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Forests on the Edge:
A Case Study of Northwest Georgia Watersheds

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Introduction

The area of developed land in the United States increased by slightly more than 48% between 1982 and 2003 (USDA NRCS 2006). Developed land includes urban and built-up land as well as land in rural areas used for roads, railroads, and transportation rights of way. Much of this increase in developed land area can be traced to a loss in rural land area. The expansion of developed land and the loss of rural land are projected to continue over the next several decades. Future land use conversion will likely continue to impact land uses and land cover in rural areas, including forests, agriculture, and open space.

There are about 749 million acres of forest within the United States, 57% of which is privately owned. Privately owned forests provide a variety of products and services, including traditional and secondary forest products, recreation opportunities, improved water quality, aesthetic landscapes, open space, and wildlife habitat, among others. In an effort to "increase public understanding of the contribution of and pressures on private forests," the USDA Forest Service initiated the Forests on the Edge project (Stein et al. 2005). The focus of phase one of that project was identifying areas of the United States where private forest lands are projected to experience increases in housing density by 2030. Based on phase one analyses, an estimated 44.2 million acres (10%) of private forests in the U.S. are projected to experience significant increases in housing development by the year 2030. Nationwide, the greatest increases in housing development in and around private forests are projected to occur in the Eastern U.S., where the majority of private forests are located. Moderate increases in housing unit density are projected for much of the Southeast, Mid-Atlantic, and New England regions of the United States. Within those regions, several watersheds in Georgia, North Carolina, Virginia, Vermont, New Hampshire, and Maine are projected to experience substantial increases in housing unit density. This case study focuses on several watersheds located in northwest Georgia.

Northwest Georgia

The case-study area extends northwest from the boundary of the Atlanta, Georgia metropolitan area to the Georgia/Tennessee border and includes the Oostanaula, Conasauga, Coosawattee, and Etowah watersheds (fig. 1). Of these watersheds, the greatest increases in residential development are projected to occur within the Etowah and Coosawattee watersheds. By 2030, an estimated 266,000 forest land acres in the Etowah watershed and 116,300 forest land acres in Coosawattee watershed are projected to experience increases in residential development. Lesser increases in housing unit densities are projected to occur in the Conasauga watershed (increased housing density on approximately 61,500 forest land acres), and the Oostanaula watershed (increased housing density on 29,300 forest land acres).

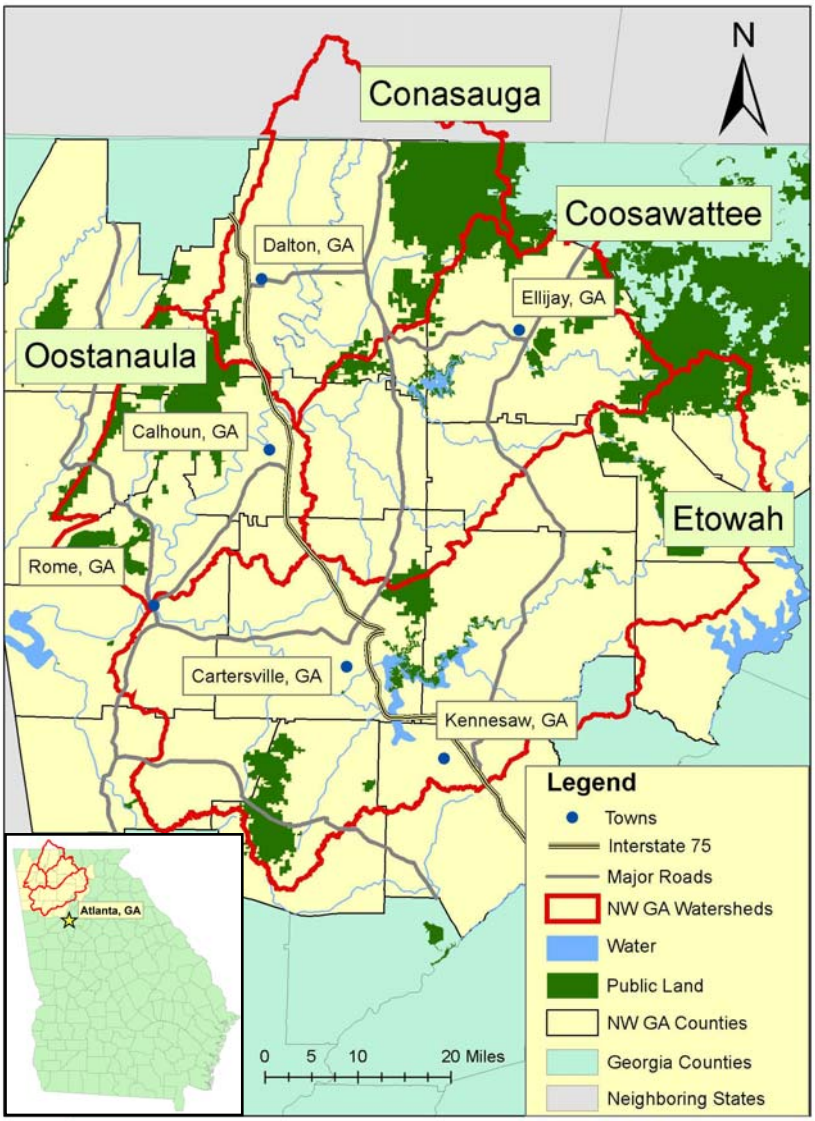

Figure 1—Northwest Georgia watersheds projected to experience moderate to high increases in residential development by 2030.

The conversion of rural land to developed uses results from market forces. Population, income, and economic growth combine to increase demands for land in residential, public infrastructure, and commercial and industrial uses. Demands also increase with people's lifestyle choices when, for example, people relocate to rural areas or desire second homes in scenic forest settings. When demands for developed land uses increase, so do the financial incentives some forest landowners have to sell land for development. The incentive is the revenue owners can earn from selling land above what they can earn from maintaining land in forest. When these market forces are at play, some forest land development is inevitable (see Kline et al. 2004 for a further discussion of the market and nonmarket values of forest land). In this document, I examine the current conditions and

recent trends in many of the factors that influence land use and land use change within the case-study watersheds in Georgia, and in the state.

Conditions and Trends in the State of Georgia

Forest Land and Timberland

There are approximately 24.7 million acres of forest in Georgia, representing 67% of the state's total land area (USDA Forest Service and Georgia Forestry Commission 2006). Georgia's forests represent about 3% of the total forest acreage in the United States. Between 1989 and 2004, the total area of forest land in the state increased by about 600,000 acres. Prior to this increase, the state's forest land acreage had been declining steadily for several decades, decreasing by 2.2 million acres between 1961 and 1989. The recent increase in forest acreage is largely the result of reforestation of agriculture land. Most of this reforestation has occurred in the southern regions of the state (Thompson and Thompson 2002). Nearly all of the forest land in Georgia (98%, or 24.2 million acres) is classified as timberland (USDA Forest Service and Georgia Forestry Commission 2006). Timberland is defined as land able to produce at least 20 cubic feet of timber per acre per year and not legally withdrawn from timber production.

The vast majority of Georgia's timberland is privately owned. Individuals and families constitute the largest timberland ownership group in Georgia, accounting for 14.2 million acres or 58% of all timberland in the state in 2004. Forest industry and "other corporations" own similar timberland acreages, 4.4 and 3.9 million acres, or 18% and 16% of timberland area, respectively. The "forest industry" ownership group represents traditional vertically integrated forest products companies, and the "other corporations" ownership group includes corporations that do not own timber mills, investment groups, and real estate trusts. Lands owned by federal, state, and local governments account for the remaining 8% of Georgia's timberland.

Like forest ownership in many other states in the U.S., the ownership of Georgia's private forests has undergone transitions over the last several decades (fig. 2). During that time, there has been a decrease in the number of acres owned by farmers and by forest industry and an increase in the number of acres owned by individuals and by "other corporations." The decline in farmer-owned timberland acreage has been ongoing since the early 1960s (Sheffield and Knight 1984) whereas the divestment of forest industry timberlands has begun more recently, starting in the 1990s. The areas of timberland owned by individuals and by non-forest-industry corporations have both been increasing steadily since the 1980s. Between 1982 and 2004, the area of timberland owned by "other corporations" increased 160%. The area of timberland owned by individuals increased 20% between 1982 and 1997 (the most recent year for which consistent data are available).

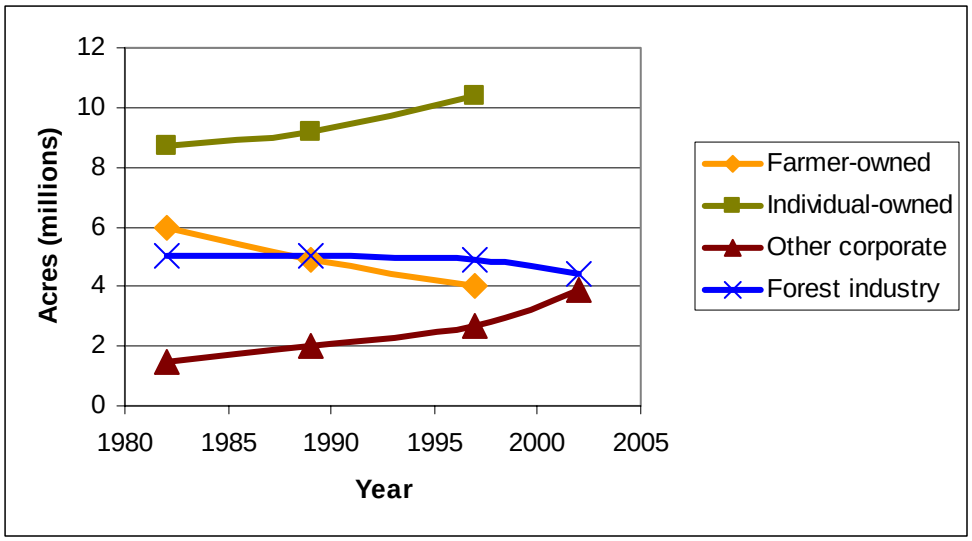

Figure 2—Recent trends in timberland ownership in Georgia. Data sources: Sheffield and Johnson 1993, Sheffield and Knight 1984, Thompson and Thompson 2002, USDA Forest Service and Georgia Forestry Commission 2006.

Although the total area of timberland in Georgia has increased in recent years (largely due to reversion of agriculture land to forested land), the periodic loss of timberland to urban and developed uses has also increased over the last three forest inventory remeasurement periods (fig. 3). The number of transitioning acres has increased from 380,100 in the 10-year period between forest inventories in 1972 and 1982 to more than 519,000 in the 8-year period between 1989 and 1997 (the most recent period for which figures are available) (Sheffield and Knight 1984, Thompson and Thompson 2002). In all three periods, the greatest number of acres transitioning from timberland to urban and developed uses was in the north-central region of the state around the Atlanta metropolitan area.

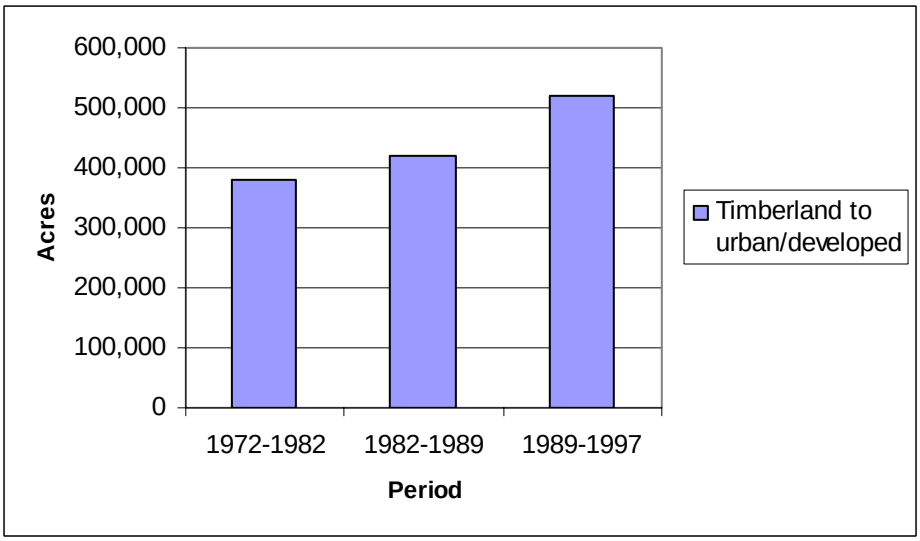

Figure 3—Periodic transition of timberland to urban and developed uses in Georgia. Data sources: Sheffield and Knight 1984, Thompson and Thompson 2002.

From 1992 through 2003, the volume of timber harvested annually from Georgia's forests has remained generally steady around 1.2 billion cubic feet (fig. 4).[1] The average annual variation in harvest level was 5% for the years in which data are available. Of the years considered, the highest annual harvest volume occurred in 1995 (1.3 billion cubic feet), and the lowest harvest volume occurred in 2001 (1.1 billion cubic feet). Nearly all of the annual timber harvest volume in Georgia originates from privately owned lands. In 2004, nonindustrial private forest owners (a group that includes families and individuals, other corporations, private trusts, etc.) accounted for 835 million cubic feet of total harvest volume in the state, while forest industry lands yielded 335 million cubic feet of harvest volume (Johnson and Wells 2005). Across the state, the southeastern and east-central counties tend to have the greatest collective annual harvest volumes, although some counties located in other parts of the state also have high annual harvest volumes (Johnson and Wells 2005).

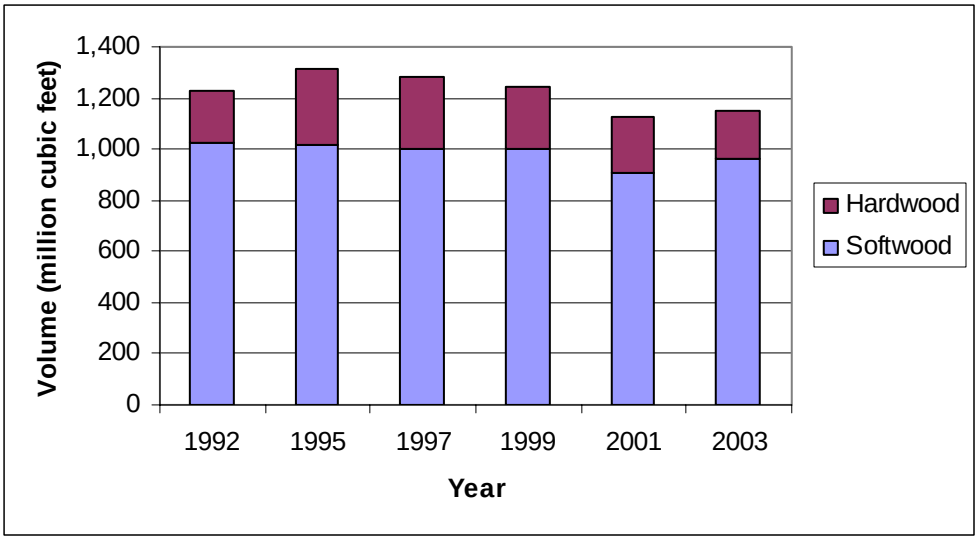

Figure 4—Timber volume harvested from forests in Georgia, 1992-2003. Data sources: Johnson et al. 1997, Johnson and Wells 2002, 2005.

Population and Housing

Georgia was ranked sixth in the Nation in the percentage change in population between 1990 and 2000 (USDC Census Bureau 2001). Over the 10-year period, the population increased 26%, from 6.5 million to 8.2 million individuals. By 2005, the population of Georgia had grown to an estimated 9 million people (USDC Census Bureau 2006) The population of Georgia is projected to increase to 12 million individuals by 2030 (USDC Census Bureau 2004b). This projected increase would make Georgia the eighth most

[1] Based upon USDA Forest Service Timber Product Output reports (which account for exports). There may be some discrepancy, however, between timber volumes harvested and timber volumes processed or exported.

populous state in year 2030—surpassing New Jersey, Michigan, and Ohio. During the 1990s, the number of housing units in the state increased from 2.6 million to 3.3. million—a 27% increase. Although the population of Georgia has increased dramatically, the individuals per housing unit has remained steady (2.48 individuals per housing unit in 2000) and is slightly greater than the national average. In other states experiencing rapid increases in population, such as Washington, the average number of individuals per housing unit has declined over time and is below the national average.

The rapidly expanding population during the 1990s resulted in an associated increase in the statewide population density, from 112 people per square mile in 1990 to 141 people per square mile in 2000. Georgia's statewide population density is well above the national average of 80 people per square mile and is also greater than the population density found for the Southern United States (115 people per square mile). Increases in the number of housing units has lead to an increase in the statewide housing unit density over the 10-year period—from 45 units per square mile to 57 units per square mile (approximately 1 unit for every 11 acres). Across the state, the greatest numbers of individuals and housing units are located in northern Georgia, yielding population and housing unit densities approximately 3 times those found in the southern portion of the state.

Domestic migration has played a significant role in the population increases of Georgia and the Southern United States. Between 1995 and 2000, net migration to the Southern States was nearly 1.8 million individuals (Franklin 2003). The only other region to have a positive net domestic migration during the period was the Western U.S., gaining just 12,000 individuals. Nationwide, the three states experiencing the greatest net migration gains between 1995 and 2000 were Florida, Georgia, and North Carolina, gaining 607,000, 341,000, and 338,000 individuals respectively (Franklin 2003). Continued substantial domestic in-migration to Georgia and its neighbor states is likely to continue in the coming years.

Conditions and Trends in the Georgia Watersheds

The watersheds considered here are located almost entirely in 16 counties within northwestern Georgia (fig. 1). The southernmost portions of the case-study watersheds lie on, or just within, the edge of the Atlanta regional area, and the northernmost boundary extends into Tennessee. Interstate 75 crosses the study area from north to south.

Timberland Area

In total, there are about 2.2 million acres of timberland in the 16 northwest Georgia counties in the case-study area (table 1). This timberland acreage represents about 9% of the state's total timberland area. The percentages of timberland area owned by private individuals (58%) and "other corporations" (18%) within northwest Georgia are consistent with the statewide ownership patterns. Departing from the statewide pattern, publicly owned timberland and forest-industry-owned timberland each constitute about 12% of timberland within the case-study area. The higher percentage of publicly owned

land in the case-study area is primarily due to the presence of the Chattahoochee-Oconee National Forest.

Table 1—Privately owned timberland within three northwest Georgia counties

Ownership	Timberland
	Thousand acres
Federal, state, and local governments	261
Forest industry	266
Other corporations	399
Individuals	1,262
Total	2,188

Data source: USDA Forest Service 2006.

Forest Cover

Forest cover extends throughout northwest Georgia. The most extensively forested area lies in the northeast portion of the case-study watersheds, within the Conasauga, Coosawattee, and Etowah watersheds (fig. 5). An expansive area of forest cover also occurs in the southernmost portion of the Etowah watershed, south of Cartersville, Georgia. Many of the most forested areas occur in and around public lands (figs. 1 and 5). The least forested portion of the study area occurs near the Interstate 75 corridor, extending from near Calhoun, Georgia, to the northern border of the Conasauga watershed. Areas of less extensive forest cover also occur west of Cartersville, Georgia, and in the area of Kennesaw, Georgia, near the Interstate 5 corridor in northwestern Cobb County.

Timber Harvest Levels

Over the last decade, about 75 million cubic feet of timber were harvested annually from the 16 northwest Georgia counties (fig. 6). This average volume represents approximately 6% of the average annual statewide harvest volume. For the years data are available, harvest volumes increased from a low in 1992 of 60 million cubic feet to a high in 1999 of 86 million cubic feet. In the years following 1999 for which data are available, annual harvest volumes in northwest Georgia have declined slightly. Counties located in the southwest portion of the case-study area generally had the greatest annual harvest volumes (fig. 7). The lowest annual harvest volumes occurred among counties located in the eastern portion of the study area and Cobb County, nearest the Atlanta metropolitan area.

Figure 5—Forest cover within the northwest Georgia case-study watersheds, 2001. Data source: U.S. Geological Survey 2003.

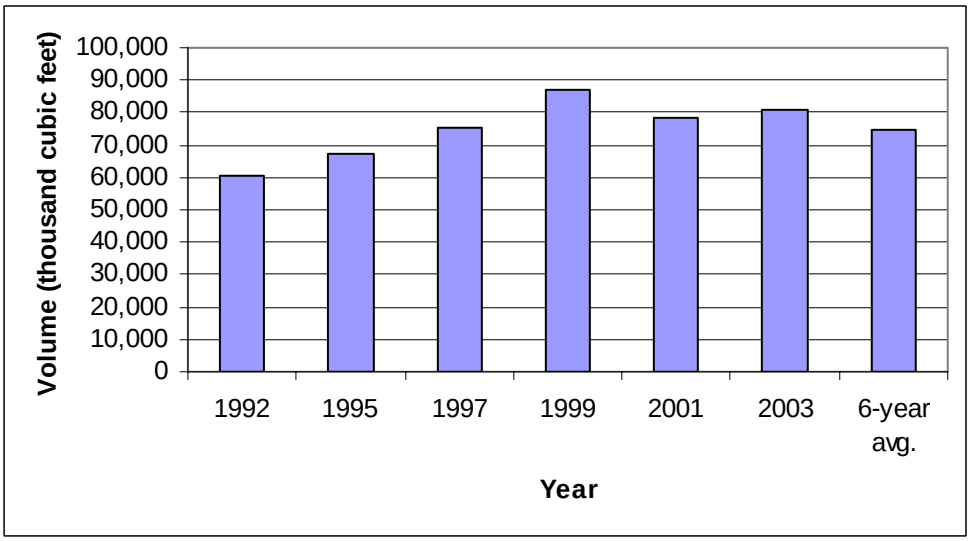

Figure 6—Annual harvest volumes in northwest Georgia, 1992-2003. Data sources: Johnson et al. 1997, Johnson and Wells 2002, 2005.

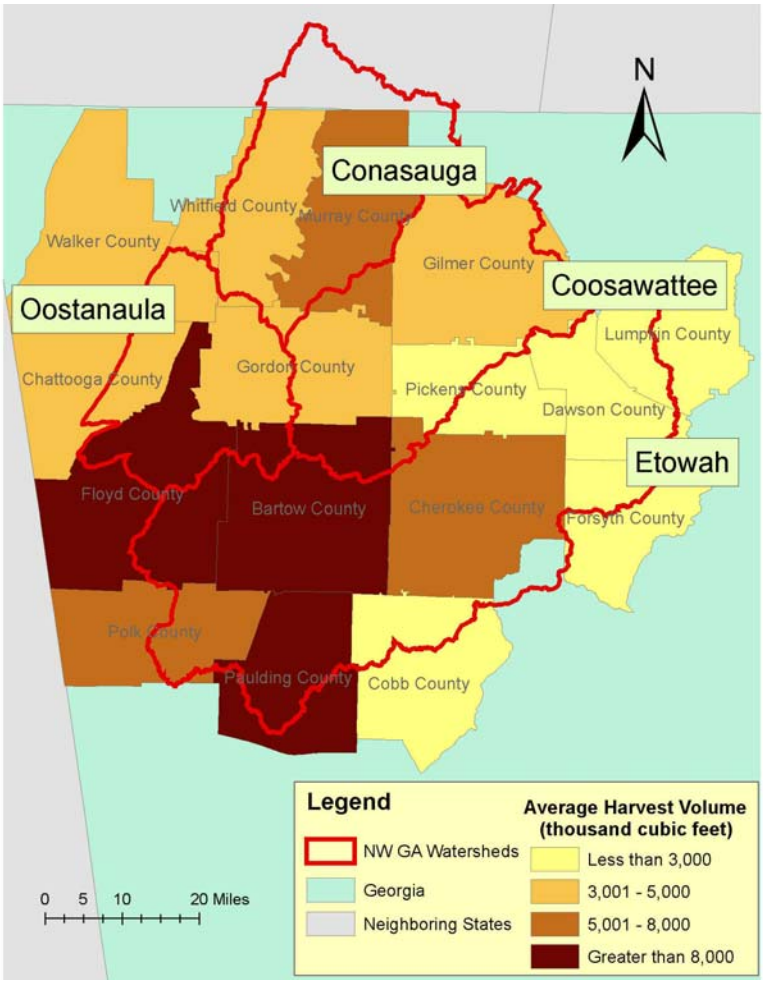

Figure 7—Average annual harvest volume by northwest Georgia county, 1992-2003. Data sources: Johnson et al. 1997, Johnson and Wells 2002, 2005.

Stumpage Values

Stumpage prices for sawtimber and pulpwood from 1996 to 2004 are presented in real dollars in figures 8 and 9. During the period, sawtimber stumpage values have remained relatively steady for pine species (*Pinus* spp.) and have been slightly increasing for oak species (*Quercus* spp.). Stumpage values for pulpwood have varied more widely from year to year over the period than those for sawtimber. Stumpage values for mixed hardwood species had been steadily increasing since 1999 but experienced a significant decline after a high in 2003. Stumpage values for pine (*Pinus* spp.) pulpwood reached a period high in 1997 but subsequently declined and have remained generally steady since 2000.

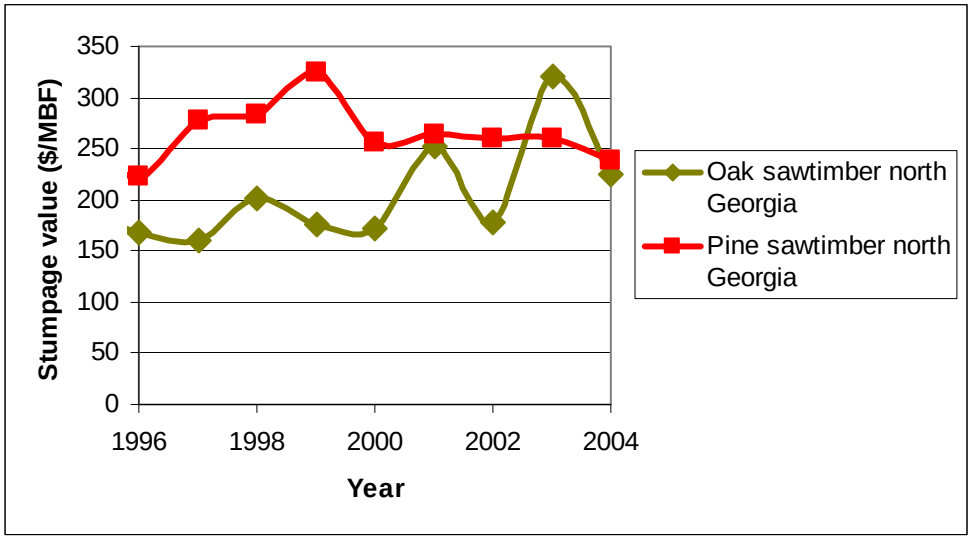

Figure 8—Third quarter sawtimber stumpage values (dollars per thousand board feet) in northern Georgia, 1996-2004 (year 2001 dollars). Data source: Prestemon 2006.

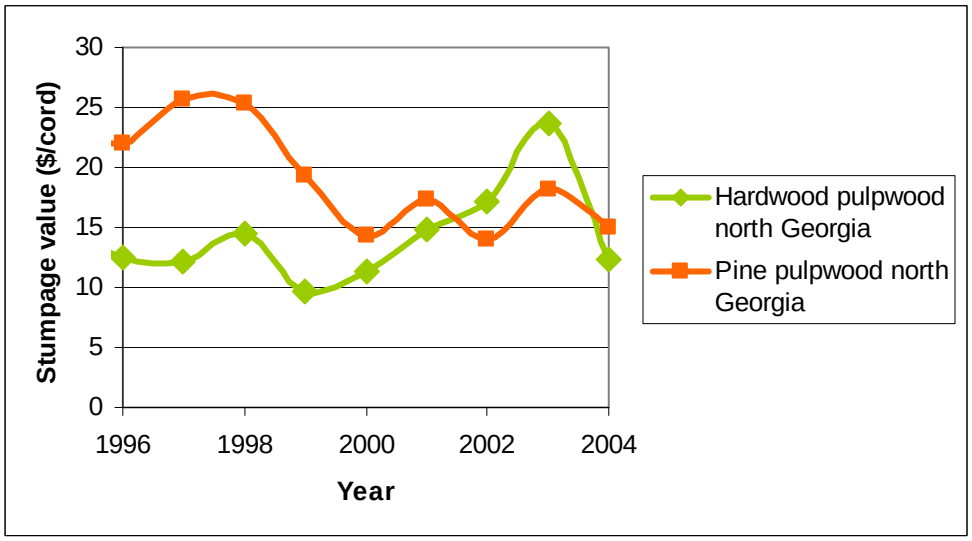

Figure 9—Third quarter pulpwood stumpage values (dollars per cord) in northern Georgia, 1996-2004 (year 2001 dollars). Data source: Prestemon 2006.

Population and Housing Trends

The populations and numbers of housing units in the four case-study watersheds increased at differing rates between 1990 and 2000 (table 2).[2] Percentage increases in both the Etowah and Coosawattee watersheds, located closest to the Atlanta metropolitan area, were above the statewide average, and the Oostanaula and Conasauga watersheds increased at rates below the statewide average. The Coosawattee watershed experienced the greatest increase in both population (64%) and number of housing units (66%). The Etowah watershed, the watershed projected to undergo the greatest increases in housing unit density, had population and housing unit increases that were just slightly lower, 62% and 58%, respectively. The smallest percentage increases in population (16%) and number of housing units (9%) occurred within the Conasauga watershed.[3] Combined, the population of the case-study watersheds increased 51% while the number of housing units increased 47% over the period—both well above the statewide average.

Table 2—Increases in population and housing units in the case-study watersheds and the state of Georgia between 1990 and 2000

	Population	Housing units
	Percent	
Etowah	62	58
Coosawattee	64	66
Oostanaula	24	23
Conasauga	16	9
Case study watersheds	51	47
Georgia state	26	27

Data sources: USDC Census Bureau 2005a, 2005b.

Within the case-study watersheds, the greatest concentration of high housing unit densities occurs in the southern portion of the Etowah watershed—the area nearest the Atlanta metropolitan region (fig. 10). Other areas of high and moderate housing unit density occur around towns and cities, as expected. These population centers and their associated high and moderate housing unit densities generally occur along major roads. The lowest housing unit densities (between 5 and 10 housing units per square mile) are located in isolated areas along the northeast and western edges of the case-study area. The remainder of the case-study area has relatively low housing unit densities (between 10 and 30 housing units per square mile).

[2] These results are based on analyses incorporating the 1990 and 2000 census block groups having geographic centroids within the watershed boundaries. Changes in the configuration of block groups from the 1990 to 2000 census can influence the results of comparisons between censuses using block groups. Based upon a comparison of the configurations of 1990 and 2000 census block groups in and around the case study watersheds the impact in this case is expected to be minor.

[3] The portion of the Conasauga watershed falling within Tennessee was not considered in this analysis.

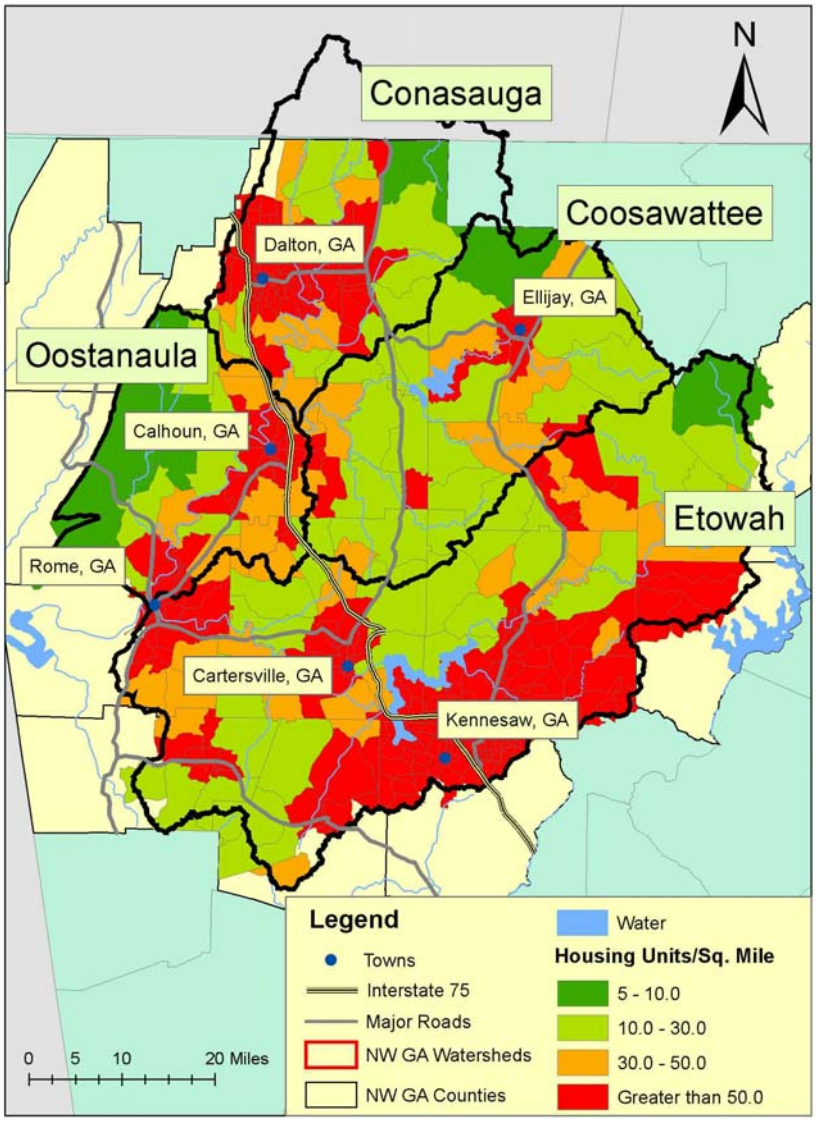

Figure 10—Housing units per square mile by census block group, 2000. Data source: USDC Census Bureau 2005b.

Seasonal homes (or second homes) constitute just 1% of the total housing stock within the case-study watersheds. This is less than the percentage found nationally (3%) (USDC Census Bureau 2004a). Although seasonal homes are a minor component of housing stock across all the case-study watersheds collectively, they do represent a significant percentage of housing stock in the northeast portion of the case-study area, near the Chattahoochee-Oconee National Forest and the Carters Lake U.S. Army Corps of Engineers project (fig. 11). In these locations, which are within the Etowah and Coosawattee watersheds, seasonal homes represent between 10 and 40 percent of all housing units. Between 1990 and 2000, the number of seasonal homes in these two watersheds increased by a combined 1,600 units (a 66% increase). In 2000, there were approximately 4,000 seasonal homes within the two watersheds.

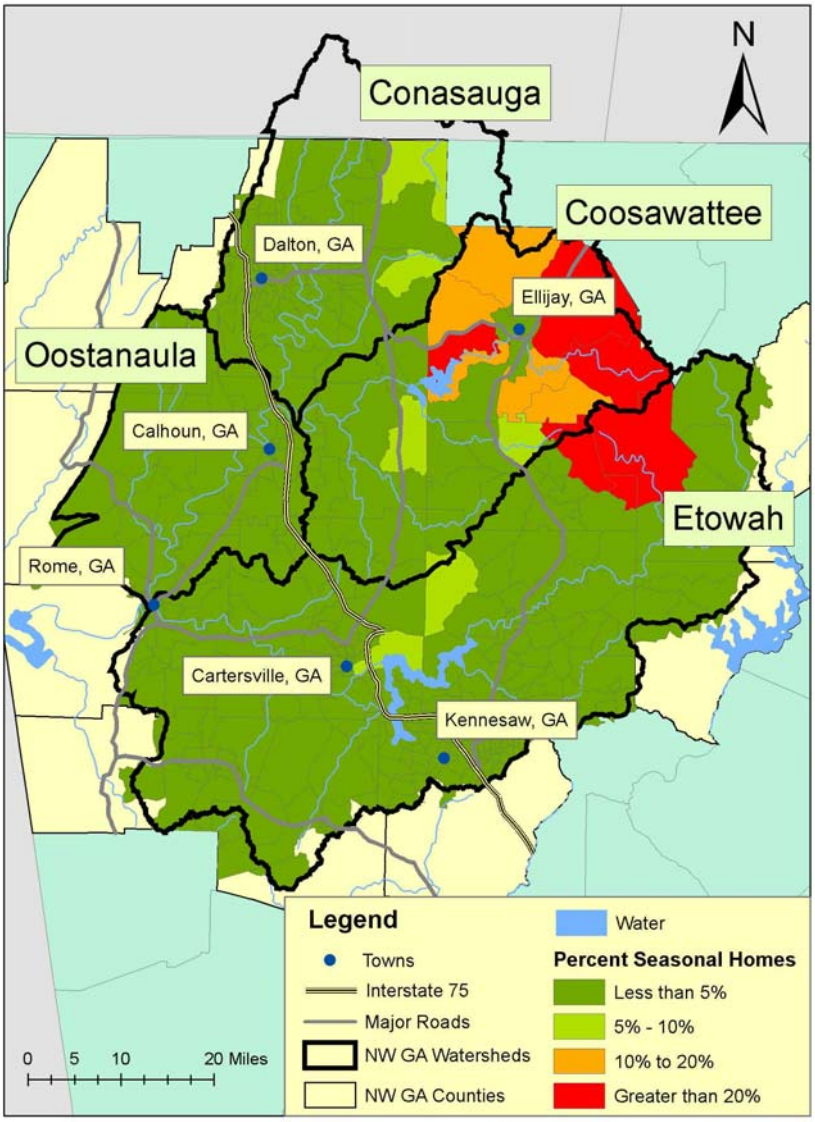

Figure 11—Percentage of housing units identified as being occupied seasonally, 2000. Data source: USDC Census Bureau 2005b.

Commuting Time

Individuals electing to relocate to rural areas often do so at the cost of having an increased commute time to their workplace—which is frequently located in an urban or suburban area. The increased cost of a longer commute is offset by the gains in utility the individual receives from relocating to the rural area (e.g., lower housing prices, proximity to natural resource amenities, larger lot sizes, etc.). Between 1990 and 2000 the average commute time nationally rose from 23.4 minutes to 25.5 minutes (Pisarski 2006). This national increase occurred concurrently with the further expansion of residential housing into rural areas.

Georgia commuters travel approximately 28 minutes to work—a greater average commute time than that found nationally (USDC Census Bureau 2006). The increase in commute times between 1990 and 2000 in Georgia was among the largest in the Nation (Pisarski 2006). Within the case-study area, average commute times for individual counties range from 21 minutes (Whitfield County) to 39 minutes (Paulding County). The average commute time of Paulding County commuters is greater than that found in any other Georgia county (Tinsley and Cude 2003). The number of commuters residing within the case-study watersheds increased 45% between 1990 and 2000. Over the same period, the percentage of commuters in the northwest Georgia watersheds with commute times longer than the 2000 national average (25 minutes or longer) increased by 66%. In 2000, slightly more than 187,000 of the approximately 367,000 commuters within the northwest Georgia watersheds traveled greater than 25 minutes to work (51%).

The percentage of commuters in 1990 and 2000 traveling longer than 25 minutes to work by census block group is depicted in figure 12. In 1990, in many of the rural areas the percentage of commuters traveling longer than 25 minutes to work was less than 50%. In only one location in 1990 did more than 75% of commuters travel 25 minutes or longer to work (fig. 12). In 2000, the number of rural areas with more than 50% of commuters traveling longer than 25 minutes was noticeably greater. In addition, in 2000, there were several rural areas where more than 75% of commuters traveled longer than 25 minutes to work (fig. 12). Those areas with the most identifiable changes in percentages of long commutes may be those currently experiencing the most dramatic increases in residential development. In addition to reflecting the long commutes of new rural residents, changes in rural commute times may also result from changes in the workplace location of long-term rural residents.

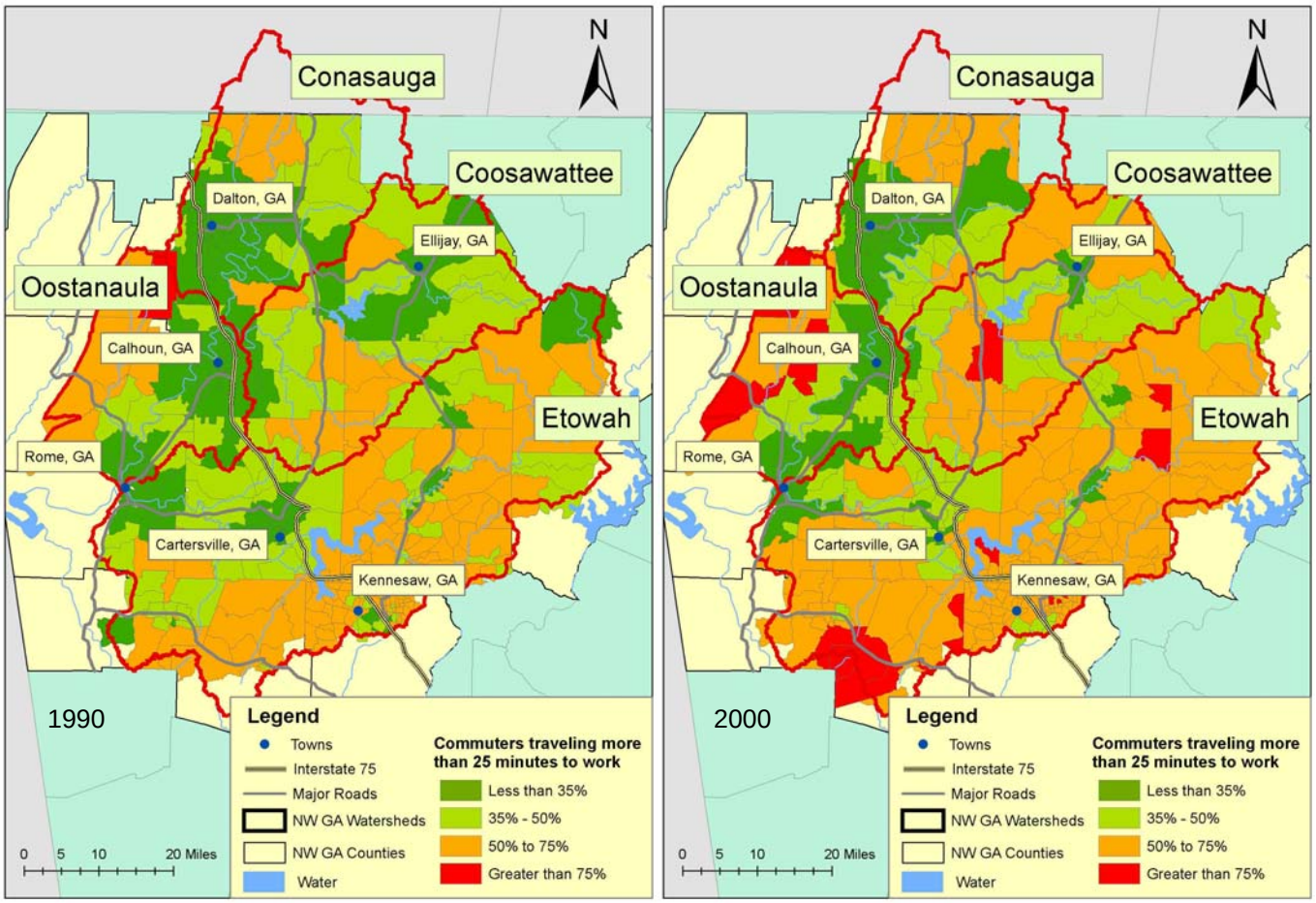

Figure 12—Percentage of commuters with a commute to work of 25 minutes or longer, 1990 and 2000. Data sources: USDC Census Bureau 2005a, 2005b.

Comprehensive Planning

Comprehensive land use plans and the associated zoning regulations form the approximate boundaries of future land use and land use change. Local municipality and county governments in Georgia complete comprehensive plans under the Georgia Planning Act of 1989, as amended, and based upon the minimum standards for local comprehensive planning adopted by the Georgia Department of Community Affairs (DCA). The statewide goals for planning include:

- a growing and balanced economy,
- protection of environmental, natural, and cultural resources,
- provision of infrastructure and services to support efficient growth and development patterns,
- access to adequate and affordable housing for all residents,
- coordination of land use planning and transportation planning to support sustainable economic development, protection of natural and cultural resources, and provision of adequate and affordable housing, and

- coordination of local planning efforts with other local service providers and authorities, neighboring communities, and state and regional plans (Georgia Department of Community Affairs, n.d.a).

Local comprehensive plans in Georgia may be completed jointly or separately for counties and the incorporated cities within those counties. All plans must be updated on a regular basis. Local governments can receive assistance in completing their comprehensive plans from the regional development center serving the governments in the area. Four regional development centers serve the local governments within the case-study area. Draft comprehensive plans must be reviewed by the regional development center serving the local government and the DCA and then formally adopted by the local governments involved.

Georgia's planning framework also allows for regional and statewide planning. Regional plans are completed by the regional development centers. Regional planning provides opportunities "to take a broader planning perspective than taken in local planning, to identify problems and opportunities that are evident from a regional perspective, and to focus on issues that are beyond the abilities of local governments to address" (Georgia Department of Community Affairs, n.d.b.). Regional plans are reviewed by the DCA for consistency with the minimum standards adopted by the DCA.

Current and Projected Residential Development

The current level of residential development differs considerably across the landscape of the northwest Georgia watersheds (fig. 13). The greatest areas of concentrated high-levels of residential development occur in the southern portion of the case-study area within the portion of the Etowah watershed nearest the Atlanta metropolitan area. Residential housing unit densities of greater than 64 units per square mile are also found near towns and along major thoroughfares, as expected. Housing densities of between 16.1 and 64 units per square mile frequently expand outward from urban centers and areas of high housing unit density. The Coosawattee watershed currently has the greatest extent of low housing unit densities. Isolated areas of moderate and high housing unit densities occur throughout the case-study area.

Significant increases in housing unit densities are projected throughout the case-study watersheds (fig. 13). By 2030, much of the Etowah watershed is projected to have housing unit densities greater than 64 units per square mile. Densities of less than 16 housing units per square mile are projected to remain in some areas of the western portion of the watershed. In the Coosawattee watershed, the highest housing unit densities are projected for the area surrounding the town of Ellijay and in the far western portion of the watershed nearest the Interstate 75 corridor. With the exception of the public land areas, nearly the entire Conasauga watershed is projected to have housing unit densities of greater than 16 units per square mile, with much of the watershed having densities of greater than 64 units per square mile. Oostanaula watershed is projected to have the least extensive increases in housing unit density, with projected areas of the

highest housing unit densities occurring in the eastern portion of the watershed, along the Interstate 75 corridor and around the city of Rome, Georgia.

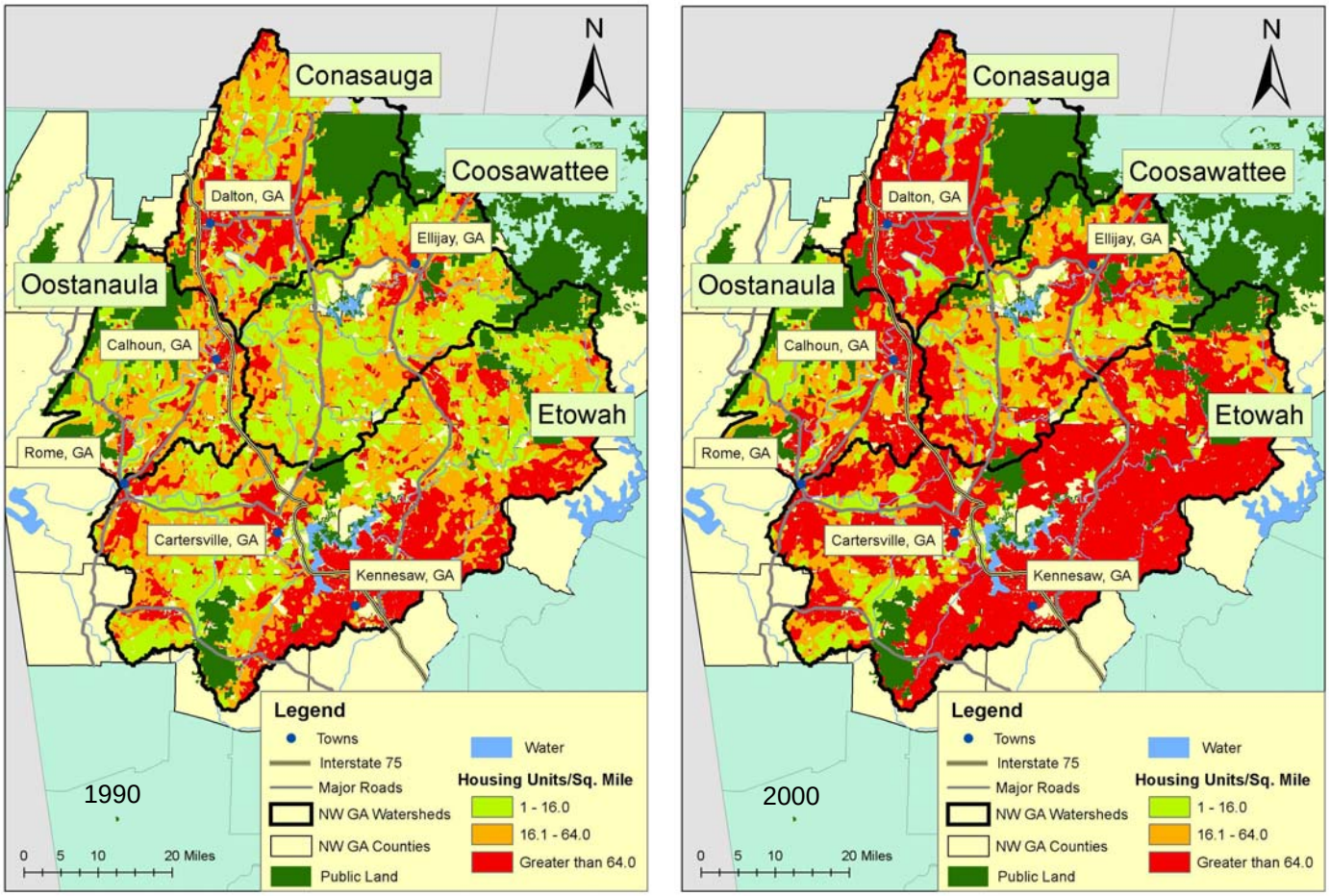

Figure 13—Year 2000 and projected year 2030 housing unit density in northwest Georgia as identified for the USDA Forest Service Forests on the Edge project. Housing data sources: Theobald 2004a, 2004b.

Increases in housing unit density are projected to occur in forested areas throughout the case-study watersheds (fig. 14). The patterns of forest cover and projected residential development suggest that the northeastern and southernmost portions of the Etowah watershed and the southern and northeastern portions of the Coosawattee watershed may experience the greatest residential development pressure on forested land. In both of these watersheds, many of the forested areas projected to experience residential development are located proximate to public lands. Although less extensive than that found in the other watersheds, residential development pressure in the forests of the Conasauga and Oostanaula watersheds also will likely increase between now and 2030.

Figure 14—Forested areas projected to experience increased residential development by 2030. Data sources: Theobald 2004b and U.S. Geological Survey 2003.

Summary

Between 1990 and 2000, the population of Georgia increased from 6.5 to 8.2 million—a 26 percent increase. By 2005, the statewide population was estimated to have increased to 9 million. During the 1990s, the number of housing units in Georgia increased by 700,000 units, reaching 3.3 million in 2000. The population and number of housing units within the case-study watersheds increased at much greater rates than the statewide averages, 51% and 47%, respectively. However, the percentage changes in population

and numbers of housing units differed across the individual case-study watersheds. Percentage changes in both population and housing units in the Etowah and Coosawattee watersheds were approximately 60%, whereas increases were near statewide averages in the Oostanaula watershed and below statewide averages in the Conasauga watershed.

Since 1989, the area of forest and timberland in Georgia has been increasing, reversing a long-time trend of declining forest acreage. These recent gains can primarily be traced to reforestation of agriculture lands located in southern portions of the state. Although total timberland area has increased, the number of timberland acres undergoing conversion to urban and developed uses has been increasing over the last several forest inventory remeasurement periods. Between 1989 and 1997 (the most recent period for which data are available) more than 519,000 acres of timberland was converted to urban or other developed uses. These conversions occurred most frequently in the region of the state surrounding the Atlanta metropolitan area.

Like elsewhere in the U.S., Georgia has experienced changes in timberland ownership patterns in recent decades. Since 1980, the numbers of acres owned by individuals and families and by “other corporations” have steadily increased. The “other corporations” ownership group has experienced the greatest increase, expanding by 160%. Over the same period, the acreage owned by farmers has steadily declined. Beginning in the early 1990s, forest industry in Georgia began divesting landholdings. This divestment has reduced the area of forest industry ownership and led to the increases in the acres of forest owned by other private corporations (including TIMOs and REITs) and, to a lesser extent, by individuals and families. The long-term impact of recent and future divestments of forest industry land on future forest area, timber supply, and land use change in Georgia is largely unknown.

Projected increases in population and the number of housing units are expected to result in expansion of the land area dedicated to residential development within the Georgia case-study watersheds. In particular, substantial increases in the extent of high housing unit density are projected to occur throughout much of the Etowah watershed, the northeast and southern portions of the Coosawattee watershed, and the western half of the Conasauga watershed. Projected housing unit densities indicate significant decreases in the extent of area having the lowest housing unit densities (less than 16 units per square mile). The pattern of projected residential development suggests that forested areas in portions of the Etowah and Coosawattee watersheds will likely face substantial increases in residential development pressure. Many of these forested areas are located proximate to public land. Projected increases in housing unit density are also expected on the less forested areas within Conasauga and Oostanaula watersheds.

Recent trends and projections indicate that residential development in northwest Georgia will continue to increase in the coming decades. Community members and local decision makers will likely be increasingly faced with identifying the role that forests and open space have in the context of the local community’s vision for the future and weighing the benefits of conserving forests and open space versus benefits derived from development. In the process of those analyses, it is important to recognize the products and services

provided by privately owned forests and the impacts that the loss of private forests might have on the local community.

Metric Equivalents

1 foot = 0.305 meters
1 acre = 0.405 hectare
1 acre = 4,046.86 square meters
1 cubic foot per acre = 0.07 cubic meters per acre
1 mile = 1.609 kilometers
1 square mile = 2.59 square kilometers

Citations

Franklin, R.S. 2003. Domestic migration across regions, divisions, and states: 1995 to 2000, Census 2000 special reports. http://www.census.gov/prod/2003pubs/censr-7.pdf. (21 July 2006).

Georgia Department of Community Affairs. [N.d.a]. Standards and procedures for local comprehensive planning "local planning requirements." http://www.dca.state.ga.us/development/PlanningQualityGrowth/programs/downloads/MinimumStandardsAdopted.pdf. (21 July 2006).

Georgia Department of Community Affairs. [N.d.b]. Minimum standards and procedures for regional planning. http://www.dca.state.ga.us/development/PlanningQualityGrowth/programs/downloads/Chapter110-12-6MinimumStandards_Regional.pdf. (21 July 2006).

Johnson, T.G.; Jenkins, A.; Wells, J.L. 1997. Georgia's timber industry—an assessment of timber product output and use, 1995. Resour. Bull. SRS-14. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 37 p.

Johnson, T.G.; Wells, J.L. 2002. Georgia's timber industry—an assessment of timber product output and use, 1999. Resour. Bull. SRS-68. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 40 p.

Johnson, T.G.; Wells, J.L. 2005. Georgia's timber industry—an assessment of timber product output and use, 2003. Resour. Bull. SRS-104. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 46 p.

Kline, J.D.; Alig, R.J.; Garber-Yonts, B. 2004. Forestland social values and open space preservation. Journal of Forestry. 102(8): 39-45.

Pisarski, A.E. 2006. Commuting in America III. National Cooperative Highway Research Program Report 550. Washington D.C.: The National Academies, Transportation Research Board. 196 p.

Prestemon, J.P. 2006. Georgia stumpage prices, 1977-2006. Unpublished data. On file with: Jeffrey Prestemon, USDA Forest Service, Southern Research Station, 3041 Cornwallis Road, Research Triangle Park, NC 27709.

Sheffield, R.M.; Johnson, T.G. 1993. Georgia's forests, 1989. Resour. Bull. SE-133. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 97 p.

Sheffield, R.M.; Knight H.A. 1984. Georgia's forests. Resour. Bull. SE-73. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 92 p.

Stein, S.M; McRoberts, R.E; Alig, R.J; [et al.]. 2005. Forests on the edge: housing development on America's private forest. Gen. Tech. Rep. PNW-GTR-636. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

Theobald, D.M. 2004a. bhc2000 v.1. Environmental Systems Research Institute (ESRI) raster digital data. On file with: David M. Theobald, Natural Resource Ecology Lab, Colorado State University.

Theobald, D.M. 2004b. bhc2030 v.1. Environmental Systems Research Institute (ESRI) raster digital data. On file with: David M. Theobald, Natural Resource Ecology Lab, Colorado State University.

Tinsley, K.; Cude, B. 2003. Georgia, state of the state's housing: Service Delivery Region 1. Athens, GA: Housing and Demographics Research Center, The University of Georgia. 59 p.

Thompson, M.T.; Thompson, L.W. 2002. Georgia's forests, 1997. Resour. Bull. SRS-72. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 41 p.

U.S. Department of Agriculture, Forest Service. 2006. Area of timberland by county and ownership class. Unpublished data. On file with: Richard Harper, USDA Forest Service, Southern Research Station, Forest Inventory and Analysis, 4700 Old Kingston, TN 37919.

U.S. Department of Agriculture, Forest Service and Georgia Forestry Commission. 2006. Forest inventory and analysis fact sheet, 2004. http://srsfia2.fs.fed.us/states/ga/GA%20Factsheet%20(March%202006).pdf. (21 July 2006).

U.S. Department of Agriculture, Natural Resources Conservation Service [USDA NRCS]. 2006. Natural resources inventory: 2003 Annual NRI. http://www.nrcs.usda.gov/TECHNICAL/land/nri03/Landuse-mrb.pdf. (31 October 2006).

U.S. Department of Commerce, Census Bureau. 2001. States ranked by percent population change: 1990 to 2000. http://www.census.gov/population/cen2000/phc-t2/tab03.pdf (20, July 2006).

U.S. Department of Commerce, Census Bureau. 2004a. Historical census of housing tables, vacation homes. http://www.census.gov/hhes/www/housing/census/historic/vacation.html. (26 June 2006).

U.S. Department of Commerce, Census Bureau. 2004b. Table 1: interim projections: ranking of census 2000 and projected 2030 state population and change: 2000 to 2030. http://www.census.gov/population/www/projections/projectionsagesex.html (21 July 2006).

U.S. Department of Commerce, Census Bureau. 2005a. Housing units by census block group, census 1990. Generated by E. White using American Factfinder. http://factfinder.census.gov.

U.S. Department of Commerce, Census Bureau. 2005b. Housing units by census block group, census 2000. Generated by E. White using American Factfinder. http://factfinder.census.gov.

U.S. Department of Commerce, Census Bureau. 2006. State and county quickfacts, Georgia. http://quickfacts.census.gov/qfd/states/13000.html. (11 July 2006).

U.S. Geological Survey. 2003. National land cover database zone 54. Remote sensing image. Generated by E. White using MRLC 2001 Web site dynamic download tool. http://gisdata.usgs.net/website/MRLC/viewer.php.