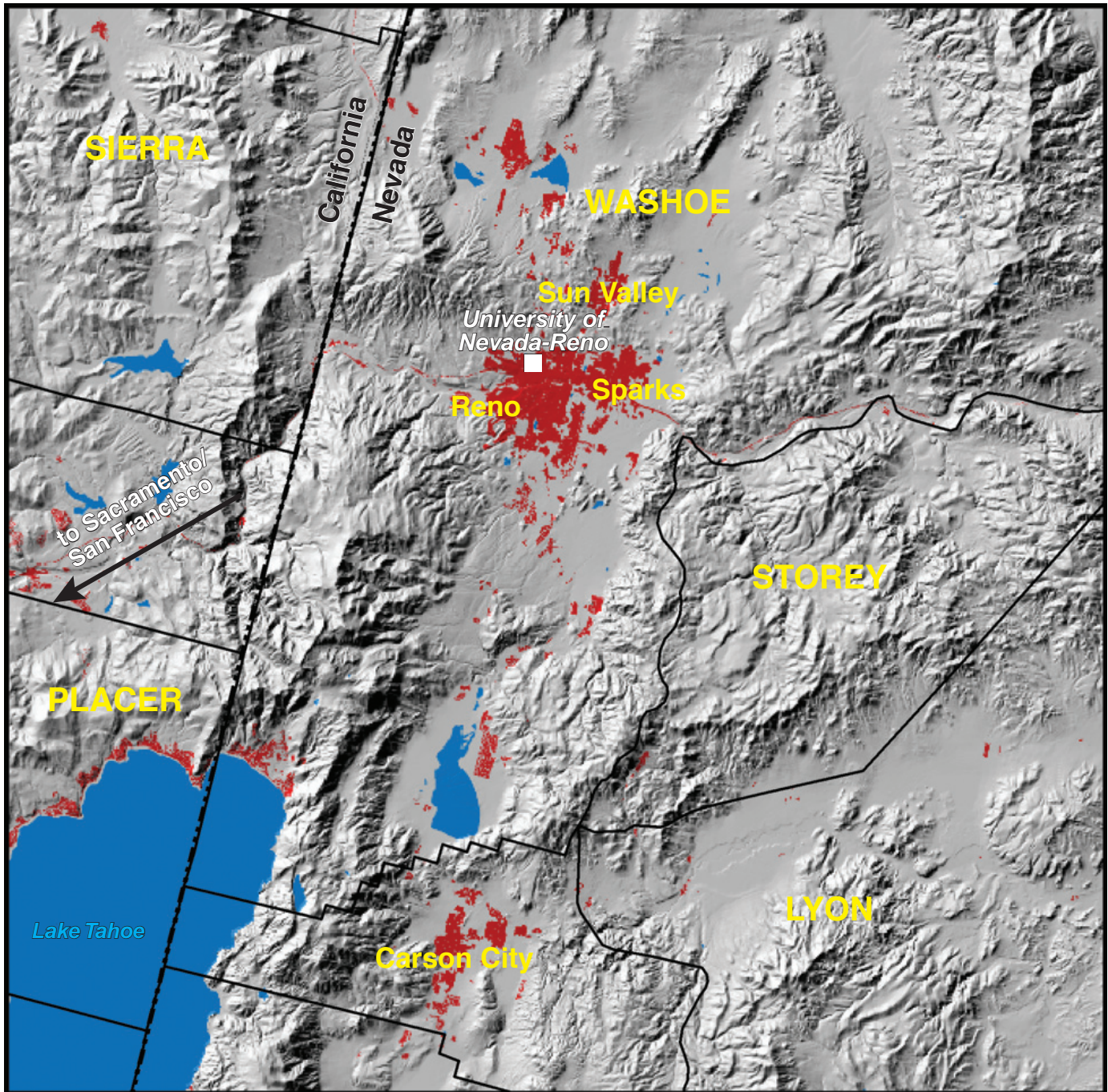
Carson City

1970 Population - 137,231
Includes Washoe, Carson City, and Storey Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 29,600 acres (46 square miles)

Reno was established in the Truckee "meadows" during the 1860s because of their location at the eastern end of a potential transportation corridor through the Sierras and access to the Comstock Lode silver mining district. The transportation goal was achieved when the first transcontinental railroad passed through Reno, linking San Francisco, 225 miles to the west, with the rest of the Nation. Interstate 80 later followed the same route. Sparks was created in 1904 as a railroad logistical center. Reno's proximity to political powers in Carson City led to its gaining the State's university. Gambling was legalized in the 1930s and, along with growing tourism and resort activity at Lake Tahoe, helped Reno-Sparks increase in size.

1992
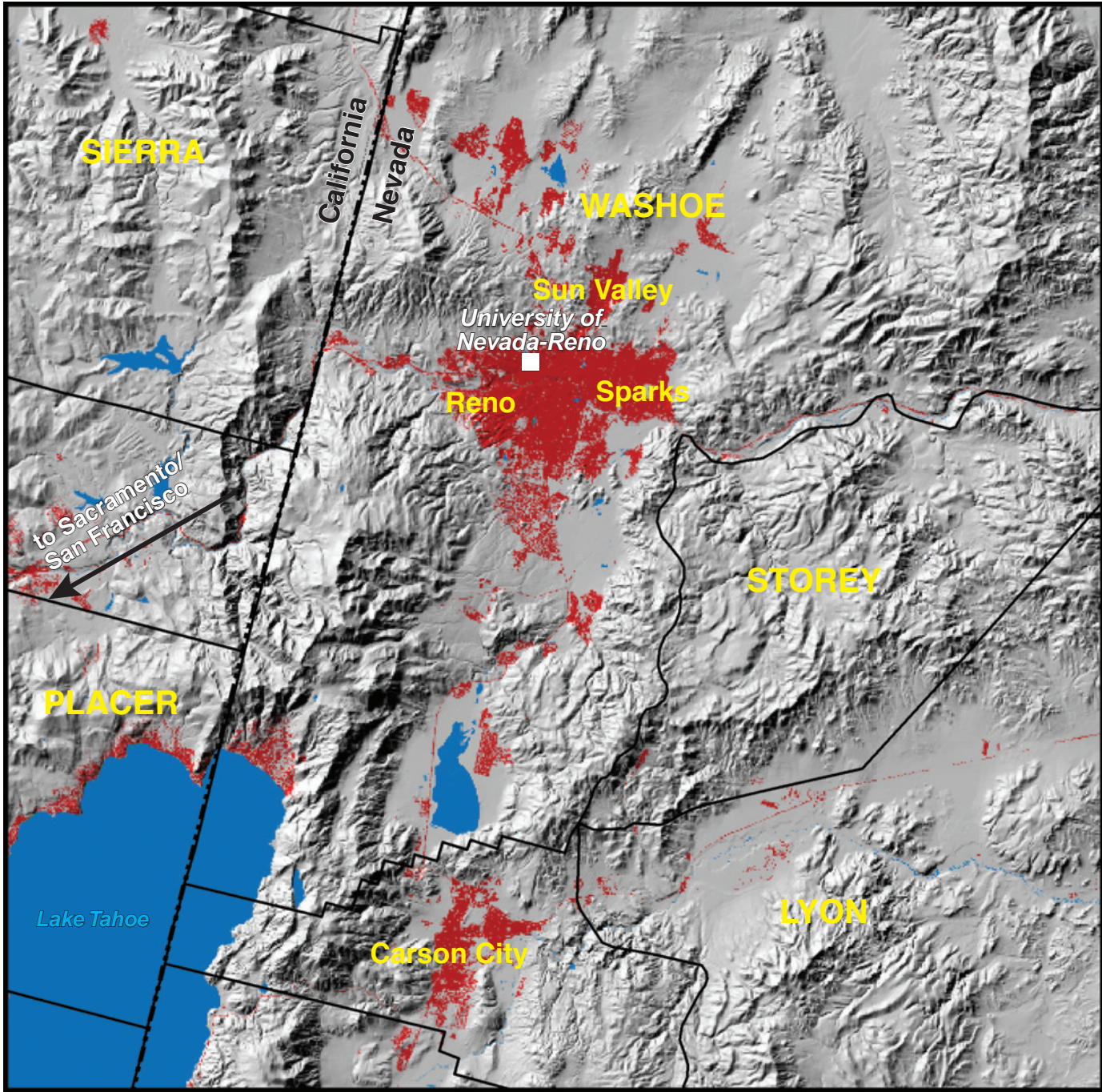
During the 1960s, changes in Nevada law encouraged further growth. First, corporations were allowed to own casinos, paving the way for larger gaming facilities. A second law created "free-port" tax zones that made the warehousing and distribution of goods from Nevada advantageous. The area benefited in all cases from access to California markets. Reno-Spark's growth has led to many challenges. The water supply in this arid region has placed urbanization at odds with irrigation-based agriculture. The basin in which the cities lie is susceptible to air pollution because of frequent temperature inversions. Past housing shortages and an influx of Californian retirees have forced lower income workers to the urban periphery, increasing pressure on existing infrastructure.
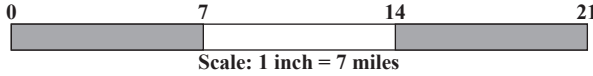
1990 Population - 297,636
Includes Washoe, Carson City, and Storey Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 55,000 acres (86 square miles)

Sacramento, California   1973
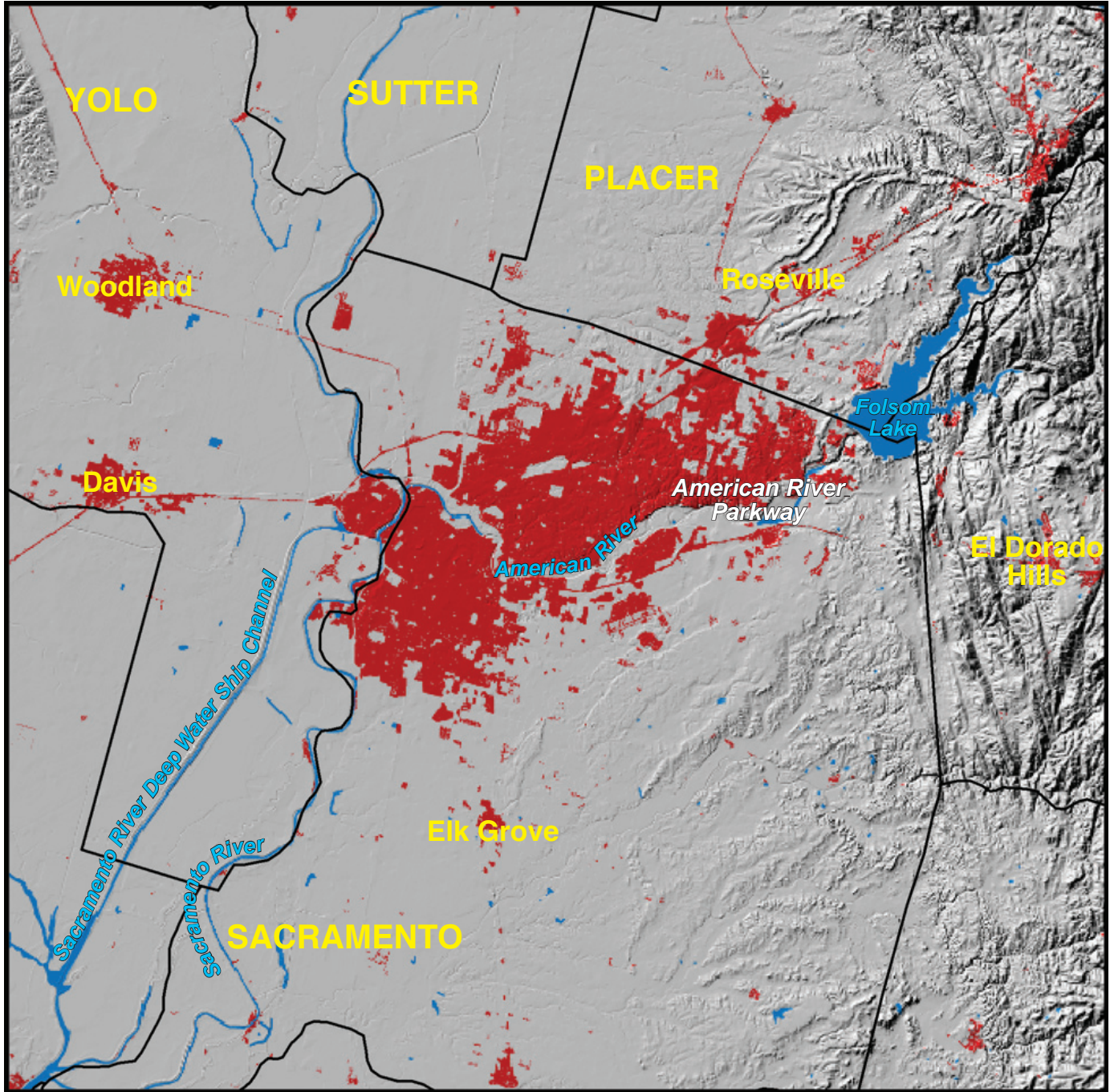
1970 Population - 803,793
Includes Yolo, Placer, and
Sacramento Counties. NOTE: por-
tions of the above listed counties
may not be visible on the map

Red areas shown as developed land
115,800 acres (181 square miles)

The City of Sacramento lies between the Sierra Nevada Mountains and the Pacific Coast
Range in northern California, at the confluence of the American and Sacramento Rivers.
The discovery of gold at Sutter's Mill on the American River in 1848 led to the city's
creation. Scars from hydraulic gold mining in the area can still be seen today.
Sacramento was the first city in California to be incorporated (1850) and by 1854 had
become the State capital. It was also the western terminus of the Pony Express and the
first transcontinental railroad. Early on, the Sacramento region was recognized for its
agricultural potential, with rich alluvial soils and abundant water.

1992
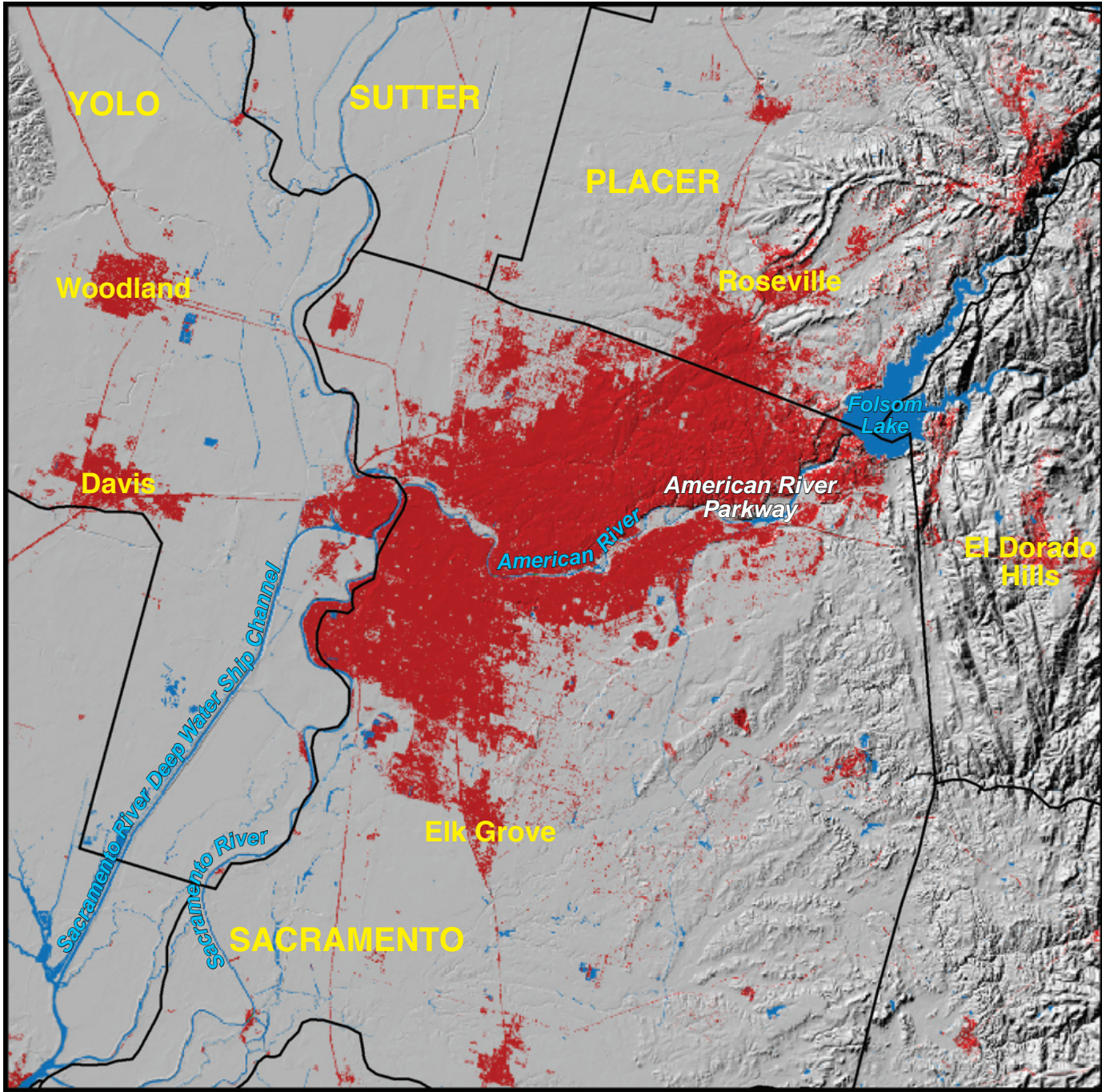
River management issues, such as flood control, irrigation and urban needs, and natural restoration, now figure in debates over water resources. Pesticides in urban storm runoff, mostly from residential landscaping, are also a concern. Sacramento County ranked 22nd nationally in absolute population gain between 1970 and 1980 and 13th between 1980 and 1990. The increase of low-density growth led to strict land use planning during the 1970s. Officials encouraged "infilling" of undeveloped areas within the urban boundary. In the 1980s, a light rail transit system was created, but existing highways have still had to be expanded, especially where the metropolitan region is extending into the Sierra foothills, which are laden with natural amenities.
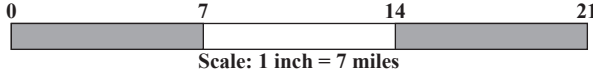
1990 Population - 1,355,225
Includes Yolo, Placer, and Sacramento Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 186,600 acres (292 square miles)

Seattle-Tacoma, Washington   1973
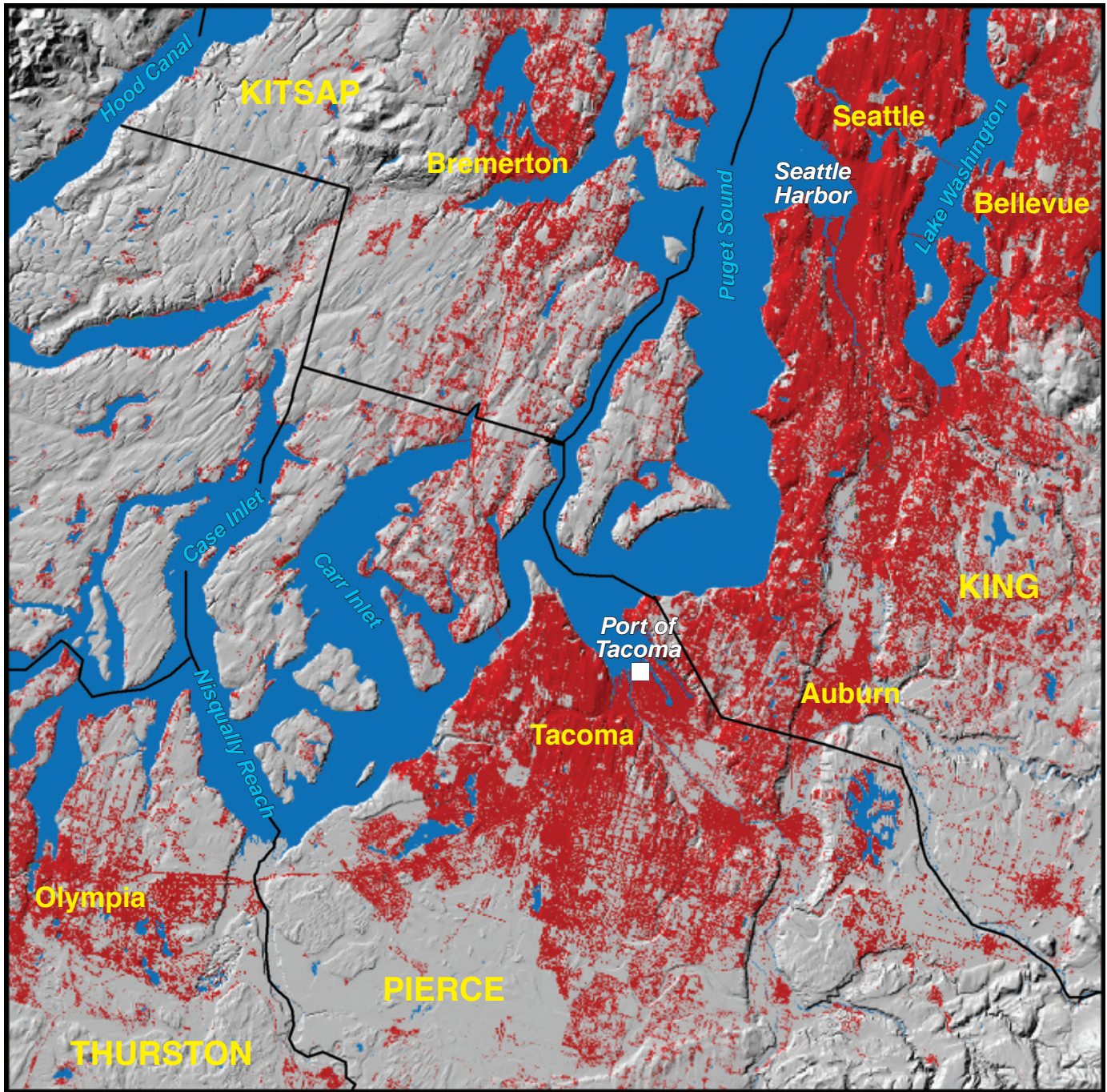
1970 Population - 1,750,339
Includes King, Pierce, Thurston, and Kitsap Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 255,900 acres (400 square miles)

Seattle was settled in 1851 and grew from a tiny sawmill town into a metropolitan area with a diverse population exceeding 2.6 million. The sister cities of Seattle and Tacoma sprawl between Puget Sound and the Cascades. They are the sites of major ports (the shortest shipping route to the Pacific Rim), a large airplane manufacturing hub (Boeing), and a high-tech industry center (led by Microsoft). Initial growth in the Puget Sound area came from timber harvesting, the Alaskan gold rush, and the northern transcontinental railroad. Seattle's population reached 237,000 by 1910. World War II spurred growth when people arrived to work in aircraft and shipbuilding industries powered by regional hydroelectricity.

1992

Scale: 1 inch = 7 miles
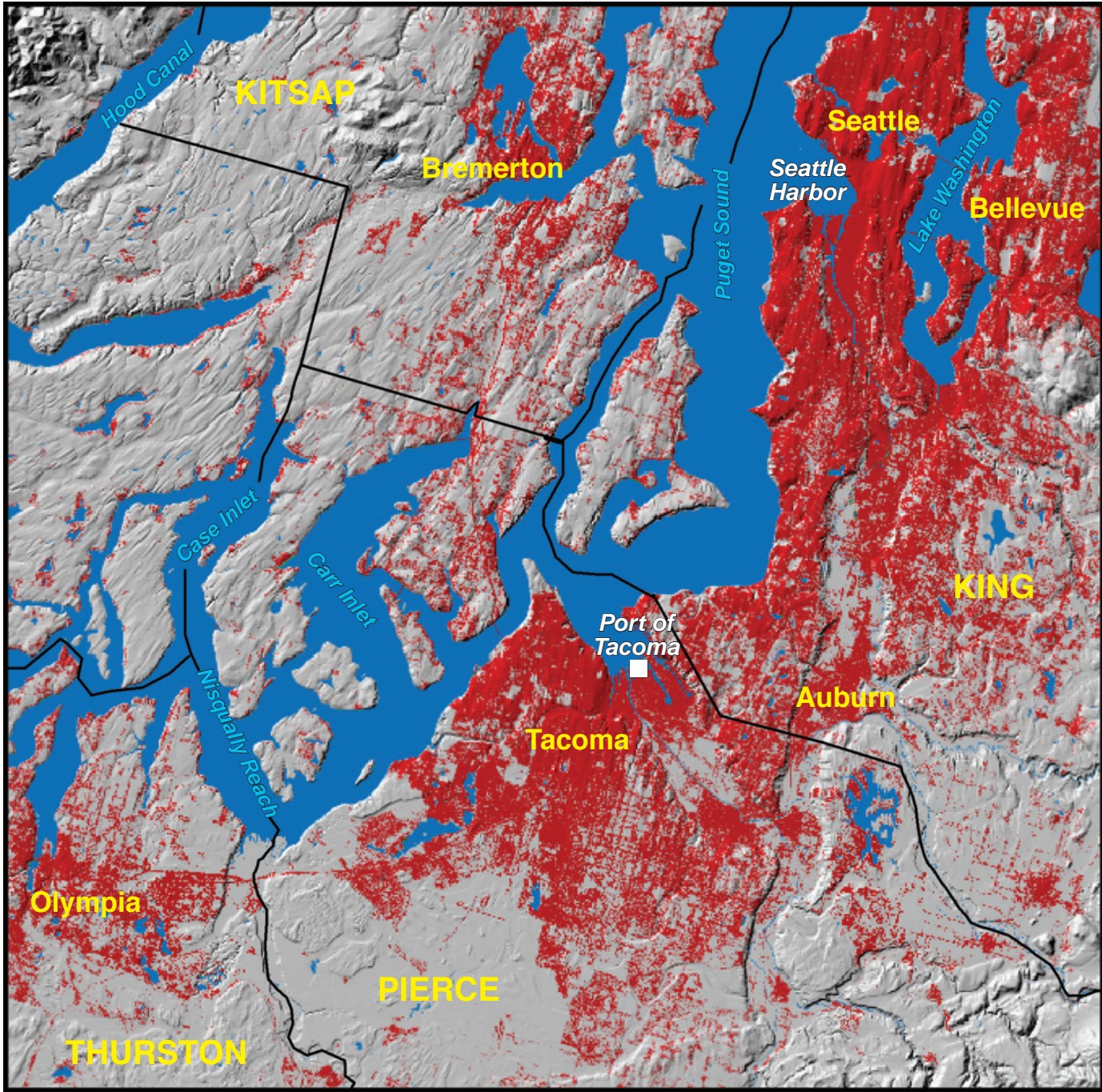
Seattle grew at least 30 percent per decade between 1940 and 1970. King County ranked 18th nationally among counties in terms of absolute population gain between 1970 and 1990 and Pierce County ranked 54th. New additions included more inland suburbs and exurbanization on the islands of the Sound. As the cities continued to expand, a low-density "urbanscape" formed from Olympia in the south to Vancouver, Canada, in the north. The rapid growth created challenges, such as traffic congestion, loss of wildlife habitat, natural hazard mitigation, and housing inflation. Area residents currently face complex decisions as they attempt to balance future growth with a unique quality-of-life.
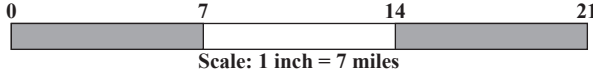
1990 Population - 2,444,477
Includes King, Pierce, Thurston, and Kitsap Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 339,400 acres (530 square miles)

Tampa-St. Petersburg, Florida   1973

PASCO

Zephyrhills

New Port Richey

HILLSBOROUGH

Brandon

Tampa

Tampa Port Authority

PINELLAS

MacDill Air Force Base

Tampa Bay

St. Petersburg
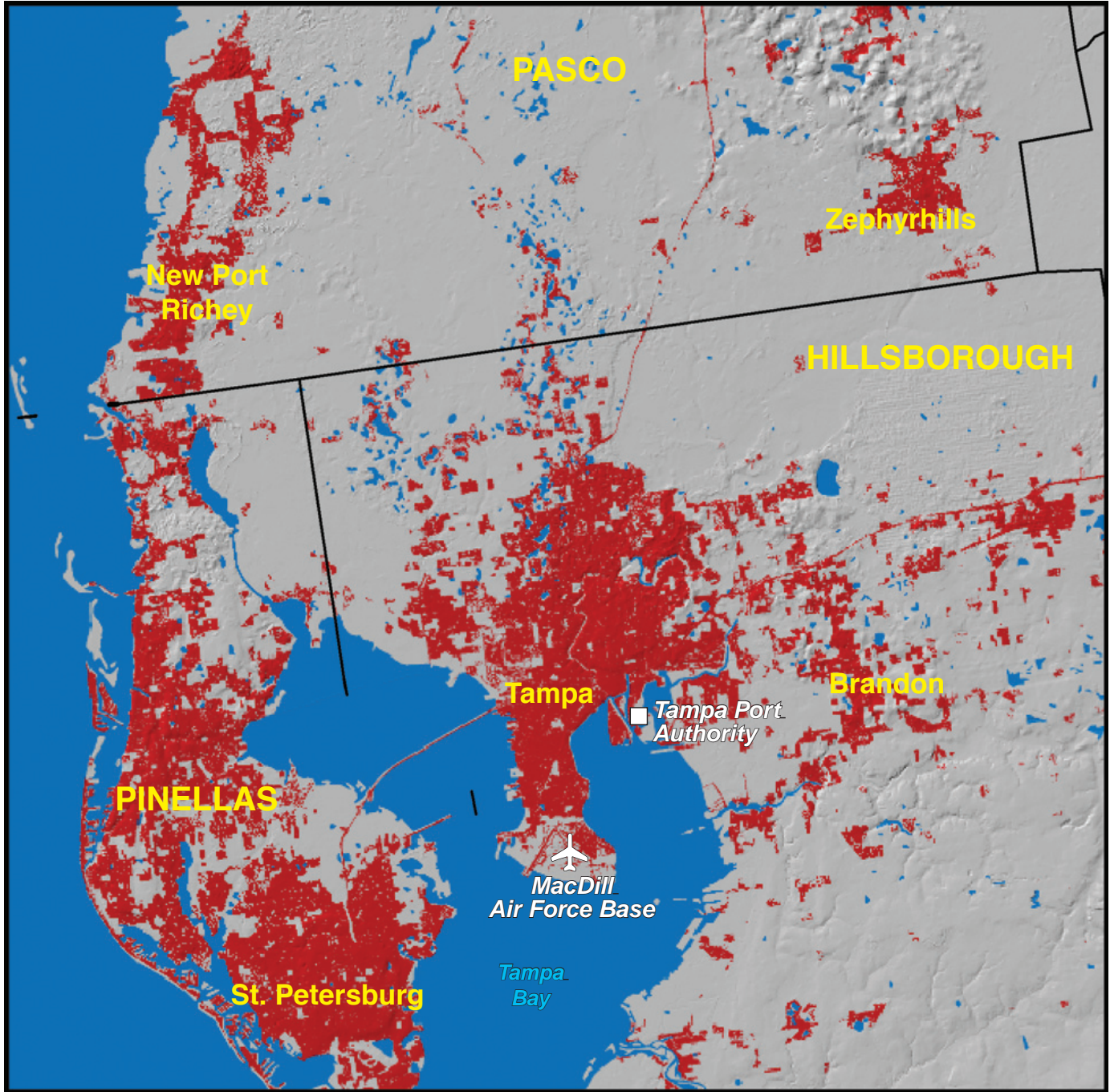
1970 Population - 1,088,549
Includes Pasco, Pinellas, and Hillsborough Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 220,300 acres (344 square miles)

Tampa Bay is one of the best natural harbors on the Gulf coast. Yet it remained relatively undeveloped until the 1880s, when Tampa became a railroad hub for Florida's western coast. Port facilities developed, from which locally mined phosphate was shipped and troops embarked for the Spanish-American War. Caribbean linkages were enhanced by the city's Cuban cigar manufacturing and banana imports. The Tampa Bay urban region was strengthened by defense spending during World War II and changing postwar demographics. Shipbuilding companies and military bases found a home in the city.

1992

Scale: 1 inch = 7 miles

| 0 | 7 | 14 | 21 |

PASCO

Zephyrhills

New Port Richey

HILLSBOROUGH

Brandon

Tampa

☐ *Tampa Port Authority*

PINELLAS

✈ *MacDill Air Force Base*

Tampa Bay

St. Petersburg

Large numbers of retirees also arrived, especially in St. Petersburg, Pinellas, and Pasco Counties. The rapid urbanization of the Tampa Bay area has not been problem free. Ecologically, pollution, ship channel dredging, and wetland destruction have damaged the Bay. Boat-based residential areas created by dredging and infilling are examples of intense shore land alteration. The lack of coordinated regional planning, particularly between Tampa-St. Petersburg and Tampa-Hillsborough County, has strained public infrastructure. Tampa Bay area residents are cooperating to correct past problems and anticipate further growth.
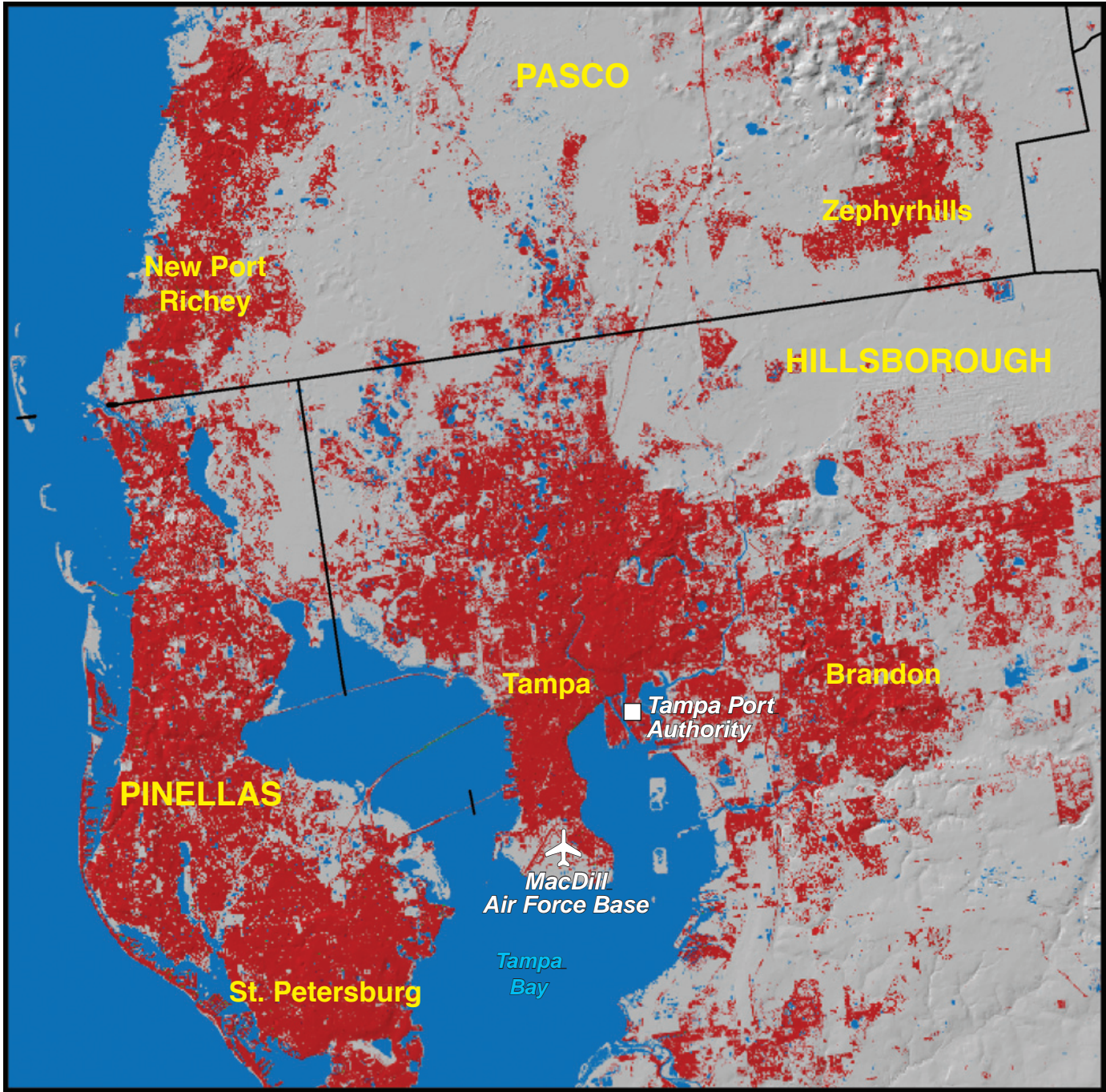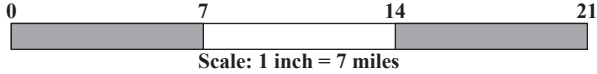
1990 Population - 1,966,844
Includes Pasco, Pinellas, and Hillsborough Counties. *NOTE:* portions of the above listed counties may not be visible on the map

Red areas shown as developed land 339,400 acres (530 square miles)

Ongoing Urban Dynamics Research

The USGS is committed to meeting the Nation's needs for current base geographic data and maps. This project demonstrates advances in technology that can be applied to the study of spatial-temporal dynamics related to human impacts on land transformation. This knowledge base and technology are being strengthened through *The National Map*, a consistent framework for geographic knowledge needed by the Nation. The building blocks of data and information used in Urban Dynamics research come from the wealth of archived USGS data and information. Additional information used in the research is acquired from sources such as the U.S. Census Bureau, Department of Agriculture, and National Aeronautics and Space Administration.

The change pair images in this booklet are just one of the many products of urban growth research associated with *The National Map*. Other products include maps and GIS projects with many layers of multiscale data and information associated with the physical changes that occur in urban areas over time. All of these products help to illustrate the changes, and from them many explanations can be derived about the causes of the changes. Ultimately, this information enhances America's ability to access, integrate, and apply geospatial data at global, national, and local scales.

Indepth Urban Dynamics research includes studies that are tracking the patterns, rates, and trends of urban change. In addition to physical changes in urban extent, correlations are being made with demographic, economic, and environmental information. In each study, the local history and description of human events in the region play a large role in understanding change. Computer models are being developed that can predict future urban growth patterns. Statistical analyses are being used to understand the causes and consequences of urban growth.

The USGS uses the geographic context of this research to provide comprehensive information needed in making land use management decisions, providing natural resource protection, and understanding significant social land use issues. A long-term goal of this research is to provide a nationally consistent description of current urban land surface and land use conditions for the Nation. A national study will highlight trends in urban change and provide a comparative analysis of diverse metropolitan areas within a national assessment of urban land use change. Another goal of this research is to inform policymakers and the public of likely impacts of urban growth. It is hoped that these activities will provide the baseline information and understanding to help resource managers and the American public understand and live comfortably with urban growth.

Acknowledgments

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